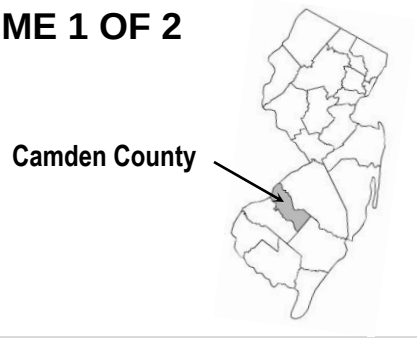
FLOOD INSURANCE STUDY

FEDERAL EMERGENCY MANAGEMENT AGENCY

VOLUME 1 OF 2



CAMDEN COUNTY, NEW JERSEY

(ALL JURISDICTIONS)

COMMUNITY NAME	NUMBER
BOROUGH OF AUDUBON	340121
BOROUGH OF AUDUBON PARK	340122
BOROUGH OF BARRINGTON[1]	340579
BOROUGH OF BELLMAWR	340124
BOROUGH OF BERLIN	340125
TOWNSHIP OF BERLIN	340126
BOROUGH OF BROOKLAWN	340127
CITY OF CAMDEN	340128
TOWNSHIP OF CHERRY HILL	340129
BOROUGH OF CHESILHURST	340397
BOROUGH OF CLEMENTON	340130
BOROUGH OF COLLINGSWOOD	340131
BOROUGH OF GIBBSBORO	340545
CITY OF GLOUCESTER	340132
TOWNSHIP OF GLOUCESTER	340133
TOWNSHIP OF HADDON	340134
BOROUGH OF HADDON HEIGHTS	340136
BOROUGH OF HADDONFIELD	340501
BOROUGH OF HI-NELLA	340530
BOROUGH OF LAUREL SPRINGS	340547
BOROUGH OF LAWNSIDE	340502
BOROUGH OF LINDENWOLD	340137
BOROUGH OF MAGNOLIA	340138
BOROUGH OF MERCHANTVILLE[1]	340569
BOROUGH OF MOUNT EPHRAIM	340140
BOROUGH OF OAKLYN	340141
TOWNSHIP OF PENNSAUKEN	340142
BOROUGH OF PINE HILL	340143
BOROUGH OF PINE VALLEY	340365
BOROUGH OF RUNNEMEDE	340144
BOROUGH OF SOMERDALE	340145
BOROUGH OF STRATFORD	340146
BOROUGH OF TAVISTOCK	340544
TOWNSHIP OF VOORHEES	340538
TOWNSHIP OF WATERFORD	340147
TOWNSHIP OF WINSLOW	349148
BOROUGH OF WOODLYNNE	340149

[1]No Special Flood Hazards Identified

REVISED:

AUGUST 17, 2016

FLOOD INSURANCE STUDY NUMBER

34007CV001C

FEMA

NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study (FIS) may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

Part or all of this FIS may be revised and republished at any time. In addition, part of this FIS may be revised by the Letter of Map Revision process, which does not involve republication or redistribution of the FIS. It is, therefore, the responsibility of the user to consult with community officials and to check the community repository to obtain the most current FIS components.

Initial Countywide FIS Effective Date: September 28, 2007

Revised Countywide FIS Dates: June 16, 2009 - to change Base Flood Elevations, to add Base Flood Elevations, to change Special Flood Hazard Areas, and to change zone designations.

August 17, 2016 – to update corporate limits, to increase Base Flood Elevations, to change Special Flood Hazard Areas, to incorporate new detailed coastal flood hazard analysis, to update roads and road names, to reflect updated topographic information, and to add floodway.

TABLE OF CONTENTS – Volume 1 – August 17, 2016

Table of Contents – Volume 2 – August 17, 2016

EXHIBITS

EXHIBITS - continued

FLOOD INSURANCE STUDY
CAMDEN COUNTY, NEW JERSEY (ALL JURISDICTIONS)

1.0 INTRODUCTION

1.1 Purpose of Study

This countywide Flood Insurance Study (FIS) revises and updates previous FISs/Flood Insurance Rate Maps (FIRMs) for the geographic area of Camden County, New Jersey, including: the Boroughs of Audubon, Audubon Park, Barrington, Bellmawr, Berlin, Brooklawn, Chesilhurst, Clementon, Collingswood, Gibbsboro, Haddonfield, Haddon Heights, Hi-Nella, Laurel Springs, Lawnside, Lindenwold, Magnolia, Merchantville, Mount Ephraim, Oaklyn, Pine Hill, Pine Valley, Runnemede, Somerdale, Stratford, Tavistock, and Woodlynne, the Townships of Berlin, Cherry Hill, Gloucester, Haddon, Pennsauken, Voorhees, Waterford and Winslow, and the Cities of Camden and Gloucester (hereinafter referred to collectively as Camden County).

Please note that on the effective date of this study, the Boroughs of Barrington and Merchantville have no identified Special Flood Hazard Areas (SFHA). This does not preclude future determinations of SFHAs that could be necessitated by changed conditions affecting the community (i.e. annexation of new lands) or the availability of new scientific or technical data about flood hazards.

This FIS aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This FIS has developed flood risk data for various areas of the county that will be used to establish actuarial flood insurance rates. This information will also be used by Camden County to update existing floodplain regulations as part of the Regular Phase of the National Flood Insurance Program (NFIP), and will also be used by local and regional planners to further promote sound land use and floodplain development. Minimum floodplain management requirements for participation in the NFIP are set forth in Title 44 of the Code of Federal Regulations (44 CFR), 60.3.

