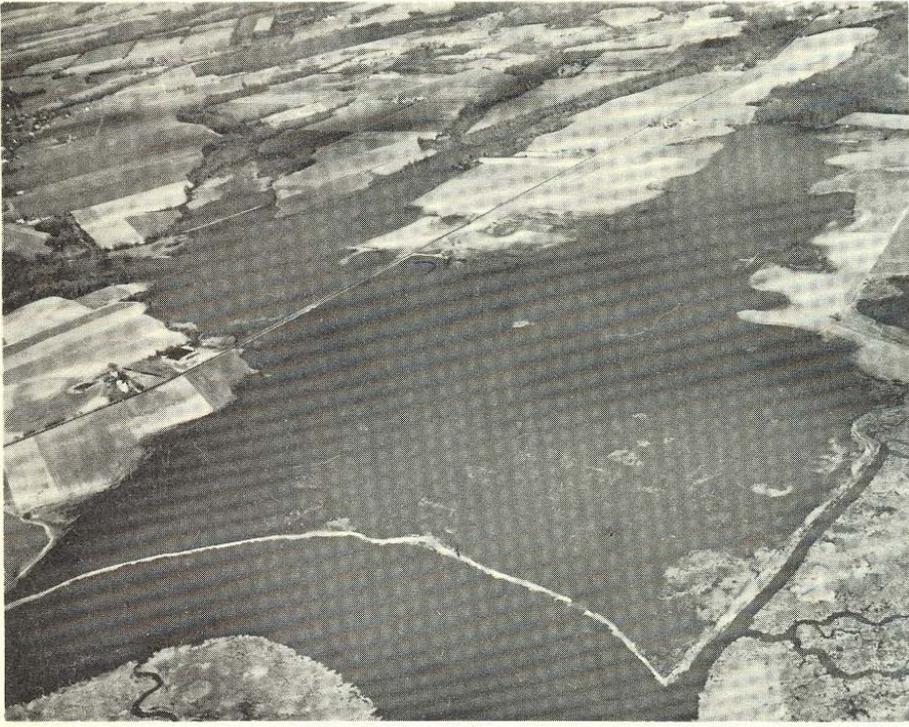


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from the desk of --
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WATERSHED WORK PLAN
for the
PINE MOUNT - MILL CREEK WATERSHED
Cumberland County, New Jersey

(2007)

Project Pine Mount-Mill Creek

State New Jersey

OPERATION AND MAINTENANCE AGREEMENT

THIS AGREEMENT, made and entered into the 11th day of April, 1963, by and between the Soil Conservation Service, United States Department of Agriculture, hereinafter referred to as the "Service", the County of Cumberland, hereinafter referred to as the "County", relates to the operation and maintenance of the following described Works of Improvement:

Dike - Length 4,225 feet; elevation 9.0 feet m.s.l.; top width 10 feet; side slopes 2:1.

Tidegate Structure - Four 48 inch diameter pipes with flap gates; vicinity of Station 30+00.

Inlet Channel - Length 1,200 feet; bottom width 12 feet.

Inlet Channel - Length 1,950 feet; bottom width 7 feet.

Outlet Channel - Length 1,700 feet; bottom width 40 feet.

The location of the structural measures is shown on the Project Map. See Figure 3 in the Work Plan.

The estimated annual cost for operating and maintaining the works of improvement herein described is \$680.00 based on present construction costs.

1. OPERATION

The parties hereto agree as follows to the operation of the works of improvement:

A. The Service will provide such technical services as are available for assistance in the proper operation of the works of improvement.

B. The County will:

1. Be responsible for operation of the works of improvement (as defined above) simultaneously with acceptance of the works of improvement from the contractor.
2. Prohibit the installation of obstructions of any kind being placed in any portion of the dike or channels.
3. Take all other necessary steps to insure that the works of improvement are permitted to function in the manner for which they were designed, and are operated in accordance with any applicable State law.

II. MAINTENANCE

The parties hereto agree as follows to the maintenance of the works of improvement:

A. The Service will:

1. Inspect the works of improvement at least annually.
2. Prepare and furnish to the County a report of inspection findings including recommendations for maintenance work needed and when such work should be completed.
3. Provide such technical services as are needed and available for preparing plans, designs and specifications for needed maintenance of the works of improvement.

B. The County will:

1. Be responsible for maintenance of the works of improvement (as listed on Page 1) simultaneously with acceptance of the works of improvement from the contractor.
2. Inspect the works of improvement at least annually and after every major storm or the occurrence of any other unusual condition that might adversely affect the works of improvement to insure proper functioning and to check for possible damage or deterioration. Items to be checked at time of inspection may include, but not be limited to, the following:
 - a. Dike.
 - (1) Settlement or cracking.
 - (2) Erosion.
 - (3) Leakage.
 - (4) Rodent, wildlife, livestock or other damage.
 - (5) Condition of vegetative cover.
 - b. Tidegate Structure.
 - (1) Damage of any kind.
 - (2) Leakage.
 - (3) Obstructions.
 - c. Channels.
 - (1) Sedimentation.
 - (2) Bank cutting.
 - (3) Debris accumulation.

3. Perform, in accordance with any applicable State laws, all maintenance needs indicated by inspections and reports thereof within the time limits specified, if any, in such manner as not to damage the works of improvement in any way. Maintenance may include, but not be limited to, the following:
 - a. Remove and dispose of debris or obstructions in the channels and tidegate structure.
 - b. Refill, smooth and vegetate rilling on dike or embankments.
 - c. Refill and vegetate settled areas of dike as required.
 - d. Repair damage to tidegate structure.
 - e. Other maintenance work as indicated in Service inspection reports.
4. Prepare a report for each inspection performed and furnish two copies to the Service. Maintain a record of all maintenance work performed and make such records available for review by the Service.
5. The County will:
 - a. Perform operation and maintenance by own facilities.
 - b. Obtain operation and maintenance funds by taxation.

III. IT IS MUTUALLY AGREED THAT:

- A. Government Representatives shall have the right of free access to inspect the works of improvement at any time.
- B. Whenever possible the parties to this agreement will make their annual inspections jointly. It is desirable that the annual inspections be made during the months of March or April. Any supplemental inspections then determined necessary will be scheduled and agreed to at that time.
- C. The County will secure prior Service approval of any agreement(s) to be entered into with other parties for any operation or maintenance of these works of improvement and furnish the Service with three copies of such agreements. If the agreement does not state a specific effective date, the County will notify the other parties to the agreement in writing of such date. Three copies of the notification will be provided the Service.

No Member of 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.

The signing of this agreement was authorized by a resolution of the governing body of the Board of Chosen Freeholders of Cumberland County, New Jersey adopted at a meeting held on March 11, 1963.

County of Cumberland
By: [Signature]
(Title) Clerk.
Date: March 11, 1963.

By: [Signature]
Director

Soil Conservation Service
United States Department of Agriculture

By: [Signature]
State Conservationist
Date: April 11, 1963.

WATERSHED WORK PLAN
PINE MOUNT-MILL CREEK WATERSHED
Cumberland County
New Jersey

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

Prepared by:

Union Bank Meadow Company
Salem-Cumberland Soil Conservation District
County of Cumberland
Township of Greenwich

Assisted by:

United States Department of Agriculture
Soil Conservation Service
Forest Service

N.J. Department of Conservation & Economic Development
Bureau of Forestry

MARCH 1962

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SECTION 1 - THE WATERSHED WORK PLAN

PINE MOUNT-MILL CREEK WATERSHED
Cumberland County, New Jersey
March 1962

SUMMARY OF THE PLAN

The Pine Mount-Mill Creek Watershed consists of two adjacent tributaries--Pine Mount Creek and Mill Creek. The combined drainage area is 6,500 acres, of which 3,200 acres are in the Pine Mount drainage area and 3,300 acres in the Mill Creek drainage area.

Pine Mount Creek starts in a truck farming area and flows through 190 acres of marsh protected by a tidewater dike before outletting into the Cohansey River. Problems in this part of the watershed include a need for irrigation water as well as a desire on the part of the sponsors to impound fresh water for wildlife habitat improvement in the marsh area.

An investigation was made of a proposed site for an irrigation reservoir in the truck farming area. The investigation included preliminary site studies, cost estimate, storage capacity and design high water level. Similarly, an investigation was made of the proposed wildlife impoundment in the marsh area. Since the concerned landowners could not see their way to providing the necessary easements and rights-of-way, these measures were excluded from any further consideration. This work plan is thus confined to the Mill Creek drainage area.

This project is sponsored by the Salem-Cumberland Soil Conservation District, the County of Cumberland, the Township of Greenwich, and the Union Bank Meadow Company.

