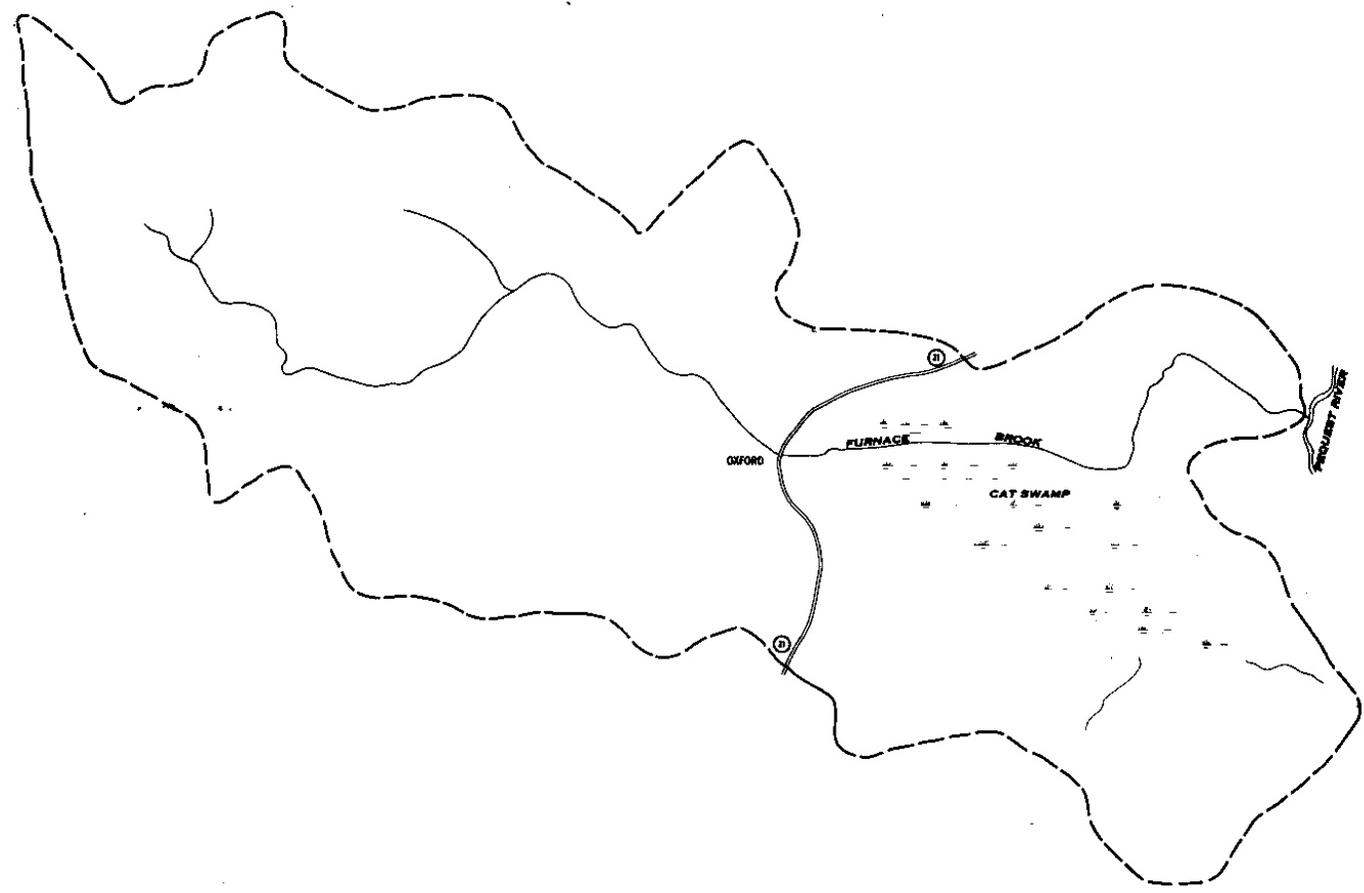


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MANUALLY SIGNED
w/ ~~signature~~
supplements 102

WORK PLAN FURNACE BROOK WATERSHED

WARREN COUNTY, NEW JERSEY



U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

APRIL 1968

Approved for
[unclear] [unclear]
11-53

APPLICATION FOR ASSISTANCE IN PLANNING AND CARRYING OUT WORKS OF IMPROVEMENT
IN NEW JERSEY
UNDER THE
WATERSHED PROTECTION AND FLOOD PREVENTION ACT

(PUBLIC LAW 566 - 83rd Congress)
(Amended PUBLIC LAW 1018 - 84th Congress)

TO THE HONORABLE
THE SECRETARY OF AGRICULTURE
UNITED STATES DEPARTMENT OF AGRICULTURE

The undersigned local organization(s) makes application for Federal assistance under the Watershed Protection and Flood Prevention Act in preparing and carrying out plans for work of improvement for the Furnace Brook watershed.

The following information is submitted in support of the application:

1. Size of watershed: 5,113 acres.
2. Location of watershed:
 - a. State(s) New Jersey
 - b. County(ies) Warren
 - c. Tributary of Pequest River & Then Delaware River
3. Watershed problems:

Flooding of roads, houses, & business areas dating back to 1902.

Future damage to residences, roads & Industry potentially great unless preventive measures are taken.

Damage to Township, County & State culverts, bridges and pipelines.

Sediment damage to Mosquito Control ditches dug during past few years.

Mosquito problem serious in times of high water.

4. Works of improvement believed to be needed:

Floodwater retention (or retentions) in upper reaches.

After retentions, then clean out & straighten channel with proper maintenance.

Upland conservation measures to be applied for erosion control on individual farm or property owner basis.

5. Benefits expected to be achieved:

Elimination of flooding of residences and industrial establishments.

Proper maintenance of channel banks now being eroded away during each heavy storm.

Mosquito control.

Improved wildlife habitat.

Multiple use of retention (permanent pool) for recreation, fish, fire protection, etc.

6. Extent of local participation:

**Sponsored jointly by
Oxford Township & Warren County Soil Conservation District**

Operation & Maintenance of works of improvement by Township

Easement & Right of Way by local people.

Promote land treatment measures for soil & water conservation.

7. Status of local organizations:

All sponsors qualify as required.

Witness the signatures of the undersigned local organization(s) on the dates shown below. (Type or print all information except signature.)

Oxford Twp. Committee, Oxford, N. J.

(Name of Local Organization)
By: (Sig.) James P. Burns
James P. Burns
Title Mayor
Date Nov. 5, 1963

This action authorized at an official meeting on November 4, 1963 at Oxford, N. J.
Attest: (Sig.) Marie M. Beers
(Secretary) Marie M. Beers

Warren County Soil Conservation District, Belvidere, N. J.

(Name of Local Organization)
By: (Sig.) Leonard C. Queitzsch
Title Chairman
Date November 13, 1963

This action authorized at an official meeting on November 13, 1963 at Belvidere, N.J.
Attest: (Sig.) Henry S. Steffan
(Secretary)

Oxford Twp. Planning Board, Oxford, N. J.

(Name of Local Organization)
By: (Sig.) Philip A. Ross
Philip A. Ross
Title Chairman
Date Nov. 5, 1963

This action authorized at an official meeting on November 4, 1963 at Oxford, N. J.
Attest: (Sig.) Marie M. Beers
(Secretary)

Contact: The above local organizations request that all correspondence or contacts pertaining to this application be directed to:

~~XXXXXXXXXX~~ Leonard C. Queitzsch
(Name)

County Court House
(Mail Address)
Belvidere, N. J.

The foregoing application for Federal assistance under the Watershed Protection and Flood Prevention Act is hereby approved.

New Jersey Department of Conservation and Economic Development

By: Allen T. Cottrell
Title: State Forester
Date: 12-18-63

WATERSHED WORK PLAN AGREEMENT

between the

Warren County Soil Conservation District
Local Organization

Oxford Township
Local Organization

New Jersey Division of Fish and Game
Local Organization

(hereinafter referred to as the Sponsoring Local Organization)

State of New Jersey

and the

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

Whereas, application has heretofore been made to the Secretary of Agriculture by the Sponsoring Local Organization for assistance in preparing a plan for works of improvement for the Furnace Brook Watershed, State of New Jersey, under the authority of the Watershed Protection and Flood Prevention Act (Public Law 566, 83d Congress; 68 Stat. 666), as amended; and

Whereas, the responsibility for administration of the Watershed Protection and Flood Prevention Act, as amended, has been assigned by the Secretary of Agriculture to the Service; and

Whereas, there has been developed through the cooperative efforts of the Sponsoring Local Organization and the Service a mutually satisfactory plan for works of improvement for the Furnace Brook Watershed, State of New Jersey, hereinafter referred to as the watershed work plan, which plan is annexed to and made a part of this agreement;

Now, therefore, in view of the foregoing considerations, the Sponsoring Local Organization and the Secretary of Agriculture, through the Service, hereby agree on the watershed work plan, and further agree that the works of improvement as set forth in said plan can be installed in about five (5) years.

It is mutually agreed that in installing and operating and maintaining the works of improvement substantially in accordance with the terms, conditions, and stipulations provided for in the watershed work plan:

1. Except as otherwise provided herein, the Sponsoring Local Organization will acquire without cost to the Federal Government such land, easements and rights-of-way as will be needed in connection with the works of improvement. (Estimated cost \$74,724). The percentages of this cost to be borne by the Sponsoring Local Organization and the Service from P.L. 566 funds are as follows:

| <u>Works of Improvement</u> | <u>Sponsoring Local Organization (Percent)</u> | <u>Service (Percent)</u> | <u>Estimated Cost (Dollars)</u> |
|---|--|------------------------------|---|
| Multipurpose Structure No. 2 and Basic Recreational Facilities | | | |
| Payments to landowners for about 137 acres of land | 50 | 50 | 41,100 |
| Relocation of power line and township road | 100 | 0 | 27,124 |
| Legal fees, surveys and other | 100 | 0 | 1,500 |
| Stream Channel Improvement | 100 | 0 | 5,000 |

2. The Sponsoring Local Organization will acquire or provide assurance that landowners or water users have acquired such water rights pursuant to State law as may be needed in the installation and operation of works of improvement.
3. The percentages of construction costs of structural measures to be paid by the Sponsoring Local Organization and by the Service are as follows:

| <u>Works of Improvement</u> | <u>Sponsoring Local Organization (Percent)</u> | <u>Service (Percent)</u> | <u>Estimated Construction Cost (Dollars)</u> |
|-------------------------------|--|------------------------------|--|
| Multipurpose Structure No. 2 | 27.6 | 72.4 | 179,000 |
| Basic Recreational Facilities | 50 | 50 | 88,435 |
| Stream Channel Improvement | 0 | 100 | 61,170 |

4. The percentages of the cost for installation services to be borne by the Sponsoring Local Organization and the Service are as follows:

| <u>Works of Improvement</u> | <u>Sponsoring Local Organization (Percent)</u> | <u>Service (Percent)</u> | <u>Estimated Installation Service Cost (Dollars)</u> |
|-------------------------------|--|------------------------------|--|
| Multipurpose Structure No. 2 | 0 | 100 | 66,950 |
| Basic Recreational Facilities | 90.9 | 9.1 ^{1/} | 22,000 |
| Stream Channel Improvement | 0 | 100 | 24,837 |

^{1/} For review and approval of designs, and for periodic inspection of construction to insure conformance to designs and specifications.

5. The Sponsoring Local Organization will bear the costs of administering contracts. (Estimated cost \$1,600.)
6. The Sponsoring Local Organization will provide assistance to landowners and operators to assure the installation of the land treatment measures shown in the watershed work plan.
7. The Sponsoring Local Organization will encourage landowners and operators to operate and maintain the land treatment measures for the protection and improvement of the watershed.
8. The Sponsoring Local Organization will obtain agreements from owners of not less than 50 percent of the land above the reservoir that they will carry out conservation plans on their land.
9. The Sponsoring Local Organization agrees that all land purchased with P.L. 566 assistance will not be sold or otherwise disposed of for the evaluated life of the project except to a public agency which will continue to maintain and operate it as a public recreational development in accordance with the Operation and Maintenance Agreement.
10. The Sponsoring Local Organization will be responsible for the operation and maintenance of the structural works of improvement by actually performing the work or arranging for such work in accordance with agreements to be entered into prior to issuing invitations to bid for construction work.
11. The costs shown in this agreement represent preliminary estimates. In finally determining the costs to be borne by the parties hereto, the actual costs incurred in the installation of works of improvement will be used.

12. This agreement does not constitute a financial document to serve as a basis for the obligation of Federal funds, and financial and other assistance to be furnished by the Service in carrying out the watershed work plan is contingent on the appropriation of funds for this purpose.

Where there is a Federal contribution to the construction cost of works of improvement, a separate agreement in connection with each construction contract will be entered into between the Service and the Sponsoring Local Organization prior to the issuance of the invitation to bid. Such agreement will set forth in detail the financial and working arrangements and other conditions that are applicable to the specific works of improvement.

13. The watershed work plan may be amended or revised, and this agreement may be modified or terminated, only by mutual agreement of the parties hereto.
14. No member of or delegate to Congress, or resident commissioner, shall be admitted to any share or part of this agreement, or to any benefit that may arise therefrom; but this provision shall not be construed to extend to this agreement if made with a corporation for its general benefit.
15. The program conducted will be in compliance with all requirements respecting nondiscrimination as contained in the Civil Rights Act of 1964 and the regulations of the Secretary of Agriculture (7 C. F. R. Sec. 15. 1-15.13), which provide that no person in the U. S. shall, on the ground of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any activity receiving Federal financial assistance.

Warren County
Soil Conservation District
Local Organization
By William Shover
Title Chairman
Date 1-18-68

The signing of this agreement was authorized by a resolution of the governing body of the WARREN COUNTY, N.J. SOIL CONSERVATION DISTRICT Local Organization adopted at a meeting held on JAN. 18, 1968

Harry Esposito
(Secretary, Local Organization)
Date JAN 18, 1968



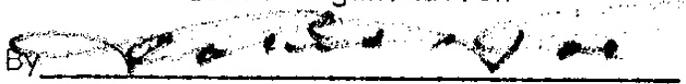
Oxford Township
Local Organization
By Stephan Koval
Title Mayor
Date Jan. 16, 1968

The signing of this agreement was authorized by a resolution of the governing body of the Twp of Oxford Local Organization adopted at a meeting held on January 16, 1968

Maie M. Beers
(Secretary, Local Organization)
Date Jan. 16, 1968

**DEPARTMENT OF CONSERVATION AND
ECONOMIC DEVELOPMENT**

New Jersey Division of Fish and Game
Local Organization

By 

Title Commissioner

Date 2/7/68

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

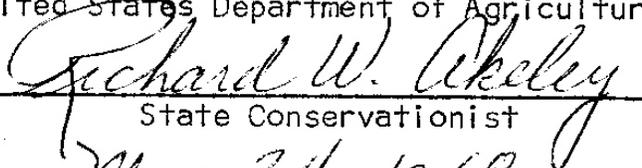
Local Organization

adopted at a meeting held on _____

(Secretary, Local Organization)

Date _____

Soil Conservation Service
United States Department of Agriculture

By 

State Conservationist

Date May 24, 1968

WATERSHED WORK PLAN
FURNACE BROOK WATERSHED
WARREN COUNTY

Prepared under the authority of the
Watershed Protection and Flood Prevention Act
(P. L. 566, 83d Cong., 68 Stat. 666 as amended)

Prepared by:

The Warren County Soil Conservation District
Oxford Township
New Jersey Department of Conservation and Economic Development
(Division of Fish and Game)

Assisted by:

United States Department of Agriculture
Soil Conservation Service
Forest Service

January 1968

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SUMMARY OF PLAN

The Furnace Brook Watershed is located in Warren County, New Jersey, about 5 miles southeast of Belvidere. It has a drainage area of 4,968 acres.

