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PROPOSED
WATERFRONT DEVELOPMENT

RED BANK
BATTLEFIELD PARK

COUNTY OF GLOUCESTER
NATIONAL PARK, NEW JERSEY

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NATIONAL PARK, NEW JERSEY

"This acknowledges the financial assistance provided by the Coastal Zone Management Act of 1972, as amended, with funds administered by the National Oceanic and Atmospheric Administration, Office of Coastal Zone Management. This study was prepared under the supervision of the New Jersey Coastal Energy Impact Program of the New Jersey Department of Energy. However, any opinions, findings, conclusions or recommendations expressed herein are those of the author(s) and do not necessarily reflect the views of NOAA or NJ DOE."

McFARLAND-JOHNSON ENGINEERS

44 Cooper Street

Woodbury, New Jersey

April 23, 1982

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1.0 Introduction

1.1 Purpose of Objectives

1.2 Project Description

1.3 Scoping

1.1 Purpose and Objectives

The purpose of the study is to investigate the feasibility of developing the waterfront lands of the Red Bank Battlefield Park. The intent is to provide a mixed-use recreational facility thereby expanding the usability of the waterfront of the existing park.

The study will analyze the background, physical and marine characteristics and other conditions of the site. The study will also assess impacts as a result of the implementation of the proposed waterfront development.

The waterfront development study will develop reasonable design criteria and construction systems for the elements included in the project scope.

1.2 Project Description

The Red Bank Battlefield Park Report consists of a concept design plan and development of the planning, engineering and environmental technical information for the recreational development of the Red Bank Battlefield Park waterfront. The intent of the report is to provide a mixed-use recreational facility; significantly expanding the usability of the existing park, especially the waterfront lands.

The concept design will include development of the waterfront as well as an approximately 6-acre lot located adjacent to and east of the existing parking facility. The waterfront development includes picnic shelters, a boat launching ramp in combination with parking facilities, an amphitheater, and public restrooms.

The development of the 6-acre lot recently acquired from the Borough of National Park will be developed to include additional parking, "tot lot" and picnic facilities connected to the main park areas by wooded pathways.

1.3 Scoping

The Scope of Work for the Waterfront Development of Red Bank Battlefield Park includes the design of an amphitheater and stage, boat ramp with support facilities, and picnic pavillions. It also includes the design for vehicular parking, toilet facilities, and open recreational areas. All facilities are to be connected by walkways and provided with site lighting.

From meetings held with Gloucester County Parks and Recreation, and recorded in the minutes of the meetings contained in Section 8.1 of the Waterfront Development Study, the scope of the Park Marina Design/Masterplan has been reduced in size.

The originally proposed marina and accompanying support facilities have been reduced to a boat launching facility. This decision was based upon the consideration of costs that would be involved in the upkeep, maintainence, and additional personnel that would be required to support such a facility. In addition, the access to the facility via municipal roads was also considered. The resultant impact to the existing facility and to the Borough of National Park merited the revision in the scope of work.

2.0 Existing Conditions

2.1 Background

2.2 Physical Characteristics

2.3 Marine Characteristics

2.4 Conditions of the Site

2.0 Existing Conditions

2.1 Background

2.1.1 Location

The Red Bank Battlefield Park is located in the Borough of National Park of Gloucester County, New Jersey. It is situated along the Delaware River at approximately river mile 91.60.

The park is in the southern section of New Jersey, in close proximity to area metropolitan centers. Red Bank Battlefield Park is located east of the City of Philadelphia, and on the western border of Gloucester County.

The park and surrounding area is shown in Figure 2.1-1.

2.1.2 History of the Area

Red Bank Battlefield Park was the site of the largest Revolutionary War battle in South Jersey: the defense of Fort Mercer, better known as the Battle of Red Bank. The purpose of Fort Mercer, along with Fort Mifflin on the Pennsylvania side of the Delaware River, was to guard the Delaware River and prevent

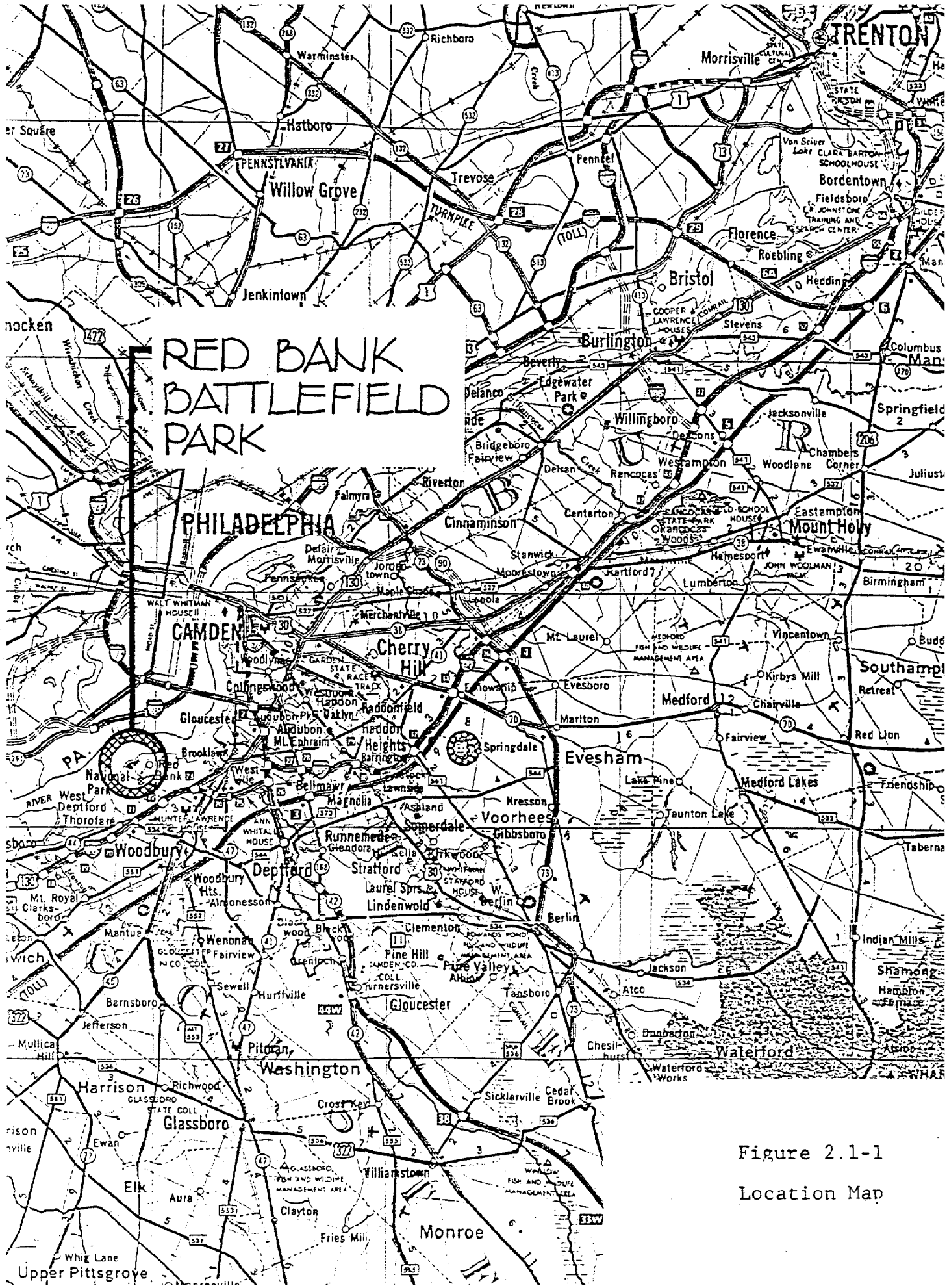


Figure 2.1-1

Location Map

British supply ships from reaching the already British occupied City of Philadelphia.

To take Fort Mercer, General William Howe, British Commander of all land forces in America, chose Count Carl Emil Ulrich Von Donop and his Hessian brigade. On October 21, 1777, Von Donop crossed the Delaware to Camden and marched into Haddonfield where they spent the night and prepared for the attack on Fort Mercer the next day.

The attack of October 22, 1777 was a disastrous defeat for the Hessian mercenaries. For the British, it was one of the most expensive campaigns, yet least productive as to ultimate outcome.

The victory of the Americans at Fort Mercer was an incomparable morale builder; previously they had only met with defeat. However, the most important result of this victory, coupled with the victory at Saratoga, New York, was that it convinced the French to ally with America against Great Britain.

The Whitall House, located on the grounds of the battlefield when the attack of October 22, 1777 took place, was owned by James Whitall and Ann Cooper Whitall. James Whitall was a member of the Committee on Correspondence and Observation of the New Jersey State Chapter. His wife, Ann, has gained acclaim in not leaving the house during the attack of Fort Mercer and in

attending to the wounded soldiers.

On October 22, 1829, the Red Bank Monument was dedicated on the fifty-second anniversary of the Battle of Red Bank.

May 16, 1872, Benjamin P. Hintage, then owner of Red Bank, deeded a hundred acres of land to the United States government for $2500.00 for the purpose of sand and gravel excavation at League Island.

In 1903, the United States decided to sell the area of the battlefield. As a result, the Gloucester County Historical Society was formed, presided over by John Gill Whitall, with the intention of preserving the Red Bank Battlefield as a public park. An Act was signed by Congress on January 27, 1905 setting apart 20 acres of Red Bank under the care of the Gloucester County Board of Chosen Freeholders.

The James Whitall Jr. House, built in 1766, was listed on the National Register of Historic Places on February 6, 1973. The Red Bank Battlefield itself was entered on the National Register on October 31, 1972.

2.1.3 Existing and Proposed Use of the Site and Contigious Properties

Red Bank Battlefield Park, significant for its role during the American Revolutionary War, is a high intensity use park. It has been estimated by Gloucester County Parks and Recreation that approximately 500,000 people visit the park annually. In addition to the historical interest the park presents, it is also equipped with a picnic area and park benches located throughout the grounds.

The park is especially used for class trips by area schools in their study of the American Revolution by touring the Whitall Mansion and the monument. Tours of the mansion and the monuments are conducted daily during the warm weather months and during the weekends as the weather becomes more inclement.

The facility is used by families and groups for picnics and barbeques. Many people, from nearby businesses, use the park during lunch hours to eat their meal and to watch the river. Mothers with pre-school children can be seen in the park during school hours.

In addition to the existing uses of the Red Bank Battlefield Park other uses are proposed for the facility. The primary purpose is to extend the use of the lower, waterfront portion of the park. A Boat Ramp for small pleasure craft of approximately 3600 pounds is proposed at the northern end of the facility with access being proposed via the area adjacent to and north of the

park belonging to the Borough of National Park. The boat ramp will be designed to accommodate small boats and parking is provided for the expanded facilities that are proposed.

An amphitheater is proposed for outdoor concerts. It will be located in the embankment in front of the monuments.

Picnic pavillions scattered about the lower elevations and connected by walking paths are proposed for a well rounded use of the waterfront area.

In addition, toilet facilities, centrally located for access by both picnickers and boat users, are proposed. It is recommended that the toilet system be a self contained organic waste system.

The proposed conceptual design for the waterfront lands has been developed to expand accessibility and public use of relatively unused portions of the park. The concept has focused on the recreational use of the waterfront lands and accessibility to the Delaware River.

2.1.4 Zoning

The existing Red Bank Battlefield Park is located in the Borough of National Park and as shown in Figure 2.1-2, is zoned

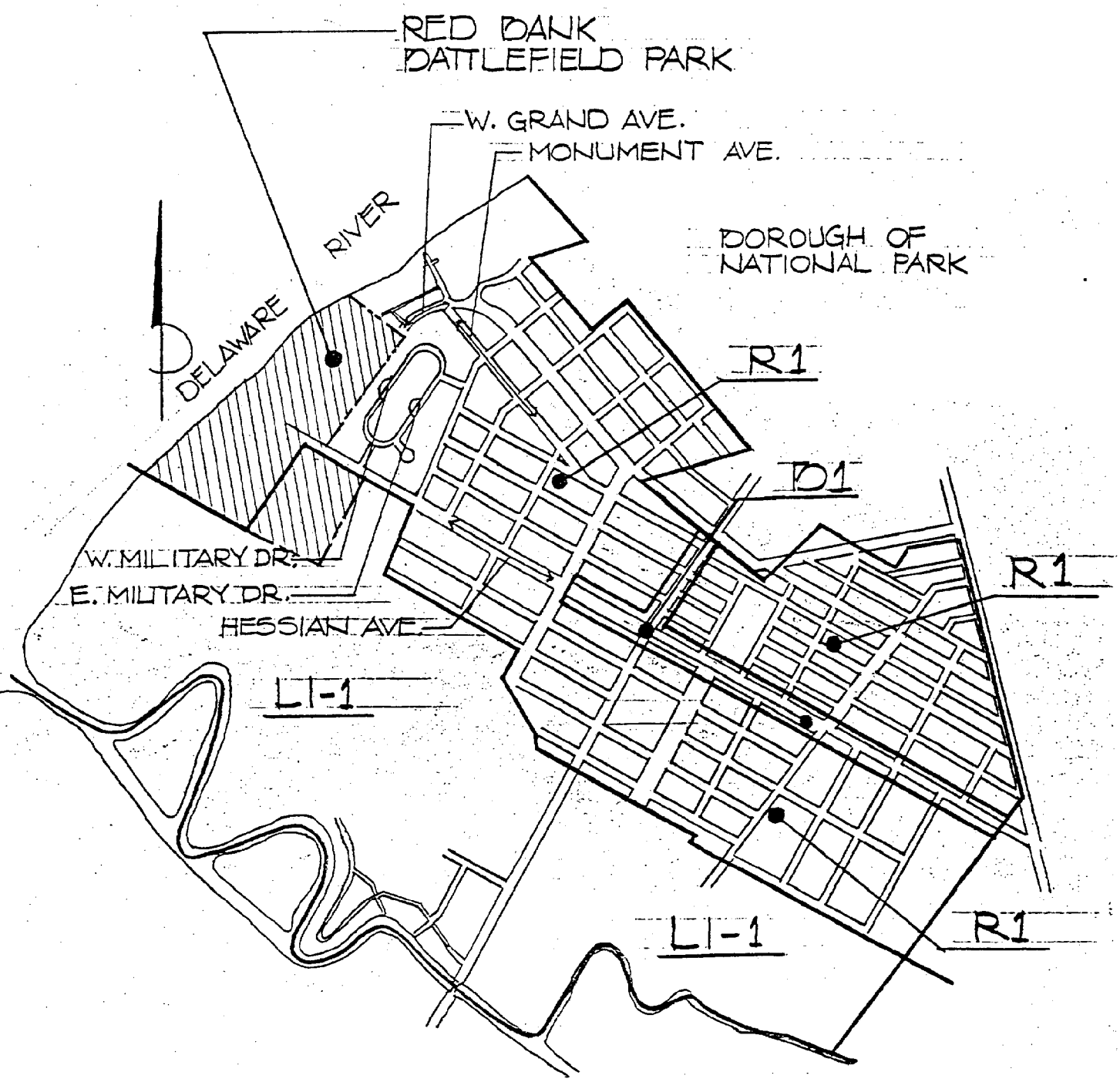


Figure- 2.1-2

Existing Zoning
of the Borough
of National Park

residential (R1). This district allows for single family detached dwellings, as well as for educational, religious, and health care facilities. It also allows for municipal uses and uses by utilities and transportation agencies. Noncommerical park, playground, or recreational areas are permitted under the R1 designation. Minimum lot size for this district is 7500 square feet.

The area of the park that has been deeded to the Red Bank Battlefield Park adjacent to and east of the existing parking lot, as well as the area adjacent and south of the park is currently zoned light industrial (L1-1). Permitted under this designation is light manufacturing, light metal processing, food packaging facilities and wholesaling and distributing outlets or facilities. Printing and publishing facilities as well as commercial greenhouses or growing of nursery stock is also permitted. The minimum lot size for the L1-1 district is 20,000 square feet.