The tidal marsh at the outlet of Mill Creek has been protected by an earth dike since early in the 1800's. Although this dike has been overtopped, breached and otherwise damaged over the years, it has been kept in good repair by the Union Bank Meadow Company, which controls the dike and protected marsh. In May 1960, a breach occurred in the dike. After spending \$3,000 in an attempt to close the breach, the Union Bank Meadow Company gave it up. Breaches soon occurred in other parts of the dike with the result that it has been eroded away.

The principal problem is damage from tidewater, both normal tides and storm tides. Some agricultural land is now permanently under water. Production on adjacent land is adversely affected by the higher water table, and is further limited by periodic flooding from

high storm tides. Damage is done to public roads, bridges and one home from normal tides as well as from storm tides. Average annual benefits amount to \$13,222. This includes \$8,357 for restoration to former productivity as shown in Table 7.

This plan provides for land treatment measures for erosion control and reduction in runoff; and for approximately 4,225 feet of dike and tidegate structure. The structural measures are planned for installation in fiscal year 1963, and land treatment measures over a 3 year period.

The estimated installation cost of the project is \$265,338, of which the Public Law 566 share is \$215,829. The remainder, \$49,509, will be paid from county, township and other funds.

The cost of installing land treatment measures, estimated at \$22,730, will be paid by landowners and operators, with such help as may be available under the Agricultural Conservation Program. Technical assistance amounting to \$950 will be provided by the Soil Conservation Service and the Forest Management Section in the New Jersey Department of Conservation and Economic Development under their going programs. No accelerated technical assistance will be needed with Public Law 566 funds.

The installation cost of the structural measures is estimated at \$241,658. Of this 81.7 percent is allocated to flood prevention and 18.3 percent to drainage. Costs of \$215,829 will be paid from Public Law 566 funds and \$25,829 from other funds. The local share includes \$440 for easements and rights-of-way and \$1,867 for administration of contracts. The County of Cumberland and the Township of Greenwich will each pay about half of the local share. Easements will be obtained by the Township of Greenwich. Responsibility for maintenance of the structural measures, estimated at \$680 annually, will be assumed by the Township of Greenwich for that part outside the Union Bank Meadow Company boundaries and by the Union Bank Meadow Company for that part within its boundaries.

Agricultural benefits are based on restoring production to that which existed when the dike was operating. Average annual primary agricultural benefits from structural measures are estimated to be \$10,235.

Non-agricultural benefits are based on savings in costs due to the project for roads and bridges and on protection to one residence which had to be abandoned when the dike breached. Average annual non-agricultural benefits are estimated at \$2,987.

No flood prevention or agricultural water management

benefits were claimed for land treatment measures.

The ratio of total primary average annual benefits, estimated at \$13,222 to average annual costs, estimated at \$9,414 is 1.4 to 1.0.

Land treatment measures for watershed protection will be operated and maintained by landowners and operators under agreements with the Salem-Cumberland Soil Conservation District.

DESCRIPTION OF THE WATERSHED

Physical Data

Mill Creek, having a drainage area of 3,300 acres, starts in the rolling terrain north of Greenwich, at an elevation of about 110 feet above mean sea level. It flows southward through a course of about 4 miles, entering the Cohansey River in the vicinity of Greenwich, which is about 6 miles upstream from the outlet into Delaware Bay. Mill Creek has one large tributary, Mounce Creek, which enters it near the outlet. Mill Creek and its tributaries flow through 300 acres of tidal marsh before entering the Cohansey River.

The terrain in the headwaters is relatively steep, starting at elevation 110 feet mean sea level at the top of the watershed and dropping to 20 feet in $1\frac{1}{2}$ miles, then more gradually to the marsh, which ranges from 0 to 4 feet mean sea level. About 20 percent of the watershed is below 10 feet mean sea level.

The average daily tide fluctuates from -2.3 to +2.6 feet mean sea level. The average maximum yearly high tide is 6.0 feet mean sea level. The highest tide of 29 years of record occurred in November 1950 when it reached 8.8 feet. This resulted from prolonged high winds blowing in an upstream direction parallel to the Cohansey River. The river thus served as a funnel into which extremely high tides were blown.

The mean annual temperature is 43 degrees, ranging from 30 in December to 75 in August. The frost free period generally extends from April 11 to October 26.

The average annual precipitation is 44 inches, fairly evenly distributed throughout the year.

Economic Data

This is an agricultural watershed, with truck farming

being the principal farm enterprise. Much of the farm produce is processed at the canning factory in Greenwich, the only community of any size in the watershed. It has a population of 300. The ketchup factory and frozen food plant in Bridgeton account for much of the remaining farm produce grown in this watershed. Bridgeton, which is 6 miles from Greenwich, has a population of 22,000. Bridgeton is designated as a 5A area by the Area Redevelopment Administration. Its geographic boundaries are described as all of Cumberland County, which includes the Pine Mount-Mill Creek Watershed.

All of the land in the Mill Creek drainage area is in private ownership. There are about 18 farms, averaging 185 acres per farm. The average value per farm is estimated at \$26,000. Of the 9 cooperators with the Salem-Cumberland Soil Conservation District, 3 have basic conservation plans.

Water supply for domestic and farm use is obtained from shallow wells.

It is believed that there will be a trend toward greater recreational activity in this watershed, particularly with the development of marinas on the Cohansey River.

The following table shows the land use in the watershed:

<u>Land Use</u>	<u>Percent</u>
Cropland	42
Hay-Pasture	4
Woodland	39
<u>Miscellaneous</u>	<u>15</u>
Total	100

The principal crops grown are tomatoes, asparagus, field corn and lima beans. Other crops include peas, snap beans, peppers, alfalfa and lettuce.

Woodlands vary widely in stand conditions and species, due mainly to aspect, soil and drainage conditions. On the wetter sites Pin oak, gum and maple types predominate. Oak, Yellow poplar, hickory and pine types, found on the well-drained sites, are more extensive. At present the woodlands function mainly to conserve soil and water, but by proper management they present a good potential for the realization of multiple use benefits.

Geology

The Mill Creek drainage area is divided physiographically into three sections. The northern uplands are developed on the Cohansey formation (sands) capped by a thin silt mantle.

The central section is a low plain separated from the upland by a low erosional scarp paralleling the Delaware River. The upper part of the lowland is also developed on the Cohansey, and also is capped by silt in the western section. The lower and westerly section of the lowland is developed on the Kirkwood formation (clays.) The Cape May formation of terrace sands overlies the Cohansey and Kirkwood and underlies the silt mantle over most of the lowland to a depth of 10 to 50 feet.

The southern section is mainly tidal marshes along the Cohansey Creek and its tributaries. These consist of deep backfilling of roughly dissected topography by organic silts and are subject to diurnal flooding by brackish to salty water. These silts range in thickness from a few feet to 40 or more where close to the Cohansey River.

Soils

More than half of the Mill Creek drainage area is covered by loam and silt loam soils of the Matapeake series. These represent the most productive soils in New Jersey. Sassafras and Galestown sandy loams and loamy sands occupy about one fourth of the drainage area. Tidal marsh occupies about 300 acres and the remainder is made up of wet soils such as muck and Othello.

The area subject to damage is composed of Sassafras soils. These soils are highly productive for commercial vegetables. No special drainage measures are needed for proper management. For vegetable crops these soils are at least as good as those in the Matapeake series.

WATERSHED PROBLEMS

Early in the 19th century many tidal marshes in southern New Jersey were developed for agriculture through protection of the marsh areas from tide water inundation by construction of dikes. Gravity disposal of upland water was provided for by tidegates, which open by pressure from upland water when the tide is ebbing and close by pressure of tidewater when the tide is coming in. Many such structures were built by meadow companies, which were organized by authority of State Law. The dike protecting the Mill Creek tidal marsh was constructed by the Union Bank Meadow

Company, organized in the early 1800's. This meadow company presently has seven members, with control of about 300 acres.

The Mill Creek dike was constructed along the bank of the Cohansey River, from material taken out of the river. It was thus subject to erosive effects of wave action and river current, and maintenance was costly. Periodically, high tides, often associated with hurricanes, caused damage to the dike. Storms that damaged or overtopped the dike occurred in August 1933, October 1933, November 1950, November 1953, August 1955, and May 1960.

In May 1960, a breach occurred, allowing tidewater to inundate the marsh. After spending over \$3,000 in an attempt to close the breach, the Union Bank Meadow Company gave up. Since then, the dike has practically disintegrated.