The Warren County Soil Conservation District, the N.J. Department of Conservation and Economic Development (Division of Fish and Game), and Oxford Township are the sponsoring local organizations.

The greatest flood recalled by local residents occurred in July, 1896. Floods occurred 3 times during July and August of 1945, causing damages to residential, commercial and industrial property.

There is a great need for recreational facilities. This watershed is within 40 miles of the more densely populated areas of the state. It has real opportunities for recreation.

A comprehensive plan for reduction of floodwater damages and development of recreation in the Furnace Brook Watershed has been developed by the sponsors, assisted by the U.S. Soil Conservation Service and the U.S. Forest Service. The N.J. Bureau of Forestry participated in development of the plan. Federal agencies consulted were the Extension Service and the Agricultural Stabilization and Conservation Service.

This plan provides for installation of conservation land treatment measures, one multipurpose flood prevention-recreation reservoir, including basic recreational facilities, and 0.3 mile of stream channel improvement. The stream channel improvement will supplement the floodwater retarding structure to provide the desired degree of protection. They are scheduled to be installed over a period of 5 years. The estimated installation cost is \$597,688, of which \$355,269 are Public Law 566 costs and \$242,419 other costs.

The estimated cost for land treatment measures is \$78,972, of which \$73,112 will be borne by other funds. The Public Law 566 share of \$5,860 is to be used entirely for accelerated technical assistance. Of this, \$1,760 will be provided by the Soil Conservation Service and \$4,100 by the U.S. Forest Service.

The installation cost of the structural measures is estimated at \$518,716, of which \$349,409 will be paid from Public Law 566 funds and \$169,307 from other funds. The installation cost includes \$74,724 for land, easements and rights of way, of which \$20,550 will be paid from P.L. 566 funds, and the remaining \$54,174 from other funds. It also includes \$1,600 for administration of contracts, payable from other than P.L. 566 funds.

The multipurpose floodwater retarding-recreation reservoir will control about 61.4 percent of the drainage area above the damage reach.

It will have storage capacity for 507 acre feet of floodwater and 622 acre feet for recreation. The area of the permanent pool will be 53 acres.

The present average annual floodwater damage in Oxford is \$26,166. With the project installed damages from the 100 year frequency storm will be virtually eliminated.

Recreation benefits are estimated at \$27,750 annually.

The ratio of average annual benefits from structural measures to average annual costs is \$58,399 to \$26,879, or 2.2 to 1.

The Township of Oxford, assisted by the Department of Conservation and Economic Development, will assume responsibility for the non-Federal share of construction costs of the reservoir and basic recreational facilities, and the installation services costs of recreational facilities. The Township will provide the land, easements and rights of way for stream channel improvements, relocation of the power line and road in the recreational development, and the non-Federal share of land acquisition costs. It will also administer contracts.

Technical assistance for operation and maintenance of forest land treatment measures will be provided by the New Jersey Bureau of Forestry in cooperation with the U.S. Forest Service through the Cooperative Forest Management Program. Other land treatment measures will be operated and maintained by landowners and operators under agreements with the Warren County Soil Conservation District.

Oxford Township will assume responsibility for operation and maintenance of structural measures. This is estimated at \$5,752 annually, of which \$4,923 is for recreation.

DESCRIPTION OF THE WATERSHED

Physical Data

The Furnace Brook Watershed lies in the rough steep terrain of northwestern New Jersey. It has a drainage area of 4,968 acres, much of it in forest land.

Furnace Brook has its headwaters in White and Washington Townships. It flows in a northeasterly direction for about 6 miles, outletting into the Pequest River at a point about 7 miles upstream from Belvidere. Furnace Brook has a gradient of 85 feet per mile from the headwaters to the swamp below Oxford, where it flattens out to about 16 feet per mile.

Elevations in the watershed range from 1,200 feet above sea level in the headwaters to 420 feet at the Pequest River.

The swamp immediately below Oxford covers an area of about 400 acres. The soil is muck which, until the early 1900's was intensively

farmed. Nearly half of the swamp is now owned by a textile dye industry and contains settling basins for the used dye. Even though the swamp was recently drained for mosquito control, it is unlikely that it will revert to agricultural use.

Domestic water supplies are obtained from wells and springs. The supply is adequate for this need. The dye industry takes water from the brook as well as from wells.

The average annual precipitation is 49 inches, distributed quite evenly throughout the year. The mean annual temperature is 52 degrees, ranging from 30 degrees in January to 73 in July. The frost free period averages generally from early May to mid-October.

Approximately 41 percent of the watershed is in forest cover. It has been determined that 4 percent of the forest land is in poor hydrologic condition, 54 percent fair, 29 percent good and 13 percent in very good condition. Fire, overcutting, damaging logging and grazing in the past have contributed to the relatively poor hydrologic conditions of some of the forest land.

Economic Data

The major farm enterprise in the Furnace Brook Watershed is dairying. Most of the farming is done on 6 farms averaging 130 acres each. All have basic conservation plans. With the exception of about 600 acres owned by industries, most of the remaining land is broken up into small parcels ranging from 3 to 100 acres. Some of this land is leased to neighboring farmers. Many of these are serviced through the Warren County Soil Conservation District and some have basic conservation plans. There is no Federally owned land in the watershed.

Principal agricultural crops grown are silage corn, small grain, hay and pasture, all consumed on the farm. Milk produced on these farms is marketed in the New Jersey-New York milkshed.

Hardwood stands occupy 98 percent of the forest land. They consist mainly of the red oak, chestnut oak, northern hardwood and cove hardwood types, with associates of black birch, hickory, pin oak, aspen and red maple. The remaining 2 percent consists of mixed coniferous plantations. About 21 percent of the forest stands are of sawtimber size, 71 percent in pole size stands, and 8 percent in stands of seedling and sapling size.

Almost all of the forest land is in private ownership, half of which is in small holdings. There are two large holdings of 500 or more acres.

Adequate forest fire protection is provided by the New Jersey Bureau of Forestry in cooperation with the U.S. Forest Service through the Clarke-McNary Cooperative Fire Control Program. As the average annual burn during the past five years has not exceeded the established fire loss index goal, intensification of fire control measures beyond

the going program is not anticipated. Other current Federal-State forestry programs include Cooperative Forest Management, Cooperative Forestation, and Cooperative Insect and Disease Control. Given protection, care and management, the forest stands are expected to contribute to the future recreational development and general economy of the area.

The unincorporated village of Oxford has 2 industrial plants. One produces hardware tools and the other is a textile dye works. These industries employ approximately 300 people.

The Oxford iron mines are located in this watershed. After almost 300 years of continuous operations, the mines were closed in 1964. They employed about 90 people. The mines have a historical significance in that ore produced was used in the manufacture of cannon balls during the Revolutionary War. The State has plans to renew the old blast furnace for a historical monument.

The population of the watershed is approximately 1,600, 70 percent of which is concentrated in the village of Oxford. In addition to local employment, residents commute to their employment in New York City; metropolitan New Jersey; Easton, Pennsylvania; and other nearby towns.

The area has excellent highway facilities. N.J. Highway 31 passes through the watershed connecting U.S. Routes 22 and 46, which lead directly to metropolitan New Jersey and New York. Commercial transportation is provided primarily by trucking companies.

The Delaware Lackawanna and Western Railroad operates on a very limited schedule through the watershed.

The following table shows the land use within the watershed:

| <u>Land Use</u> | <u>Acres</u> | <u>Percent</u> |
|----------------------------|--------------|----------------|
| Cropland | 546 | 11 |
| Pasture | 525 | 11 |
| Forest Land | 2,036 | 41 |
| Idle | 1,549 | 31 |
| Other (Urban, Roads, Etc.) | 312 | 6 |
| TOTAL | 4,968 | 100 |

The trend is toward much of the idle land reverting to forest land, either by planting or by natural reproduction, and to urban use.

Geologic and Soils Data

Furnace Brook is in the Highlands Physiographic Province. The

watershed slopes are steep and rough. The soils are loams and gravelly loams, which have major limitations to cultivation. Some soils have major limitations to even grazing and woodland uses.

WATERSHED PROBLEMS

Land Use Problems

Farms in this watershed are low producing compared to the rest of the county. With the exception of a very few, they are too small to be efficient operating units. Their income is supplemented by income from outside activities. Only about 22 percent of the land in the watershed is in cropland and pasture. The remainder is in forest land, idle and other uses. Many of the fields are small, making it difficult to apply conservation practices. Operators of the few efficient farm units are dependent upon leasing additional land from others. There is little incentive on the part of either the owner or the operator of small parcels to apply permanent type land treatment measures.

With the increased demand for recreation, landowners will be motivated to conversion of land to recreational use as a source of income.

Floodwater Damage

Floods are caused primarily by flash storms occurring during the summer months. Most of the damages occur from the large infrequent floods. Major damaging storms occurred three times during July and August of 1945, and again in August 1955. The greatest storm recalled by local residents was that of July 1896, when a bridge washed out and the Post Office was washed away and deposited in a meadow several hundred feet downstream.

Damageable property includes 13 residences and 2 public buildings, valued at \$143,000; 12 commercial establishments, having gross receipts of \$485,000; and one industry, having a weekly payroll of \$11,000. Other damageable property includes roads and bridges.

Erosion and Sediment Damage

Stream bank erosion is generally a minor problem. Normal sheet erosion averages only one ton per acre per year. However, during major floods sediment contributes materially to urban property damage.

Problems Relating to Water Management

Water Supply

Domestic water supplies are obtained from wells and springs. The supply is adequate for current needs.

Recreation

The Furnace Brook Watershed is within 40 miles of the more densely populated areas of New Jersey. There is a great need to provide

recreation for these people. Although there are numerous lakes in the area northwest of this watershed, most are in private ownership and not accessible to the public.

Existing public recreational facilities in the area include the following:

1. Jenny Jump Forest, located in Warren County, 5 to 10 miles from the watershed. In two areas, facilities include those for camping and picnicking.
2. Worthington Forest, located along the Delaware River in Warren County, about 20 miles from the watershed. This has facilities for camping, swimming, boating, fishing and picnicking.
3. Stokes Forest. This is in Sussex County, about 50 miles from the watershed. Facilities include camping, swimming, fishing and picnicking.
4. Swartswood State Park, in Sussex County, about 40 miles from the watershed.
5. Stephens State Park, in Warren and Morris Counties, 15 miles from the watershed.
6. Hackle-Barney State Park, Morris County, about 25 miles away.
7. Voorhees State Park, Hunterdon County, about 15 miles away.

Of the above, only Stokes Forest and Worthington Forest have water related recreational facilities. They cannot begin to satisfy the needs of the public.

PROJECTS OF OTHER AGENCIES

This project is within the Delaware River Basin. The water resources of the Basin are administered by the Delaware River Basin Commission. This is an interstate-Federal compact commission, consisting of a Federal representative appointed by the President and the Governors of Pennsylvania, New York, New Jersey and Delaware. The Commission is charged with adoption and operation of a single comprehensive plan for immediate and long-range development and uses of the water resources of the Delaware River Basin. Measures included in this plan will become a part of the Delaware River Basin Commission's Comprehensive Plan before installation begins.

BASIS FOR PROJECT FORMULATION

A major objective of the sponsors is protection of residential, commercial and industrial property from floodwater damages. It was mutually agreed by the sponsors and the Soil Conservation Service to

develop a project that would provide as close to 100 percent protection from the 100 year storm as is economically feasible.

The sponsors also recognized a need for public recreation in this area. Hence, the availability of sites for multiple-purpose development was a prime consideration. It was mutually agreed to provide as large a recreation reservoir as possible without necessitating the relocation of major roads or purchase of private dwellings.

Sites closer to the damage area were considered but discarded when preliminary site investigations indicated excessively high construction costs. To achieve floodwater reduction benefits by stream channel improvement in lieu of floodwater retarding structures was considered impractical, since it would require costly replacement of bridges and would produce adverse effects downstream.

The combination of upstream reservoir and stream channel improvement will provide the degree of flood protection desired by the sponsors and will provide for their recreational needs.

The development of good, efficient land use is the major objective of the sponsors. They will work with other agencies and groups in attaining this objective, with particular emphasis on establishment of income producing recreation enterprises.

WORKS OF IMPROVEMENT TO BE INSTALLED

Land Treatment

The land treatment included in this plan is in accord with the long range plans of the Warren County Soil Conservation District and Oxford Township. The treatment is a key unit in the plan, since the achievement of maximum stability in erosion and runoff in the upper portion of the watershed is basic to the efficient functioning of the structural measures, and is an essential factor in the success of the project. Interdependent land treatment measures designed to alleviate flood and sediment problems and improve the area, will be employed to adequately treat the planned areas and meet established goals. They will also contribute to the improvement, preservation and optimum utilization of watershed resources.

Forest land makes up 41 percent of the watershed and is the major land use. The forestry program, developed from a statement of land treatment needs prepared by the New Jersey Bureau of Forestry and the U.S. Forest Service, provides for 145 acres to be adequately treated with forestry measures during the project installation period. Tree planting, skid trail and logging road erosion control, and hydrologic cultural operations are the planned program measures that will be applied on forest land. Tree planting, reforestation of open land, is necessary to adjust to land use capability and to reduce runoff and erosion by developing a protective cover and an absorbent forest floor of litter and humus. Hydrologic cultural operations, including weeding,

thinnings, improvement, release and harvest cutting, are aimed at improving hydrologic conditions by manipulation of stand composition to create favorable conditions for maximum production and protection of litter, humus and forest cover. Erosion control measures applied to skid trails and logging roads are necessary to reduce runoff, erosion and sedimentation. This will be accomplished by diverting runoff with simple water bars at specified intervals and by sowing forest grasses in combination with wildlife food species on disturbed areas. Individual management plans will be prepared for approximately 20 forest landowners, involving 1,000 acres, outlining practical measures to be applied in the immediate future to maintain and improve the hydrologic condition of their forest land.

The accelerated land treatment for cropland, grassland and the other areas was developed from needs and goals determined by the Warren County Soil Conservation District with assistance from the Soil Conservation Service. Conservation treatment measures such as conservation cropping systems, crop residue use, cover cropping, diversions, contour farming and strip cropping will be used in combination to adequately treat cropland. Pasture and hayland renovation and proper pasture use will be used to treat grassland. Recreation enterprises will be developed from land currently in forest, crop, pasture and idle use. Applicable measures include recreation access roads, area stabilization, recreation area planting, recreation area pruning and thinning, recreation area land grading and shaping, recreation trails and walkways, pipelines, and ponds. Accelerated technical assistance will be provided by the Soil Conservation Service through the Warren County Soil Conservation District to landowners for the development of 16 basic conservation plans, 15 basic plan revisions and the application of land treatment measures.

Structural Measures

One multipurpose flood prevention-recreation site will be constructed on Furnace Brook approximately one mile upstream from Oxford. This site has a drainage area of 2.87 square miles and controls 61.4 percent of the drainage area contributing to the damage reach in Oxford. The sediment storage requirement is 31 acre feet based on a 50 year accumulation. The recreation pool will have a surface area of about 53 acres and a maximum depth of 35 feet. The principal spillway will consist of a two stage riser and a 30 inch diameter pipe. The low stage will have an 11 CSM release rate and the high stage will have a release rate of 50 CSM. A total of 3.18 inches of runoff will be stored between the low stage of the principal spillway and the crest of the emergency spillway. The emergency spillway will be 500 feet wide and cut in earth. The maximum height of the dam will be 51.5 feet and will contain 164,700 cubic yards of earth fill. The estimated installation cost of the dam is \$300,486.

The Jersey Central Power and Light Company has a power line crossing the site of the permanent pool. Costs for modification consist of relocating the line to one side of the pool. About 700 feet of White Township Road will be relocated.