2.1.5 Riparian Rights

Tidal or riparian lands fall under the ownership of the State of New Jersey, unless it has already divested its ownership by the issuance of a riparian conveyance. Although the extent of tidal lands in the Borough of National Park has not as yet been mapped, a comparison of the present day conditions as defined by

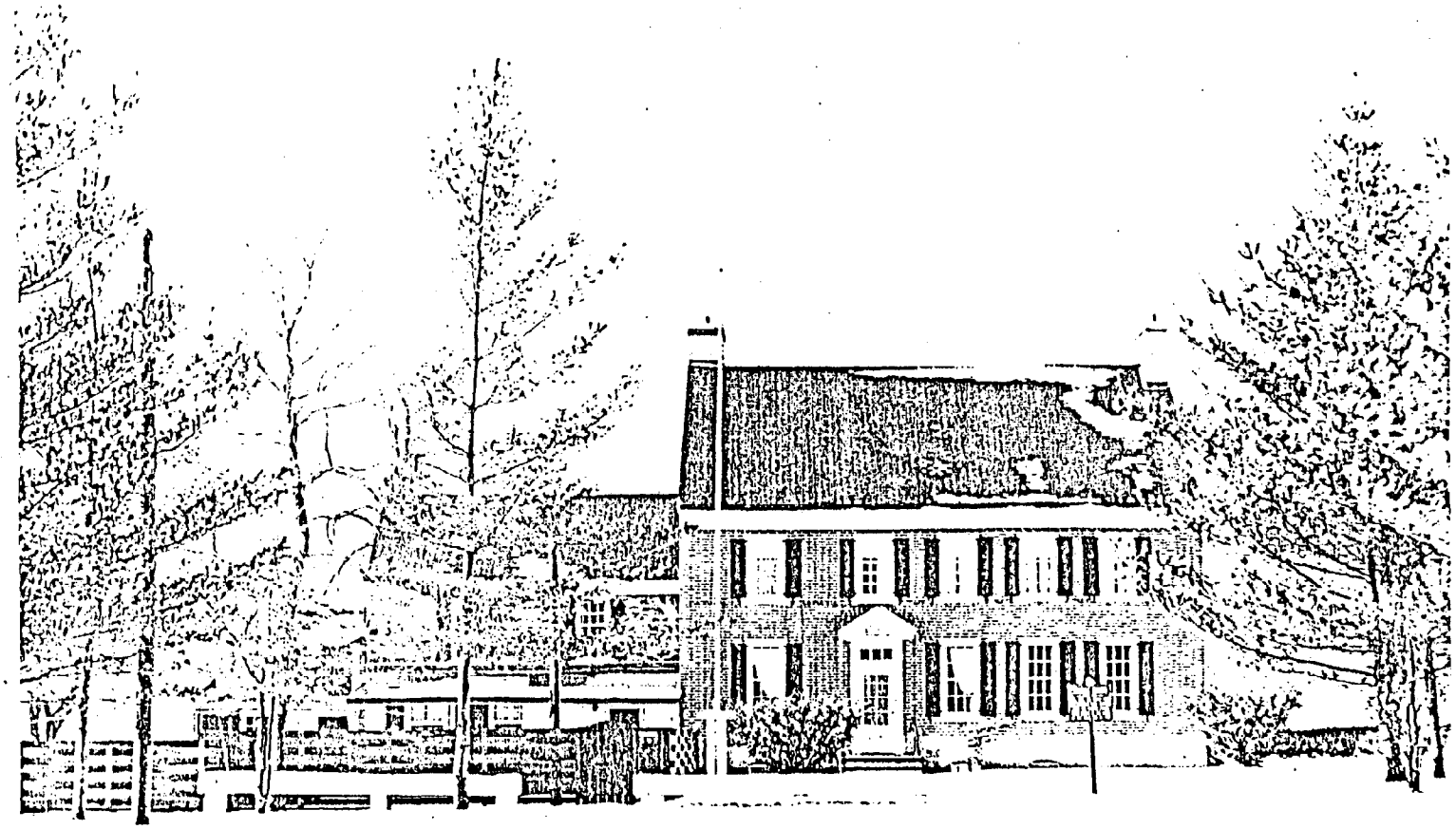
the site base map "C1" and park site plans circa 1935 show considerable variations in land area. The extent of this variation is shown on plan "C1a". The new land area involved is approximately 328,000 square feet, or 7.5 acres and is the majority of the waterfront lands under consideration for development.

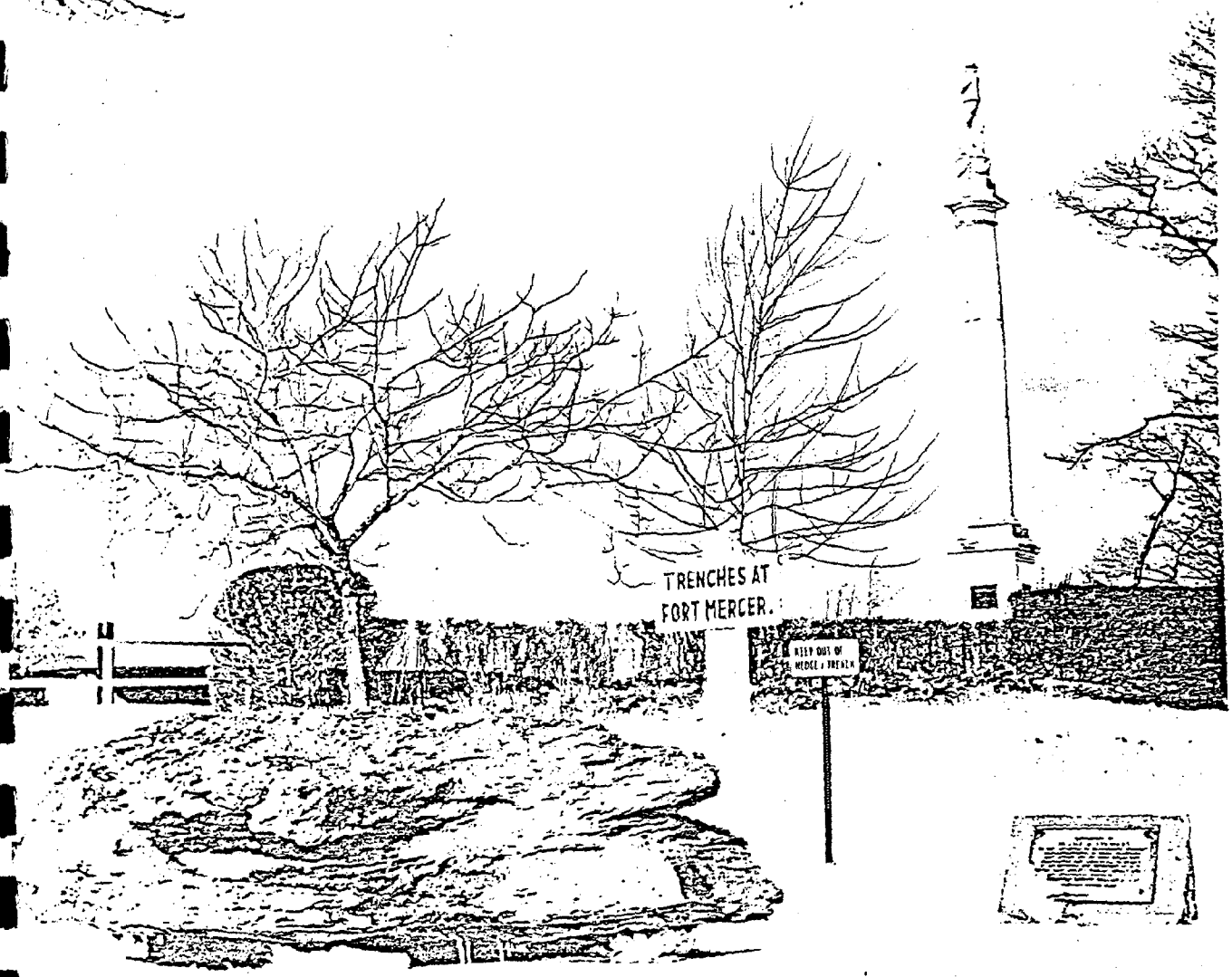
In conjunction with the new lands, approximately 17,000 square feet of lands as defined by the circa 1935 park site plan is now underwater. These lands are at the southerly end of the park running parallel to an existing bulkhead.

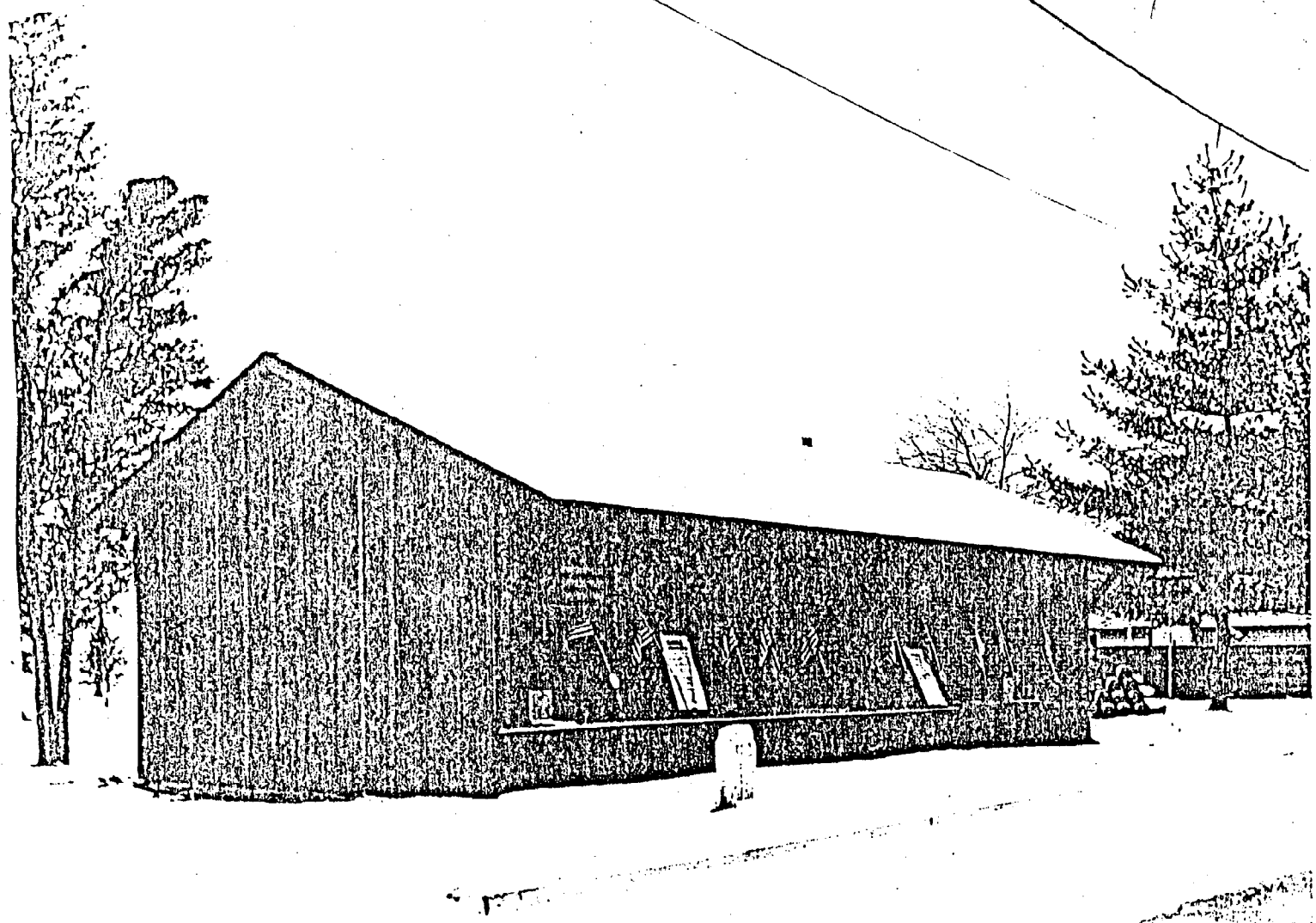
Therefore, the question of ownership of the proposed waterfront lands will have to be reviewed by the New Jersey Bureau of Tidelands, Department of Environmental Protection.

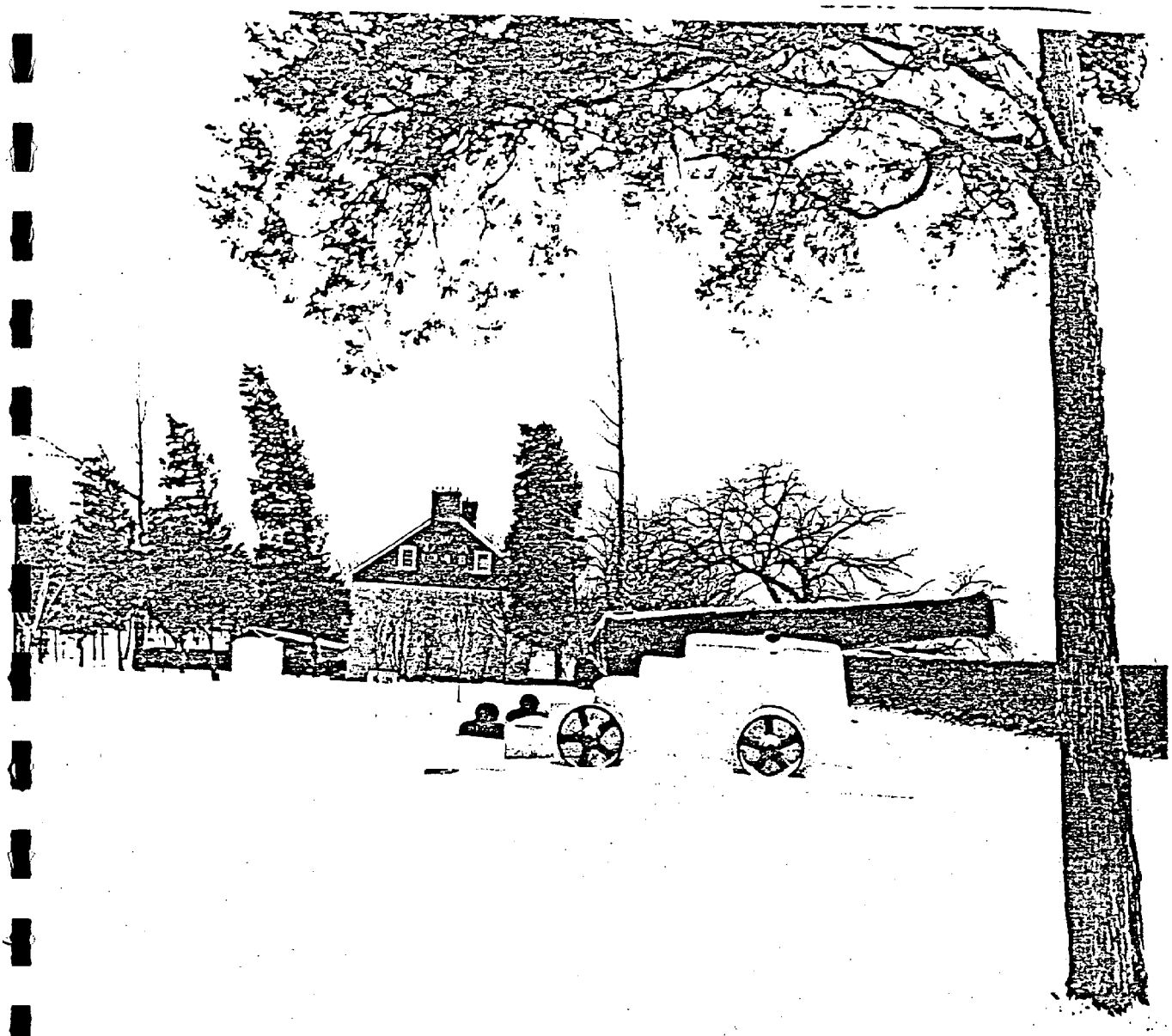
2.1.6 Pictures of Red Bank Battlefield Park

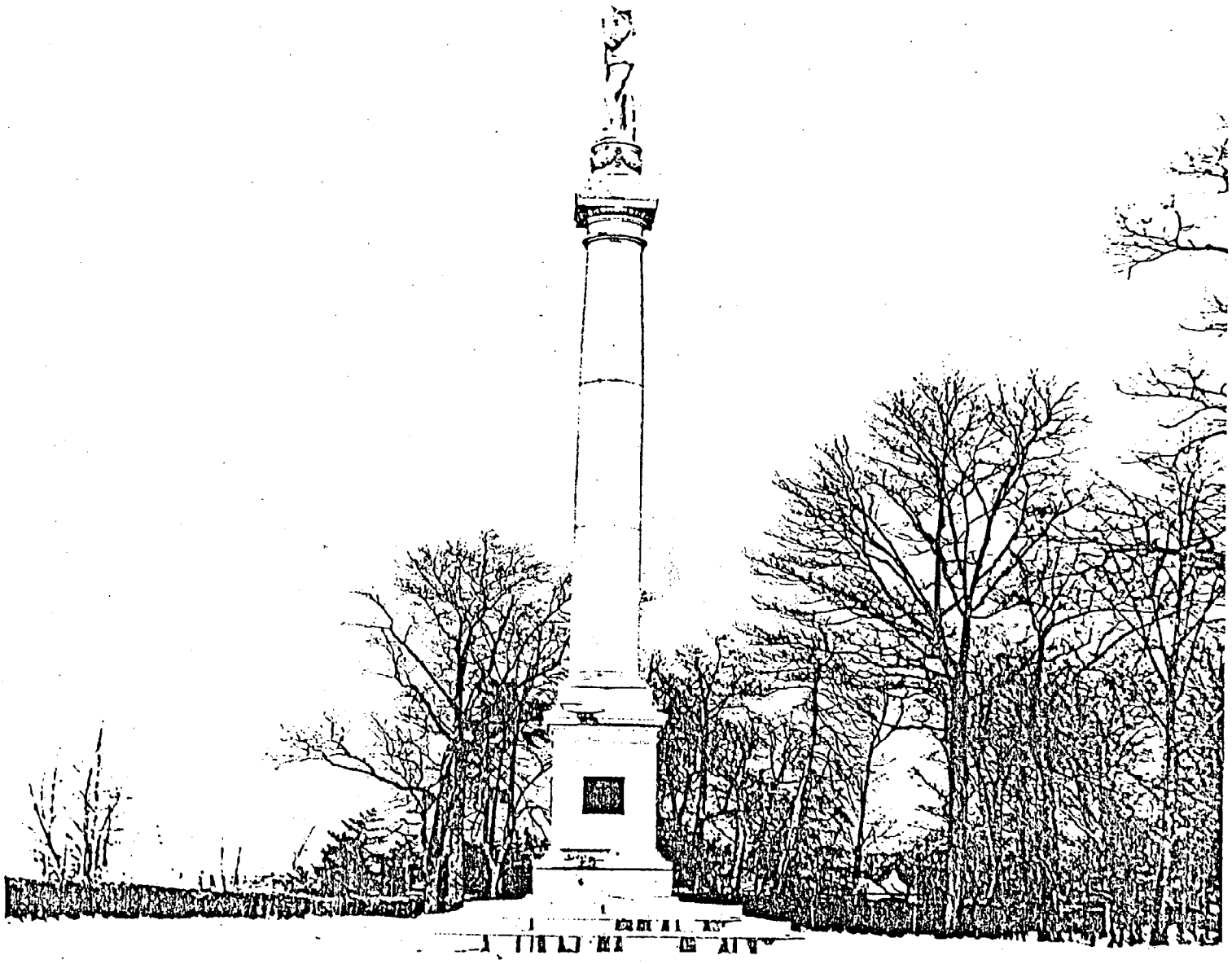
WHITALL HOUSE
BUILT 1748
COL. CARL VON DONOP AND
HIS HESSIANS WERE TREATED
HERE FOR WOUNDS AFTER
THEIR DEFEAT AT THE SIEGE
OF RED BANK OCT. 22, 1777.