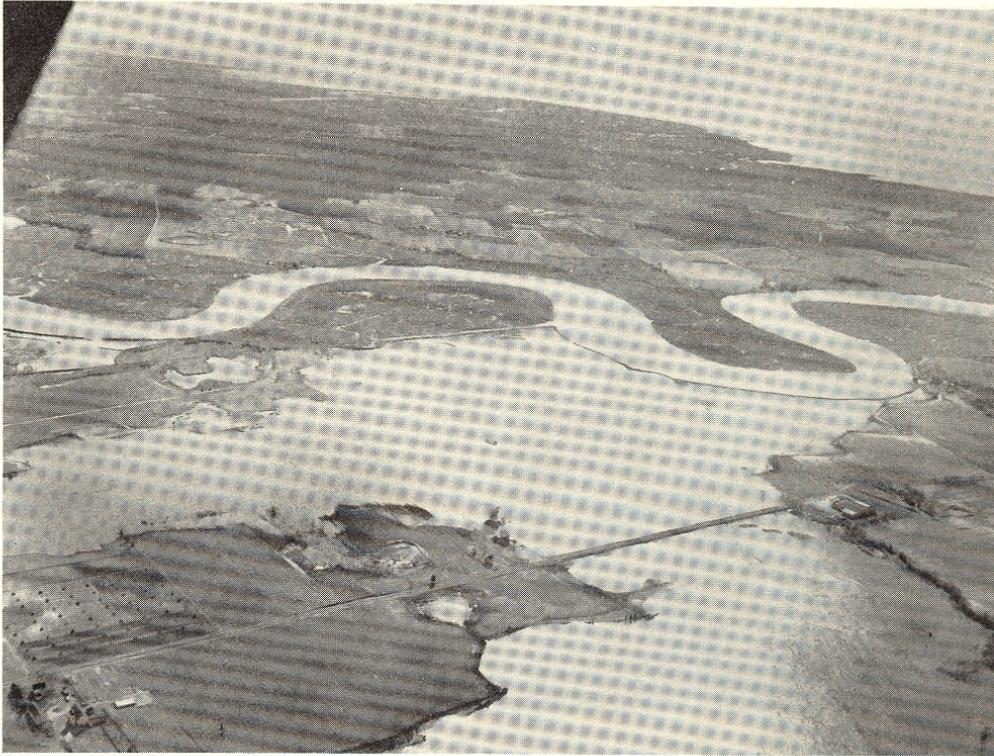
While the dike was operative the water level was held to elevation -1.0 to -1.5 feet m.s.l. Truck crops were grown at elevations as low as 3.0 feet. Land below elevation 3.0 feet to +0.5 feet was used for hay.

Now, with the dike breached, the average daily high tide is 2.6 feet, and frequently exceeds 4.0 feet. This happened three times in one week in April 1961. The average maximum yearly high tide is 6.0 feet. The adverse effects of the tidewater extend beyond the land that is permanently inundated. Adjacent land is affected by the higher water table and by exposure of this land to inundation during the big storm tides. One hundred seventy acres of agricultural land have been taken completely out of production by the breaks in the dike. Fifty-one acres of cropland and 248 acres of woods and pasture have been adversely affected.

Other effects from exposure to tidal action include damage to the Bridgeton-Greenwich Road; a Township road crossing the upper end of the marsh; washing out of a farm lane across the upper end of the marsh; cutting off access to one residence and exposing other residences to damage in high storm tides. Cumberland County spent about \$6,800 in repairing damage to the Bridgeton-Greenwich Road resulting from high tides between January and April 1961. The road was closed to public travel for several weeks during this period.

Domestic water is obtained largely from shallow wells. The supply for this purpose is adequate.

Although erosion is moderate to severe in the headwaters of Mill Creek, little sediment reaches the problem area. Sediment damages therefore were not evaluated.



Flooding from daily high tides.



Breach in Union Bank Meadow Company Dike in May 1960.
Local attempts to repair the dike have failed.



Tidewater flooding damages cropland and isolates home of Louis Thomas near Greenwich, New Jersey.



Newlan Watson's asparagus field flooded by tides from the Cohansey River, Greenwich, New Jersey.

Fire prevention is a forestry problem. This area is currently not included in the regularly organized protection system. However, the New Jersey Forest Fire Service is charged with the protection of all woodlands from fire. They will cooperate in promotional work designed to educate the people in the elimination of fire hazards and proper methods to prevent the starting of fires. They will also go into any area upon request for purposes of fire suppression. This can be accomplished by a telephone call to the nearest Section Warden. Fire hazards in this area are high and there have been frequent fires in the past. The New Jersey Bureau of Forestry will cooperate to the fullest extent with the sponsors of this watershed for fire prevention and suppression.

EXISTING OR PROPOSED WORKS OF IMPROVEMENT

There are no existing or proposed works of improvement that will affect or be affected by the works of improvement included in this plan.

WORKS OF IMPROVEMENT TO BE INSTALLED

Land Treatment Measures

Land treatment measures for watershed protection to be established over the three year installation period of the project are listed in Table 1. These measures will be carried out by landowners and operators under existing programs of assistance to Soil Conservation Districts. No additional assistance from Public Law 566 funds will be needed to establish these measures on the land.

Land treatment measures will consist of those that will reduce erosion and runoff. These include the following:

Contour Farming (15 acres) - Conducting farming operations on sloping cultivated land in such a way that plowing, land preparation, planting, and cultivation are done on the contour. This includes following established grades of terraces, diversions, or contour strips, and farming between trees in orchards and vineyards planted on the contour.

Cover Cropping (450 acres) - Using close-growing grasses, legumes or small grain in a cropping system primarily for summer or winter protection. Cover crops usually occupy the land for a period of one year or less.

Conservation Cropping System (360 acres) - Growing crops in combination with needed cultural and management measures. Cropping systems include the use of rotations that contain grasses and legumes, as well as sequences in which the desired benefits are achieved without the use of such crops.

Diversions (.6 miles) - Grading or digging a channel, with a supporting ridge on the lower side, across the slope.

Outlet Construction (1,120 linear feet) - Constructing channels for the disposal of runoff water from diversions or terraces and other structures, including alteration of watercourses.

Tree Planting (80 acres) - Planting tree seedlings in open areas to establish a stand of forest trees.

Woodland Harvest Cutting (10 acres) - Removing mature crop trees in a manner that will encourage regeneration and normal development of a new stand.

Woodland Thinning (15 acres) - Removing trees of low or no commercial value from an immature woodland or from overstocked stands.

Woodland Weeding (20 acres) - Removing shrubs or trees of poor form or less desirable or inferior species, which are restricting the growth of desirable trees.

Controlled Burning (50 acres) - Using light fire to reduce fire hazard and improve conditions for forest stand development where the area to be burned is predetermined and the intensity of the fire controlled.

Firebreaks, Plowed or Bulldozed (16,370 linear feet) - Installing barriers designed to check or stop uncontrolled fires on woodland.

Structural Measures

The old, badly damaged Mill Creek dike will be replaced by a new dike located about 0.3 mile inland from the banks of the Cohansey River. It will be constructed of mineral soil, having a length of 4,225 feet, top width of 10 feet, and side slopes of 2:1. The side slopes will be capped with alluvial silt taken out of the marsh to facilitate establishment of vegetative cover. The elevation of the top of the dike will be 9.0 feet m.s.l. Figure 2 shows a typical cross-section. Adequate borrow pits of mineral soil are located within a reasonable distance of the site.

A tidegate structure, consisting of four 48 inch diameter pipes, will be installed in the vicinity of Station 30+00.

More thorough site investigations, however, may indicate a more suitable location. The outlet ends of the pipes will be equipped with flap gates that will open with a head of water from the inside and close when the incoming tide reaches an elevation higher than the water inside the dike. See Figure 2. The normal water level immediately inside the dike will be in the vicinity of elevation -1.5 m.s.l. The design high water just inside the dike is +0.4 m.s.l.

In order that the tidegate structure will function as designed, two inlet channels and an outlet channel will be constructed. One inlet channel will be 1,200 feet long with a 12 foot bottom width; the other will be 1,950 feet long with a 7 foot bottom width. The outlet channel, extending from the tidegate structure to the Cohansey River, will be 1,700 feet long, with a bottom width of 40 feet to provide an adequate channel to the river.

The location of the structural measures is shown on the Project Map. See Figure 3.

BENEFITS FROM WORKS OF IMPROVEMENT

Direct benefits from the proposed structural measures accrue to 469 acres of agricultural land, one residence, and to the general public in protection to 0.3 mile of public roads and a bridge. About 77 percent of the benefits are agricultural and 23 percent non-agricultural.