About 137 acres of land will be purchased. This includes 53 acres for the recreation pool, another 15 acres for floodwater storage and 69 additional acres for the dam and spillway, recreational facilities, access road and public access around the perimeter of the reservoir.

Recreation facilities will be capable of handling an expected peak load of 400 visitors. In addition to an access road, there will be facilities for swimming, boating, trout fishing and picnicking. Provisions will be made for parking, sanitation, water supply and electric power. About 4400 feet of 2-lane gravel road, starting from Washington Avenue, will provide access to the recreational development. The parking lot, consisting of 100 spaces, will have a rock base with gravel surface. The beach will consist of 6 inches of sand over an area of about 400 x 100 feet. Boat launching facilities will consist of a single lane gravel surface ramp and turn around area. The bathhouse, a 20 x 30 foot concrete structure, will include a 6-unit sanitary facility. Additional sanitary facilities will consist of a concrete block shelter with chemically treated replaceable tanks, and a 4000 gallon septic tank. A well, pump, outlets and about 500 feet of pipe line for distribution will provide water supply. About 2000 feet of line with poles are needed to distribute power where needed. About 3000 feet of fence along the toe of slope of the dam, along Buckley Avenue and along the west side of the recreational development adjacent to private dwellings are needed to control access. Other facilities include a 20 foot long floating boat dock, a diving platform consisting of a float and board, a 40 x 50 foot picnic shelter with concrete floor, 30 heavy wood picnic tables, 15 metal grill fire rings, a concrete block incinerator and appropriate signs and markers. See Table 2B for details of quantities and costs of recreational facilities. The estimated installation cost of recreation facilities is \$126,623.

The floodwater retarding structure will be supplemented by stream channel improvement. The peak discharge from a 100 year frequency storm will be essentially contained within the channel banks throughout the damage reach by the floodwater retention structure and channel improvement combination.

Stream channel improvement will extend from the D. L. & W. Railroad north of town to just downstream from the Washington Avenue bridge (Station 99+70 to 82+10), a distance of 0.3 mile. The channel between the railroad bridge and Route 31 will be an earth channel with a 30 foot bottom width and 2:1 side slopes. The Route 31 bridge floor will be paved with reinforced concrete and the abutments underpinned where necessary. Detailed investigations will be conducted during the final design stage to determine the exact amount of underpinning that will be required.

The channel between Route 31 and the Washington Avenue bridge will have a bottom width of 18 feet, 2:1 side slopes and a 0.9 percent grade. Because of the high velocities which develop in this reach, the channel bottom and banks will be lined with riprap. Between Route 31 and the railroad bridge vegetative covering of the banks will be established by seeding. In disposing of spoil, low areas along the north bank will be

raised. The estimated installation cost of the stream channel improvement is \$91,607.

Figure 1 shows a plan view of the recreational development; Figure 2, a cross sectional view of the dam and spillway; and Figure 3, cross sectional views of the channel improvement and spoil disposal. See the Project Map for location of structures, and Tables 1, 2, 2B, 3 and 3A for details of quantities, costs and design features of structural measures.

EXPLANATION OF INSTALLATION COSTS

Land Treatment Measures

Costs for installation of land treatment measures were based on current costs for rental of contract equipment and farm labor, equipment and materials.

Costs for technical assistance in installation of land treatment measures under supervision of the Soil Conservation Service were based on analysis of Work Unit records. Costs of technical assistance for the installation of forest land treatment measures are based on actual expenditures and accomplishments of the New Jersey Bureau of Forestry. An analysis of cost against accomplishments was made for each measure to determine unit cost.

Structural Measures

Construction costs for structural measures, including underpinning of bridge abutments, were based on calculated quantities of the major bid items and estimated unit costs obtained from recent bid prices for similar construction items in this area. Estimated construction costs include an allowance of 12 percent for contingencies.

The cost estimate for minimum basic recreational facilities was made by the Oxford Township Committee assisted by the Soil Conservation Service.

Installation services include costs for geological investigations, engineering services, final designs, supervision and inspection, and administrative overhead.

The estimated cost for geological investigations was based on estimates of time and equipment rental rates, and on laboratory test rates. Costs for engineering surveys, designs, and supervision and inspections were based on estimates of man days to complete this phase of installation, using cost records for similar work done in the past as a guide. Administrative costs were based on records kept by the state fiscal office for previous jobs. Installation services costs thus computed amount to 34.6 percent of construction cost estimates.

The estimated cost for administration of contracts was obtained from the local contracting organization, based on past experience.

Land rights costs for stream channel improvement measures were based on land values provided by the local tax assessor.

Land rights costs associated with the recreational development include \$25,124 for relocation of power line and \$2,000 for relocation of a township road. These costs were estimated by the power company and township officials, respectively, and will be paid from other than Public Law 566 funds. Also included are \$41,100 for about 137 acres of land for the reservoir and recreational facilities, to be cost shared 50-50 between Public Law 566 and other funds. Land values were obtained from the local tax assessor. Legal fees, estimated by township officials at \$1,500, will be borne by other than Public Law 566 funds.

Installation costs for the multipurpose structure were allocated to each purpose by the "Use of Facilities" method. The allocation to flood prevention amounts to 26.0 percent and to recreation 74.0 percent.

The P.L. 566 share of the amount of installation cost of structural measures allocated to flood prevention is 97.0 and to recreation 48.4 percent.

The construction cost of basic recreational facilities, estimated at \$88,435, will be cost shared 50-50 between Public Law 566 and other funds. The installation services costs are estimated at \$22,000, of which the P.L. 566 share is \$2,000. The P.L. 566 share represents the cost of review and approval of designs, and periodic inspection of construction to insure conformance to designs and specifications. The local share of \$20,000 is for surveys, designs, preparation of specifications, letting contracts, supervision of construction and inspections.

The following is the proposed schedule of obligations:

| Year | Structural Measures | | Land Treatment | |
|-------|---------------------|-----------|----------------|----------|
| | P.L. 566 | Other | P.L. 566 | Other |
| 1st | \$ 36,200 | \$ 30,124 | \$1,500 | \$10,000 |
| 2nd | 97,837 | 34,050 | 1,200 | 20,000 |
| 3rd | 207,382 | 105,133 | 1,200 | 20,000 |
| 4th | 7,990 | | 1,200 | 20,000 |
| 5th | | | 760 | 3,112 |
| Total | 349,409 | 169,307 | 5,860 | 73,112 |

EFFECTS OF WORKS OF IMPROVEMENT

The proposed structures will provide virtually complete protection to the damage area in Oxford from the 100 year frequency storm. Floodwater reduction benefits will accrue to 13 residences, 12 commercial establishments, 2 public buildings and one industry, affecting about 250 individuals and weekly payrolls of \$14,000. Roads and bridges will be protected from floodwater damages.

Under present conditions the 100-year storm inundates 10 acres in the center of Oxford. With the project installed all of this flooding will be eliminated.

This is one of the most scenic parts of the state, with its hills, woods, streams and attractive rural country side. It is located about 20 miles from the proposed Delaware Water Gap National Recreation Area. This watershed is in the midst of many attractive trout streams, stocked by the New Jersey Division of Fish and Game. These are heavily used by fishermen, to the extent of being over crowded at times. The proposed multipurpose reservoir will supplement the recreational values already present in this area. Facilities will be provided for fishing, boating, picnicking and skating. Trout fishing will be the type provided, primarily rainbow and brown. It is estimated that the recreational development will attract 20,000 visitor days annually. Most of the recreational use will take place between the latter part of May and early September. Some activities, however, will take place throughout the year. The fishing season extends from about mid April to the end of February.

It is believed that the public recreational improvement will induce landowners both within and adjacent to the watershed, to convert some of their land to private recreational use. This, in turn, will result in greater family farm income and efficiency of operation.

The entire local economy will be enhanced by the increased business brought in by vacationers and by local residents in the area who come to utilize the recreational facilities. Local labor equipment and materials will be utilized in construction and maintenance of structural measures and private recreation enterprises.

PROJECT BENEFITS

Floodwater and associated sediment damages to industrial, commercial, and residential property in Oxford will be reduced \$26,166 annually. Of these benefits, \$25,644 are attributed to structural measures and \$522 to land treatment measures. Benefited are one industry, 12 commercial establishments, 13 residences, and 2 public buildings.

Recreation benefits of \$27,750 annually are based on 20,000 visitor days per year.

The \$25,644 average annual flood damage reduction benefits from structural measures include \$22,299 direct and \$3,345 indirect benefits. Indirect benefits result from reduction of losses associated with detouring traffic and otherwise upsetting daily routine. Secondary benefits estimated at 10 percent of the direct primary benefits, are expected to accrue within the zone of influence of the project. These include additional economic activities of buyers, shippers and suppliers of the additional goods and services made possible by the project. They are not included in project justification. Secondary benefits from a national viewpoint were not considered pertinent to the evaluation. Redevelopment benefits were not evaluated.

COMPARISON OF BENEFITS AND COSTS

Average annual primary benefits from all structural measures are estimated at \$53,394. Average annual costs are estimated at \$26,879 giving a benefit-cost ratio of 1.9 to 1.

Average annual benefits including local secondary benefits from all structural measures are estimated at \$58,399, as compared to average annual costs of \$26,879, a benefit-cost ratio of 2.2 to 1.

See Table 6 for details on benefit-cost computations.

PROJECT INSTALLATION

The Warren County Soil Conservation District will cooperate with landowners and operators in carrying out the accelerated land treatment program over a period of 5 years. Technical assistance will be provided by the Soil Conservation Service to District Cooperators for planning and installation of those measures for which the Soil Conservation Service is responsible. The New Jersey Bureau of Forestry, in cooperation with the U. S. Forest Service, will provide technical assistance for installation of the forest land measures. At least 50 percent of the agricultural land in the drainage area of the proposed reservoir will be under cooperative agreement with the Soil Conservation District prior to initiation of construction.

The Warren County Soil Conservation District will coordinate the activities of Federal, State and local agencies and groups in accomplishing the installation of planned land treatment measures during the installation period of the project. Concerned agencies and groups include the following:

1. The U. S. Soil Conservation Service, which provides technical assistance to landowners and operators for installation of land treatment measures.
2. The U. S. Forest Service and the N. J. Bureau of Forestry, which cooperatively provide technical assistance to landowners and operators for installation of forest land treatment measures.

3. The Agricultural Stabilization and Conservation Service which, through the County Committee, provides financial assistance to landowners and operators for installation of land treatment measures.
4. The Farmers Home Administration, which provides soil and water conservation loans to eligible landowners requesting them.
5. The N.J. Agricultural Extension Service, which provides information and education assistance to landowners and operators.
6. The N.J. Division of Fish and Game, which provides technical assistance and fish and plant materials to landowners and operators.
7. The Oxford Township Committee.

Prior to the start of each year of the installation period the Warren County Soil Conservation District will meet with representatives of the concerned agencies and groups to develop land treatment goals and assign responsibilities for reaching the goals. Particular attention will be given to information and education activities needed to motivate landowners and publicize information. Consideration will be given to newspaper articles, newsletters, radio broadcasts, group meetings and individual contacts.

The Soil Conservation Service will provide technical assistance in the design of the multipurpose reservoir and stream channel improvement measures, preparation of construction drawings and specifications, supervision of construction, preparation of contract payment estimates, final inspection, execution of certificates of completion, and performance of related activities in the establishment of the planned structural measures. The Service will review and approve designs for recreational facilities, and make periodic inspections during construction to insure conformance to designs and specifications.

Oxford Township will take the responsibility for providing the non-Federal share of construction costs of the reservoir and recreational facilities, and of the installation services costs of recreational facilities. In these they will be assisted by the New Jersey Department of Conservation and Economic Development. Oxford Township will acquire the necessary land, easements and rights of way. These include easements for stream channel improvements, relocation of the Jersey Central Power and Light Company transmission line, relocation of about 700 feet of public road, acquisition of about 137 acres of land, and legal fees associated with the purchase. Oxford Township has the power of eminent domain and will use such power, if necessary, to acquire the needed land, easements and rights of way. The Soil Conservation Service will participate to the extent of providing 50 percent of the cost of acquiring about 137 acres of land in the recreational development, except the cost of surveys and legal fees associated with acquisition. Oxford Township will provide the Jersey Central Power and Light Company

with necessary rights for ingress and egress to maintain the power transmission line. The Township will administer contracts.

FINANCING PROJECT INSTALLATION

Federal assistance for carrying out the works of improvement as described in the work plan will be provided under the authority of the Watershed Protection and Flood Prevention Act, Public Law 566 (83d Cong., 68 Stat. 666) as amended.

Cost sharing assistance for installation of land treatment measures will be made available to eligible landowners and operators, consistent with needs and funds available, through the Agricultural Conservation Program.

Technical assistance for installation of land treatment measures will be made available from Public Law 566 funds and funds made available from going programs. These include Soil Conservation Service assistance to Soil Conservation Districts, the Cooperative Forest Management Program administered by the U.S. Forest Service and the N.J. Bureau of Forestry.

The Farmers Home Administration will provide soil and water conservation loans to eligible farmers requesting them for installation of land treatment measures.

The New Jersey Green Acres Program was passed by referendum in 1960. It provided an appropriation of \$60,000,000 for the purpose of land for open spaces by the State, and by county and municipal governments with matching State funds. The non-Federal share of costs for land acquisition for the recreational development will be acquired with Green Acres funds by the State and Oxford Township on a matching funds basis.

The costs for relocating the power line and public road, and the non-Federal share of reservoir construction cost and installation cost of recreational facilities will be paid by Oxford Township. The New Jersey Department of Conservation and Economic Development will assist the Township with these costs from Dingle-Johnson funds. The remainder will be budgeted by Oxford Township.

Land, easements and rights of way for stream channel improvements are expected to be donated.

The sponsoring local organizations understand that all necessary land, easements and rights of way must be obtained or be assured by condemnation proceedings before Federal money is made available.

PROVISIONS FOR OPERATION AND MAINTENANCE

Forest land treatment measures will be maintained by the landowners. Technical assistance will be provided by the New Jersey Bureau of Forestry in cooperation with the U.S. Forest Service through the Cooperative Forest Management Program. Cropland, grassland and recreation measures will be maintained by landowners and operators under cooperative agreements with the Warren County Soil Conservation District.

Maintenance of the reservoir structure will include mowing the dam and emergency spillway areas, removal of trash interfering with the spillway and repair of any damage to the dam or spillway. Operation and maintenance of the recreational facilities includes policing and cleanup; maintenance of access roads and parking lots; repair of facilities; and maintenance of a desirable fish population. Maintenance of stream channel improvement measures will consist of periodic removal of sediment and debris, and control of vegetation on the banks. Some bank erosion is to be expected in the section between Route 31 and the railroad bridge due to high velocities.

Oxford Township will assume responsibility for operation and maintenance, estimated at \$5,752 annually. Of this, about \$4,923 is for recreation.

Structural measures will be inspected at least once a year and after each major storm. Written inspection reports will be prepared by the Township and made available to the Soil Conservation Service at any time. For the first 3 years the Soil Conservation Service and the Township will jointly make the annual inspection, and will jointly determine what maintenance measures are needed. After the first 3 years the Township will make the required inspections and send copies of the reports to the Soil Conservation Service. The New Jersey Division of Fish and Game will determine the need for stocking or modifying the fish population. The Service will provide design information and technical assistance that may be needed and available in performing maintenance work.

An operation and maintenance agreement between the Soil Conservation Service and Oxford Township will be executed prior to issuance of invitations to bid.