TRENCHES AT
FORT MERCER.







2.2 Physical Characteristics

2.2.1 Meteorological

The normal climate of Gloucester County can be described as humid and temperate with few extreme temperature changes within short periods. The climate is predominantly influenced by air masses and prevailing winds from the west and south.

The coldest month is February with an average temperature of 32.3 degrees F. while the mean temperature of the warmest month (July) is 75.4 degrees F. The highest temperature of record for the County was recorded in August, 1918 when the thermometer reached 106 degrees F. and the lowest observed temperature was minus 13 degrees F. in February 1934. Extended periods of hot weather occur much more frequently than do periods of extremely cold weather.

The average annual precipitation is 44.27 inches and is generally distributed throughout the year. The monthly range is 3.11 inches in October and November to 5.06 inches in August. Although average rainfall is evenly distributed throughout the year, there may be wide fluctuations within any single year. The constantly shifting jet streams from the west and the influence of hurricanes from the south are mainly responsible for these fluctuations. The month of September is illustrative of these

effects inasmuch as it has recorded the lowest rainfall of any month and also the third highest. The rainfall on these occasions was 0.21" and 11.95" respectively. One of the driest periods on record occurred from 1961 to 1965.

The average annual snowfall for the County is 22.2 inches but yearly totals have ranged from 55.4 inches in 1899 to 1.9 inches in 1950. The greatest amount of snowfall usually occurs in January. Snowfalls of 1 inch or greater occur only about 6 times per winter.

The predominant wind through the winter months is northwesterly, with southerly winds occurring in the summer months. The average wind speed over the years is approximately 10 mph. Winds over 50 mph occur infrequently, while winds over 70 mph are very rare.

Atmospheric stagnation periods happen relatively infrequently but do occur most often in the fall when large high pressure cells stall over the eastern United States. During the summer, nocturnal cooling on the ground surface produces temperature inversions. However, these are usually dissipated by heating during the day.

Judging from data from the New Castle and Philadelphia airports the County experiences heavy fog (visibility less than

0.25 mile) an average of 39 days per year. The occurrence of fog is at a maximum during October through February and a minimum during June and July.

2.2.2 Topography, Geology, and Soils

Topography

The physical characteristics or topography of the Red Bank Battlefield Park are extreme. The park consists of elevations ranging between less than one foot at the waters edge to 36.5 feet at the top of an embankment.

The waterfront area of the park consists of hydraulic fill. Based upon elevations taken 40 feet south of the monument at the site the tidal zone reaches an elevation of 4.6 feet. Behind the tidal zone, the flood zone extends east for approximately 219 feet and reaches an elevation of 9.5 feet. From this point the embankment begins and rises to an elevation of 36.4 feet in a distance of 56 feet. From the top of the embankment, east to the fence line, the topography of the area levels off, sloping down somewhat to the eastern boundary of the park.

A cross section, showing elevations of the park taken 50 feet north of the Whitall House and running east from the waterfront to the eastern boundary of the park, is less extreme

as that taken near the monument. Elevations range from 0.9 feet at the waters edge to 18.3 feet over the embankment.

The topography of the area can be seen in a section of the U.S. Geological Quadrangle Map (Woodbury) shown in Figure 2.2-1.

Geology

Gloucester County is located within the Atlantic Coastal Plain Province and is underlain by gravel, sand, lime sand, salt, marl and clay. The major geological strata that underlies the Coastal Plain have the form of relatively thin, slightly tapering wedges superimposed one upon another.

The Red Bank Battlefield Park is located on the Magothy and Raritan geologic outcrop. The top of the Magothy Foundation dips about 40 - 45 feet per mile to the southeast toward the Atlantic Ocean. The basal part of the Raritan Formation dips approximately 60 feet or more per mile. The Raritan and Magothy Formations rest unconformably on the Wissahickon Formation which has no outcrop in Gloucester County.

The Raritan and Magothy Formations are considered to be mostly of continental origin. They were deposited largely by the action of streams. The Formations are composed of light-colored quartz or sand, clay, and some gravel. In Gloucester County, the

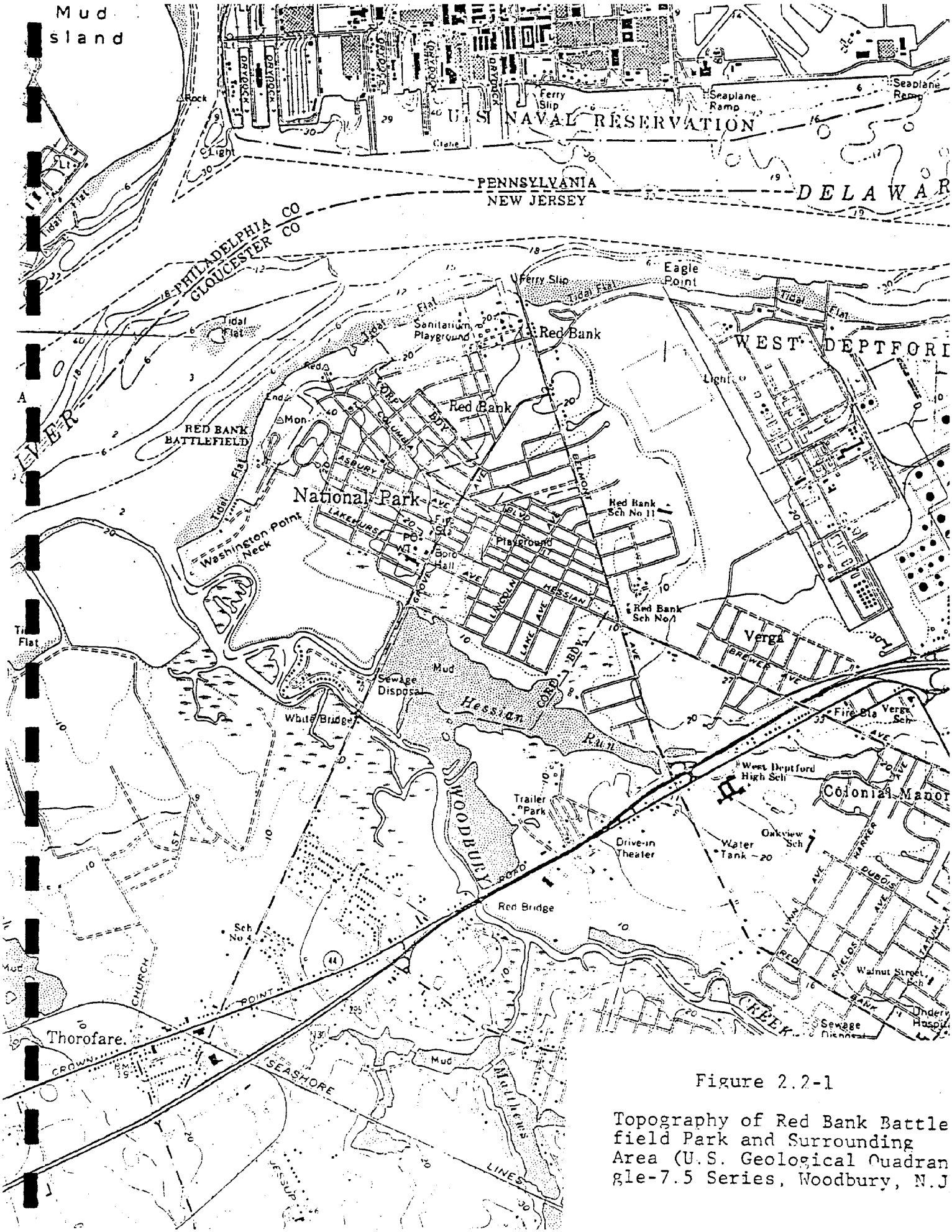


Figure 2.2-1

Topography of Red Bank Battle field Park and Surrounding Area (U.S. Geological Quadrangle-7.5 Series, Woodbury, N.J

Raritan and Magothy Formations cannot be differentiated, except locally, because of similar othology.

The undifferentiated Raritan and Magothy Formations contain the most important and productive aquifers in Gloucester County. Industries adjacent to the Delaware River and most of the public water companies in the County obtain groundwater from these formations.

According to "Special Report 30, Water Resources and Geology of Gloucester County, New Jersey, 1969", most of the wells in the National Park - Westville area tap the basal zone of two zones of the unconfined Raritan and Magothy Formations. In the National Park area yields of between 250 and 1200 gallons per minute are produced.

Precipitation on the outcrop area is an important source of recharge to the aquifer. During periods of low flow, generally between September and November, water from the Delaware River is a source of recharge to the aquifer, especially in the high pumpage areas.

However, the quality of the river water in the National Park - Westville vicinity is usually satisfactory for most uses. Also, much of the pumpage near the river is from the lower water bearing zone which is probably not interconnected with the river.

According to the geologic survey, a well of the National Park Water Company, located at Lakehurst and Grove Avenue was drilled to a depth of 282 in April, 1956. The pumping tests conducted in April 1956 revealed a static water level of 52 feet below land surface. A yield of 636 gallons per minute was produced with a drawdown of 31 feet. The specific capacity was 20.5 gallons per minute per foot (gpm/ft).

Soils

Formation of soil is based upon various local conditions including: local climatic conditions, composition of parent materials, groundwater behaviour, and vegetation and animal activities. These conditions are modified by wind, water erosion, and human activities.

Within Gloucester County, there are nine general soil associations; each containing a few major soils and several minor soils in a characteristic pattern. Soil associations tend to conform closely to the underlying major rock types from the geologic formations they were derived.

Only one soil association is present at the Red Bank Battlefield Park. This is the Downer - Woodstown-Sassafras - Klej (DWSK) Association. These soils occur as a discontinuous

belt 1.5 to 4 miles along the Delaware River. Most areas are flat ranging from 10 to 40 feet in elevation. The dominant soils have a thick, loose, sandy surface layer over a subsoil containing slightly more clay and a very sandy substratum. Wind erosion can be a problem involving this soil association.

Soils of the Red Bank Battlefield site are shown in the map of Figure 2.2-2. The soils map, based upon the Gloucester County Soil Survey and supplied by the Gloucester County Planning Department, reveals the three soil types which make up the Red Bank Battlefield Park. These are the Made land (Mc) and Sassafras and Downer soils.

The Made Land (Mc) is composed of coarse material pumped from the channel of the Delaware River. Made land is low in natural fertility and ranges from strongly acid to medium acid. The fill material may range in depth from 10 to 20 feet.

The Sassafras soils are represented as SsE on the soils map of the project area. This soil series is characterized by a grayish-brown surface layer over yellowish-brown or strong brown, hiding sandy loam to sandy clay loam. Beneath this is a loose sand or gravelly sand substratum. The Sassafras soils at the park have very steep slopes, perhaps approximating 40 percent. Because of this steep slope, the soils are weakly developed, being very sandy with little subsoil.

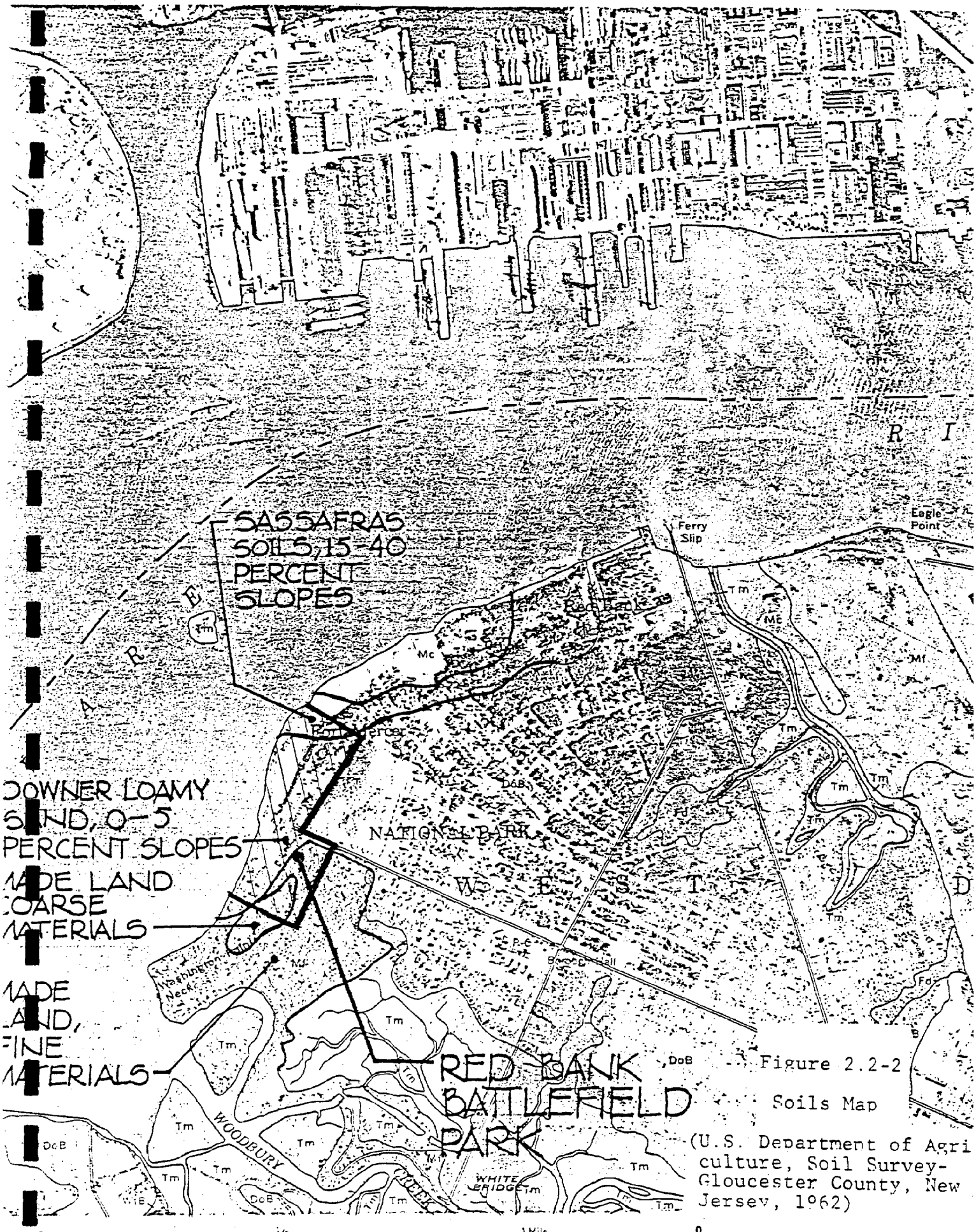


Figure 2.2-2

Soils Map

(U.S. Department of Agriculture, Soil Survey-Gloucester County, New Jersey, 1962)

The Downer soils at the park are situated at the higher elevation and are nearly level to gently sloping. These soils are well drained characterized by a grayish-brown surface layer over a yellowish-brown, light sandy loam subsoil.

A description of the soil types as they relate to the proposed construciton of the waterfront development of the park is given in the geotechnical analysis section of this report.

2.2.3 Vegetation

The higher elevations of the park consist of well-manicured lawns and planted trees for the purpose of enhancing the historical buildings and monuments in the park.

The picnic area located at the south side of the park also consists of lawn and planted trees.