The 469 acres of agricultural land benefitted are owned by seven landowners, ownerships ranging from 1 to 114 acres.

Agricultural benefits are based on restoration to former productivity. When the dike breached in May 1960, 170 acres of agricultural land were completely put out of production through inundation and higher water table. Fifty-one additional acres of cropland were adversely affected by the higher water table. Installation of the structural measures will result in restoring these acres to previous productivity.

Agricultural benefits are allocated partly to flood prevention and partly to drainage based on cost. This resulted in allocating \$8,357 to flood prevention and \$1,878 to drainage. The primary average annual agricultural benefits are estimated to be \$10,235. Secondary benefits are estimated at \$3,613. Secondary benefits were not used for project justification, but were used to compute cost sharing.

An average annual benefit of \$2,722 to roads and bridges will be brought about by elimination of the need to raise the roads and replace the bridge. The home which had to be vacated will again be usable for residency. Indirect benefits will result from eliminating the need for closing roads during periods of high tides, and loss of business associated with closing of roads.

The highest tide of record was in November 1950, when the Corps of Engineers recorded 8.8 feet m.s.l. This was a freak storm in that high winds prevented the tides from ebbing until the next high tide cycle. This is a rare occurrence. The next highest tide of record is 7.0 feet, in August 1933. With the dike constructed to elevation 9.0 feet m.s.l., 100 percent protection is afforded against the highest tide of record.

COMPARISON OF BENEFITS AND COSTS

The average annual benefits from structural measures on Mill Creek are estimated at \$13,222, and the average annual costs \$9,414, a benefit-cost ratio of 1.4 to 1.0. Average annual benefits attributed to flood prevention and agricultural water management are shown in Table 8.

ACCOMPLISHING THE PLAN

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

Land treatment measures will be established by farm owners and operators in cooperation with the Salem-Cumberland Soil Conservation District over a 3 year period. The Soil Conservation Service and the Forest Management Section of the New Jersey Department of Conservation and Economic Development, with assistance from the U. S. Forest Service, will assist the District in planning and application of these measures under their going programs. No accelerated technical assistance will be needed to apply the land treatment measures within the project period. The Cumberland County Agricultural Stabilization and Conservation Committee will cooperate by providing financial assistance to landowners and operators in line with needs and funds available for those practices which will help accomplish the conservation objectives. The Farmers Home Administration will provide soil and water conservation loans to all eligible farmers requesting them.

The Soil Conservation Service will provide technical assistance in planning and designing of structural measures, the preparation of plans and specifications, the supervision of construction, the preparation of contract payment estimates, the making of final inspection, the execution of certificates of completion, and the performing of related duties in establishment of the planned structural measures for flood prevention and agricultural water management.

The Union Bank Meadow Company has authority vested within the organization to install the dike, along with necessary channels and tidegates. The dike will extend outside the jurisdiction of the Union Bank Meadow Company to the extent that one easement will be needed. The landowner has indicated that this easement will be donated. The Township of Greenwich will obtain this easement.

The Township of Greenwich will act as the local contracting organization.

Funds for the local share of the construction cost will be provided by the County of Cumberland and the Township of Greenwich, each paying about 50 percent of the local share. Money will be budgeted for this purpose and will be available when needed. Application for a loan from the Farmers Home Administration will not be made.

The structural measures will be installed during fiscal year 1963. Land treatment measures will be completed in fiscal year 1964.

Schedule of Expenditures

Fiscal Year	<u>Structures</u>		<u>Land Treatment</u>	<u>Total</u>
	P.L. 566	Other	Other	
1962	\$107,914	\$12,915	\$4,000	\$124,829
1963	107,915	12,914	10,000	130,829
1964	-	-	9,680	9,680
TOTAL	\$215,829	\$25,829	\$23,680	\$265,338

The New Jersey Agricultural Extension Service, through the County Agricultural Extension Agent, will assist the sponsors in carrying out an information and educational program. This program will be directed toward developing an understanding and appreciation of the program by landowners and all interested people in the watershed.

PROVISIONS FOR OPERATION AND MAINTENANCE

Land treatment measures will be operated and maintained by landowners and operators under cooperative agreement with the Salem-Cumberland Soil Conservation District.

The Township of Greenwich and the Union Bank Meadow Company will assume responsibility for maintenance of the structural works of improvement, estimated at \$680 annually. The Union Bank Meadow Company responsibility will be for that portion within their boundaries and the Township responsibility for the remainder. Maintenance will consist of periodic inspections, mowing the dike, channel excavation, repair of tidegate structure, and repair of any damage to the dike. Funds for maintenance will be raised by assessment of members of the Union Bank Meadow Company. Members will be assessed each year and the money put into a maintenance fund for use when it is needed.

All structural measures will be inspected at least once a year and after each unusually high tide. Representatives of the Township of Greenwich, the Union Bank Meadow Company and the Soil Conservation Service will jointly make the annual inspection.

Written inspection reports will be prepared by the Township and Union Bank Meadow Company representatives at least once a year and will be available at any time to the Soil Conservation Service.

The Soil Conservation Service will determine what maintenance measures are needed and will so notify the Township of Greenwich. It will provide design information and technical assistance that may be available and needed to the sponsoring local organization in performing works of maintenance.

The Township of Greenwich and the Union Bank Meadow Company will execute an operation and maintenance agreement with the Soil Conservation Service prior to issuance of invitations to bid.

COST SHARING

The cost of the total project is estimated at \$265,338. Of this, \$215,829, or 81 percent will be paid from Public Law 566 funds and \$49,509, or 19 percent from other funds.

The P.L. 566 cost covers \$163,233 construction cost, including 12 percent contingencies and \$52,596 for instal-

lation services (Engineering and Administrative costs.)

The other than P.L. 566 costs include:

1. \$22,730 for applying land treatment measures on non-Federal land. This will be borne by landowners with such help as is available under the Agricultural Conservation Program. In addition, \$950 will be provided from the going program for technical assistance.
2. \$23,522 construction costs, including 12 percent contingencies. This is to be shared equally by the County of Cumberland and Township of Greenwich.
3. \$440 for easements and rights-of-way, all of which will be donated.
4. \$1,867 for administration of contracts, to be handled by the Township of Greenwich.
5. Operation and maintenance, estimated at \$680 annually, to be incurred by the Union Bank Meadow Company.

Eighty two percent of the cost of the structural measures, or \$197,316, was allocated to flood prevention and 18 percent, or \$44,342 was allocated to agricultural water management (drainage) by the First Alternative Method for allocating costs for a multiple purpose flood prevention and drainage facility. The procedure is explained in Section II, Economic Investigations. See Table 9 for cost allocation.

Total agricultural water management benefits include secondary as well as direct identifiable benefits. Secondary benefits result from increased harvesting, processing, transporting and related activities. The ratio of direct identifiable to total benefits is \$1,878 to \$5,491, or 34 percent.

Secondary benefits were not used for project justification, but were used to determine sharing for costs allocated to agricultural water management (drainage.)

CONFORMANCE OF PLAN TO FEDERAL LAWS AND REGULATIONS

This project will have no effect on any proposed plan for the comprehensive development of the Delaware River Basin.

This plan does not provide for bringing any new land into agricultural production.

SECTION 2 - INVESTIGATIONS, ANALYSES, SUPPORTING TABLES AND FIGURES

Project Formulation

The primary objective of the sponsoring local organizations was replacement of the damaged Mill Creek dike to protect agricultural and urban property from tidewater.

Other objectives included provision for irrigation water needs in the Pine Mount Creek drainage area, and development of a wildlife impoundment in the marsh area inside the Pine Mount Creek dike.

An investigation was made of a proposed site for an irrigation reservoir on Pine Mount Creek. The investigation included preliminary site studies, cost estimate, storage capacity and design high water level. The concerned landowners could not reach agreement on use of the site for this purpose. Hence it is not a part of this plan.

Similarly, an investigation was made of the proposed wildlife impoundment in the marsh area on Pine Mount Creek. The concerned landowners could not see their way to providing the necessary easements and rights-of-way, hence this was not included in the plan.

Hydrology and Hydraulics

The hydrology and hydraulic design for the inlet ditches, tidegate structure and the outlet ditch is based on restoring the agricultural land to its former productivity. "C" drainage curve was used in determining the size of these structural measures.