TABLE 1 - ESTIMATED PROJECT INSTALLATION COST

Furnace Brook Watershed, New Jersey

| Installation Cost Item | Acres ^{1/} to be Treated | Unit | Number | Estimated Cost - (Dollars) ^{2/} | | |
|----------------------------------|---|------|--------|--|----------------|----------------|
| | | | | P.L. 566 | Other | Total |
| LAND TREATMENT | | | | | | |
| Soil Conservation Service | | | | | | |
| Cropland | 546 | | | | 26,547 | 26,547 |
| Grassland | 636 | | | | 34,555 | 34,555 |
| Recreation | 200 | | | | 3,130 | 3,130 |
| Technical Assistance | | | | 1,760 | 5,280 | 7,040 |
| SCS Subtotal | | | | 1,760 | 69,512 | 71,272 |
| <hr/> | | | | | | |
| Forest Service | | | | | | |
| Forest land | 145 | | | | 2,300 | 2,300 |
| Technical Assistance | | | | 4,100 | 1,300 | 5,400 |
| FS Subtotal | | | | 4,100 | 3,600 | 7,700 |
| <hr/> | | | | | | |
| TOTAL LAND TREATMENT | | | | 5,860 | 73,112 | 78,972 |
| <hr/> | | | | | | |
| STRUCTURAL MEASURES | | | | | | |
| Soil Conservation Service | | | | | | |
| Dams, Multipurpose | | No. | 1 | 129,685 | 49,315 | 179,000 |
| Stream Channel Improvement | | Mi. | 0.3 | 61,170 | | 61,170 |
| Basic Recreational Facilities | | No. | 1 | 44,217 | 44,218 | 88,435 |
| Subtotal Construction | | | | 235,072 | 93,533 | 328,605 |
| <hr/> | | | | | | |
| Installation Services | | | | | | |
| Soil Conservation Service | | | | | | |
| Engineering | | | | 55,797 | 20,000 | 75,797 |
| Other | | | | 37,990 | | 37,990 |
| Subtotal - Installation Services | | | | 93,787 | 20,000 | 113,787 |
| <hr/> | | | | | | |
| Other Costs | | | | | | |
| Land, Easements & R/W | | | | 20,550 | 54,174 | 74,724 |
| Administration of Contracts | | | | | 1,600 | 1,600 |
| Subtotal - Other Costs | | | | 20,550 | 55,774 | 76,324 |
| <hr/> | | | | | | |
| TOTAL STRUCTURAL MEASURES | | | | 349,409 | 169,307 | 518,716 |
| <hr/> | | | | | | |
| TOTAL PROJECT | | | | 355,269 | 242,419 | 597,688 |
| <hr/> | | | | | | |
| SUMMARY | | | | | | |
| Subtotal SCS | | | | 351,169 | 238,819 | 589,988 |
| Subtotal FS | | | | 4,100 | 3,600 | 7,700 |
| <hr/> | | | | | | |
| TOTAL PROJECT | | | | 355,269 | 242,419 | 597,688 |

January, 1968

^{1/} Non-Federal land
^{2/} Price Base 1967

TABLE 1A - STATUS OF WATERSHED WORKS OF IMPROVEMENT

Furnace Brook Watershed, New Jersey

| Measures | Unit | Applied to Date | Total Cost (Dollars) ^{1/} |
|--------------------------------|------|-----------------|------------------------------------|
| Conservation Cropping System | Ac. | 343 | 13,720 |
| Contour Farming | Ac. | 47 | 470 |
| Contour Orchard | Ac. | 4 | 60 |
| Cover Cropping | Ac. | 12 | 180 |
| Crop Residue Use | Ac. | 37 | 185 |
| Diversions | L.F. | 900 | 135 |
| Pasture & Hay Renovation | Ac. | 55 | 2,475 |
| Pasture Proper Use | Ac. | 8 | 400 |
| Strip Cropping | Ac. | 34 | 510 |
| Tree Planting | Ac. | 15 | 1,000 |
| Hydrologic Cultural Operations | Ac. | 75 | 1,100 |
| Fire Control | Ac. | 2,036 | 2,100 |
| TOTAL | - | - | 22,335 |

^{1/} Price Base 1967

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TABLE 2 - ESTIMATED STRUCTURAL COST DISTRIBUTION

Furnace Brook Watershed, New Jersey

(Dollars) 1/

| Structure | Installation Cost - P.L. 566 Funds | | | | | Installation Cost - Other Funds | | | | | Total Installation Cost | |
|-------------------------------|------------------------------------|--------------------------|----------------|---------------|----------------|---------------------------------|-----------------------|---------------|---------------------------|--------------|-------------------------|-------------------|
| | Construction | Installation Engineering | Services Other | L, E & R/W | Total P.L. 566 | Construction | Installation Services | L, E & R/W | Other Admin. of Contracts | Legal Fees | | Total Other Funds |
| Dams, Multipurpose Site #2 | 129,685 | 40,010 | 26,940 | 12,741 | 209,376 | 49,315 | 39,865 | 1,000 | 930 | 91,110 | 300,486 | |
| Stream Channel Imp. | 61,170 | 13,787 | 11,050 | | 86,007 | | 5,000 | 600 | | 5,600 | 91,607 | |
| Basic Recreational Facilities | 44,217 | 2,000 | | 7,809 | 54,026 | 44,218 | 20,000 | 7,809 | 570 | 72,597 | 126,623 | |
| TOTAL | 235,072 | 55,797 | 37,990 | 20,550 | 349,409 | 93,533 | 20,000 | 52,674 | 1,600 | 1,500 | 169,307 | 518,716 |

January, 1968

- 1/ Price Base 1967
- 2/ Includes \$25,124 for relocation of the power line and \$2,000 for relocating a township road.

TABLE 2A - COST ALLOCATION AND COST SHARING SUMMARY

Furnace Brook Watershed, New Jersey

(Dollars) 1/

| | Purpose | | Total |
|------------------------------|------------------|----------------|----------------|
| | Flood Prevention | Recreation | |
| <u>COST ALLOCATION</u> | | | |
| Site #2 | 110,880 | 205,794 | 316,674 |
| Basic Recrea- tional Fac. | | 110,435 | 110,435 |
| Stream Ch. Improvement | 91,607 | | 91,607 |
| TOTAL | 202,487 | 316,229 | 518,716 |
| <u>COST SHARING</u> | | | |
| P.L. 566 | 196,438 | 152,971 | 349,409 |
| Other | 6,049 | 163,258 | 169,307 |
| TOTAL | 202,487 | 316,229 | 518,716 |

January, 1968

1/ Price Base 1967

TABLE 2B - BASIC RECREATION FACILITIES

Furnace Brook Watershed, New Jersey

| Item | Unit | Number | Unit Cost (dollars) | Cost (dollars) |
|--|---------|--------|------------------------|-------------------|
| Clearing | Ac. | 20 | 150 | 3,000 |
| Access Road (2 lane - gravel) | LF | 4,400 | 3.50 | 15,400 |
| Parking (100 spaces - rock base gravel) | Sq. Ft. | 30,000 | .20 | 6,000 |
| Planting | Ac. | 20 | 50 | 1,000 |
| Beach (400'x100'-6" sand) | Sq. Ft. | 40,000 | .12 $\frac{1}{2}$ | 5,000 |
| Boat Dock (Floating) | LF | 20 | 50 | 1,000 |
| Boat Launching Access and Ramp (200 Ft. single lane - gravel turn around) | Unit | 1 | 1,000 | 1,000 |
| Bathhouse (20'x30' concrete - includes 6-unit sanitary fac.) | Unit | 1 | 9,000 | 9,000 |
| Diving Platform (Float & board) | Unit | 1 | 1,000 | 1,000 |
| Picnic Shelter (40'x50') | Unit | 1 | 3,000 | 3,000 |
| Picnic Tables | Ea | 30 | 50 | 1,500 |
| Sanitary Fac. (12 unit) | Ea | 1 | 9,000 | 9,000 |
| Septic Tank (including drain field) | Ea | 1 | 2,500 | 2,500 |
| Fire Rings (Metal grill) | Ea | 15 | 50 | 750 |
| Water Supply | | | | |
| Well (complete with pump) | Unit | 1 | 3,500 | 3,500 |
| Outlets and 500' line | Unit | 1 | 750 | 750 |
| Electrical Connections (lines & poles) | LF | 2,000 | 1 | 2,000 |
| Fence | LF | 3,000 | 3.50 | 10,500 |
| Signs & Markers (Directional & entrance) | Unit | 1 | 600 | 600 |
| Incinerator (concrete block) | Unit | 1 | 400 | 400 |
| Engineers estimate | | | | 76,900 |
| 15% Contingencies | | | | 11,535 |
| TOTAL | | | | 88,435 |

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TABLE 3 - STRUCTURE DATA

MULTIPURPOSE STRUCTURE

Furnace Brook Watershed, New Jersey

| ITEM | AMOUNT | UNIT |
|--------------------------------------|---------|----------|
| Drainage Area | 2.87 | sq. mi. |
| Storage Capacity | | |
| Sediment | 20 | ac. ft. |
| Floodwater | 487 | ac. ft. |
| Recreation | 622 | ac. ft. |
| Total | 1,129 | ac. ft. |
| Between high and low stages | 115 | ac. ft. |
| Surface Area | | |
| Sediment pool | 6 | ac. |
| Floodwater pool | 68 | ac. |
| Recreation pool | 53 | ac. |
| Volume of Fill | 164,700 | cu. yds. |
| Elevation Top of Dam | 591.5 | ft. |
| Maximum Height of Dam | 51.5 | ft. |
| Emergency Spillway | | |
| Crest Elevation | 586.9 | ft. |
| Bottom Width | 500 | ft. |
| Type | Earth | |
| Percent chance of use | 1 | |
| Ave. Curve No. - Cond. II | 69 | |
| Emergency spillway hydrograph | | |
| Storm Rainfall (6-hour) | 10.3 | in. |
| Storm runoff | 6.36 | in. |
| Velocity of flow (V_c) <u>1/</u> | 4.9 | ft./sec. |
| Discharge rate <u>1/</u> | 2,068 | c.f.s. |
| Max. w.s. elev. <u>1/</u> | 588.5 | ft. |
| Freeboard hydrograph | | |
| Storm rainfall (6-hour) | 25.3 | in. |
| Storm runoff | 20.6 | in. |
| Velocity of flow (V_c) <u>1/</u> | 9.3 | ft./sec. |
| Discharge rate <u>1/</u> | 13,093 | c.f.s. |
| Max. w.s. elev. <u>1/</u> | 591.5 | ft. |
| Principal Spillway | | |
| Elevation of low stage | 579.0 | ft. |
| Capacity-low stage | 33 | c.f.s. |
| Capacity-high stage | 143 | c.f.s. |
| Capacity Equivalents | | |
| Sediment volume | 0.11 | in. |
| Detention volume | 3.18 | in. |
| Spillway storage | 2.20 | in. |
| Class of Structure | C | |

1/ Maximum during passage of hydrograph

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**TABLE 3A - STRUCTURE DATA
CHANNEL IMPROVEMENT**

Furnace Brook Watershed, New Jersey

| Station | Water-shed Area (sq.mi.) | Required Capacity (cfs) | Manning's 'n' Value | Channel Design | | Design Water Surface Elev. (msl) | Design Depth (ft) | Flow Area at Design Depth (sq.ft.) | Planned Hydraulic Gradient (ft/ft) | Channel Velocity at Design Depth (ft/sec) | Planned Capacity at Design Depth (cfs) | Volume of Exc. (cu.yd.) | Volume of Concrete (cu.yd.) | Volume of Riprap (cu.yd.) |
|---------|--------------------------|-------------------------|---------------------|----------------|-------------|----------------------------------|-------------------|------------------------------------|------------------------------------|---|--|-------------------------|-----------------------------|---------------------------|
| | | | | Bottom Width | Side Slopes | | | | | | | | | |
| 81+77 | 4.44 | 1,240 | 0.040 | 18 | 2:1 | 489.34 | 5.23 | 148.9 | 0.00900 | 8.37 | 1,240 | 1591/ | | 1051/ |
| 82+40 | 4.44 | 1,240 | 0.040 | 18 | 2:1 | 488.78 | 5.23 | 148.9 | 0.00900 | 8.37 | 1,240 | 322 | | 202 |
| 83+02 | 4.44 | 1,240 | 0.040 | 18 | 2:1 | 478.21 | 5.23 | 148.9 | 0.00900 | 8.37 | 1,240 | 322 | | 202 |
| 83+65 | 4.44 | 1,240 | 0.040 | 18 | 2:1 | 477.65 | 5.23 | 148.9 | 0.00832 | 8.37 | 1,240 | 339 | | 207 |
| 84+27 | 4.44 | 1,240 | 0.040 | 18 | 2:1 | 477.13 | 5.27 | 150.4 | 0.00768 | 8.24 | 1,240 | 343 | | 208 |
| 84+90 | 4.44 | 1,240 | 0.040 | 18 | 2:1 | 476.65 | 5.35 | 153.6 | 0.00736 | 8.07 | 1,240 | 343 | | 208 |
| 85+52 | 4.44 | 1,240 | 0.040 | 18 | 2:1 | 476.19 | 5.46 | 157.9 | 0.00560 | 7.85 | 1,240 | 343 | | 208 |
| 86+15 | 4.44 | 1,240 | 0.040 | 18 | 2:1 | 475.84 | 5.67 | 166.4 | 0.00352 | 7.45 | 1,240 | 343 | | 208 |
| 86+77 | 4.44 | 1,240 | 0.040 | 18 | 2:1 | 475.62 | 6.01 | 180.4 | 0.00224 | 6.87 | 1,240 | 410 | | 219 |
| 87+40 | 4.44 | 1,240 | 0.040 | 18 | 2:1 | 475.48 | 6.43 | 198.4 | 0.00208 | 6.25 | 1,240 | 464 | | 232 |
| 88+02 | 4.44 | 1,240 | 0.040 | 18 | 2:1 | 475.35 | 6.87 | 217.1 | 0.00288 | 5.71 | 1,240 | 464 | | 232 |
| 88+65 | 4.44 | 1,240 | 0.040 | 18 | 2:1 | 475.17 | 7.25 | 235.8 | 0.00048 | 5.26 | 1,240 | 464 | | 232 |
| 89+27 | 4.44 | 1,240 | 0.040 | 18 | 2:1 | 475.14 | 7.78 | 261.2 | 0.00064 | 4.75 | 1,240 | 464 | | 232 |

(continued)

TABLE 3A - STRUCTURE DATA (cont'd)
CHANNEL IMPROVEMENT

Furnace Brook Watershed, New Jersey

| Station | Watershed Area (sq. mi.) | Required Capacity (cfs) | Manning's 'n' Value | Channel Design | | Design Water Surface Elev. (msl) | Design Depth (ft) | Flow Area at Design Depth (sq. ft.) | Planned Hydraulic Gradient (ft/ft) | Channel Velocity at Design Depth (ft/sec) | Planned Capacity at Design Depth (cfs) | Volume of Exc. (cu. yd.) | Volume of Concrete (cu. yd.) | Volume of Riprap (cu. yd.) |
|---------|--------------------------|-------------------------|---------------------|----------------|-------------|----------------------------------|--------------------|-------------------------------------|------------------------------------|---|--|--------------------------|------------------------------|----------------------------|
| | | | | Bottom Width | Side Slopes | | | | | | | | | |
| 89+90 | 4.44 | 1,240 | 0.040 | 18 | 2:1 | 475.10 | 8.30 | 287.2 | 3.38 ^{3/} | 4.32 | 1,240 | 258 | 140 ^{2/} | |
| 90+89 | 4.44 | 1,240 | 0.040 | 18 | 2:1 | 471.72 | 5.78 | 170.8 | 0.00229 | 7.26 | 1,240 | 388 | | |
| 91+50 | 4.51 | 1,290 | 0.040 | 30 | 2:1 | 471.58 | 6.13 | 259.2 | 0.00169 | 4.97 | 1,290 | 385 | | |
| 92+15 | 4.51 | 1,290 | 0.040 | 30 | 2:1 | 471.44 | 6.24 | 265.0 | 0.00192 | 4.87 | 1,290 | 741 | | |
| 93+40 | 4.51 | 1,290 | 0.040 | 30 | 2:1 | 471.18 | 6.48 | 278.2 | 0.00224 | 4.63 | 1,290 | 683 | | |
| 94+65 | 4.51 | 1,290 | 0.040 | 30 | 2:1 | 470.96 | 6.76 | 294.1 | 0.00248 | 4.38 | 1,290 | 445 | | |
| 95+90 | 4.51 | 1,290 | 0.040 | 30 | 2:1 | 470.77 | 7.07 | 311.7 | 0.00272 | 4.14 | 1,290 | 445 | | |
| 97+15 | 4.51 | 1,290 | 0.040 | 30 | 2:1 | 470.61 | 7.41 | 332.0 | 0.00296 | 3.88 | 1,290 | 421 | | |
| 98+40 | 4.51 | 1,290 | 0.040 | 30 | 2:1 | 470.48 | 7.78 | 354.3 | 0.00336 | 3.64 | 1,290 | 130 | | |
| 99+65 | 4.51 | 1,290 | 0.040 | 30 | 2:1 | 470.40 | 8.20 ^{4/} | 380.5 | | 3.39 | 1,290 | | | |

1/ Only to station 82+09
 2/ Reinforced Concrete Volume for Route 31 bridge floor and underpinning.
 3/ Drop in water surface elevation through Rt. 31 bridge.
 4/ Back water at railroad bridge over Furnace Brook.
 5/ Station number at upper end of the channel reach is the design point for the reach.
 6/ 100 year frequency-6 hour duration discharge.