The entire area below the embankment is located in the 100 year flood zone as designated by the Federal Housing Authority Flood Plain Mapping. The majority of the lower elevation of the park is made up of hydrological fill.

The major coastal features of the park consists of the area from the embankment to the waters edge and varies the length of

the park.

The highest elevations involve the section north and adjacent of the park which is being considered as an area for an access road to the beach and the proposed boat launching facility.

The embankment is very steep with a slope of possible 40 percent. The slope is vegetated by oak and pine with scattered sumac.

At the bottom of the embankment, the vegetation consists of high sedges, scattered black locust and three small trees.

The lower sand areas approaching the water line is vegetated with lower sedges and goldenrod.

Approximately 10 to 15 feet of the area of the beach is involved in daily tidal inundations. The lower areas also are deposited with wood and the debris washed from the river.

Beginning at the north boundary of the park south to the monuments, the slope of the embankment gradually decreases. The embankment is still vegetated by oak and pine. The area from the bottom of the embankment to the area of tidal zone is relatively flat vegetated by sedges, and scattered black locust trees.

Pieces of trash and debris are also scattered in this area.

An approximate 5 foot change in elevation distinguishes the gravelly tidal area from the area east to the embankment.

The area from the monuments at the top of the embankment to this historical mansion is less steep than previously described. The vegetation ranges from a high grass to a well-kept mowed lawn located in and around the historical and maintenance buildings.

The flat, sandy area at the bottom of the embankment to the tidal zone is vegetated by low sedge. This area, as previously described, runs into the 10-15 foot tidal zone.

The coastal section of the park from the maintenance building to the southern boundary of the park consists of a 5-10 foot embankment held up by a block bulkhead. A narrow section of sand exists at the base of the bulkhead before the tidal area.

2.2.4 Wildlife

The vegetation of an area, along with the associated animal population, form a complex system of ecological processes and interactions. In a natural state, an oscillating equilibrium is maintained between the plant-animal and predator-prey relationships.

The area of the Red Bank Battlefield Park consists of three general types of vegetation; the tidal marsh or tidal area, lowland forest, and upland forest. The three tidal marsh vegetations can be found just south of the boundaries of the park; adjacent to the Woodbury Creek.

In the following survey, the various types of vegetation are presented. The animal populations are then inventoried according to the vegetation type of their habitat. This information is from a study done by Jack McCormick and Associates of Logan Township, an environment similar to the Red Bank Battlefield Park area and also located along the Delaware River and in Gloucester County but south of the study area.

Wild rice, spatterdock, arrow arum and pickelweed form extensive marshes in tidal areas in the tributaries to the Delaware River. Marsh mallow also is a prominent component of these marshes and is most conspicuous during the winter.

The lowland forest type of vegetation makes up the area of transition between elevations of the park. It characteristically thrives on steam flood plains and other areas in which the water table is at or near the surface most of the year. The vegetation of this area, based upon elevation and soil type, consists of mixed oaks and scattered pines.

The upland forests occupy the most elevated and better drained areas. The most common trees associated with upland forest include oak, hickory, beech, dogwood, sassafras, black gum, red cedar and cherry. Maple leaf, irburnum, blackberry, blueberry and sumac are the principal shrubs. Grape, honeysuckle, poison ivy and bullbrier form dense vine tangles in some areas.

The following wildlife survey constitutes a partial inventory of Gloucester County and was collected from published reports of biological studies conducted in the area. The species listed below were found or are known to be present and are representative of Southern New Jersey. The following list of animals known to reside in Gloucester County are listed and classified according to the areas of vegetation they inhabit.

Birds	Tidal Marsh	Lowland Forest	Upland Forest
Blackbird, red-winged	X	X	
Bluejay	X		X
Bobwhite			X
Cardinal		X	X
Catbird		X	
Chickadee, black-capped			X
Coot	X		
Crow, Common		X	X
Dove, morning		X	X
Duck, black	X		
Duck, mallard	X		
Egret, common	X		
Flicker, yellow-shafted			X
Flycatcher, crested		X	X

Grackle, purple	X		X
Gull, herring	X		
Heron, great blue	X		
Heron, green		X	
Hummingbird, rub-throated	X		
Killdeer	X		
Kingbird	X		
Marten, purple	X		
Plover, semi-palmated	X		
Sparrow, swamp		X	
Swallow, barn		X	X
Swallow, tree	X		X
Tanager, scarlet			X
Thrasher, brown		X	X
Thrush, Swainson's			X
Thrush, wood			X
Vireo, blue-headed			X
Warbler, blackpole			X
Warbler, black-throated green			X
Warbler, magnolia		X	
Warbler, myrtle			X
Warbler, yellow	X		X
Woodpecker, downy		X	
Woodpecker, red-banded		X	X
Wren, Carolina			X
Wren, short-billed marsh	X		
Yellowlegs, greater	X		
Yellowlegs, lesser	X		
Mammals:			
Deer, whitetailed		X	X
Muskrat	X		
Opossum		X	
Rabbit, cottontail			X
Raccoon	X	X	X
Squirrel, eastern gray			X
Reptiles:			
Toad, Fowler's			X
Turtle, painted	X		
Turtle, snapping	X		

The only crustacea present, depending upon the salinities of the Delaware River at Red Bank, would be the fiddler crab.

2.3 Marine Characteristics

2.3.1 Hydrology

The Delaware River is tidal; as a result, water levels fluctuate with the tides. In the area of the river of National Park and Philadelphia, mean low tide is at elevation 0 while mean flood tide is 6.27 feet according to the U.S. Engineers Datum for the Delaware River.

The rate of water flow varies with the tides and is shown below according to "Tidal Current Charts; Delaware Bay and River" by the National Oceanic and Atmospheric Administration of the U.S. Department of Commerce, 1978.

Time Relative to Tide At the Entrance to the Delaware Bay	Rate of Flow At Red Bank (Knots)	Direction of Flow
2 hrs. before maximum flood	2.4	downstream
1 hr. before maximum flood	2.4	downstream
maximum flood	2.2	downstream
1 hr. after maximum flood	1.8	downstream
2 hrs. after maximum flood	.8	downstream
3 hrs. after maximum flood	.8	upstream
2 hrs. before maximum ebb	2.4	upstream
1 hr. before maximum ebb	2.7	upstream

maximum ebb	2.4	upstream
1 hr. after maximum ebb	1.4	upstream
2 hrs. after maximum ebb	-	upstream
3 hrs. after maximum ebb	1.8	downstream

The depths of the river off the Red Bank Battlefield Park are shown in Figure 2.3-1. The area off shore is very shallow except for the river channel that is dredged for large boat traffic. This channel is kept to a depth averaging between 35 and 40 feet; and is located approximately 2500 feet off shore.

Frequent waves and wash result from ship traffic up and down the Delaware River as well as wind action. Tidal eddies exist around Mud Island located approximately of the north shore of the Park.

2.3.2 Flooding

Information on flooding for the Delaware River, in the vicinity of Red Bank Battlefield Park, was obtained from the Federal Emergency Management Agency (FEMA). Flood mapping for New Jersey is presently in the process of being revised. The most recent mapping available was utilized in the proposed design of the Red Bank Battlefield improvements.

The maximum 100 year flood elevation for the Natonal Park

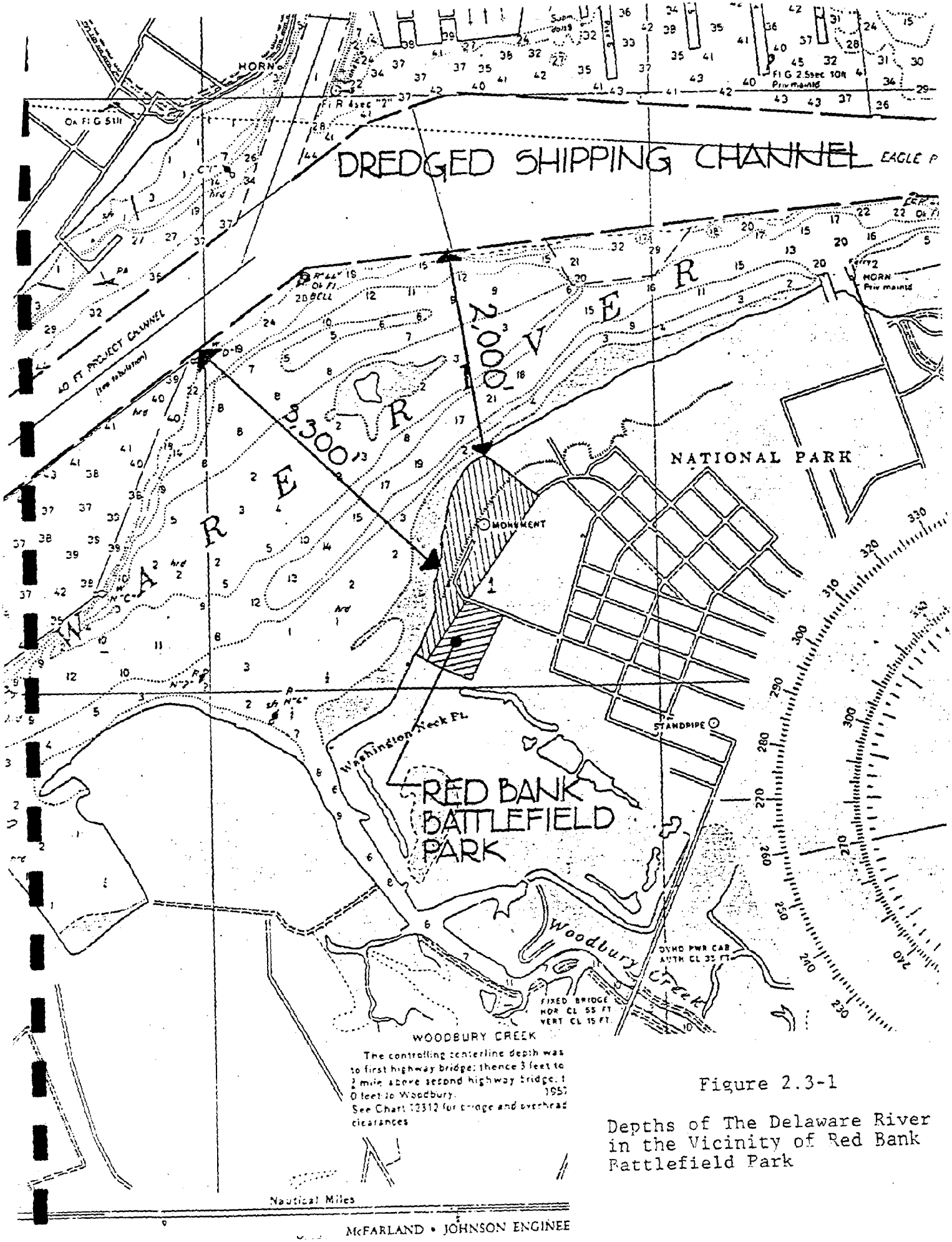


Figure 2.3-1

Depths of The Delaware River in the Vicinity of Red Bank Battlefield Park

area is 10 feet. As anticipated, the lower elevations of the park are located within the 100 year flood designaton, Zone A.

The U. S. Army Corps of Engineers was also consulted regarding flooding of the Delaware River for the National Park area. According to their records, the highest flood on record at Fort Mifflin, the monitoring station in the Delaware River across from the Red Bank Battlefield Park, was recorded at 8.6 feet. This record occurred during the storm of August 23, 1933. The second highest flood on record at Fort Mifflin occurred during the storm of November 25, 1950, when the river rose to 8.5 feet. The third highest flood on record occurred on October 25, 1980 when the river reached an elevation of 8.1 feet. This is 4.6 feet above the mean high water mark of 3.5 feet at Fort Mifflin based upon 1948 tabulations.

Although the three highest floods on record at Fort Mifflin exceeded 8 feet normal flood levels fall between 5.5 and 7.5 feet.

Normal flooding of this area is a combinaton of above normal tidal waters moving up the river from the Delaware Bay as well as above normal stormwater discharge to the river.

2.3.3 Water Quality

Information on water quality of the Delaware River adjacent to the Red Bank Battlefield Park in National Park was obtained from the division of Water Resources of the New Jersey Department of Environmental Protection (NJDEP). This information is assimilated and utilized jointly by the NJDEP, the Delaware River Basin Commission (DRBC), and the U.S. Environmental Protection Agency (US EPA).

For the purpose of this report, data were used from analyses obtained at the Fort Mifflin monitoring station located in the channel of the Delaware River at latitude 39 51 550 and longitude 075 03 28.0; river mile 91.60. The Fort Mifflin monitoring station is located just southwesterly of the Red Bank Battlefield Park.

The most recent data available for the area is the result of approximately 59 surface water samples taken in the period between July and October of 1976. The analyses of the samples involved the chemical characteristics of the river. Selected constituents are as listed:

Parameter	Number of Samples	Maximum Value	Minimum Value	Mean
Turbidity (ITU)	14	6.0	2.0	3.02
Dissolved Oxygen (mg/l)	43	9.5	1.3	6.94
Dissolved Oxygen (% SAT)	41	85.6	15.5	58.36
BOD 5 (mg/l)	59	3.9	1.2	3.37

pH (su)	17	7.7	6.3	6.9
Organic Nitrogen (mg/l)	42	1.3	.6	1.0
NH_3 +NH_4 - N Total (mg/l)	59	.87	.10	.45
Total Kjeldh Nitrogen (mg/l)	56	1.90	.25	1.16
Phosphate total (mg/l)	58	.32	.10	.18
Chloride total (mg/l)	59	40	8	19
Fecal Coliform (MPN/100 ml)	56	160,000	0	15,732
Total Coliform (MPN/110 ml)	39	660,000	0	97,950

The chemical constituents tested for in the above analyses include the pH, dissolved oxygen (DO), biological oxygen demand (BOD5), and the nutrient and chloride concentration of the water.

The pH is a measure of the acidity or alkalinity of a waterway or body of water and may change significantly depending upon the acid or alkali discharged. A change in natural pH below 5.0 and above 9.0, can be expected to cause fish mortalities.

Dissolved oxygen is a measure of the oxygen concentration of a waterway or water body. The DO concentration should remain above 5 mg/l for a diversified water biota.

The biological oxygen demand is an indirect measure of the amount of biological degradable organic material present: an indication of the amount of DO that will be depleted from water

during the natural biological assimilation of organic pollutants. The determination of the BOD5 in a waterway is proportional to the degree of pollution in natural waters.

Nutrients or fertilizing elements, more specifically nitrogen and phospherous, are mainly responsible for the eutrophication of waters. Of the two nutrients; nitrogen and phospherous, phospherous is usually the limiting factor and governs normal plant growth. Above a concentration of 0.1 mg/l phospherous, water is excessively enriched.

The presence of coliform organisms is indicative of fecal contamination since coloform organisms originate in the intestinal tract of humans and other warm-blooded animals. Coliform is a biological constituent of natural waters.

Turbidity, a physical characteristic of natural waters, is a measure of light transmitted or reflected by a finely divided suspension and is measured in Jackson Turbidity Units (JTU). Turbidity affects the photosynthetic process as a result of reduced light penetration.

The portion of the Delaware River described above is located in Zone 4 of the New Jersey Department of Environmental Protection (NJDEP) Surface Water Quality Standards, February, 1980. The limits of Zone 4 are described as that portion of the

Delaware River from river mile 95.0, just below the mouth of the Big Timber Creek, to the Pennsylvania-Delaware Line at river mile 78.8. According to the state water quality standards, this section of the river should be able to provide the industrial water supply after reasonable treatment and be suitable for navigation and secondary contact recreation (i.e., fishing and boating). It should also be suitable for wildlife, maintenance of resident fish and other aquatic life, and passage of anadromous fish.

The analyses as previously described portray the general character of the Delaware River in the vicinity of Red Bank Battlefield park. The surface quality of the river meets the general water quality standards put forth by the NJDEP as described above. It is therefore suitable for navigation and secondary contact recreation.

2.3.4 Dredging Frequency and Spoil Disposal

Dredging within 100 feet of waters edge of the site does not now occur. Dredging does occur at the shipping channel in mid river. Spoil disposal occurs south of the park at a Corps of Engineers controlled spoil disposal site.

2.3.5 Erosion/Accretion Regime

There is no evidence of erosion at the waterfront area. The ridge is well vegetated and the only evidence of erosion in this area is from pedestrian traffic at the sides of the existing concrete steps and one location behind the Whitall Mansion. The erosion at the Whitall Mansion is most likely due to rainwater runoff from the Mansion.

Accretion of soils at the waterfront, based on Corps of Engineers survey, circa 1964, and the existing conditions of the site show minimal or no accretion of soils. Also, discussions with the Department of Geology of the New Jersey Departmment of Environmental Protection substantiate this observation.

2.3.6 Design Wave

Based on recorded meteorological data for the project location, average wind velocity is 20 m.p.h. with a maximum velocity of 50 m.p.h. occurring infrequently. Prevailing winds are northwesterly in the winter months and southerly in the summer months. The maximum wind generated wave under these conditions would have a significant height of 1.70 feet and a period of 27.6 seconds, and would produce the greatest impact on the proposed facilities in the winter months. Under average conditions, the significant wave height would be reduced to 0.34 feet and the associated period to 12 seconds.