Tide cycle data from December 1960, to May 1961, was obtained from a tide stage recorder set up on the Cohansey River. An average high tide (plus 2.6 feet m.s.l.) and an average low tide (minus 2.3 feet m.s.l.) were determined using the period December 1, 1960, through January 5, 1961. This period represents the average conditions which might be encountered. Using this data an actual average cycle was chosen and utilized as a basis for design. The design high water level on the upstream side of the tidegate structure was set at plus 0.4 feet m.s.l. The tidegate structure, consisting of four 48" diameter pipes, was designed for an average inflow of 147.1 cfs ("C" curve.) The discharge through the tidegates will be zero at high tide and 360 cfs at low tide. Therefore, the inlet and outlet channels were designed to have a capacity of 360 cfs. The invert of the tidegate will be set at minus 6.0 feet mean sea level.

Flood stages for a 25 year frequency 24 hour duration storm and a 50 year frequency 24 hour duration storm were checked using the procedure outlined in Technical Release No. 10. The dike will not be overtopped and no roads or houses will be endangered from upland flooding.

The elevation of the top of the dike was established by using the criteria from Standards and Specifications for Agricultural Dikes and Levees, dated May 29, 1958, issued from the Engineering and Watershed Planning Unit, Soil Conservation Service, Upper Darby, Pennsylvania. The Army Corps of Engineers, from a study of tidal data (1936-39, 1947-49 and 1952-1960) at Fort Miles, Delaware, indicates that the average maximum yearly high water elevation is 6.0 feet m.s.l. in the vicinity of Greenwich, New Jersey. Using 6.0 feet m.s.l., 1.5 feet for freeboard, and 1.5 feet for wave action, the top of the settled dike was set at 9.0 feet m.s.l. (see Figure 1.) High water marks of record were gathered from the local citizenry and Corps of Engineers. They ranged in elevation from 7.5 feet m.s.l. to 8.8 feet m.s.l. for the extreme high tide of November 1950.

Engineering and Geology

Three possible Mill Creek dike locations were considered. The first is on the existing dike. Since this location is too close to the Cohansey River, where erosion is taking place, this was immediately discarded.

The second alternative is a line extending from 50 feet inside the west abutment of the existing dike, directly across the marsh to high ground in the vicinity of the east abutment. Soundings were made along this line at intervals of approximately 200 feet, starting at the east abutment. The depth of muck along the first 1,000 feet ranged from 30 to 40 feet, indicating the need for a large quantity of earth fill. At this point the proposal was abandoned as being too costly.

The third alternative is located approximately 0.3 mile upstream from the existing dike. This is the shortest distance across the salt marsh and proved to be the best of the three alternatives considered. A dike in this location will be about 4,225 feet long. About 2,500 feet will be constructed on tidal marsh, with the balance on solid ground.

A profile was run along the proposed centerline. Soundings were made at intervals of approximately 200 feet along the centerline across the marsh. A steel pipe with a standard soil auger bit welded to the end was used as a probe. The soil auger was used to enable sampling at various depths.

The results of the soundings are tabulated below:

<u>Station</u>	<u>Depth of Probe</u> (feet)	<u>Remarks</u>
19+00	3	Hard sand bottom
22+16	5	Hard sand bottom
25+28	32	Firm silty clay layer--no further penetration
28+08	30	Firm silty clay layer--no further penetration
29+38	11	Hard sand bottom
31+18	10	Hard sand bottom
32+84	18	Hard sand bottom
34+23	42	Firm bottom not reached
36+08	35	Firm silty clay layer--no further penetration
37+19	29	Firm silty clay layer--no further penetration
39+21	24	Firm silty clay layer--no further penetration
41+88	1	Hard sand bottom

The dike will be constructed from mineral soil. Adequate borrow material is available within a reasonable distance of the site. The dike will have a top width of ten (10) feet and side slopes 2:1. The side slopes will be capped with a two foot layer of organic silt taken from the adjoining marsh in order to facilitate the establishment of a good grass cover.

The tidegate structure will be located approximately at Station 30+00. This location was selected for two reasons. First, the foundation is good. Since 30+00 is directly over the buried interfluve the depth of muck is only ten to eleven feet. The second reason is the availability of inlet and outlet channels for the tidegate structure. Cross-sections were taken of the possible outlet channels. The channel with the greatest capacity is close to Station 30+00. More detailed site investigations, however, may

indicate a more favorable location.

In computing the volume of earth fill, it was assumed that the muck in the tidal marsh would be displaced to a depth not to exceed thirty (30) feet. Where the soundings were less than thirty feet it was assumed that the earth fill would settle to the hard bottom. The shape of the fill under the marsh surface was assumed to be a rectangular solid having a width equal to the bottom width of the dike at the marsh level.

The average end area method was used for computing volumes. Twenty percent was added to the computed volume of mineral soil and fifty percent to the alluvial silt to allow for shrinkage.

The total estimated volume of earth fill is 129,541 cubic yards of mineral soil and 11,510 cubic yards of alluvial silt.

Spot elevations were taken in the flooded area and in the agricultural land adjacent to the flooded area. These elevations were plotted on aerial photos and contour maps were drawn on overlays of the photos. The contour maps were used by the hydrologist for the stage-storage relationship and by the economist to determine the benefitted area.

Economics

Economic justification is based on restoration of agricultural land to former productivity and reduction in damaged to urban property. Yield data, based on the relationship of production to depth to the water table, was obtained in consultation with Rutgers Agricultural College and Soil Conservation Service personnel. It was determined by this group that adverse effects of tidewater on crop production would, by raising the water table, extend to elevation 8.0 m.s.l. Crops considered were tomatoes, asparagus, field corn and hay.

The agricultural benefit area was determined by planimetry from aerial photographs areas formerly used for hay and crops to the eight foot contour line. Benefits were based on yields that were obtained prior to the breach in the dike. Net benefits were obtained by deducting production, harvesting and marketing costs. These costs were developed from information obtained from growers, local agricultural leaders, and New Jersey Experiment Station and Extension personnel. Agricultural benefits were long-termed using the ARS July 1959, revised project long-term U.S. price index for commercial vegetables. The following table shows how net benefits were derived:

COMPARISON OF NET RETURN WITHOUT AND WITH PROJECT

WITHOUT PROJECT

Crop	Acres	Yield Per Acre	Total Production	Long-Term Prices	Value of Product	Production Costs	Net Return
Hay	25	2.3 ton	57.5	28.90	1661.75	1120.00	541.75
Field Corn	13	64 bu.	832	1.57	1306.24	864.00	442.24
Asparagus	13	1588 lbs.	20644	.104	2146.98	2003.56	143.42
Totals	-	-	-	-	5114.97	3987.56	1127.41

WITH PROJECT

Hay	99	2.3 ton	227.7	28.90	6580.53	4455.00	2025.53
Field Corn	27	80 bu.	2160	1.57	3391.20	1795.50	1595.70
Tomatoes	69	12.6 ton	869.4	30.30	26342.82	19801.62	6541.20
Asparagus	26	2117 lbs.	55042	.104	5724.44	4524.00	1200.44
Totals	-	-	-	-	42038.99	30576.12	11362.87

Net Benefits = \$11,362 - \$1,127 = \$10,235

Benefits to roads and bridges were based upon the savings in annual costs of raising the roads and the installation of a new bridge which would be necessary if the project is not installed. Residential benefits were based on the annual equivalent difference between the estimated market value of the property now and the market value with the project installed. Indirect damages were computed at 5 percent of the direct damages. These include costs of detouring traffic and resultant loss of business by merchants. Urban benefits were converted to long-term prices using the ARS September 1957 price projection.

Construction costs were based on current prices. Operation and maintenance costs were converted to long-term values.

Easement costs were based on current land values as provided by the local people.

The cost of the dike was allocated using the first alternative described in Section 1132.211 of the Watershed Protection Handbook, Soil Conservation Service.

Costs were estimated for the drainage dike based on the requirements to protect against daily tidal fluctuation. These costs were based on the estimated yardage of fill and the required tidegate and approach channels to provide drainage for the 469 acres of wet land. These estimates totaled \$44,342.

Costs for flood prevention were considered equal to the costs of the multiple purpose dike, channel improvement and tidegate, \$197,316.

Using this alternative the allocation to drainage would be:

$$\frac{44,342}{44,342 + 197,316} = 18.3 \text{ percent}$$

The remaining 81.7 percent is allocated to flood prevention.

The following table shows the division of cost allocation between flood prevention and agricultural water management. It further shows the breakdown of costs to be paid from Public Law 566 funds and other funds.