TABLE 4 - ANNUAL COST

Furnace Brook Watershed, New Jersey

(Dollars) 1/

| EVALUATION UNIT | AMORTIZATION OF INSTALLATION COST <u>2/</u> | OPERATION AND MAINTENANCE COST | TOTAL |
|---|---|--------------------------------|--------|
| Multipurpose Structure #2 and Stream Channel Imp. | 21,127 | 5,752 | 26,879 |
| TOTAL | 21,127 | 5,752 | 26,879 |

January, 1968

1/ Price Base 1967 for installation cost Adjusted normalized price for O&M

2/ Amortized @3 1/4% for 50 years

TABLE 5 - ESTIMATED AVERAGE FLOOD DAMAGE REDUCTION BENEFITS

Furnace Brook Watershed, New Jersey

(Dollars) ^{1/}

| Item | Estimated Average Annual Damage Without Project | Estimated Average Annual Damage With Project | Damage Reduction Benefit |
|------------------|---|--|--------------------------|
| Floodwater | | | |
| Non-agricultural | | | |
| Industrial | 17,664 | 0 | 17,664 |
| Commercial | 4,654 | 0 | 4,654 |
| Residential | 435 | 0 | 435 |
| Indirect | 3,413 | 0 | 3,413 |
| TOTAL | 26,166 | 0 ^{2/} | 26,166 |

January, 1968

^{1/} Price Base - Adjusted normalized price

^{2/} Damages will occur in storms greater than the 100 year frequency event

TABLE 6 - COMPARISON OF BENEFITS AND COSTS FOR STRUCTURAL MEASURES

Furnace Brook Watershed, New Jersey

(Dollars) ^{1/}

| Evaluation | AVERAGE ANNUAL BENEFITS | | Secondary | Total | Average Annual Cost | Benefit Cost Ratio |
|--|-------------------------------------|--|-----------|--------|---------------------|--------------------|
| | Flood Prevention (damage reduction) | Non-Agricultural Water Management (recreation) | | | | |
| Multipurpose Structure #2 and Stream Channel Improvement | 25,644 ^{2/} | 27,750 | 5,005 | 58,399 | 26,879 | 2.2 to 1 |
| TOTAL | 25,644 ^{2/} | 27,750 | 5,005 | 58,399 | 26,879 | 2.2 to 1 |

^{1/} Costs are taken from Table 4 and benefits are based on adjusted normalized prices.

January, 1968

^{2/} In addition it is estimated that land treatment measures will provide flood damage reduction benefit of \$522 annually.

INVESTIGATIONS AND ANALYSIS

Engineering

Multipurpose Reservoir

A topographic map was developed for the site using a four foot contour interval and a horizontal scale of one inch equals two hundred feet. A semi-controlled aerial photograph was used as a base map. A bench level circuit (sea level datum) was run to the site for vertical control. Valley cross sections were surveyed and plotted directly on the aerial photograph. The contour lines were sketched on the photograph in the field using the plotted data and visual observations.

Stage-storage and stage-area curves were developed using the areas planimetered from the topographic map.

Sediment storage for the site was based on the expected accumulation over a 50 year period. The estimate of soil loss was calculated by Musgrave's Probable Soil Loss Formula. The elevation of the recreation pool was limited by roads and private property that the sponsors were unwilling to inundate. The elevation of the emergency spillway crest was established by routing the principal spillway storm through the two stage riser and 30-inch diameter pipe. The design high water and top of dam elevations were established by routing the emergency spillway and freeboard hydrographs.

Volumes of earth cut and fill were computed by using the average end area method.

Stream Channel Improvement

Bench level surveys, based on sea level datum, were run to the proposed channel improvement. Cross sections were taken at approximately 250 foot intervals along the 0.3 miles of proposed channel improvement. The cross sections were plotted on aerial photographs (scale 1" = 100') and used for horizontal control.

Deepening and widening of the channel is necessary to gain the required capacity thereby destroying the channel lining. The channel banks and bottom between Washington Avenue and Route 31 will be lined with riprap. The riprap size and gradation required for stability will be determined during final design.

The bottom of the Route 31 bridge will be lowered. The exact amount of underpinning of the bridge will be determined by a detailed investigation during final design.

Riprap, excavation and backfill volumes were computed by using the average end area method. Concrete volume was determined by calculating the cross-sectional area of the design section and multiplying by the length of the proposed item of work.

Economics

To determine flood damage in affected areas a physical check of the residences, commercial and industrial establishments was made. Through personal interviews with homeowners and representatives of business and industry damage schedules were prepared in one foot increments of flood-water depths.

The 100 year storm elevation was used as the maximum stage for determining damages. The starting point of damages was related to the elevation of the bank of the stream zero damage elevation.

Schedules were prepared for approximately 90 percent of the residences, 100 percent of the commercial establishments, for one industrial plant, and 2 public buildings.

The area was broken down into five reaches. Damage estimates in each reach were summarized by stages and correlated with the hydrologic data to prepare stage damage and damage frequency curves. Damage estimates were converted to long term prices using the Commerce Department Construction Cost Composite Price Index to obtain the Adjusted Normalized Price.

Determination was made of the average annual damage without the project and with planned land treatment and structural measures installed.

Recreation benefits for the multipurpose reservoir were based on a value of \$1.50 per visitor day since the site will be developed for intensive recreational use.

Factors considered in making the determination include:

1. Size of recreation pool
2. Surrounding area available
3. Population of the area
4. Accessibility to other areas
5. Amount and types of recreational facilities
6. Seasonal recreational opportunities

The estimated cost of land, easements and rights of way was based on land values obtained from the local tax assessor.

Project evaluation was based on 50 year life expectancy.

Secondary benefits were based on 10% of the primary direct benefit. Those stemming from the project include improvements to homes and business and business expansion brought about by reduction of the

flood hazard. Those induced by the project include new and expanded businesses and services brought about by the recreational activities. Indirect benefits were based on 15% of the direct floodwater reduction benefits.

Hydrology and Hydraulics

Soil Conservation Service Technical Release 20, Computer Program For Project Formulation, was used in the hydrologic phase of planning the watershed. This Computer Program was used to (1) compute runoff from rainfall, (2) develop hydrographs from computed runoff, (3) combine hydrographs, and (4) route hydrographs for present and future conditions.

Soil-cover complex numbers, rainfall amounts, cross-section data for routing reaches, times of concentration and structure data were part of the input data needed for the Computer Program.

Three sub-watersheds were utilized in the hydrologic analysis. Soil-cover complex numbers were computed for each sub-watershed using table 3.9-1 in the SCS National Engineering Handbook, Hydrology, Section 4. Data to compute soil-cover complex numbers was furnished by the Warren County Work Unit Conservationist. The U.S. Forest Service computed curve numbers for forest land.

Rainfall amounts for the 100-year frequency 6-hour duration and 5-year frequency 6-hour duration events were obtained from Weather Bureau Technical Paper No. 40.

The principal spillway is a two-stage riser. A 36-inch pipe and a 30-inch pipe were tried. Three elevations of the second stage were established for each size pipe based on storage of 0.75 inches, 1.25 inches, and 1.75 inches. The 30-inch pipe with 0.75 inches low stage storage gave the desired results in the damage areas at least cost. The low stage maximum release (orifice control) was about 33 cubic feet per second. The high stage maximum release (pipe control) was about 143 cubic feet per second.

Minimum storage requirements for determining the crest elevation of the emergency spillway were based on routing the 100-year frequency 6, 24, 48, 72, and 96-hour duration hydrographs through the principal spillway.

The emergency spillway and freeboard designs were determined from hydrographs produced by rainfalls taken from hydrologic maps based on U.S. Weather Bureau Technical Paper No. 40. The SCS Technical Release 35 was used for routing these storms through the structure.

Discharge-frequency curves for present and future conditions in the damage areas were plotted from the Computer Program output data.

Stage-discharge relationships in the damage area were established by water surface profiles, using the step method outlined in National Engineering Handbook, Hydrology, Section 4.

The stage-discharge relationships and the discharge-frequency curves were used in the economic analysis.

Geology

The site is underlain by pre-Wisconsin glacial till and granite gneiss. The narrow floodplain is underlain by more recent sands, gravels and organic silt.

Hand auger borings were made along the proposed centerline of the dam. In addition, stream cuts were examined and available State Bureau of Geology maps were studied. Logs of 9 deep test holes drilled 1,600 to 2,600 feet downstream from the site were available.

Granite gneiss is believed to underlie the entire site. The weathered gneiss is firm and slowly permeable. Fractures within the gneiss may be more permeable but leakage should not be a problem, since first, gneiss is a notoriously poor yielder of water to wells, and secondly, gneiss is naturally covered by from at least 10 to more than 100 feet of glacial till.

The glacial till thickens from at least 10 feet beneath the left abutment to more than 100 feet beneath the right abutment. The till is a silty and sandy low plastic clay with increasing amounts of silt and sand with depth. Permeabilities are less than 1 foot per day.

The floodplain is underlain by about 8 feet of sandy, gravelly and silty alluvium. Recognizable units are restricted horizontally and vertically. About 4 feet of soft organic silt underlies the left side of the floodplain. The alluvium is underlain by glacial till.

Adequate borrow material consisting of silty and sandy clay (glacial till) is available. No special problems exist for excavating the emergency spillway in the right abutment. Seepage should not be a problem with the existing till cover and availability of blanket material, if needed.