I. Max. Wave (@ 50 mph wind)

$$H = 0.0555\ U\ F^{0.5}$$

where: H = significant wave height, feet
U = wind velocity, knots
F = fetch, nautical miles

$$H = 0.0555\ (50 \div 1.151)\ (3000 \div [5280 \times 1.151]^{0.5}$$

$$= 0.0555\ (43.4)(0.49)^{0.5}$$

$$= 1.70'$$

Wave Period $T = 5\ U^{0.5}\ F^{0.25}$

$$= 5(43.4)^{0.5}\ (0.49)^{0.25}$$

$$= 5(6.6)(0.84)$$

$$T = 27.6 \text{ seconds}$$

II. Average Wave (@ 10 mph wind)

$$H = 0.0555(10 \div 1.151)(0.49)^{0.5}$$

$$= 0.0555(8.7)(0.7)$$

$$H = 0.34'$$

$$T = 5(8.7)^{0.5}(0.49)^{0.25}$$

$$= 5(2.95)(0.84)$$

$$T = 12 \text{ seconds}$$

III. Riprap Requirements

$W = YrH3/KD(Sr-1)^3 \cot \alpha$

Where: W = weight of individual riprap unit

H = wave height

KD = slope coeff. of riprap

α = angle of riprap slope with horiz.

Si = specific gravity of riprap

Yr = specific weight of riprap

<u>Given:</u> H = 1.70 x 1.7 = 2.89

KD - 3.5

α = 18 15' 46"

Sr = 2.4

Y = $150^{\#}$/cf.

$W = 150x24.1/3.5(2.4.1)^3(3)$

$= 3615/3.5(2.74)(3)$

$= 125.5^{\#}$/riprap unit

Rock Size: 125/150 = 0.83 cf/riprap unit

$V = 4/3 \quad r^3$

$r = \sqrt[3]{V / 4/3\,\pi}$

$= \sqrt[3]{0.83/4.18}$

r = 0.58

diameter = 1.16' say 15"

2.4 Conditions of the Site

2.4.1 Site Access

Site access to the waterfront area of the park is limited by the major natural feature of the site, the ridge of the land side of the beach, and the historical significance of the entire higher elevations of the park.

There are two possible means of access to the waterfront area. First and most desirable is from the northern border of the park. This means of access would require the use of waterfront lands belonging to the Borough of National Park and connection to Beach Avenue of the Borough of National Park.

The second possible means of access would be at the southern side of Whitall Mansion. However, the development of an access road in this area would be extremely close to the Whitall Mansion and is not considered advisable, since major traffic in this area would endanger the historical nature of the park. The activities of the total park would also be divided by a road in this area and limit safe pedestrian traffic for most of the area to be developed at the waterfront.

Therefore, we recommend that the Borough of National Park be contacted to develop use of these lands for the access road to

the waterfront area of the park.

2.4.2 Site Exposure to Noise, Especially Aircraft

The Red Bank Battlefield Park is located along the Delaware River of National Park. The area is located away from major highways and is accessible from Hessian Avenue which ends at the park entrance. As a result, the visitors to the park are not disturbed by noise from automobile or other such traffic.

However, the Philadelphia International Airport is located across the river from the park. The river serves as an aerial artery for aircraft arriving and departing from the airport.

2.4.3 Obstruction and Debris Presence

Debris present on the site is limited to minimal washup of miscellaneous trash, trees and vegetation.

2.4.4 Utilities and Site Drainage

The Red Bank Battlefield Park is serviced by a 3 inch P.S.E.& G. gas main located in the Hessian Avenue Right-Of-Way (ROW) and ends at the gate of the facility.

Sewer service is provided by the National Park collection

system. An 8 inch Asbestos Cement Pipe runs under the north side of Hessian Avenue and connects to the Whitall House.

A fire hydrant is located on the southside of Hessian Avenue, at the gate to the Red Bank Battlefield Park. A water main runs along the south side of Hessian Avenue between the fire hydrdant and the Whitall House.

A 36 inch by 24 inch arched storm drain runs from the inlet on the south side of Hessian Avenue at the gate to the park, southwest across the park, and outfalls into the Delaware River just south of the maintenance buildings.

South Road, located at the top of the ridge above the waterfront area presently belonging to the Borough of National Park, is proposed for annexation to the Red Bank Battlefield Park. This road is also adjacent to park property and contains both water and sewer service. Both services terminate at the boundary of the Park.

3.0 Engineering Analysis

3.1 Geotechnical Assessment

3.2 Foundation Analysis

3.3 Preliminary Design Criteria
- Foundations

3.4 Preliminary Design Criteria
- Civil Design Parameters

3.5 Marine Engineering Analysis
- Boat Ramp

3.1 Geotechnical Assessment of Site

The soils at Red Bank Battlefield consist of three main types; Sassafras, Downer and Made Land. The Sassafras and Downer type soils are similar soils both being mixtures of sand and loam. Sassafras is moderately sandy soil over stratified sand and loamy sand layers. Downer soil is sandy loam over stratified sand and loamy sand layers. The "Made Land" is composed of sandy material pumped from the bottom of the Delaware River.

The topography of the land is an important geotechnical feature here. The area between the river and the embankment is very low lying land and is composed of loose sandy beach soil which is easily eroded. The sandy soil at the top of the embankment is more stable and is out of the immediate flood area because it is about 35 feet above the normal water level of the river. Therefore, erosion of the soil undermining the foundation will not be under consideration in the area at the top of the embankment.

It must be noted that the foundation analysis has been done from information from Gloucester County Soil Survey Maps (Fig. 2.2-2) and from site inspections; no soil borings have been taken. Information gained from soil borings during the design of the proposed structures should be analyzed and the foundation design adjusted according to good engineering practice. Final

design of any of the structures should not be attempted without obtaining adequate soils data.

We will assume the loose sand in the area in front of the embankment to have a safe bearing capacity of 1 ton per square foot and the area in back of the embankment to have a 1.5 ton per square foot safe bearing capacity. These assumptions are based on values taken from Foundation Engineering by Alfredo R. Jumikis and are usable for preliminary reports when soils borings and tests are not justified or not available.

3.2 Foundation Analysis

The structures proposed on this site are the following: Bulkhead/slope protection, Boat ramp, Outdoor stage and amphitheater, Picnic shelters, Public toilets, Parking facilities and adjoining roadways. We will give each structure suitable design alternatives and evaluate each alternative in terms of stability, bearing capacity and cost.

3.2.1 Parking Lot and Adjoining Roadways

By inspection the soil at the site appears to be a good subgrade material. This conclusion is reinforced by the properties of the soils obtained from the soils maps and the Soils Conservation Service when applied to the "Group Index" of the American Association of State Highway and Transportation

Officials (AASHTO).

The Group Index is defined by an empirical equation which permits a determination of probable soil performance. The Group Index is a function of soil particle size and the soils ability to drain and compact. Both Sassafras and Downer soils groups have a low plastic index (the soil drains and compacts well without a noticeable volume change) and small soil particle size which gives a near zero Group Index. A Group Index of zero generally indicates a good subgrade material for roadways. Therefore, the material at the site should be a good subbase and no excavation and backfilling is necessary for the parking lot and adjoining roadways because of poor material. The parking lot may be brought up to its required elevations by using existing material at the site from excavated areas. Even though the parking lot is not being built up a great deal (between 1 and 3 feet) excavation material will probably not be sufficient at the site and good quality fill will have to be hauled in and used.

Because of the small relative size of the picnic shelters and the light loads which will be encountered in such a structure, the foundation need not be extensive. Since the picnic shelter will need roof supports at each corner we suggest that these roof supports be used as low capacity piles/posts which can be driven into the ground. The floor slab can be poured on grade and the roof supports anchored firmly by pouring

the concrete floor slab around the supports. These supports can be given further anchorage by pouring concrete around them below the floor slab.

Another alternative would be to provide a footing around the perimeter of the entire floor slab. This would prove too costly, however. Therefore, we recommend the use of the roof supports as low capacity piles. Because the concrete floor slab will distribute the load over its area and because the loads are light, this foundaton will be satisfactory for bearing capacity and settlement while being of low cost.

3.2.3 Public Toilets

The type of public toilet to be used for this project is an organic waste treatment system. The loads on this structure will also be light consisting mainly of dead loads.

The type of foundation used for this structure should be similar to the one used for the picnic shelter, a slab on grade poured monolithically around roof supports which have been augered and driven into the ground for added stability and support.

3.2.4 Outdoor Stage and Amphitheater

The proposed site is to have an outdoor stage with stage seating. The outdoor stage will be about 1200 square feet and the stage seating is to accommodate about 640 people. The activities proposed for the stage are small limited production plays and small concerts. The placement of this amphitheater is an important design feature in this case. The stage is to be placed in front of the embankment on the low lying "beach" area and the seating is proposed to go up the embankment slope.

The soil in the area of the stage is loose beach sand which is not suitable for shallow foundations. The stage should have a deep foundation which will not succumb easily to the undermining effects of erosion. A shallow foundation such as a shallow footing is not appropriate because if the soil is washed away from around the footing the structure could collapse. The most appropriate type of deep foundaton is timber piles due to its relative low cost for a deep foundation.

The stage should be designed to hold 150 lbs. per SF. of live load. This translates to a foundation which should safely carry 98 tons of live load. A timber pile foundaton driven to the appropriate length will carry these loads and give protection against erosion.

The stage seating will follow the slope of the embankment to allow for the natural elevation of the seats. This embankment is

on a slope of between 20 - 30 degrees with the horizontal. On sandy soils the placing of loads on a shallow foundaton on such a steep slope may cause the possible expulsion of soil from under the footing causing a tilting or overturning effect. Therefore, a deep foundation is necessary.

The amphitheater should be designed to hold 100 pounds per square foot. A properly designed timber pile foundaton will adequately handle these loads and prevent settlement and slippage.

3.2.5 Bulkhead/Slope Protection

A bulkhead is to be constructed around the parking lot area which is facing the water. The bulkhead's function is to retain the fill used in building up the elevation of the parking lot and also to resist the damaging effects of scour and flooding on any structure behind the bulkhead. The types of bulkheads to consider are steel sheet piling and timber sheeting with timber piles. Although not classically a bulkhead but which also protects the ground behind it is rip rap which will also be considered as an alternative.

Rip rap is stones or rock from 6 inches to 1 foot in diameter. The rip rap is placed along the slope of the ground on which it is erected. Therefore, sufficient space must be

available for the slope on which the rip rap will be placed.

The timber bulkhead would consist of timber piles driven about every 10 feet with horizontal timber sheeting behind them. With preservative treatment, timber bulkheads can remain structurally sound for long periods of time.

Steel sheet piling bulkhead would be driven to a depth of one half to two thirds of its height above ground. The main disadvantage of steel sheeting is that the cost is comparatively high because the height of the fill to be retained is relatively small and hence does not need a material so strong as steel, nor as expensive, to retain it.

Because of cost we recommend rip rap slope protection to protect the parking lot. The parking lot will be elevated about 3 feet and the slope of the rip rap should be about 4 feet horizontal to 1 foot vertical.

3.2.6 Boat Ramp

The proposed boat ramp will be constructed of concrete.

The ramp will be used for small pleasure boats weighing up to about 3600 pounds. Both live and dead loads will be transferred over the area of the boat ramp to the soil. The

bearing capacity of the soil should support such a structure without a foundation and the boat ramp can rest directly on the soil assuming the bearing capacity of the soil is 1 ton per square foot as previously stated. Scouring around the boat launch should be solved by placing a small concrete lip around the structure.

3.3 PRELIMINARY DESIGN CRITERIA - FOUNDATIONS

3.3.1 Picnic Shelters and Public Toilets

The foundation of these two facilities can be basically the same. They are slabs on grade with low capacity piles/posts for extra support. The posts/piles can be 8" x 8" timbers and augered a few feet into the ground and then driven another few feet. When the floor slab is poured the area around the pile should be also filled with concrete to make a monolithic post for stability and bond. The posts are also to be used for roof supports. (See Sketch).

3.3.2 Amphitheater

Both the stage and the seating area are to be built using timber piles. The piles should be 10" diameter treated timber piles, driven to a 20 ton capacity. The number of piles and their spacing must support both the live and dead loads and be

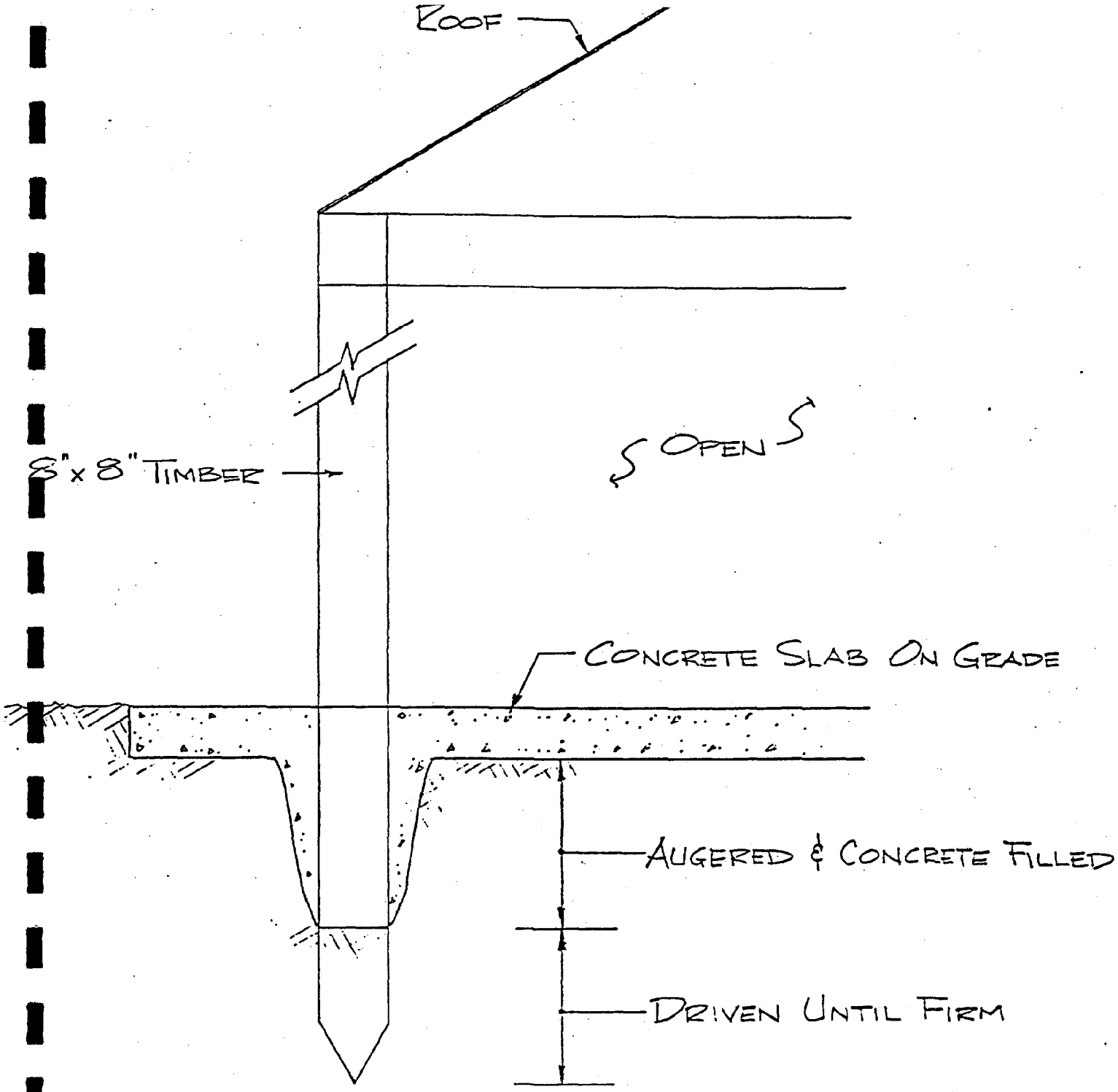
spaced adequately so that any part of the superstructure is not overstressed.

The stage seating for the amphitheatre may be constructed of reinforced concrete. The seating may be constructed of reinforced concrete beams laid longitudinally along the embankment supporting a precast seating section. The longitudinal beams will have the timber piles embedded into them. Also, "deep keys" may be provided for added stability against sliding. (See Sketch).

Amphitheater seating of reinforced concrete will have excellent durability and very low maintenance. Use of precast seating sections instead of forming and pouring concrete in place will ease and speed the construction process considerably because of the difficulty that placing concrete on a steep embankment entails. However, the longitudinal concrete beams on which the precast sections will sit should be poured in place due to the fact that the timber piles are embedded in them.