COST SHARING

	FLOOD PREVENTION		AGRIC. WATER MANAGEMENT		TOTAL FUNDS		
	Public Law 566 (A)	Other (B)	Public Law 566 (D) 46%	Other (E) 54%	Public Law 566 (G) (A+D)	Other (H) (B+E)	Total (I) (G+H)
CONSTRUCTION	Total (A+B)	Total (C)	Total (D)	Total (E)	Total (F) (D+E)	Total (G+H)	Total (I) (G+H)
Engineering Estimate	136149		9594	21002	30596	145743	166745
Contingencies 12%	16338		1152	2520	3672	17490	20010
Sub-Total	152487		10746	23522	34268	163233	186755
Installation Services							
Engineering Services	30198		6786	-	6786	36984	36984
Other	12747		2865	-	2865	15612	15612
Sub-Total	42945		9651	-	9651	52596	52596
Administration of Contracts		1525		342	342	-	1867
Land Easements & Rights-of-way		359		81	81	-	440
Sub-Total		1884		423	423	-	2307
GRAND TOTAL	195432	1884	20397	23945	44342	215829	241658
PERCENTAGE					18.3491%	89.31%	100%

The sharing of costs allocated to flood prevention was based upon Public Law 566 funds bearing \$195,432 which includes all of the costs of construction and installation services. "Other" funds will bear \$1,884 which includes the share of the estimated costs for land, easements, and rights-of-way and the costs of administering the contracts allocated to flood prevention in the same proportion that the total costs were allocated.

Direct benefits from the agricultural water management benefits are 34 percent. However, due to policy requirements, 54 percent of these costs were allocated to other than Public Law 566 funds.

The needs for land treatment measures for watershed protection were determined by consultation with the Work Unit Conservationist and local personnel representing the Extension Service, Agricultural Stabilization and Conservation Service, Soil Conservation District and Forest Management Section of the Department of Conservation and Economic Development.

Table 1

ESTIMATED PROJECT INSTALLATION COST

Pine Mount-Mill Creek Watershed
New Jersey

Price Base 1961

*See previous pages
for P.L. 566
has been - no willis*

21,671

Installation Cost Item	Unit	No. to be Applied	Estimated Costs (Dollars)		
			P.L. 566	Other	Total
<u>LAND TREATMENT FOR WATERSHED PROTECTION</u>					
Soil Conservation Service					
Contour Farming	acre	15 + 17		120	120
Cover Cropping	acre	450	476	6,750	6,750
Conservation Cropping System	acre	360	360	10,800	10,800
Diversions	mile	.5	1571	320	320
Outlet Constructions	feet	1,120	0	140	140
Technical Assistance	dollars			320	320
<u>SCS Subtotal</u>				18,450	18,450
Forest Service					
Tree Planting	acre	80	40	3,200	3,200
Woodland Harvest Cutting	acre	10	215	215	215
Woodland Thinning	acre	15	2167	325	325
Woodland Weeding	acre	20	2125	435	435
Controlled Burning	acre	50	100	50	50
Firebreaks--Bulldozed	feet	8,450	004	345	345
Firebreaks--Plowed	feet	7,920	004	30	30
Technical Assistance	dollars			630	630
<u>FS Subtotal</u>				5,230	5,230
<u>TOTAL LAND TREATMENT</u>				23,680	23,680
<u>STRUCTURAL MEASURES</u>					
Soil Conservation Service					
Dikes & Levees	mile	.8	123,702	19,373	143,075
Stream Channel Improvement ^{1/}	mile	.9	39,531	4,149	43,680
<u>SCS Subtotal Construction</u>			163,233	23,522	186,755
<u>INSTALLATION SERVICES</u>					
Soil Conservation Service					
Engineering			36,984	7032	36,984
Other			15,612	-	15,612
<u>SCS Subtotal Installation Services</u>			52,596	-	52,596
<u>OTHER COSTS</u>					
Land Easements and Rights-of-way					
Administration of Contracts			-	440	440
			-	1,867	1,867
<u>Subtotal Other Costs</u>			-	2,307	2,307
<u>TOTAL STRUCTURAL MEASURES</u>			215,829	25,829	241,658
<u>TOTAL PROJECT</u>			215,829	49,509	265,338
<u>SUMMARY</u>					
Subtotal Soil Conservation Service			215,829	44,279	260,108
Subtotal Forest Service			-	5,230	5,230
<u>TOTAL PROJECT</u>			215,829	49,509	265,338

Table 2

ESTIMATED STRUCTURE COST DISTRIBUTION

Pine Mount-Mill Creek Watershed
New Jersey

Price Base 1961
(Dollars)

Structure	INSTALLATION COST - P.L. 566 FUNDS					INSTALLATION COST - OTHER FUNDS					Estimated Installation Cost
	Construction Eng. Est.	Construction Contingencies	Installation Engineering	Services Other	Total Public Law 566	Construction Eng. Est.	Construction Contingencies	Admin. of Contracts	Easements & R/W	Total Other	
Dikes & Levees	110,447	13,255	26,226	11,565	161,493	17,298	2,075	1,430	340	21,143	182,636
Stream Channel Improvement <input checked="" type="checkbox"/>	35,296	4,235	10,758	4,047	54,336	3,704	445	437	100	4,686	59,022
GRAND TOTAL	145,743	17,490	36,984	15,612	215,829	21,002	2,520	1,867	440	25,829	241,658

Includes tidegate structure

March 1962

Handwritten calculations:

$$\begin{array}{r} 47520 \\ 5280 \\ \hline 52800 \end{array}$$

$$\begin{array}{r} 42240 \\ 5280 \\ \hline 47520 \end{array}$$

Table 3

STRUCTURE DATATIDEWATER DIKE

Pine Mount-Mill Creek Watershed
New Jersey

Item	Unit	Total
Length	feet	4,225
Maximum Height	feet	10.0
Elevation, Top of Dike	feet (m.s.l.)	9.0
Top Width	feet	10
Side Slopes	XXXX	2:1
Volume of Fill		
Mineral Soil	cu.yd.	129,541
Alluvial Silt	cu.yd.	11,510
Total	cu.yd.	141,051
Average High Tide	feet (m.s.l.)	2.6
Average Low Tide	feet (m.s.l.)	-2.3
Average Maximum Yearly High Tide	feet (m.s.l.)	6.0
Highest Tide of Record	feet (m.s.l.)	8.8
Average Capacity of Tidegate	cfs	150.4
Maximum Discharge Through Tidegate	cfs	360
Elevation, Tidegate Invert	feet (m.s.l.)	-6.0

March 1962

Table 3A
STRUCTURE DATA
CHANNELS
 Pine Mount-Mill Creek Watershed
 New Jersey

Channel Designation	Station Numbering For Reach	Station (100 ft)	Station (100 ft)	Watershed Area (sq. mi.)	Required Drainage Curve	Required Drainage Capacity (cfs)	Planned* Channel Capacity (cfs)	Average Bottom Width (ft.)	Average Side Slope	Average Depth (ft.)	Average Grade (pct.)	Average Velocity In Channel (ft./sec)	Volume of Excavation (1,000 cu. yds.)
Hounce Creek	0 4.0	4.0 19.5	4.0 19.5	1.64 1.64	C C	57.5 57.5	126.0 126.0	7 7	1:1 1:1	4.6 3.7	0.50 0.10	2.0 1.8	0.99 2.28
Mill Creek	0	12.0	12.0	3.09	C	104.1	234.0	12	1:1	4.7	0.15	2.1	3.48
Outlet Ditch	0 4.0	4.0 17.0	4.0 17.0	4.73 4.73	C C	154.8 154.8	360 360	40 40	1:1 1:1	5.1 4.9	0.0 0.0	1.8 1.8	3.33 4.04

* Inlet and outlet channel capacity based on maximum capacity of tidegates at low tide.