- LEGEND**
- — — — — Recreation Development Bdy.
 - - - - - Township
 - ==== Roads
 - ==== Proposed
 - + + + + - Railroad (Abandoned)
 - ~~~~~ Drainage
 - Powerline
 - x - x - Fence

Figure 1
**RECREATION DEVELOPMENT
 FURNACE BROOK WATERSHED
 WARREN COUNTY, NEW JERSEY**

U.S. DEPARTMENT OF AGRICULTURE
 SOIL CONSERVATION SERVICE

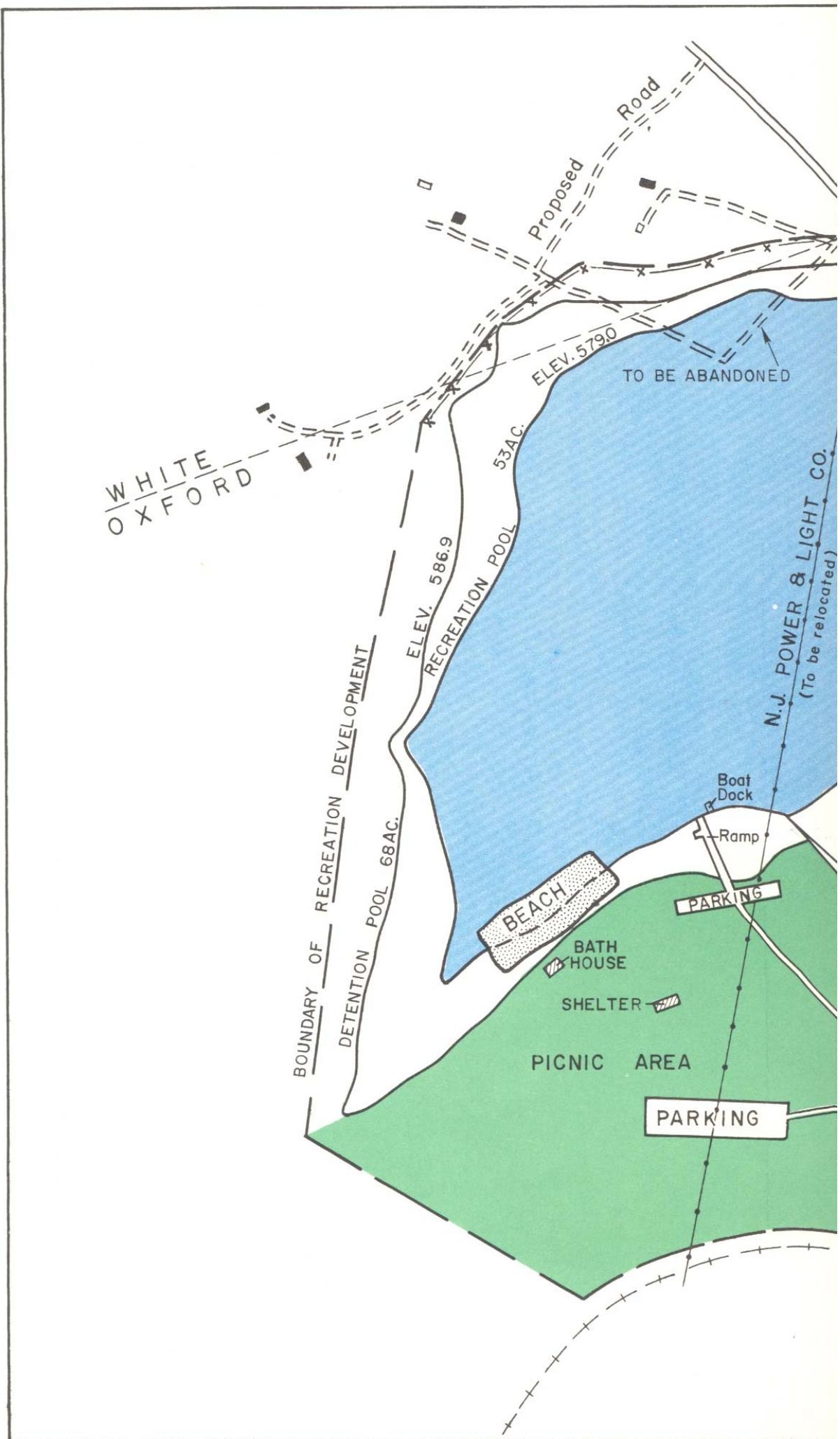


FIGURE 2 - PIPE AND RISER

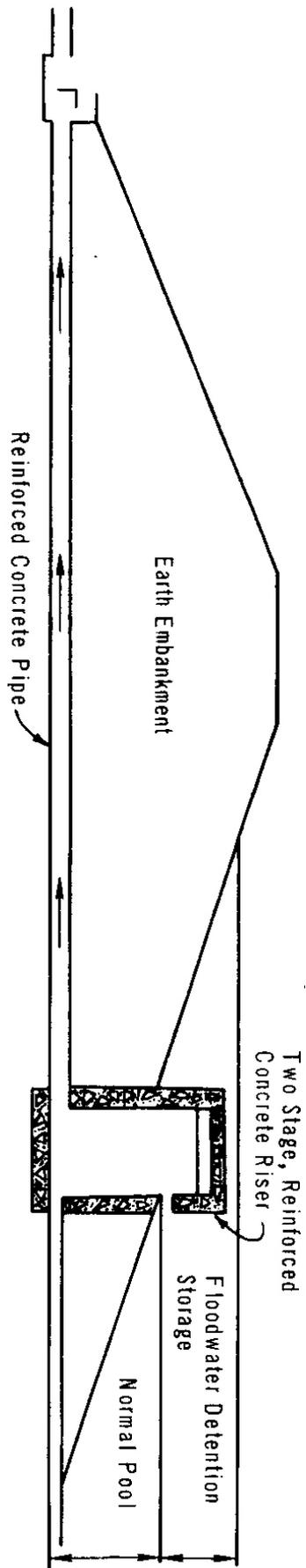


FIGURE 3 - CHANNEL IMPROVEMENT
TYPICAL CHANNEL CROSS SECTIONS

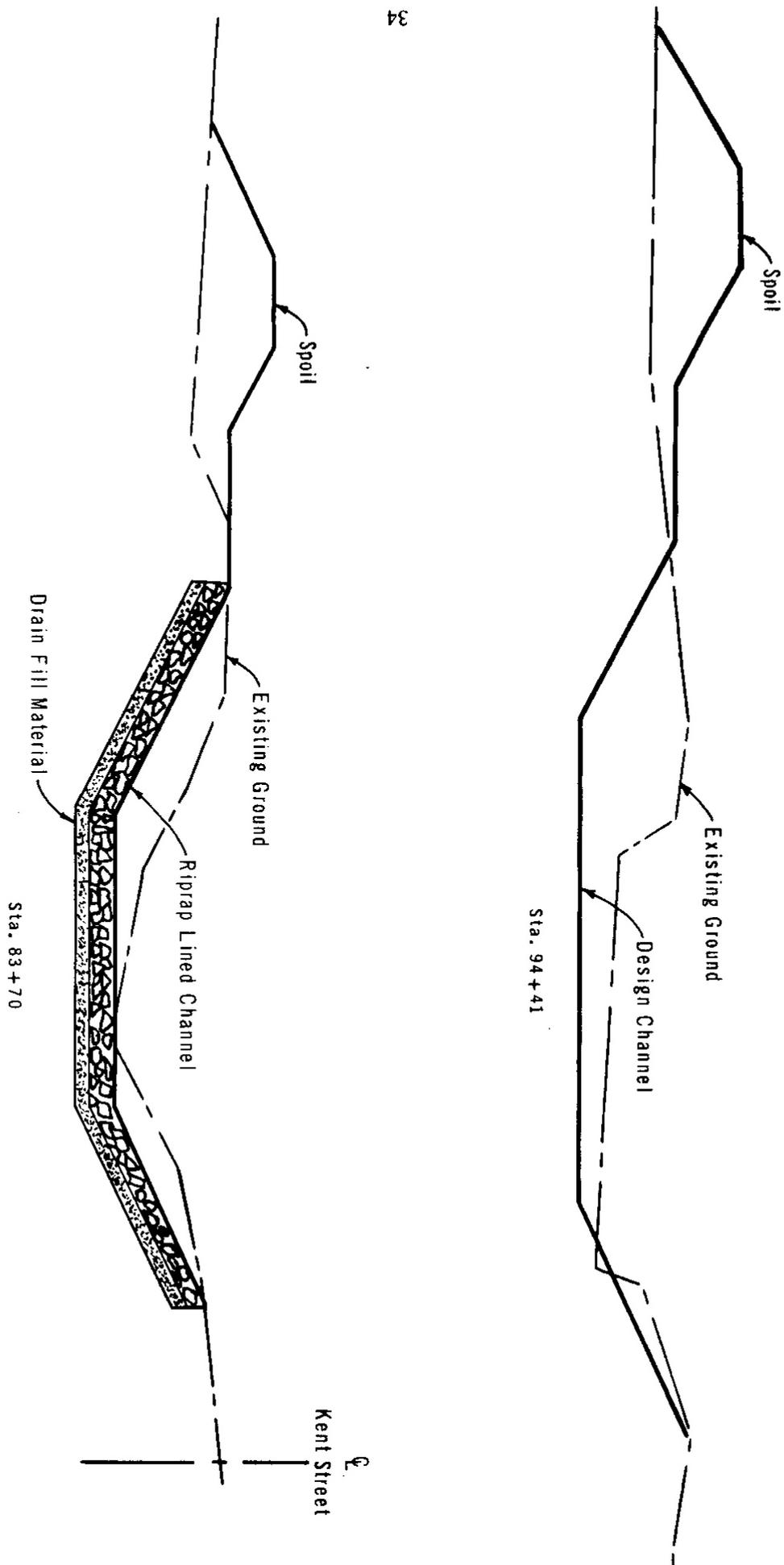


FIGURE 4 - CHANNEL PROFILE

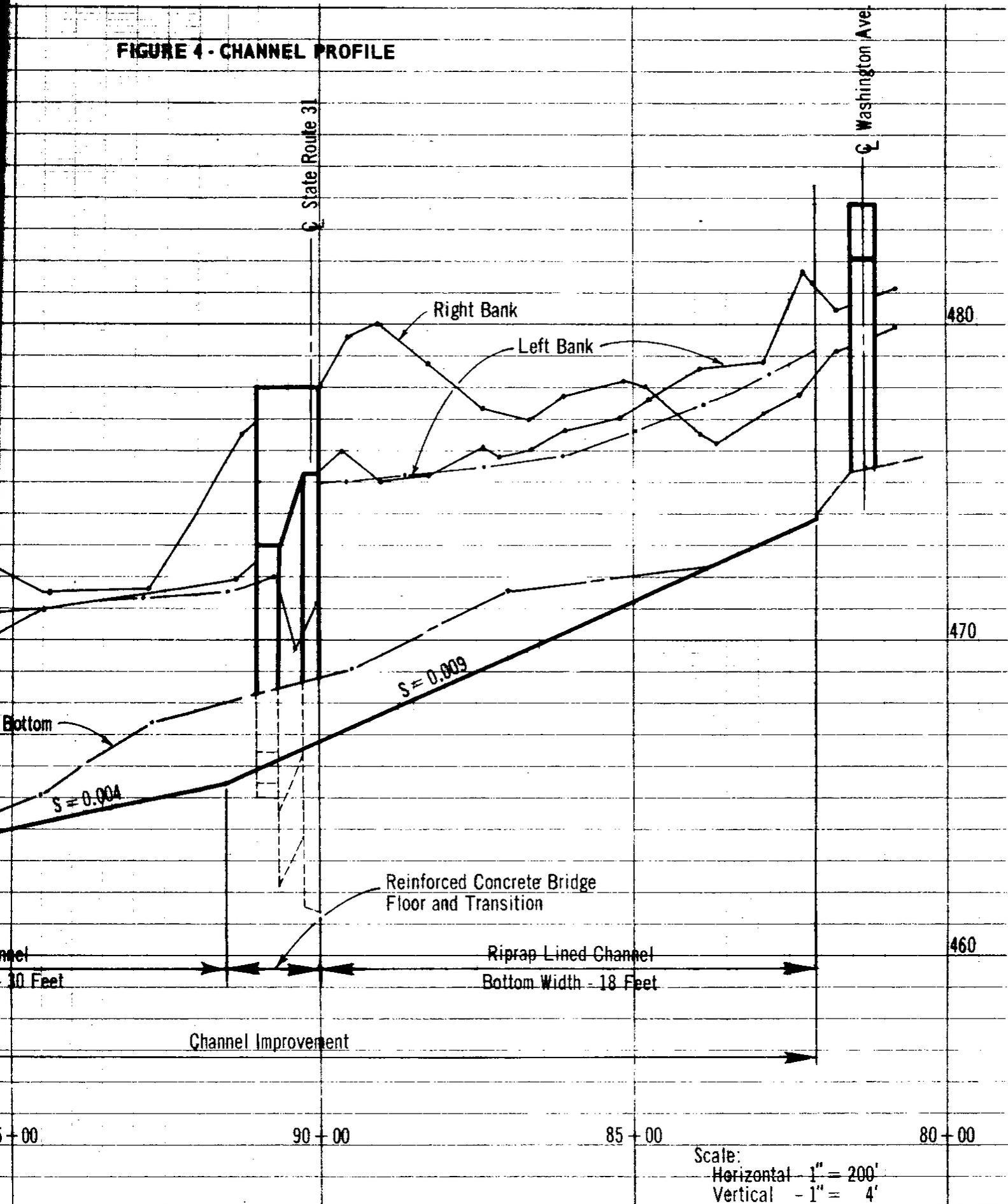
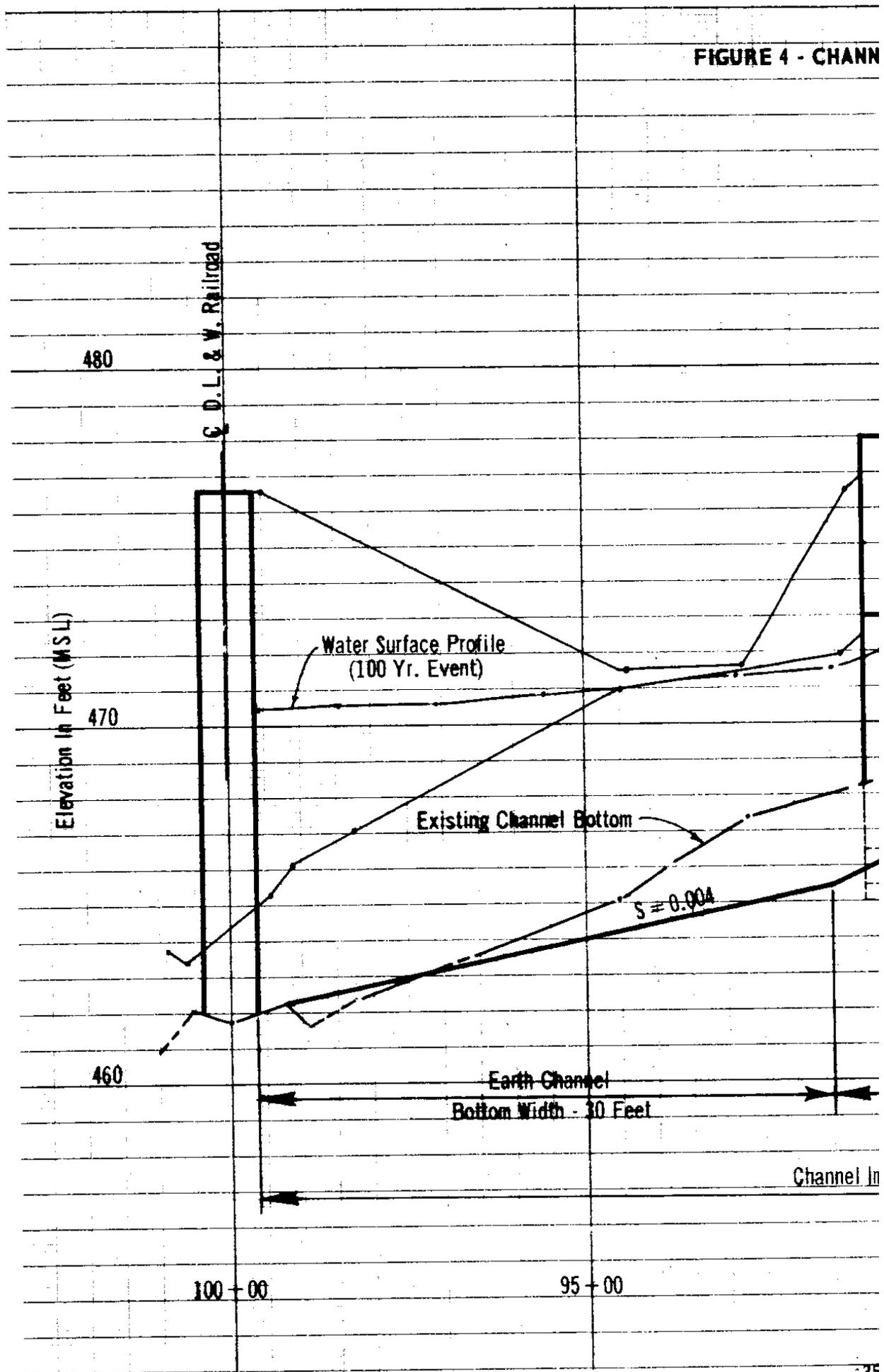


FIGURE 4 - CHANN

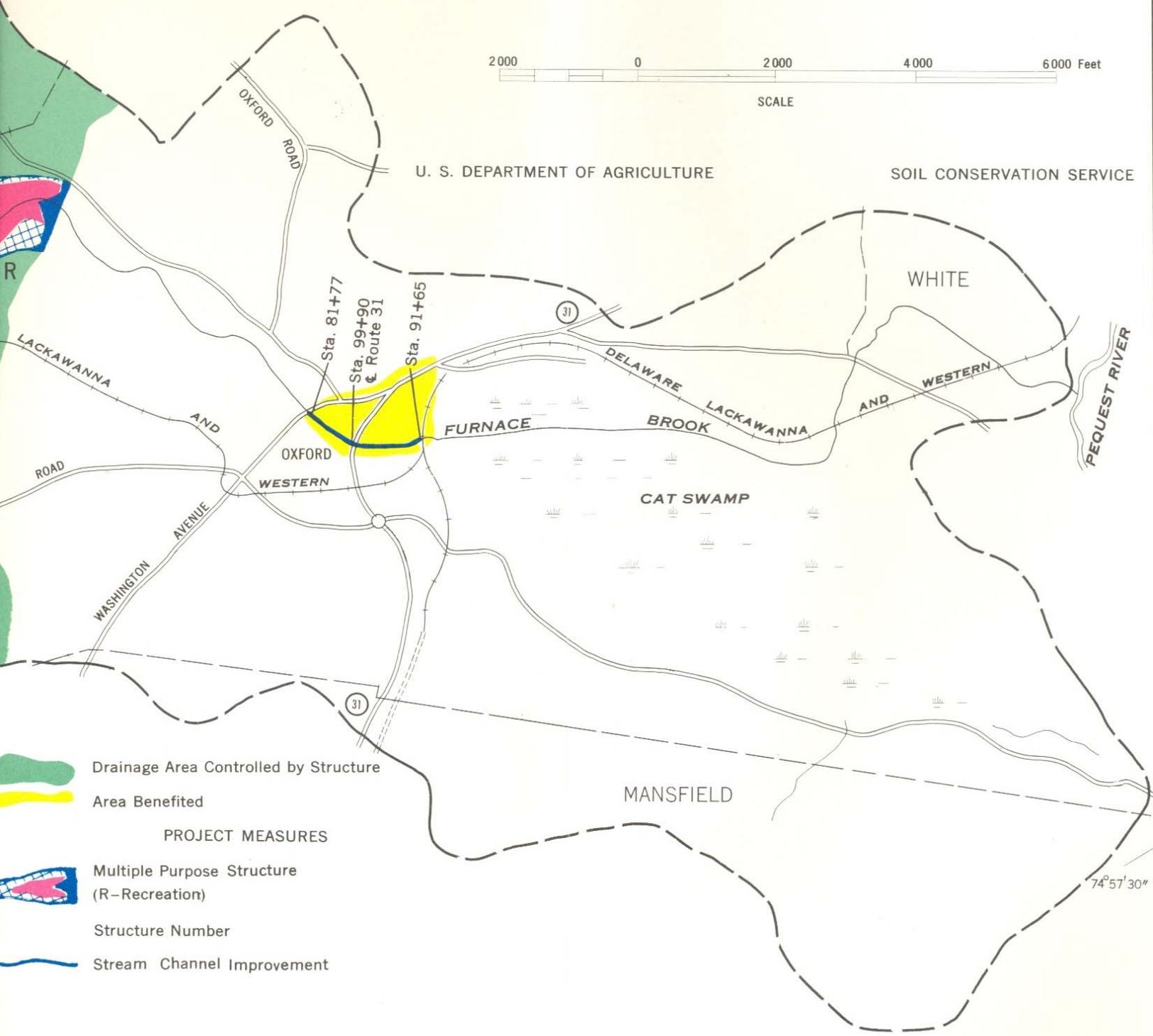
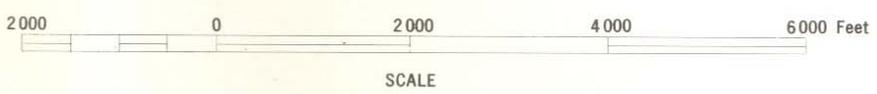
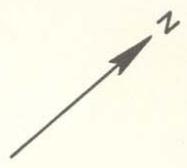


PROJECT MAP

FURNACE BROOK WATERSHED

WARREN COUNTY, NEW JERSEY

75°00'



- Drainage Area Controlled by Structure
- Area Benefited
- PROJECT MEASURES**
- Multiple Purpose Structure (R-Recreation)
- Stream Channel Improvement

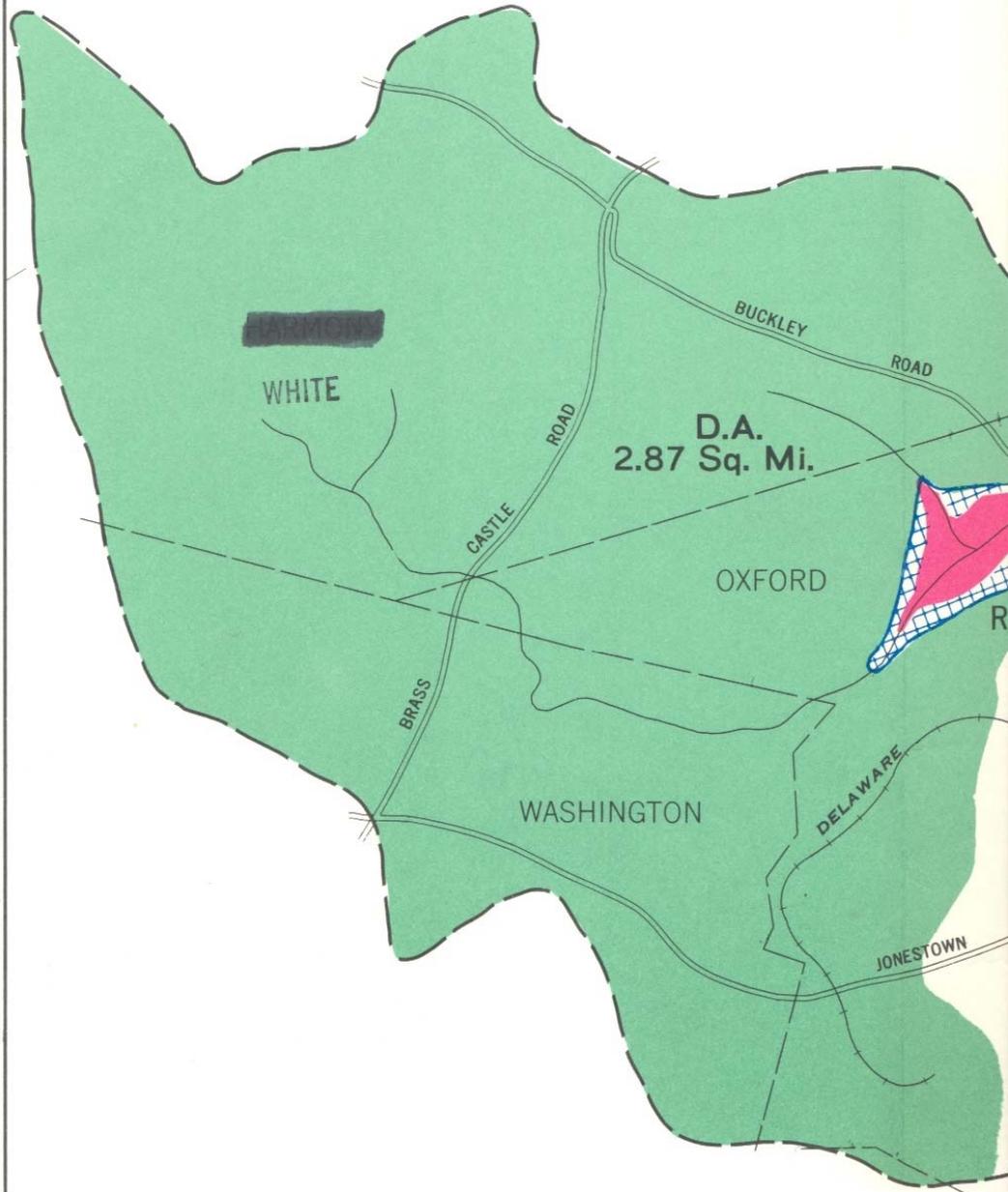
40°47'30"

74°57'30"

74°57'30"

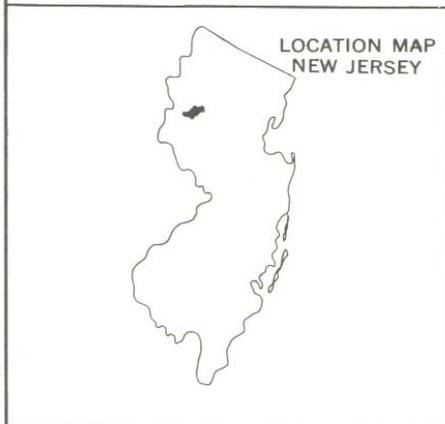
40° 47' 30"

75° 02' 30"



LEGEND

-  Good Motor Roads 
-  Poor Motor Roads 
-  Railroads
-  Streams 
-  Watershed Boundary 
-  Township Line 
-  Marsh 



SUPPLEMENTAL WATERSHED WORK PLAN AGREEMENT #1

between the

Warren County Soil Conservation District
Local Organization

Oxford Township
Local Organization

New Jersey Department of Conservation and Economic Development
(Division of Fish and Game)
Local Organization

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

and the

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

Whereas, the Watershed Work Plan Agreement for Furnace Brook Watershed State of New Jersey, executed by the sponsoring local organization named therein and the Service, became effective on the 24th day of May 1968; and

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

Whereas, it has been found necessary to modify the Watershed Work Plan to enable the Sponsoring Local Organization to utilize loan provisions of the Act; *and*

Whereas, a Supplemental Watershed Work Plan which modified the Watershed Work Plan dated April, 1968 for said watershed has been developed through the cooperative efforts of the Sponsoring Local Organization and the Service; which plan is annexed to and made part of this agreement;

Now, therefore, the Sponsoring Local Organization and the Service hereby agree upon the following modifications of the terms, conditions, and stipulations of said Watershed Work Plan Agreement:

The Township of Oxford intends to utilize loan assistance provisions of the Act to finance a part of its cost for recreation facilities and for relocation of a power line.

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

Warren County Soil Conservation District
Local Organization

By William Shouder

Title Chairman

Date 10-8-69

The signing of this agreement was authorized by a resolution of the governing body of the Warren County Soil Conservation District
Local Organization

adopted at a meeting held on October 8 1969

Mary E. Serfass
(Secretary, Local Organization)

Date 10-8-69

Oxford Township
Local Organization

By Carl Kauffman

Title Mayor

Date Sept. 26 - 1969

The signing of this agreement was authorized by a resolution of the governing body of the Oxford Township
Local Organization

adopted at a meeting held on June 3, 1968

Maie M. Beers
(Secretary, Local Organization)

Date Sept 26, 1969

New Jersey Department of Conservation and Economic
Development - Division of Fish and Game

Local Organization

By L. G. Mac Roman

Title Director

Date October 15, 1969

The signing of this agreement was authorized by a resolution of the governing body of the New Jersey Department of Conservation and Economic Development, Division of Fish and Game

Local Organization

adopted at a meeting held on _____

(Secretary, Local Organization)

Date _____

Soil Conservation Service
United State Department of Agriculture

By Richard W. Wiley

Date October 21, 1969

Supplemental Watershed Work Plan

The township of Oxford has filed application through Farmers Home Administration for a loan under provisions of the Act in the amount of \$80,000 to finance its share of the cost for recreation facilities and for relocation of a power line, all associated with the recreational development at multiple purpose Site No. 2. The loan application is under consideration by Farmers Home Administration.

Supplemental Watershed Work Plan

The township of Oxford has filed application through Farmers Home Administration for a loan under provisions of the Act in the amount of \$80,000 to finance its share of the cost for recreation facilities and for relocation of a power line, all associated with the recreational development at multiple purpose Site No. 2. The loan application is under consideration by Farmers Home Administration.

SUPPLEMENTAL WATERSHED WORK PLAN AGREEMENT #2

FOR THE

FURNACE BROCK WATERSHED

WARREN COUNTY

FEBRUARY 1972

SUPPLEMENTAL WATERSHED WORK PLAN AGREEMENT #2

between the

Warren County Soil Conservation District
Local Organization

Oxford Township
Local Organization

New Jersey Department of Environmental Protection
(Division of Fish, Game and Shellfisheries)
Local Organization

(hereinafter referred to as the Sponsoring Local Organization)

State of New Jersey

and the

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

Whereas, the Watershed Work Plan Agreement for Furnace Brook Watershed, State of New Jersey, executed by the Sponsoring Local Organization named therein and the Service, became effective on the 24th day of May 1968; and

Whereas, a Supplemental Watershed Work Plan Agreement for Furnace Brook Watershed, State of New Jersey, executed by the Sponsoring Local Organization named therein and the Service, became effective on the 21st day of October 1969; and

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

Whereas, it has been found necessary to modify the Watershed Work Plan Agreement as supplemented in order to implement the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 for said watershed;

Now, therefore, the Sponsoring Local Organization and the Service thereby agree upon the following modifications of the terms, conditions, and stipulations of said Watershed Work Plan Agreement as supplemented.

1. Paragraph numbered 16 is hereby added to read as follows:

The Sponsoring Local Organization will provide relocation advisory assistance services and make the relocation payments to displaced persons as required by the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (Public Law 91-646, 84 Stat. 1894) effective as of January 2, 1971, and the Regulations issued by the Secretary of Agriculture pursuant thereto. Prior to July 1, 1972, the Sponsoring Local Organization will comply with the real property acquisition policies contained in said Act and Regulations to the extent that they are legally able to do so in accordance with their State law.

After July 1, 1972 the real property acquisition policies contained in said Act shall be followed in all cases.

The Service will bear 100 percent of the first \$25,000 of relocation payment costs for any person, business, or farm operation displaced prior to July 1, 1972. Any such costs for a single dislocation in excess of \$25,000 and all costs for relocation payments for persons displaced after July 1, 1972 will be shared by the Sponsoring Local Organization and the Service as follows:

| | <u>Sponsoring Local Organization</u> (percent) | <u>Service</u> (percent) | <u>Estimated Relocation Payment Costs</u> (dollars) |
|------------------------|---|-----------------------------|--|
| Relocation Payments | 40.6 | 59.4 | 0 ^{1/2} |

1/ Investigation has disclosed that under present conditions the project measures will not result in the displacement of any person, business, or farm operation. However, if relocations become necessary, relocation payments will be cost-shared in accordance with the percentages shown.

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

Warren County
Soil Conservation District
Local Organization

By Roman J. Schmitz

Title Chairman

Address Steger St. Hackettstown N.J. 07840
Zip Code

Date 5/10/72

The signing of this agreement was authorized by a resolution of the governing body of the Warren County Soil Conservation District
Local Organization

adopted at a meeting held on 5/10/72

Harry E. Serfass
(Secretary, Local Organization)

Address Steger St. Hackettstown N.J. 07840
Zip Code

Date 5/10/72

Oxford Township
Local Organization

By Mathew T. Bieber

Title Mayor

Address Henderson St. Oxford N.J. 07840
Zip Code

Date 3-12-72

The signing of this agreement was authorized by a resolution of the governing body of Oxford Township
Local Organization

adopted at a meeting held on APRIL 12, 1972

Linda Belkey (Clerk)
(Secretary, Local Organization)

Address Oxford Avenue, Oxford 07863
Zip Code

Date 3-12-72

New Jersey Department of Environmental Protection
(Division of Fish, Game and Shellfisheries)

Local Organization

By

Richard G. Sullivan

Title Commissioner

Address P.O. Box 1809, Trenton, N.J. 08625

Date

5/22/72

Zip Code

Soil Conservation Service
United States Department of Agriculture

By

W. J. Parker

Title State Conservationist

Address P. O. Box 219, Somerset, N. J. 08873

Date

5/24/72

Zip Code

MINOR MODIFICATION OF FURNACE BROOK WORK PLAN

By

EXCHANGE OF CORRESPONDENCE

Between

WARREN COUNTY SOIL CONSERVATION DISTRICT

OXFORD TOWNSHIP

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
(Division of Fish, Game, and Shellfisheries)

and

SOIL CONSERVATION SERVICE

UNITED STATES DEPARTMENT OF AGRICULTURE

March 1973

It has become necessary to modify the Furnace Brook Watershed Work Plan which became effective on May 24, 1968 and supplemented on October 21, 1969 and May 24, 1972. This modification is to change the fencing from a recreation cost to a construction cost. It will allow 1625 linear feet of fence to be placed on the left abutment from the outlet channel around the end of the dam to a point where Buckley Avenue diverges from the lake. Fencing is needed as soon as possible to protect the structure from immediate access of vehicular traffic from Buckley Avenue which is destroying the protective vegetation and cutting the embankment.