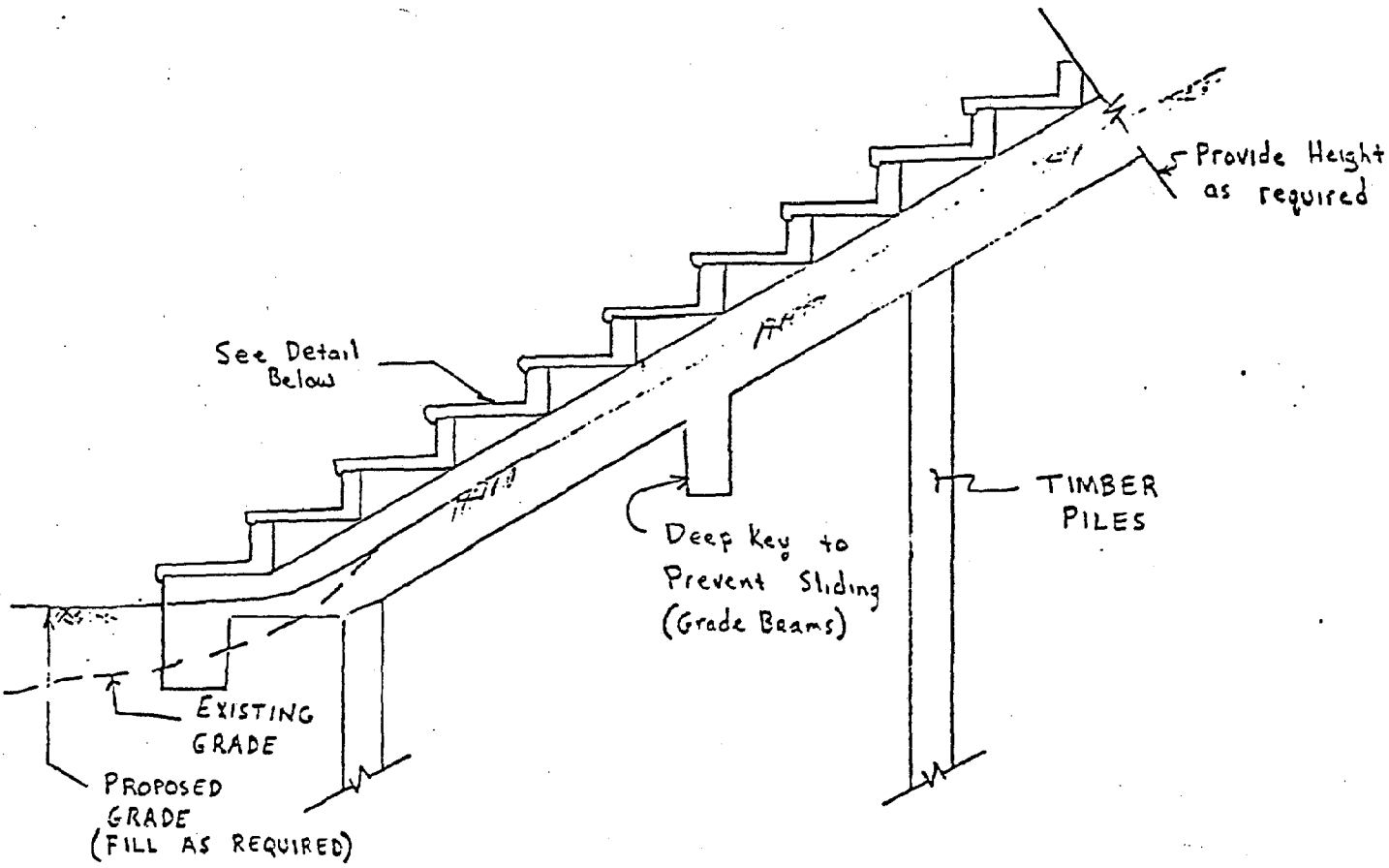
Another alternative stage seating arrangement would be timber seating. Although the initial cost for timber seating would be lower, the maintenance costs would be higher and the expected life of the seats will be less.

A terraced seating arrangement consisting of 8" x 8" treated

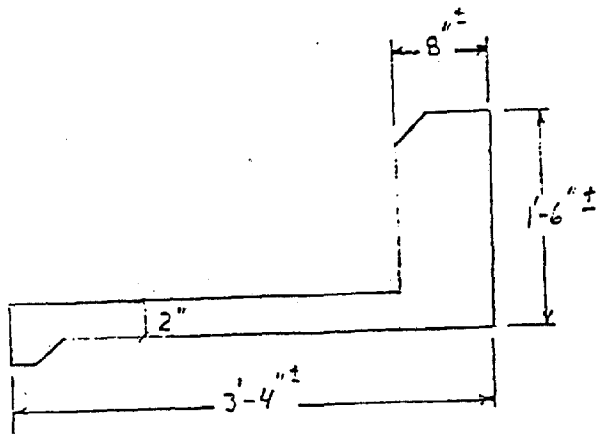


TILE/POST & SLAB DETAIL - FOR PICNIC SHELTER & PUBLIC TOILE

NOT TO SCALE



CROSS SECTION - STAGE SEATING
Not To Scale



DETAIL - TYPICAL PRECAST SEATING SECTION

wood steps with brick pavers on a sand bed forming the surface of each terraced area was considered. However, this system was requested changed by the Gloucester County Parks and Recreation due to expected maintenance costs. Vandalism could also be expected to this type of installation.

3.3.3 Slope Protection

The rip rap slope protection should be made of stones of about 6" to 1 foot in diameter and laid on a slope of 4 horizontal to 1 vertical. A lip should be provided at the toe of the rip rap slope to prevent scouring from undermining the slopes.

3.4 Preliminary Design Criteria - Civil

3.4.1 Design Parameters

Design criteria has been established based on the existing marine conditions at the site, as described in Section 2.3 - Marine Characteristics, size and limitations of existing roads, in the Borough of National Park, conceptual design scope requests by Gloucester County parks and Recreation and the predominate type of recreational boating along the Delaware River and in Gloucester County.

This criteria is used in the conceptual layout of the proposed boat launching ramp and adjacent parking and access facilities. The average size powerboat that would be launched from this location would have a length of sixteen to eighteen feet and a draft less than two feet. Sailboats will be limited to approximately 12' to 16' feet, because of their increased draft. This, combined with a maximum tow vehicle length of nineteen feet and an allowance of three feet for the boat trailer, yields a design vehicle length of forty feet. This design vehicle was used in all calculations pertaining to parking stalls and roadway geometry.

3.4.2 Roadway and Parking Area

The parking area, as proposed, provides 36 parking spaces having dimensions of ten feet by forty feet. These spaces will accommodate 36 tow vehicle/boat trailer rigs, or 20 rigs and 32 passenger cars when the center island is used solely for passenger cars. The parking area will accommodate the design vehicle, as previously specified, with regard to all turning radii. One way traffic through the parking area has been proposed to minimize confusion during periods of high usage.

Approximately 800 lineal feet of 25' wide access road will be required to link the proposed boat launching facility and parking areas to the existing Borough of National Park road known as Beach Avenue.

The geotechnical assessment of the site, Section 3.1, has produced indications that the existing soils are suitable for use as road subgrade. No stabilization will be required prior to placement of any pavement. We recommend that the pavement for the access road, parking area and boat ramp approach consist of 2" FABC-1, placed on 6" soil aggregate Designation I-2. Additionally, we recommend that 6"x8"x18" concrete curb be constructed around the perimeter of all bituminous pavement to eliminate the possibility of erosion and/or pavement undermining due to flooding and stormwater runoff.

3.4.3 Boat Launch Ramp

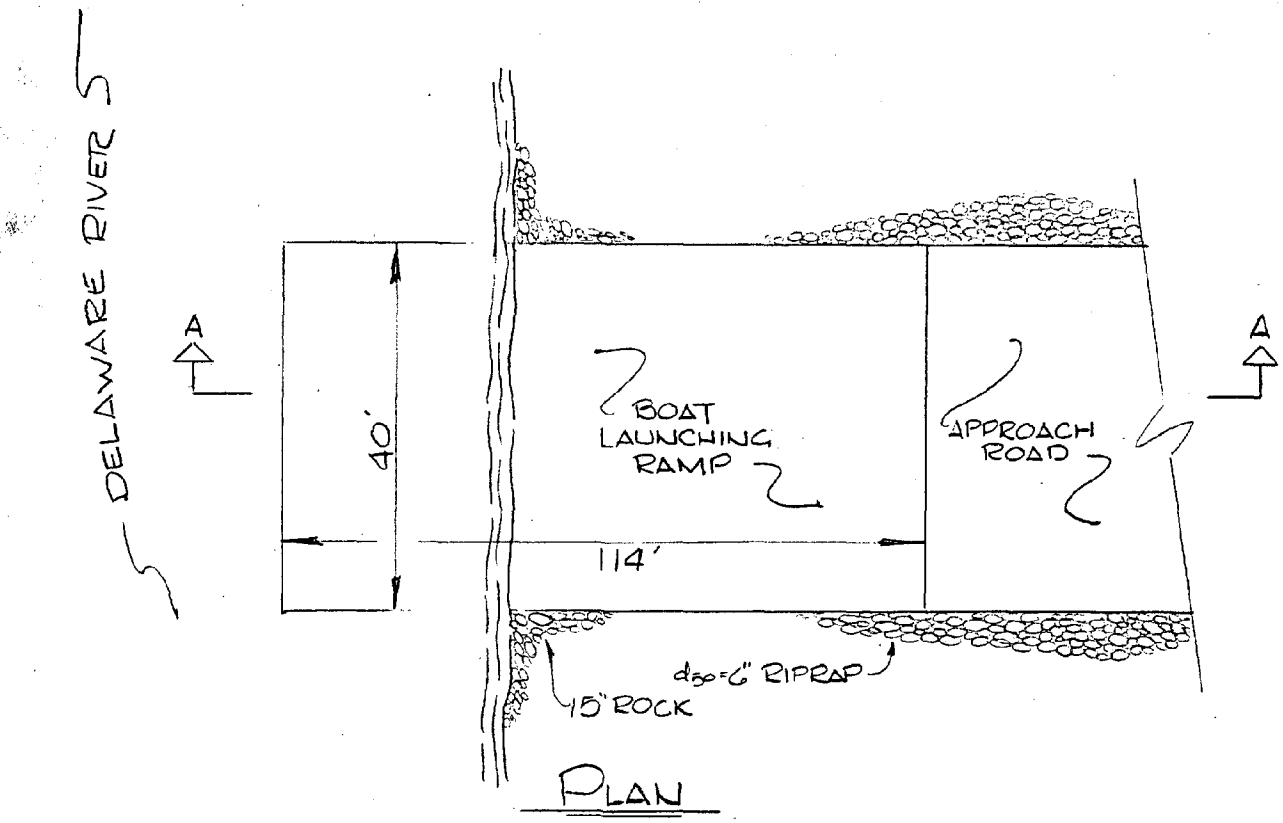
The proposed boat ramp, as shown in Figure 3.4.1, is forty feet wide and approximately one hundred fourteen feet long. The ramp will project into the Delaware River approximately forty two feet beyond the mean low tide line. Due to the length of the ramp and its vertical location, it will be available for full use at all times and will not be limited by high or low tides. The width of the ramp will facilitate multiple simultaneous launching manuevers to minimize waiting time for ramp use.

Due to the constant eroding action of ebb and flood tides and the nature of the foundation material, reinforced concrete is the only material acceptable for use in the construction of the proposed ramp. Consideration must be given to stabilization of the ramp structure to prevent longitudinal sliding due to embankment failure.

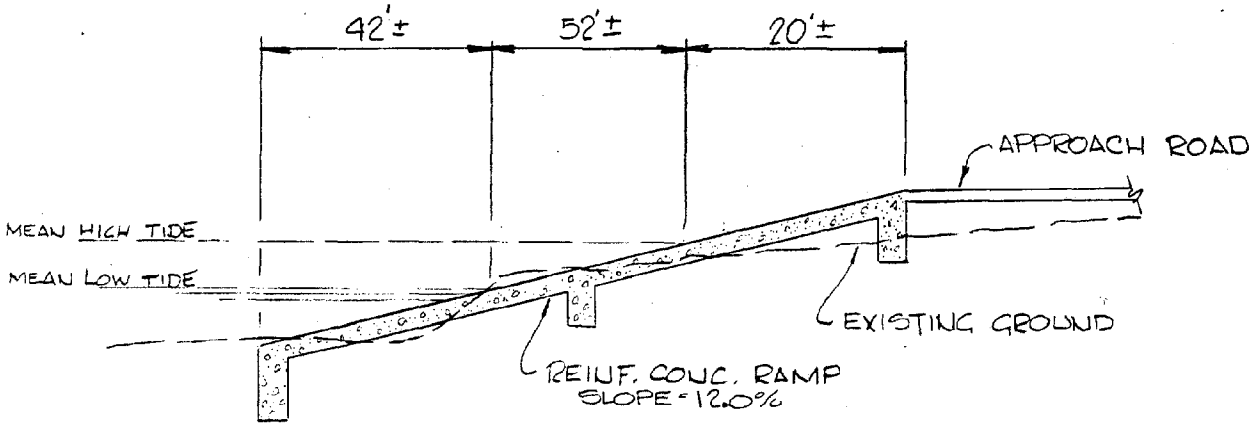
3.5 Marine Engineering Analysis

The proposed facility is subject to several hydrological constraints.

The Federal Emergency Management Agency has tentatively established the 100 year flood line at elevation 10.0 in this area. The existing ground elevations in the access road, parking and ramp areas are several feet below this flood line but it is



PLAN



SECTION A-A

FIGURE 3.4-1
BOAT LAUNCHING RAMP
NOT TO SCALE

not cost effective to fill the entire area to an elevation exceeding that of the 100 year flood plain since the only structure subject to inundation during such an extreme storm event would be the proposed pavement. See Figure 3.5-1 for an illustration of the proposed facilities relative to the various flood stages.

As noted in Section 2-3, Marine Characteristics, there are several energy systems generated by the river which will act on the proposed facililties and must be addressed. These are, namely, tides, currents and waves.

The effects of these conditions will be limited to the boat launching ramp and adjacent slope protection, since all other improvements are an average of three feet above mean high water. Preliminary calculations indicate that fifteen inch rock should be used for all slopes subject to tidal and wave action.

Rip rap slope protection is proposed for stabilizaton of all areas which are above an average of three feet above mean high water and are subject to erosion or displacement due to water movement. A median stone diameter of six inches should be sufficient for this purpose.

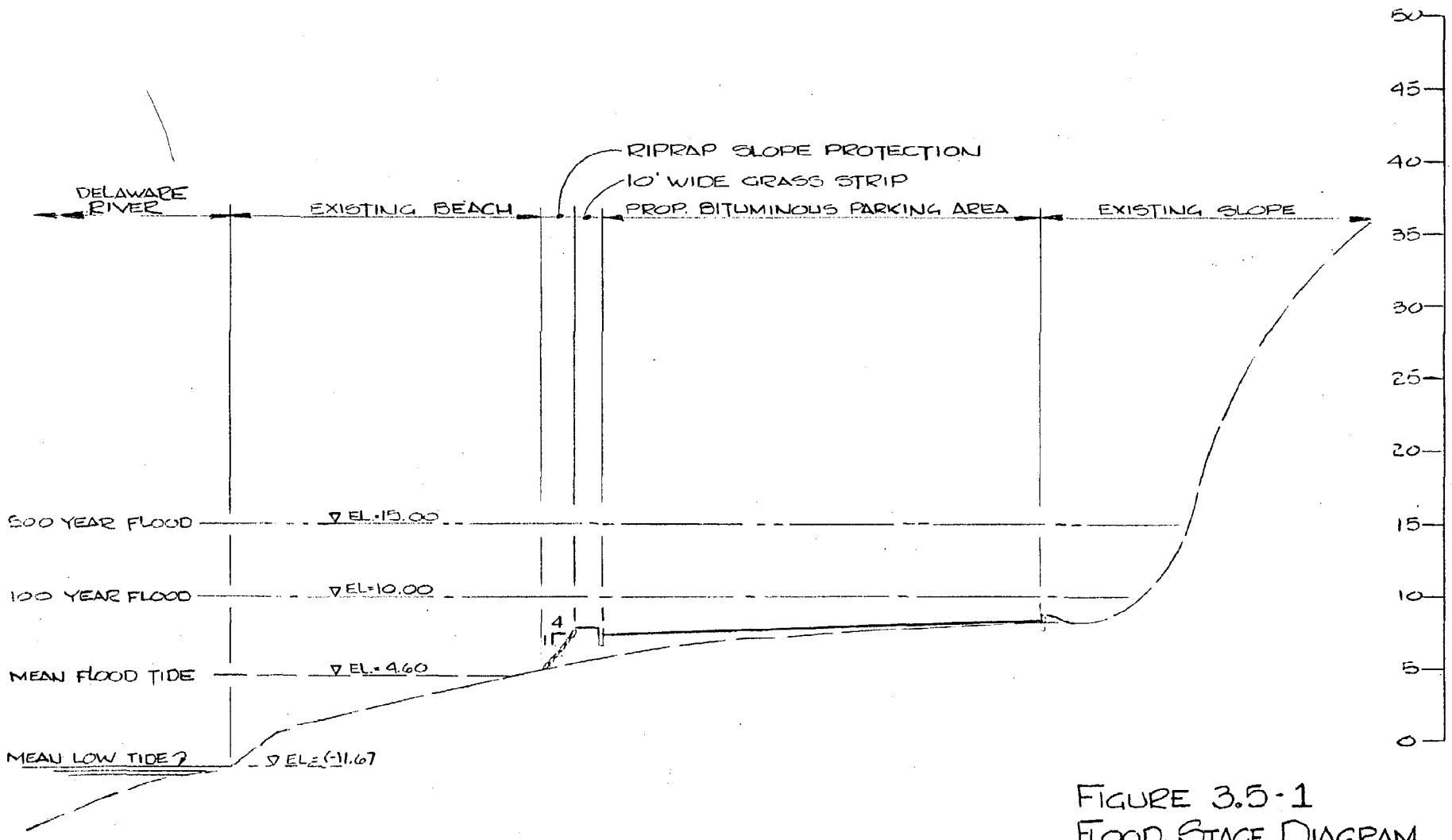


FIGURE 3.5-1
FLOOD STAGE DIAGRAM
NOT TO SCALE

Since the boat ramp must project into the current of the river, eddies will be created and mild siltation will probably occur. This will generate minor maintenance activity in the form of cleaning. However, as the navigable river channel is located approximately 2500 feet from shore, the construction of the boat ramp will not affect the river channel.