March 1962

Table 4

SUMMARY OF PHYSICAL DATA

Pine Mount-Mill Creek Watershed
New Jersey

Item	Unit	Quantity Without Project	Quantity With Project
Watershed Area	sq.mi.	5.15	XXXX
Watershed Area (All Privately Owned)	acre	3,300	3,300
Cropland	acre	1,284	1,380
Grassland	acre	74	231
Woodland	acre	1,290	1,290
Other	acre	652	399
Area Subject to Damage From Tidewater Inundation	acre	469	0
Average Annual Rainfall	inches	44	XXXX

March 1962

Table 5

SUMMARY OF PLAN DATA

Pine Mount-Mill Creek Watershed
New Jersey

Price Base 1961

Item	Unit	Quantity
Years to complete project	year	3
Total installation cost	dollar	265,338
Public Law 566 funds	dollar	215,829
Other	dollar	49,509
Annual operation and maintenance cost (all non-Federal)	dollar	680
Average annual monetary benefits	dollar	13,222
Agricultural	percent	77
Non-agricultural	percent	23
Structural Measures		
Dikes and levees, and stream channel improvement <u>1/</u>	each	1
Benefits from restoration to former productivity		
Flood prevention	dollar	8,357
Drainage	dollar	1,878

1/ Includes tidegate structure

March 1962

Table 6

ANNUAL COSTS

Pine Mount-Mill Creek Watershed
New Jersey

Price Base 1961
(Dollars)

Measures	Amortization ^{1/} of Installa- tion Cost	Operation ^{2/} and Main- tenance Cost	Total
Dikes and levees, and stream channel improve- ment ^{3/}	8,734	680	9,414

^{1/} 50 years @ 2-5/8% interest March 1962

^{2/} Long-term prices as projected by
ARS Price Projection, September 1957

^{3/} Includes tidegate structure

Table 7

MONETARY BENEFITS FROM STRUCTURAL MEASURES

Pine Mount-Mill Creek Watershed
New Jersey

Dollars^{1/}

Item	<u>AVERAGE ANNUAL MONETARY BENEFITS</u>		Average Annual Monetary Benefits
	Est. Average Annual Damage Without Project	With Project	
Underwater damage (tides)			
Restoration to former productivity			
Crop Production	8,357	XX	8,357
Non-agricultural			
Roads and bridges	2,722	0	2,722
Residences	133	0	133
Indirect damage	132	0	132
<u>TOTAL, ALL DAMAGE</u>	<u>11,344</u>	<u>0</u>	<u>11,344</u>
<u>TOTAL FLOOD PREVENTION BENEFITS</u>	<u>XXXXXX</u>	<u>XX</u>	<u>11,344</u>
Damage	XXXXXX	XX	1,878
Secondary ^{2/}	XXXXXX	XX	3,613
<u>TOTAL AGRICULTURAL WATER MANAGEMENT BENEFITS</u>	<u>XXXXXX</u>	<u>XX</u>	<u>5,491</u>
<u>TOTAL PRIMARY BENEFITS</u>	<u>XXXXXX</u>	<u>XX</u>	<u>13,222</u>
<u>TOTAL MONETARY BENEFITS</u>	<u>XXXXXX</u>	<u>XX</u>	<u>16,835</u>

Long-term price level as projected by
ARS Price Projection, September 1957

March 1962

Not used for project justification

Table 8

BENEFIT COST ANALYSIS

Pine Mount-Mill Creek Watershed
New Jersey

Dollars^{1/}

80 Dikes and levees, and stream channel improvement^{3/} 11,344 1,878^{2/} 13,222 9,414 1.4:1.0

Measures	AVERAGE ANNUAL BENEFITS			Average Annual Cost	Benefit Cost Ratio
	Flood Prevention	Agricultural Water Management	Total		
	(floodwater)	(drainage)			

- 1/ Benefits based on long-term prices as projected by ARS Price Projection, September 1957. Costs based on 1961 costs. March 1962
- 2/ Does not include secondary benefits of \$3,613 annually.
- 3/ Includes tidegate structure.

Table 9

ALLOCATION OF INSTALLATION COSTS OF STRUCTURAL MEASURES

Pine Mount-Mill Creek Watershed
New Jersey

Price Base 1961
(Dollars)

Item	Purpose		Total
	Flood Prevention	Agricultural Water Management	
Multiple Purpose Dikes and levees, and stream channel improvement <u>1/</u>	197,316	44,342	241,658
<u>TOTAL</u>	<u>197,316</u>	<u>44,342</u>	<u>241,658</u>
Public Law 566	195,432	20,397	215,829
<u>Other</u>	<u>1,884</u>	<u>23,945</u>	<u>25,829</u>
<u>TOTAL</u>	<u>197,316</u>	<u>44,342</u>	<u>241,658</u>

1/ Includes tidegate structure

March 1962

Table 9A

CLASSIFICATION OF AGRICULTURAL WATER MANAGEMENT BENEFITS

Pine Mount-Mill Creek Watershed
New Jersey

<u>Purpose</u>	<u>Direct Identifiable</u> <u>Dollars</u>	<u>Percent</u>	<u>Other</u> <u>Secondary</u>	<u>Total</u>
Drainage	1,878	34	3,613	5,491

March 1962

TYPICAL CROSS-SECTION OF MILL CREEK DIKE
Station 28+08

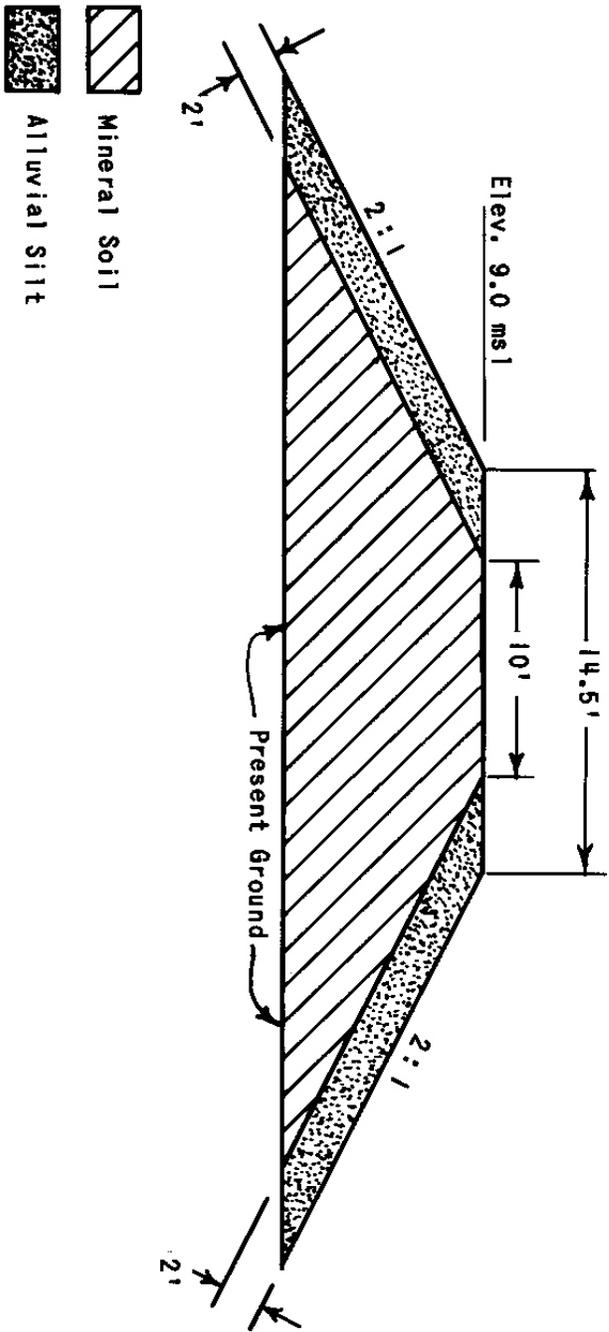


Figure 1.

TYPICAL CROSS-SECTION OF MILL CREEK DIKE
Station 28+08

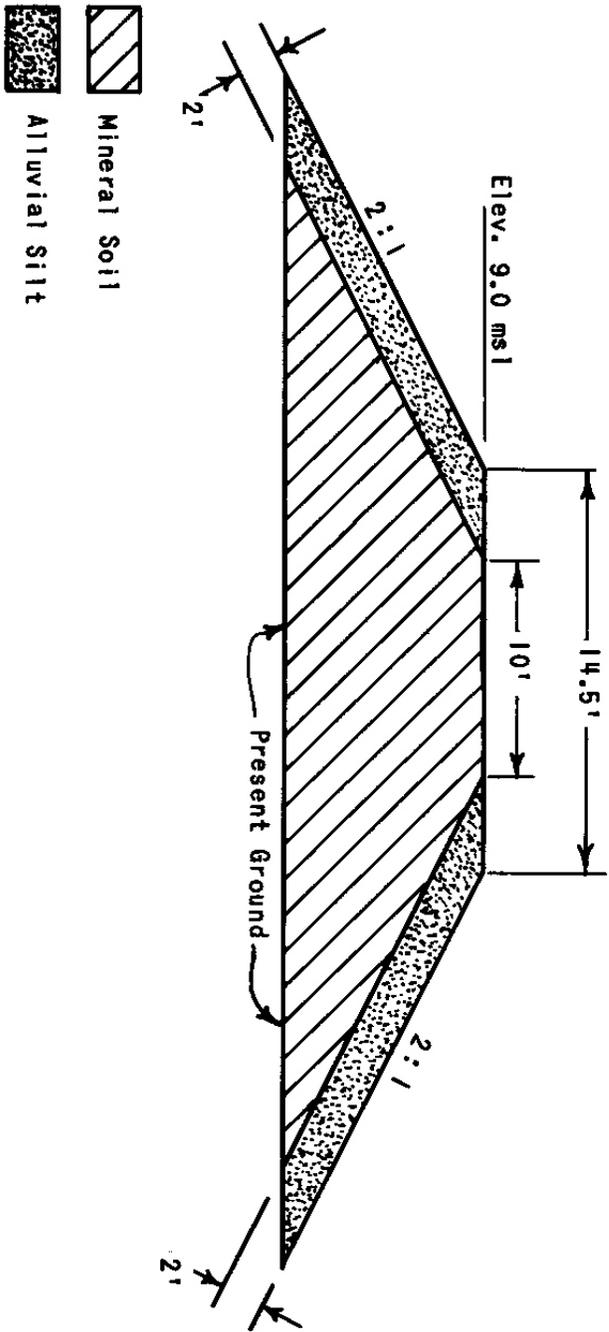


Figure 1.