The estimated total cost of this work is \$13,000 and includes all costs of materials, time and labor. As a construction cost, it will be cost shared at the percentages listed in paragraph 3 of the Watershed Work Plan agreement for Multipurpose Structure No. 2 -- Sponsoring Local Organization 27.6 percent, Service 72.4 percent.

Engineering costs are estimated at \$1000 and project administration costs are estimated at \$500 both of which will be totally paid by the Service.

The Sponsoring Local Organization and the Service agree to these terms, and further agree that the other terms, conditions, and stipulations of the original Watershed Work Plan Agreement as supplemented are not modified herein.

CONCURRED:

Warren County Soil Conservation District

Norman Schmitz Chairman 3/22/73
(Signature) (Title) (Date)

Oxford Township

Martin T. Decker Mayor 3-22-73
(Signature) (Title) (Date)

New Jersey Department of Environmental Protection
(Division of Fish, Game, and Shellfisheries)

Russell M. ... Director _____
(Signature) (Title) (Date)

Soil Conservation Service

Wilson J. ... State Cons. 4/19/73
(Signature) (Title) (Date)

NEW JERSEY

Furnace Brook Project (P.L. 566) Warren County Fiscal Year 1975

The Project In Brief. Authorized - May 24, 1968. Estimated completion - during the fiscal year 1977. Area - 4968 acres (all privately owned). Sponsors - Warren County Soil Conservation District, Oxford Township, New Jersey Department of Environmental Protection. Estimated total cost - \$597,688 (\$355,269 PL-566, \$242,419 other). Principal problem - flood damage to residential, industrial, and public buildings. Land use - 22 percent cropland and pastureland, 41 percent woodland, 37 percent idle and urban.

Progress In Land Treatment. About 50 percent of the accelerated land treatment program has been applied. There are 24 cooperators, 11 of which are income producing enterprises. Fifty-six percent of the land is adequately protected.

Progress In Structural Measures. The planned structural measures consist of a multiple-purpose flood prevention - recreation structure (Site 2), recreation facilities at Site 2, and 1580 feet of channel work in the town of Oxford.

Construction of Site 2 has been completed at a cost of \$479,894. Oxford Township is operating a temporary recreation program at the site. An environmental assessment is underway to determine the impact of the recreation facilities and the channel work and an environmental impact statement will be prepared.

Progress In Obtaining Land Rights. Land rights acquisition for Site 2 and the recreation facilities area is complete. Progress is being made for final location and necessary easements for the access road to the recreation area. Oxford Township is currently working on obtaining land rights for the channel improvement. Easements have been obtained for making the archeological investigations where the channel work will be done. An estimated \$73,000, of which \$20,000 was PL-566 funds, has been spent on land rights.

NEW JERSEY

Furnace Brook Project (P.L. 566) Warren County

The Project In Brief. Authorized - May 24, 1968. Estimated completion - during the fiscal year 1976. Area - 4968 acres (all privately owned). Sponsors - Warren County Soil Conservation District, Oxford Township, New Jersey Department of Environmental Protection. Estimated total cost - \$597,688 (\$355,269 PL-566, \$242,419 other). Principal problem - flood damage to residences, industry and public buildings. Land use - 22 percent crop and pasture land, 41 percent woodland, 37 percent idle and urban.

Progress In Land Treatment. About 50 percent of the accelerated land treatment program has been applied. There are 24 cooperators, 11 of which are income producing enterprises. Fifty-six percent of the land is adequately protected.

Progress In Structural Measures. The planned structural measures consist of a multiple-purpose flood prevention - recreation structure, Site 2, Recreation Facilities at Site 2 and 1580 feet of channel work in the town of Oxford.

Construction of Site 2 has been completed at a cost of \$479,894. Oxford Township is currently operating a temporary recreation development at the site. An environmental assessment is underway to determine the impact of the Recreation Facilities and the channel work and the need for an environmental impact statement.

Progress In Obtaining Land Rights. Land rights acquisition for Site 2 and the Recreation Area is complete. Oxford Township is currently working on obtaining land rights for the channel improvement. An estimated \$73,000, of which \$20,000 was PL-566 funds, has been spent on land rights.

NEW JERSEY

Furnace Brook Project (P.L. 566) Warren County

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Progress In Land Treatment. Accelerated land treatment is getting underway. Measures planned for cropland--conservation cropping systems--65 acres, contour farming--252 acres, contour orchards--3 acres, cover cropping--371 acres, crop residue use--412 acres, diversions--1710 feet, and strip cropping 100 acres. Pastureland--pasture and hayland renovation--54 acres, pasture proper use--565 acres. Forest land treatment to date includes 11,000 trees planted on 11 acres; timber stand improvement on 10 acres, 57 acres of marked and cut woodland harvested; and 8 management plans covering 180 acres have been prepared. Technical assistance has been provided to 13 landowners. Estimated cost of land treatment is \$8,972.00.

Progress In Structural Measures. Construction of the multipurpose reservoir was completed in November 1971. A fence is being constructed along Buckley Avenue for protection of the dam and safety of people along the road. Fish and Game people have stocked the lake with trout as well as warm water fish. Warren County plans to become a sponsor and take over the lake and construct the planned recreational facilities. This should occur in early 1974. Channel work is scheduled for June 1974. Foundation investigations and design work are completed and concurrence from State and Federal Fish and Game officials has been received.

Progress In Obtaining Land Rights. Acquisition of the land rights for the recreational facilities is complete and the SLO is beginning to work on obtaining the needed land for the channel modification. An estimated \$3,000 (includes \$20,000 PL-566 funds) has been spent on land rights.

NEW JERSEY

Furnace Brook Project (P.L. 566) Warren County

The Project In Brief. Authorized - May 24, 1968. Estimated completion - in the fiscal year 1974. Area - 4,968 acres (all privately owned). Sponsors - Warren County Soil Conservation District, Oxford Township, New Jersey Department of Environmental Protection. Estimated total cost - \$597,688 (\$355,269 PL-566, \$242,419 other). Principal problem - flood damage to residences, industry and public buildings. Land ownership and use - privately owned, 2 percent crop and pasture land, 41 percent woodland, 37 percent idle and urban.

Progress In Land Treatment. Accelerated land treatment is getting underway. Measures planned for cropland--conservation cropping systems- 25 acres, contour farming-252 acres, contour orchards-3 acres, cover cropping-371 acres, crop residue use-412 acres, diversions-1710 feet, and strip cropping 100 acres. Pastureland--pasture and hayland renovation- 4 acres, pasture proper use-565 acres. Forest land treatment to date includes 11,000 trees planted on 11 acres; timber stand improvement on 57 acres, 57 acres of marked and cut woodland harvested; and 8 management plans covering 180 acres have been prepared. Technical assistance has been provided to 13 landowners. Estimated cost of land treatment is \$8,972.00.

Progress In Structural Measures. Construction of the multipurpose reservoir completed in November 1971. A fence is being constructed along Buckley Avenue for protection of the dam and safety of people along the road. Fish and Game people have stocked the lake with trout as well as warm water fish. Warren County plans to become a sponsor and take over the lake and construct planned recreational facilities. This should occur in early 1974. Channel work is scheduled for June 1974. Foundation investigations and design work are completed and concurrence from State and Federal Fish and Game officials has been received.

Progress In Obtaining Land Rights. Acquisition of the land rights for the recreational facilities is complete and the SLO is beginning to work on obtaining the needed land for the channel modification. An estimated \$20,000 (includes \$20,000 PL-566 funds) has been spent on land rights.

1973

NEW JERSEY

Furnace Brook Project (P.L. 566) Warren County

The Project In Brief. Authorized - May 24, 1968. Estimated completion - in the fiscal year 1974. Area - 4,968 acres (all privately owned). Sponsors - Warren County Soil Conservation District, Oxford Township, New Jersey Department of Environmental Protection. Estimated total cost - \$597,688 (\$355,269 PL-566, \$242,419 other). Principal problem - flood damage to residences, industry and public buildings. Land ownership and use - privately owned, 22 percent crop and pasture land, 41 percent woodland, 37 percent idle and urban.

Progress In Land Treatment. Accelerated land treatment is getting underway. Measures planned for cropland--conservation cropping systems- 365 acres, contour farming-252 acres, contour orchards-3 acres, cover cropping-371 acres, crop residue use-412 acres, diversions-1710 feet, and strip cropping 100 acres. Pastureland--pasture and hayland renovation- 454 acres, pasture proper use-565 acres. Forest land treatment to date includes 11,000 trees planted on 11 acres; timber stand improvement on 10 acres, 57 acres of marked and cut woodland harvested; and 8 management plans covering 180 acres have been prepared. Technical assistance has been provided to 13 landowners. Estimated cost of land treatment is \$78,972.00.

Progress In Structural Measures. Construction on the multipurpose reservoir was completed in November 1971. Closing of the gate has been delayed until a small deficiency in the principal spillway pipe is repaired. This should be completed by October 1972. Foundation investigation and design work are complete with concurrence from both State and Federal Fish and Game officials. Construction is scheduled for the summer of 1973. Basic recreation facilities will follow completion of the channel.