4.0 Design of the Waterfront Development

4.1 Concept Design Waterfront Area

4.0 Design Of The Waterfront Development

4.1 Concept Design Waterfront Area

The concept design of the waterfront lands has been most dramatically controlled by several factors: The limited access of vehicular traffic, the historical significance of the park, the susceptibilty of the waterfront lands to periodic flooding, and the ambience and character of the park's existing construction.

The proposed construction of an access road approaching from the Borough of National Park's Beach Avenue, has enabled the waterfront vehicular activity to be separated from the basic historical activities of Red Bank Battlefield Park. Simultaneously, this location of the access road has enabled the remaining waterfront lands to be developed without being separated from the park by major circulation elements.

The access road terminates at a new parking area and boat launch facility. The parking area has been designed to accommodate car and trailer vehicles and to also provide parking for standard passenger vehicles. The center portion of the parking area has been developed to provide dual availability of parking for either car and trailer use or passenger vehicle use.

The remainder of the waterfront lands extend from the parking area to a major historical element of the park, the Whitall Mansion. The proposed development of this area is focused on family or group picnicking, pavillions with pathways extending along the beachfront area.

The ground levels are proposed to be incrementally raised to provide protection for portions of the new facilities from possible flooding. Open areas are developed about the pavillions at several levels for recreational activities. The division of this portion of the park into separate levels also enables the beach areas to be separated from other recreational activities of the waterfront area.

An amphitheater and stage is located just north of the Whiteall Mansion on the ridge that runs parallel to the Delaware River. The amphitheater uses the natural feature of the site on the ridge, to provide access from both the waterfront lands and the higher elevations of the historical area of the park. It also, in a sense, "bridges" the activities of the separate areas of the park.

The stage located at the base of the amphitheater has been sized to accommodate movable partitions or stage scenery and also to provide off-centerstage activities at the stage elevation.

Toilet facilties are proposed for the waterfront areas and are located in proximity to the picnic pavillions. Their location is approximately centered between the amphitheater and the lower parking area and on the highest ground of the waterfront development. Self-contained digesters are recommended for sewage disposal.

4.1.1 Construction Materials

The picnic pavillions, toilet facilities and stage are all recommended to be of similar construction. The recommended system is essentially wood-frame and wood-pile construction with cedar shingles for roofed areas.

While the exact systems are not the same as existing construction on the site, the use of wood and especially the cedar shingles are similar and compatible usage of materials. The park's existing picnic pavillions and shelters are of wood-frame and cedar shingle construction.

Since the pavillions, stage and toilets could be subjected to flooding, wood piles have been chosen as the basic structural element.

Concrete slabs are proposed for the floor construction of the picnic pavillions, toilets, and stage for several reasons.

All of the structures require lateral bracing of their structural system at the floor level which the concrete slabs will provide. The finish surface of the floors all require reasonable maintenance costs. And, the nature of the structures useage require surfaces that are durable, flush and impermeable.

The amphitheater is proposed to be of concrete construction. The major factor in this choice has been the impact of possible yearly maintenance and the function of the facility. The amphitheater will accommodate approximately 600 people for day and night activities. The necessary lighting, handrail and seating systems can be more securely and durably installed in concrete construction as opposed to a construction built into the slope.

A totally wood amphitheater is feasible; however, the maintenance of a structure of this type can be expected to be more costly and periodic.

4.1.2 Site Lighting

Site lighting is proposed for the walkways extending from the amphitheater to the new parking areas. The individual picnic pavillions are proposed to be lighted and have waterproof receptacles. The electrical service is limited to the pavillions above the 10-foot elevation. The toilets are also to have

electrical service.

The stage will have extensive lighting and electrical service as would be required by this type of facility.

5.0 Cost Analysis

5.0 Cost Estimate

A. Access Road, Parking Area, Boat Ramp and Rip Rap Bulkhead		$137,300.00
B. Picnic Shelters		60,480.00
C. Toilet Facility		17,600.00
D. Amphitheater		238,600.00
E. Stage		9,900.00
F. Miscellaneous Site Work		69,300.00
G. Electrical Site Work		48,500.00
H. Development of Six-Acre Parcel Adjacent to Southeast Border of Park		130,500.00
SUBTOTAL: Labor & Material		$712,180.00
Contingency at 20%	$142,436.00	$854,616.00
Contractor's Overhead at 20%	170,923.00	1,025,539.00
Contractor's Profit at 10%	102,554.00	1,128,093.00
Labor Insurance at 20% (1/2 L & M)	71,218.00	1,199,311.00
Tax at 5% (1/2 L & M)	17,805.00	1,217,116.00
SUBTOTAL: Construction Cost		1,217,116.00
Bid Bond at 1%	12,171.00	1,229,287.00
Total Construction Cost		$1,229,287.00
A/E Fee at 10%	$122,928.00	1,352,215.00
Site Topographical Survey at 2%	24,585.00	1,376,800.00
Soil Analysis at .5% (Includes Soil Borings)	6,146.00	1,382,946.00
Estimated Project Costs		$1,383,000.00

A. Access Road, Parking Area, Boat Ramp and Rip Rap Bulkhead

Embankment	1050 C.Y. at 2.65	$ 2,782.50
Soil Agg. I-2	8450 S.Y. at 2.50/S.Y.	21,125.00
2" FABC-1	887 T. at 30.00/T.	26,610.00
Concrete Curbing	3000 L.F. at 10.50/L.F.	31,500.00
Conc. Boat Ramp	90 C.Y. at 300./C.Y.	27,000.00
Rip Rap	800 S.Y. at 30.00	24,000.00
Topsoiling (4")	900 S.Y. at 2.00	1,800.00
Sodding	900 S.Y. at 2.75	2,475.00
SUBTOTAL		$137,300.00

B. Picnic Shelter (Each)

Concrete Slab: 64 S.Y. x 16.00/S.Y.	=	$ 1,030.00
Pole Support(pile): 4x16'=64 l.f. x 7.50/l.f.	=	480.00
Wood Roof Structure (all treated lumber)		
Beams: 4 - 4"x16"x16' = 64 l.f. x 12.00/l.f.	=	770.00
Hips: 4 - 3"x12"x12' = 48 l.f. x 5.60/l.f.	=	270.00
Roof Rafters: 2x8' at 16' o.c. at 170 s.f. x .90/s.f.	=	160.00
Purling: 1 x 3 for cedar shakes	=	60.00
Cedar Shakes	=	300.00
Miscellaneous Hardware	=	200.00
Picnic Table (wood pre-cut)	=	330.00
Grill (Vandal resistant) in place	=	100.00
Trash Receptacle in place	=	80.00
Each	=	$ 3,780.00
x 16 shelters	=	$60,480.00

C. Toilet Facility

Base Shelter Design	=	$ 3,780.00
In Addition:		
Extend Pole Support	=	360.00
Floor Structure	=	240.00
Plank Flooring	=	160.00
Plank Siding	=	320.00
Siding Subframing	=	240.00
SUBTOTAL	=	$ 5,100.00
Plumbing (2 urinals/3 W.C./4 sinks/ piping hot water heater & extension of service	=	7,000.00
SUBTOTAL		$17,600.00

D. CONCRETE AMPHITHEATER

Cast-In-Place Concrete Grade Beams 200 cu. yds. x 300/c.y.	=	$ 60,000.00
Wood Piles	=	26,000.00
Precast Concrete Stepped Seating System 6600 s.f. x 20.00/s.f.	=	132,000.00
Wood Seating	=	6,000.00
Hand Rails	=	8,000.00
Landscaping & Grading	=	6,600.00
SUBTOTAL	=	$238,600.00

E. Stage

Piling	=	$ 5,000.00
Floor Framing	=	1,600.00
Stage planking	=	1,100.00
Steps	=	600.00
Stage Rear Walls (wd. planks)	=	900.00
Bracing for Walls	=	700.00
SUBTOTAL	=	$ 9,900.00

F. Miscellaneous Site Work
Waterfront Development

Pathways

2" FABC over 4" gravel 6'-0" wide 2100 l.f. x 3.00/l.f.	=	$ 6,300.00
Landscape ties terracing = 5500 l.f. x .90+	=	5,000.00
Miscellaneous Equipment		
16 Benches (wd. 8' long) ($200 ea.)	=	3,200.00
16 Trash Receptacles ($80+ ea.)	=	1,300.00
Fill and Grading	=	30,000.00
Signage	=	3,000.00
Seeding and Fine Grading approx. 15,000 s.y. at 1.00/yd.	=	15,000.00
Chain Link Fence (300 l.f. x 10.00/ft.)	=	3,000.00
Play Equipment Allowance	=	2,500.00
SUBTOTAL	=	$69,300.00

G. Electrical Site Work

Extension of Service and Transformer	=	$10,000.00
Site Lighting - Amphitheater Walkways (30 lights)	=	15,000.00
Electrical Service at Stage	=	15,000.00
Electrical Service at Toilets	=	3,500.00
SUBTOTAL	=	$48,500.00

H. Development of Six-Acre Parcel Adjacent to Southeast Border of Park

Parking Lot

Excavation	1322 C.Y.	3.50/C.Y.	$ 4,627.00
Embankment	1983 C.Y.	2.65/C.Y.	5,255.00
6" Th. Soil Agg. I-2	3966 S.Y.	2.50/S.Y.	9,915.00
2" Th. FABC-1	437 Tons	30.00/Tons	13,110.00
6"x8"x18" Conc. Curbing	1095 L.F.	10.50/L.F.	11,498.00
4" Th. Topsoiling	521 S.Y.	2.00/S.Y.	1,042.00
Sodding	521 S.Y.	2.75/S.Y.	1,433.00
Modify Existing Inlet			
Type B. Inlet	2 Unit	1375./U.	2,750.00
18" R.C.P.	350 L.F.	30.75/L.F.+	10,770.00
Landscaping			4,000.00
SUBTOTAL			= $72,400.00

H. (continued)

Tot Lot at Six-Acre Parcel	=	$ 2,500.00
Equipment Purchased by County		
Play System Installed by Contractor		
Landscape Ties	=	800.00
Benches (2)	=	400.00
Trash Receptacles (2)	=	160.00
SUBTOTAL	=	$3,860.00
Miscellaneous Improvements		
Pathways (700 l.f.)	=	$ 2,200.00
Trash Receptacles (4)	=	320.00
Benches (4)	=	800.00
Picnic Shelters (4)	=	15,120.00
Clearing	=	2,000.00
Seeding (10,000 s.y. at 1.00/yd.)	=	10,000.00
Site Lighting	=	3,000.00
Fence, Masonry (440 ft. x 20/ft.)	=	8,800.00
Chain Link (1200 ft. x 10/ft)	=	12,000.00
TOTAL (H)		$130,500.00

Annual Maintenance Costs

Cleaning of Facilities (daily) (summer only)	=	$ 4,000.00
Cleaning of Toilet Digesting System (yearly)	=	1,600.00
Miscellaneous Repair	=	3,400.00
Yearly Maintenance Costs	=	$ 9,000.00
Operations Costs (One person yearly salary)	=	16,000.00
Annual Operations and Maintenance Costs	=	$25,000.00

6.0 Environmental Analysis

6.1 Existing Environmental Conditions

6.2 Identification of Short and Long-Term Impacts

6.3 Mitigation Measures of all Adverse Impacts

6.0 Environmental Analysis

6.1 Existing Environmental Conditions

Various existing environmental conditions of the site have been discussed in detail within Chapter 2 of the Waterfront Development report of Red Bank Battlefield Park. Chapter 2 covers the history of the area as well as the physical and marine characteristics of the site. It also covers existing utilities and access to the site.

6.2 Identification of Short and Long-Term Impacts

The purpose of the proposed improvements for the Red Bank Battlefield Park is primarily to extend the use of the lower, waterfront portion of the park.

An access road from Beach Avenue of the Borough of National Park is to connect with a parking area. The parking spaces will accommodate 36 tow vehicle/boat trailer rigs, or 20 rigs and 32 passenger cars when the center island is used solely for passenger cars. From the parking lot, a concrete boat ramp will be constructed.

An amphitheater with a seating capacity of 640 is to be constructed just south of the proposed parking lot into the

embankment, making it acccessable from both the waterfront and the upper elevations of the park.

Additional picnicking facilities, conversation areas, "tot lot" as well as additional lavatory facilities are included in the proposed design.

Short-term Impacts

Implementaton of the proposed design would create short-term impacts resulting from construction processes.

Air pollutant emissions of carbon monoxide and hydrocarbons would be emitted from the construction equipment utilized at the site. However, these emissions will only be temporary and would not be significant enough to affect the air quality in the general area.

Noise associated with the construction process would be expected to be an irritation to visitors of the facility.

Permanent land and vegetation disturbance would occur as a result of the construction of the proposed access road, the parking lot, and the amphitheater. Being that only grasses are present in the area proposed for major construction, significant disturbance of wildlife is not expected to occur.

The access road as well as the parking lot, and boat ramps, although above the average flood levels at an average of 7 feet, will be constructed in such a way as to not be affected by major flooding.

The water resources, i.e. the quality of the Delaware River, is not expected to be impacted due to the implementation of the proposed design.

Long-term Impacts

The major, long-term impact which can be expected to occur due to the implementation of the park expansion, would be greater accessibility and recreational value to areas of the park previously not easily accessible.

A decrease in areas of wildlife habitat would be expected in the areas of lower elevations due to increased usage. More specifically this would be in the area of the access road in the section proposed for annexation from the Borough of National Park. However, surrounding areas are sufficient to accommodate this displacement. Possible wildlife could expect to consist of certain types of transient marsh birds such as the tree swallow, plover, and yellow digs. Small game animals such as rabbits and rodents may also be displaced.

Runoff from the lower elevation parking area (4560) square feet) would be expected to contain only negligible amounts of hydrocarbons. Based upon the volume of the Delaware River, hydrocarbon pollution of the waterway due to runoff of the parking would be insignificant.

The overall aesthetic value of the proposed project would be significantly increased, resulting in a well-manicured, architecturally pleasing recreational facility.

6.3 Mitigation Measures of all Adverse Impacts

The primary, short-term, impacts resulting during the construction of the proposed improvements are only temporary. These impacts are discussed in the previous section.

Permanent land and vegetation disturbance resulting in displacement of wildlife of the area is not expected to be significant. Any wildlife within the park grounds displaced either directly by construction activities or indirectly by increased use of the park could be accommodated by areas adjacent to the park.

In summary, no significant adverse impacts are anticipated as a result of the implementation of the proposed design for the Red Bank Battlefield Park. Therefore, a discussion of mitigation measures is not required.

7.0 Permitting Requirements

7.0 Permitting Requirements

McFarland-Johnson Engineers was granted a contract for a study involving the development of the Red Bank Battlefield Park by the Gloucester County Board of Chosen Freeholders in a resolution conducted on September 26, 1981.

As per the contract, the study involves the "preparation of a concept design plan and development of the planning, engineering, and environmental information for the recreational development of the Red Bank Battlefield waterfront". The study is required to be consistent with the State's developing and approved coastal zone management program.

Two permits must be obtained for the implementaton of the proposed development of the Red Bank Battlefield Park. One is required by the New Jersey Department of Environmental Protection and the other by the U.S. Army Corps of Engineers.

In applying for a waterfront development Permit, the application must include the submission of the following:

- A completed CP#1 standard applicaton form.
- A fee
- A Statement of Compliance with Coastal Resource and Development Policies.
- Evidence of notificaton of application to County and

Municipal Planning Boards and Environmental Commissions and County and Municipal Clerks.

- Location map.
- Plan of proposed project.
- List of names and addresses of adjacent lands.
- Evidence of applicant's request for (or possession of) required legal documents, deeds, title certificate, riparian grants, licenses and permits establishing the right to use or occupy riparian land.

The U. S. Army Corps of Engineers 404 Permit would involve the review of plans and photos of the proposed project. A public notice would be advertised with a 30 days comment period. If no adverse comments are received, then approval could be granted within 45-60 days.