TYPICAL CROSS-SECTION OF DIKE AT TIDEGATE STRUCTURE

Station 30+00

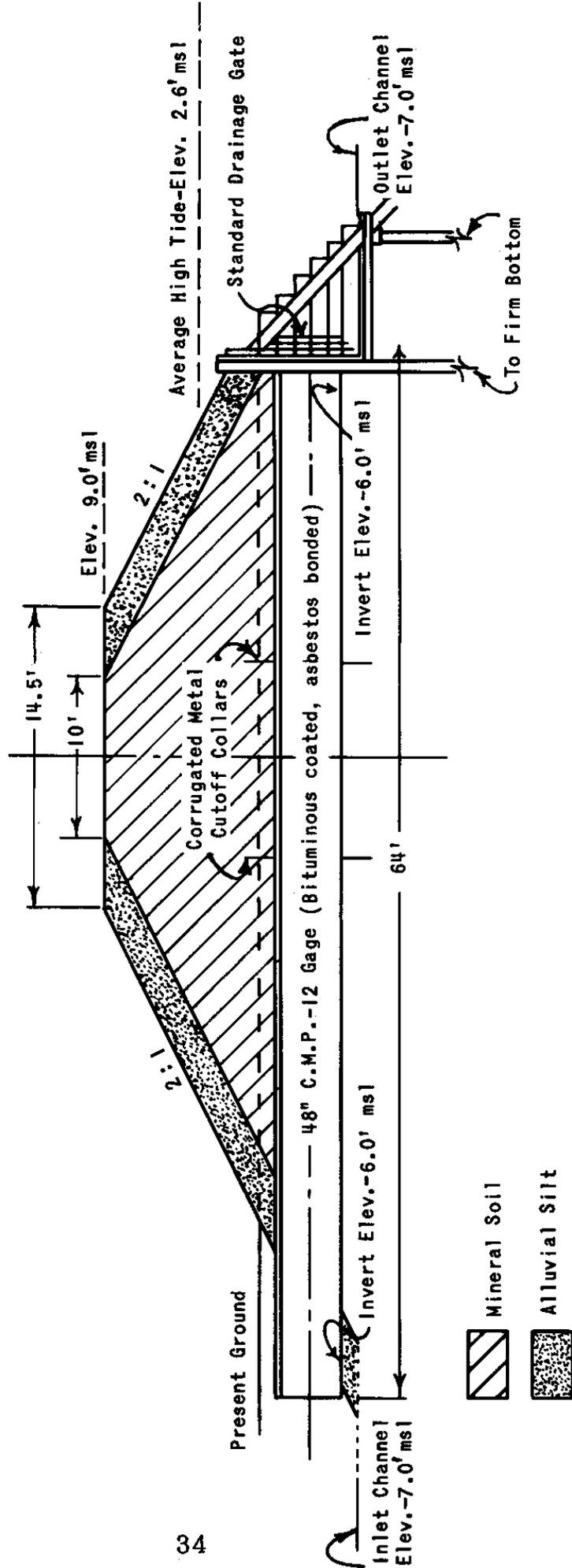


Figure 2.

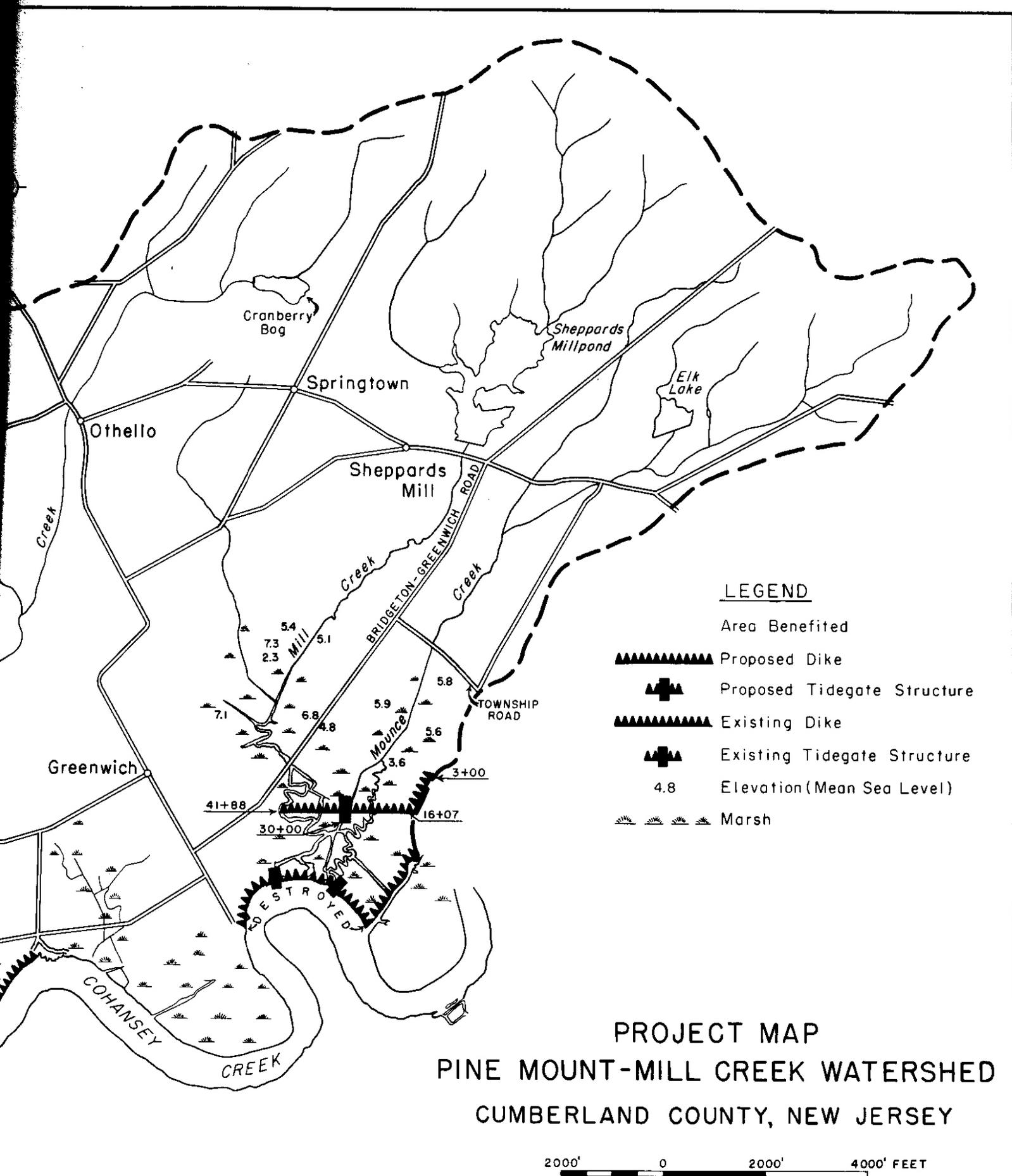
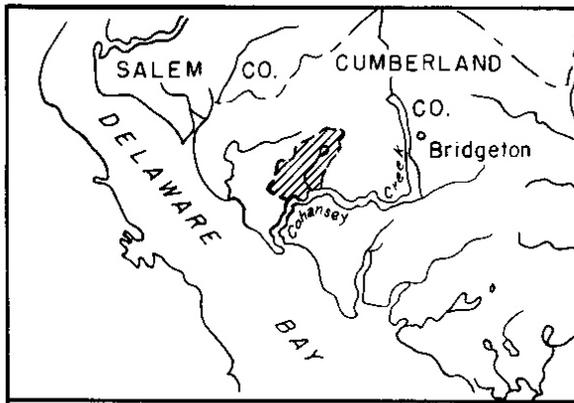


Figure 3



LOCATION MAP