Progress In Obtaining Land Rights. Acquisition of the land rights for the recreational facilities is complete and the SIO is beginning to work on obtaining the needed land for the channel modification. An estimated \$73,000 (includes \$20,000 PL-566 funds) has been spent on land rights.

1972

NEW JERSEY

Furnace Brook Project (P.L. 566) Warren County

The Project in Brief: Authorized - May 24, 1968. Estimated completion - in the fiscal year 1974. Area - 4,968 acres (all privately owned). Sponsors - Warren County Soil Conservation District, Oxford Township, New Jersey Department of Environmental Protection. Estimated total cost - \$597,688 (\$355,269 PL-566, \$242,419 other). Principal problem - flood damage to residences, industry and public buildings. Land ownership and use - privately owned, 22 percent crop and pasture land, 41 percent woodland, 37 percent idle and urban.

Progress in Land Treatment. Accelerated land treatment is getting underway. Measures planned for cropland -- conservation cropping systems - 365 acres, contour farming - 252 acres, contour orchards - 3 acres, cover cropping - 371 acres, crop residue use - 412 acres, diversions - 1,710 feet, and strip cropping - 100 acres. Pastureland -- pasture and hayland renovation - 454 acres, pasture proper use - 565 acres. Forest land -- acres to be treated is 145. Estimated cost of land treatment is \$78,972.

Progress in Structural Measures. Construction of the multipurpose reservoir started last fall is completed except for finishing the seeding contract - probably another 3 or 4 weeks. Designs for the 0.3 mile of channel improvement are nearing completion. Construction is scheduled for early spring of 1972. Basic recreation facilities will follow completion of the channel.

Progress in Obtaining Easements and Rights-of-Way. Oxford Township completed negotiations with nine landowners for the acquisition of the 140 acres needed for the multipurpose reservoir and basic recreation facilities. This cost \$70,000 (\$35,000 PL-566 and \$35,000 local). Negotiations are also underway for easements valued at \$5,000 for the 0.3 mile of channel improvement. All but one have been acquired.

1971

NEGATIVE DECLARATION
FOR
RECREATIONAL FACILITIES
AT
OXFORD FURNACE LAKE
IN THE
FURNACE BROOK WATERSHED
WARREN COUNTY, NEW JERSEY
April 1976

INTRODUCTION

The Furnace Brook Watershed, with a drainage area of approximately 4968 acres, is located in Warren County in the mountainous region of northwestern New Jersey. The work plan for the Watershed was formulated to reduce floodwater damages in the village of Oxford and to provide water-based recreational opportunities for the area's residents. The plan provides for the installation of conservation land treatment measures, a multiple-purpose flood prevention-recreation reservoir, including recreational facilities, and 0.3 miles of stream channel work.

The project was authorized for construction in January 1968. The 53-acre multiple-purpose flood prevention-recreation reservoir, now known as Oxford Furnace Lake, was completed in 1973. The sponsors have purchased the land area needed for the water-based recreational facilities and in 1973, they cleared most of the proposed parking, picnicking, beach, and access road areas. In 1975, over 6400 people used temporary facilities installed at the lake. This negative declaration pertains only to the installation of the permanent recreational facilities at Oxford Furnace Lake. An environmental impact statement is being prepared for the remaining stream channel work.

AUTHORITY

This project for watershed protection and flood prevention in the Furnace Brook Watershed is being implemented under the authority of the Watershed Protection and Flood Prevention Act (PL-566, 83rd Congress, 68 Stat., 666), as amended.

SPONSORING LOCAL ORGANIZATIONS

Warren County Soil Conservation District
Stiger Street, Hackettstown, N.J. 07840

Oxford Township
98 Lincoln Avenue, Oxford, N.J. 07863

New Jersey Department of Environmental Protection
Division of Fish, Game and Shellfisheries
P.O. Box 1390, Trenton, N.J. 08625

PROPOSED ACTION

The planned action involves the construction of recreational facilities on 84 acres of land adjacent to Oxford Furnace Lake. The facilities will include parking areas, a boat dock and ramp, picnic areas, sanitary facilities, and a beach and swimming area with bathhouse. The access road will be improved and electrical service will be provided for the area.

The sanitary facilities and water supply system will be designed and operated in accordance with all applicable state and local health regulations. Construction plans will include appropriate measures for the control of erosion and sedimentation during the installation period, and suppressors will be used to keep noise and dust within tolerable limits. All facilities will be designed to permit use by the physically handicapped.

PROBABLE IMPACTS

The installation of the permanent recreational facilities at Oxford Furnace Lake will provide a high quality recreational development with opportunities for swimming, fishing, boating, and picnicking. The recreational development is expected to attract 20,000 visitors annually with a peak day usage of 400. Average annual recreational benefits are estimated at \$27,750.

Additional selective clearing, on about three acres of land, will be required for the installation of the permanent recreational facilities. This will result in the loss of additional wildlife habitat. There will be temporary increases in noise, dust, and traffic in the area during the construction period. As facility usage increases in the future, the influx of recreationalists will generate greater volumes of traffic, noise, and litter on the roads in the surrounding area.

CONSULTATION

The Work Plan for the Furnace Brook Watershed was developed in consultation with various local, state, and federal agencies. Public input was obtained by citizen participation at open meetings. Additional meetings were held with local, county, and state officials, and consultants during the development of the detailed plans and designs for the recreational facilities.

The following state and federal agencies participated in the environmental assessment of this project:

New Jersey
Department of Environmental Protection
Bureau of Archeology

United States
Fish & Wildlife Service
Forest Service
Environmental Protection Agency
Advisory Council on Historic Preservation

An archeological survey of the area revealed no prehistoric resources of any significance. There are no sites listed on either the National Register of Historic Places or the New Jersey State Register of Historic Places in the planned recreational area.

If evidence is found during construction that archeological values exist, the National Park Service and appropriate state interests will be notified. Arrangements will be made, satisfactory to the sponsors, the Service, and appropriate authorities, for any required relocation or salvage activities. These activities, if necessary, will be performed in accordance with the Archeological and Historical Preservation Act (PL 93-291). Since this is a federally assisted local project, there will be no change in the existing responsibilities of any federal agency under Executive Order 11593 with respect to archeological and historical resources.

CONCLUSIONS

The environmental assessment of this federal action indicates that the installation of the recreational facilities at Oxford Furnace Lake will neither create significant adverse local, regional, or national impacts on the environment nor cause significant controversy. As a result of these findings, the State Conservationist, Soil Conservation Service has

determined that the preparation and review of an environmental impact statement is not needed for the installation of the recreational facilities.

Information and data collected during investigations and the environmental assessment are on file and may be reviewed by interested parties at the office of the Soil Conservation Service, 1370 Hamilton Street, Somerset, New Jersey 08873.

Approved by: Chester F. Bellard 4-28-76
Chester F. Bellard Date
State Conservationist

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

RECREATIONAL FACILITIES
IN THE
FURNACE BROOK WATERSHED, NEW JERSEY

Notice of Availability of Negative Declaration

Pursuant to Section 102(2) (C) of the National Environmental Policy Act of 1969; the Council on Environmental Quality Guidelines (40 CFR Part 1500); and the Soil Conservation Service Guidelines (7 CFR Part 650); the Soil Conservation Service, U.S. Department of Agriculture, gives notice that an environmental impact statement is not being prepared for the installation of the recreational facilities in the Furnace Brook Watershed, Warren County, New Jersey.

The environmental assessment of this federal action indicates that the project will not create significant adverse local, regional, or national impacts on the environment and that no significant controversy is associated with the project. As a result of these findings, Mr. Chester F. Bellard, State Conservationist, Soil Conservation Service, has determined that the preparation and review of an environmental impact statement is not needed for this project.

The project involves the construction of recreational facilities on 84 acres of land adjacent to Oxford Furnace Lake (Site 2). The facilities will include parking areas, a boat dock and ramp, picnic areas, sanitary facilities, and a beach and swimming area with bathhouse.

The negative declaration is being filed with the Council on Environmental Quality and copies are being sent to various federal,

Recreational Facilities
Furnace Brook Watershed, New Jersey
Notice of Availability of
Negative Declaration

Page 2

state, and local agencies. The basic data developed during the environmental assessment is on file and may be reviewed by interested parties at the Soil Conservation Service, 1370 Hamilton Street, Somerset, New Jersey, 08873. A limited number of copies of the negative declaration is available from the same address to fill single copy requests.

No administrative action on implementation on the proposal will be taken until 15 days after the date of this publication.

Deputy Administrator for Water Resources
Soil Conservation Service

Date:

(Catalog of Federal Domestic Assistance Program No. 10.904,
National Archives Reference Services.)