8.0 Coordination

8.0 Coordination

This chapter involves the coordination efforts involved in the preparation of the document; "Proposed Waterfront Development Red Bank Battlefield Park".

It consists of memorandums of meetings, a listing of contacts, and letters involved in the coordination involved in assembling the waterfront development document.

McFARLAND • JOHNSON ENGINEERS, INC.
44 COOPER STREET • WOODBURY, NEW JERSEY 08096 • (609) 845-0529

Reply to: P.O. Box 351, Woodbury, N.J. 08096

October 30, 1981

Aerial Data Reduction Association Inc.
9285 Commerce Highway
Pennsauken, N.J. 08110

Attn: David Nail

Dear Mr. Nail:

The area of Red Bank Battlefield Park which we are interested in for aerial photo enlargement is shown on the enclosed photocopies of sections of the Philadelphia and Woodbury U.S.G.S. quadrangle sheets of the 7.5 minute series.

We would appreciate it if you could give us an estimate on the costs of 1" = 100' and 1" = 50' scale enlargements. Also, could you give us the cost of any aerial photos if available?

If you have any questions, please feel free to contact me.

Very truly yours,

McFARLAND-JOHNSON ENGINEERS, INC.

Sharon Ollett

Sharon Ollett

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enclosures

McFARLAND • JOHNSON ENGINEERS, INC.
44 COOPER STREET • WOODBURY, NEW JERSEY 08096 • (609) 845-0529

Reply to: P.O. Box 351, Woodbury, N. J. 08096

November 30, 1981

Federal Emergency Management Agency
Insurance and Hazard Mitigation
26 Federal Plaza
New York, New York 10278

Attention: Mr. Robert Reynolds

Dear Mr. Reynolds:

Mr. Lawerence Bayun of the N.J.D.E.P. indicated that it was necessary to obtain an authorization from you for a release of flood hazard information before it is available through the F.E.M.A.

Our company is conducting a preliminary study in the Borough of National Park of Gloucester County, New Jersey. It is important that we have recent flood information for this project. We are then asking for a release of information for the Borough of National Park and the adjacent Township of West Deptford, both in Gloucester County, New Jersey. From information obtained from Mr. Bayun, the project is entitled: Supplemental XI.

Very truly yours,

McFARLAND-JOHNSON ENGINEERS, INC.

Sharon Ollett

Sharon L. Ollett

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McFARLAND • JOHNSON ENGINEERS, INC.
44 COOPER STREET • WOODBURY, NEW JERSEY 08096 • (609) 845-0529

Reply to: P.O. Box 351, Woodbury, N.J. 08096

November 30, 1981

Chief of Datum and Information Branch
National Ocean Survey
6001 Executive Boulevard
Rockville, Maryland 20852

Routing Code C233

Dear Sir:

Our company is conducting a preliminary study in the expansion of waterfront facilities for a county park located in the Borough of National Park of Gloucester County, New Jersey. It is important that we have water level fluctuations for the Delaware River. We are, therefore, requesting water level information, Philadelphia Datum for the past 25 years.

Because the project must be completed by the end of the year to qualify for funding, we would be appreciative if you could forward this information as soon as possible.

Very truly yours,

McFARLAND-JOHNSON ENGINEERS, INC.

Sharon Ollett

Sharon L. Ollett

kas

McFARLAND • JOHNSON ENGINEERS, INC.
44 COOPER STREET • WOODBURY, NEW JERSEY 08096 • (609) 845-0529

Reply to: P.O. Box 351, Woodbury, N.J. 08096

December 4, 1981

Delaware River Basin Commission
Project Review Section
P. O. Box 7360
225 State Police Drive
West Trenton, New Jersey 08628

Attn: Mr. David Everett

Re: Request for information regarding necessary permit procedures

Dear Mr. Everett:

We are presently preparing a concept design plan for the recreational development of the Red Bank Battlefield Park waterfront located in the Borough of National Park of Gloucester County, New Jersey. The preliminary design involves an amphitheater, a boat ramp for small pleasure craft of approximately 3600 pounds, as well as additional picnicking and outdoor lavatory facilities. The plans, when implemented, will provide increased public access to the Delaware riverfront.

We, then, are requesting information regarding the permit procedures which would be necessary for the implementation of this project. Your assistance in this matter will be appreciated.

Very truly yours,

McFARLAND-JOHNSON ENGINEERS, INC.

Sharon Ollett

Sharon Ollett

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Ms. Sharon L. Ollett
McFarland - Johnson Engineers, Inc.
44 Copper Street
Woodbury, NJ 08096

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL OCEAN SURVEY
Rockville, Md. 20852

December 8, 1981

OA/C233:JRH

REF: C233-151

Your letter of November 30, 1981 has been received.

- [ ] The tidal information requested is not processed at this time (see remarks). Please check with this Office for update, Area Code 301-443-8467.
- [ ] Tidal bench mark information requested has not been published (see remarks).
- [ ] Tidal information requested is not available (see remarks).
- [ ] The publications requested are not available from this Office.
- [ ] Your letter has been forwarded to:

REMARKS: Your request is being processed. Please contact us if there are any further questions.

Sincerely yours,

James R. Hubbard
Chief, Tidal Datum and Information Branch, C233
Tides and Water Levels Branch
Oceanographic Division

DELAWARE RIVER BASIN COMMISSION
P.O. BOX 7360
WEST TRENTON, NEW JERSEY 08628

(609) 883-9500

GERALD M. HANSLER
EXECUTIVE DIRECTOR

HEADQUARTERS LOCATION
25 STATE POLICE DRIVE
WEST TRENTON, N.J.

December 10, 1981

Ms. Sharon Ollett
McFarland-Johnson Engineers, Inc.
44 Cooper Street
Woodbury, New Jersey 08096

Dear S. Ollett:

SUBJECT: Proposed Recreational Development at Red Bank Battlefield Park

Enclosed is a copy of the Delaware River Basin Commission's Rules of Practice and Procedure for your reference. Section 2-3.5 attempts to list the types of projects subject to Commission review and also classifies projects by type or size that are normally exempt from review.

Without more specific details, it is difficult to indicate if your proposed project will be subject to review or not.

Generally, if your project is not in the flood plain, does not involve the filling of 25 acres or more of wetlands, does not include a water withdrawal or a discharge of wastewater, and is not a substantial encroachment, it would not require a formal review by the DRBC.

If after reviewing the enclosed Rules of Practice and Procedure you have any questions, I will be glad to discuss them with you or if you prefer to send a copy of your plans when they are completed, we can advise you at that time.

Very truly yours,

David B Everett

David B. Everett, P. E.
Supervising Civil Engineer

DBE:mz
Encl.

McFARLAND • JOHNSON ENGINEERS, INC.
44 COOPER STREET • WOODBURY, NEW JERSEY 08096 • (609) 845-0529

Reply to: P.O. Box 351, Woodbury, N.J. 08096

December 16, 1981

Delaware River Basin Commission
Project Review Section
P. O. Box 7360
225 State Police Drive
West Trenton, New Jersey 08628

Attn: Mr. David Everett

Re: Confirmation on the necessity of a permit for the Red Bank Battlefield Park Development

Dear Mr. Everett:

On December 16, 1981 I talked to Mr. Ralph Manning as to whether or not a permit would be necessary in the implementation of the proposed improvements to the Red Bank Battlefield Park. He indicated that I should send a letter, specifically describing the proposed project.

With the design stage of the park improvement in process I can be more specific about the proposed Red Bank Battlefield development.

The Red Bank Park is made up of two distinct elevations separated by a steep embankment. The lower elevations where most of the development is to occur is located within the 100 year flood elevations (10 feet) designated by the Federal Emergency Management Agency. The picnic and the parking area will be located at approximately elevation 7. The parking area which is to accommodate approximately 70 cars and/or boats will be connected to the boat ramp. The concrete boat ramp is designed to accommodate pleasure craft of a maximum of 3600 pounds and will dip below mean high water. The boat ramp and the parking area will be surrounded by riprap of approximately a 4:1 slope.

I hope this informaton is adequate for a determination as to whether a permit would be required for the implementaton of this project. Your assistance and patience in this matter is appreciated.

Very truly yours,

McFARLAND-JOHNSON ENGINEERS, INC.

Sharon Ollett

Sharon Ollett

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44 COOPER STREET • WOODBURY, NEW JERSEY 08096 • (609) 845-0529

Reply to: P.O. Box 351, Woodbury, N.J. 08096

Progress Meeting - December 21, 1981

Present:	W. Zycinsky	Director, Gloucester County Parks and Recreation
	R. Benjamin	Vice President, McFarland-Johnson
	T. Coleman	Architect, McFarland-Johnson
	D. Weir	Civil Engineer, McFarland-Johnson
	S. Ollett	Environmentalist, McFarland-Johnson

The attached Progress Report was presented to define the status of the project. After the presentation of the report, an open discussion of the proposed waterfront development ensued.

The following is a list of modifications or refinements of the proposed waterfront development.

1) Define and show a system of vehicular control at the north end of the development.

2) Eliminate existing parking at the existing picnic area located at the southeast corner of the park. Define the extent of the six acre parcel adjacent to this corner of the park and show development of this area to include parking of approximately 100 spaces and a "Tot-Lot" to be located near the existing picnic area. Provide play equipment for the "Tot-Lot".

3) Investigate the possibility of a concrete amphitheater in lieu of the wood landscapes ties and brick paver system built into the existing slope presently proposed.

4) Provide for night-lighting of the amphitheater and adjacent areas.

5) Provide for fencing or other control measures at all boundaries of the expanded park.

6) New parking on six-acre parcel to be related to the amphitheater.

7) The number of visitors to the park per year was defined as approximately 5000 cars per week from May through October and 750 to 1000 cars per week from November through April. An average of 3 persons per car was assumed. This data converts to approximately 500,000 persons per year.

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44 COOPER STREET • WOODBURY, NEW JERSEY 08096 • (609) 845-0529

Reply to: P.O. Box 351, Woodbury, N.J. 08096

PROGRESS REPORT

1. Task and Work Products as listed are complete.

Task A - Field Reconnaissance and Inventory

Work Product I: Base Map
Work Product II: Narrative Report
Work Product IV: Picture Board

Task B - Foundation Engineering Analysis

Work Product I: Narrative
Work Product II: Design Criteria & Conceptual Details

Task C - Marine Engineering Analysis

Work Product I: Narrative
Work Product II: Conceptual Design

Task D - Park/Boat Launch & Dock Site Plan

Task E - Environmental Analysis

Task F - Engineering Cost Analysis

2.&3. Soil borings in the area of the project site were not available. Therefore, the design analysis of soils conditions has been made from Soil Conservation data records for the park waterfront area.

The design variations as set forth during the initial meeting of October 26, 1981 have been instituted. They are as follows:

Elimination of Docks and focus of design on boat launching only.

Development of Picnicking recreational features. Shelters, pathways, toilet facilities, etc.

A well defined survey of the park was not available. Aerial photography of the site was obtained at 1" = 100' scale. This data was traced and then photographically enlarged to 1" = 50' for use as the base map.

4. Elimination of docking features.

DELAWARE RIVER BASIN COMMISSION
P.O. BOX 7360
WEST TRENTON, NEW JERSEY 08628

(609) 883-9500

GERALD M. HANSLER
EXECUTIVE DIRECTOR

HEADQUARTERS LOCATION
25 STATE POLICE DRIVE
WEST TRENTON, N.J.

December 28, 1981

Ms. Sharon Ollett
McFarland-Johnson Engineers, Inc.
44 Cooper Street
Woodbury, New Jersey 08096

Dear Ms. Ollett:

The additional information you provided in your letter of December 16, 1981 does not indicate that you are planning anything that would be a substantial encroachment. The Delaware River Basin Commission regulations allow the recreational use of flood plain areas and the facilities you mention should be acceptable if approval were required. However, to date, you have not indicated any proposal that would require formal action by the DRBC.

Very truly yours,

David B. Everett

David B. Everett, P. E.
Supervising Civil Engineer

DBE:mz

McFarland–Johnson Engineers, Inc.

	MEMORANDUM
To: File	Date: Feb. 5, 1982
From: S. Allett	
Subject: Red Bank Battlefield Park Waterfront Dev.	Project No. 81-2681.0

Tom Coleman obtained from the Gloucester County Engineering Dept., on February 5, 1982, the following items:

1) Vegetation map of the upper elevations north of the Whitall Mansion
2) Deed transferring the park from the U.S. General Land Office to the Gloucester County Board of Freeholders
3) Proposed Sea Wall at National Park (2 drawings)
4) Section of Concrete Sea Wall
5) Concrete Stairway Drawing

PROPOSED WATERFRONT DEVELOPMENT

REDBANK BATTLEFIELD PARK

PHONE RECORD

Date	M-J Personnel	Agency	Agency Contact Name	Phone	Remarks
/22	S. Ollett	NJDEP-DIVISION OF COASTAL SER		292-2573	TRANSFERRED TO DEPT OF Geology
/22	"	NJDEP-DEPT. OF GEOLOGY	Dr. Halisi-kun	292-2576	To set up a meeting - not available
/22	"	Delaware River Basin Commission	Rick Fromuth	883-9500	Send a letter describing project - permit
/22	"	USCOE - Hydrolics Branch	Lee Vuscovich	215-597-4810	Meeting for 10/23 at 9:00 AM
/22	"	Gloucester Co. Planning Dept	Chuck Romick	881-1200	will return call
/22	"	Gloucester Co. Historical Society	Edie Holly	845-4771	hrs. open
/22	"	Gloucester Co Planning Dept	Chuck Romick	881-1200	only mapping available is from Allen
/30	"	NJDEP-Bureau of Flood Plain Mag	Clark Gilman	292-2296	will send latest available info.
10	"	Aerial Data Reproduction (ADR)	DAVID NAIL	663-7200	will return call
5	"	ADR	DAVID NAIL	663-7200	will return call
/6	"	ADR	DAVID NAIL	663-7200	2-50' scale reprod ≈ @ $84.
6	"	ADR	DAVID NAIL	663-7200	Received letter sent on Monday
	"	ADR	DAVID NAIL	663-7200	2 Cronnan's at 100' scale = $217 & 40
	"	ADR	DAVID NAIL	663-7200	Talk to Howard Bennit about pick-up
	"	ADR	Howard Bennit	663-7200	Enlargements are ready.
12	"	NJDEP-Div. of COASTAL RESOURCES	Belinda	292-2573	To Pick up Coastal Management Plan
2	"	DEP-Div. Coastal Resources-Tides	Jim Mortimer	292-2938	State mapping is not available
12	"	Dept. Geology - Flood Mapping	Larry Bayern	292-2296	not available until after lunch
12	"	Bon National Park	[illegible]	[illegible]	[illegible]

PROPOSED WATERFRONT DEVELOPMENT

REDBANK BATTLEFIELD PARK

PHONE RECORD

ıte	M-J Personnel	Agency	Agency Contact Name	Phone	Remarks
12	S. Ouett	West Dept Township	Mrs. Dashco	845-4004	availability of master plan.
24	"	US. Weather Bureau		215-627-5575	personel not available
5	"	US. COE	Gee. Vescovich	215-597-4810	transferred to ~~Survey & Branch~~ Consulting Engineers
30	"	NJDEP - Water Poll. Cont'l	Gary Henry	984-4415	water quality info
30	"	NJDEP - Dept. Geology - Flood Map.	Larry Bayern	292-2296	busy
30	"		Larry Bayern	292-2296	must go through FEMA for Flood Ma
30	"	NOAA	Steve Lyles	301-443-8467	only water level fluctuations are
1	"	NOAA - Circulatory Surveys Bch.	Bob Muirhead	301-443-8501	will return my call
1	"	NOAA - Circulatory Surveys Bch.	Bob Murhead	301-443-8501	U should get info from Victor G
8	"	Victor Gustin		215-WA2-6243	App. to discuss hydrology
9	"	FEMA	Robert Reynolds	212-264-4734	Mapping avail. from URS Co. Inc
9	"	URS Co. Inc.	Alex Zepponi	201-573-1100	not in
10	"	URS. Co. Inc.	Alex Zepponi	201-573-1100	possibly available from Co. Plann
10	"	Gloucester Co. Planning	Chuck Porick	881-1200	can pick up work sheets Flood
15	"	NOAA	Steve Lyles	301-443-8467	data already obtained from Victor G
5	"	DEP - Div. of Coastal Resources	Bob Tudor	292-0062	apply for Water Front Dev. Permit
5	"	COE - Hydrolics	Gee. Vescovitch	215-597-4810	busy
6	"	COE - Hydrolics	Gee Vescovitch	215-597-4810	referred to Permits Branch

PROPOSED WATERFRONT DEVELOPMENT

REDBANK BATTLEFIELD PARK

PHONE RECORD

te	M-J Personnel	Agency	Agency Contact Name	Phone	Remarks
6	S. Olcott	Delaware River Basin Commission	Ralph Manning	883-9500	requests letter describing project
1	"	DEP - Coastal Management	Robert Cubberly	292-6151	riparian lands assumed to be m HL

Appendix A - Bibliography

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