In some States or communities, floodplain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence and the State (or other jurisdictional agency) will be able to explain them.

1.2 Authority and Acknowledgments

The sources of authority for this FIS are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

This FIS was prepared to include all jurisdictions within Camden County in a countywide format. Information on the authority and acknowledgments for each jurisdiction included in this countywide FIS, as compiled from their previously printed FIS reports, is shown below.

Bellmawr, Borough of: the hydrologic and hydraulic analyses for the FIS report dated August 1979 were completed by the

	U.S. Army Corps of Engineers (USACE), Philadelphia District, for the Federal Insurance Administration (FIA), under Inter-Agency Agreement No.IAA-H-10-77, Project Order No. 9. That work was completed in July 1978.
Brooklawn, Borough of:	the hydrologic and hydraulic analyses for the FIS report dated March 1979 were performed by the USACE, Philadelphia District, for the FIA, under Inter-Agency Agreement No. IAA-H-10-77, Project Order No. 9. That work was completed in July 1978.
Camden, City of:	the hydrologic and hydraulic analyses for the FIS report dated June 1, 1981, were performed by the USACE, Philadelphia District, for the FIA, under Inter-Agency Agreement No. IAA-H-18-78, Project Order No. 31. That work was completed in January 1980.
Cherry Hill, Township of:	for the original August 15, 1978, FIS, the hydrologic and hydraulic analyses were completed in April 1977 by the USACE, Philadelphia District for the Federal Emergency Management Agency (FEMA) under Inter-Agency Agreement Nos. H-15-72 and H-16-75, Project Order Nos. 18 and 22 respectively. for the FIS dated January 2, 1992, revised hydrologic and hydraulic analyses for Tindale Run were performed by the USACE, Philadelphia District, for FEMA, under Inter-Agency Agreement No. EMW-89-E-2994, Project Order No. 1, Task Letter No. 2. That work was completed in June 1990.
Collingswood, Borough of:	the hydrologic and hydraulic analyses for the FIS report dated January 1978 were performed by the USACE, Philadelphia District, for the FIA, under Inter-Agency Agreement No. IAA-H-7-76, Project Order No. 11, Amendment No. 1. That work was completed in May 1977.
Gibbsboro, Borough of:	the hydrologic and hydraulic analyses for the FIS report dated April 15, 1981, were performed by the USACE, Philadelphia District, for the FIA, under Inter-Agency Agreement No. IAA-H-18-78, Project Order No. 31. That work was completed in February 1980.

Gloucester, City of:	the hydrologic and hydraulic analyses for the FIS report dated March 1979, were performed by the USACE, Philadelphia District, for the FIA, under Inter-Agency Agreement No. IAA-H-10-77, Project Order No. 9. That work was completed in May 1978.
Gloucester, Township of:	the hydrologic and hydraulic analyses for the FIS report dated June 1, 1982, were performed by the USACE, Philadelphia District, for FEMA, under Inter-Agency Agreement No. IAA-H-10-77, Project Order No. 9, Amendment No. 2. That work was completed in March 1979.
Haddon, Township of:	the hydrologic and hydraulic analyses for the FIS report dated September 1, 1981, were performed by the USACE, Philadelphia District, for FEMA, under Inter-Agency Agreement No. IAA-H-18-78, Project Order No. 31. That work was completed in June 1980.
Haddonfield, Borough of:	the hydrologic and hydraulic analyses for the FIS report dated October 1976 were performed by the USACE, Philadelphia District, for the FIA, under Inter-Agency Agreement Nos. IAA-H-19-74 and IAA-H-16-75, Project Order Nos. 6 and 17 respectively, Amendment No. 3. That work was completed in March 1976.
Lawnside, Borough of:	the hydrologic and hydraulic analyses for the FIS report dated March 1978 were performed by the USACE, Philadelphia District, for the FIA, under Inter-Agency Agreement No. IAA-H-7-76, Project Order No. 11. That work was completed in April 1977.
Lindenwold, Borough of:	the hydrologic and hydraulic analyses for the FIS report dated March 1980 were performed by the USACE, Philadelphia District, for the FIA, under Inter-Agency Agreement No.IAA-H-10-77, Project Order No. 9, Amendment No. 2. That work was completed in May 1979.
Pennsauken, Township of:	for the original October 1976 FIS, the hydrologic and hydraulic analyses were completed in February 1976 by the USACE, Philadelphia District for FEMA under Inter-Agency Agreement Nos.IAA-H-19-74 and IAA-H-16-75, Project Order Nos. 17 and 6, respectively.

	for the FIS dated October 16, 1991, revised hydrologic and hydraulic analyses were performed by the USACE, Philadelphia District, for FEMA, under Inter-Agency Agreement No. EMW-89-E-2994, Project Order No. 1, Task Letter No.2. That work was completed in May 1990.
Runnemede, Borough of:	the hydrologic and hydraulic analyses for the FIS report dated July 1979 were performed by the USACE, Philadelphia District, for the FIA, under Inter-Agency Agreement No. IAA-H-10-77, Project Order No. 9. That work was completed in September 1978.
Somerdale, Borough of:	the hydrologic and hydraulic analyses for the FIS report dated August 1978 were performed by the USACE, Philadelphia District, for the FIA, under Inter-Agency Agreement No. IAA-H-7-76, Project Order No. 11, Amendment No. 1. That work was completed in July 1977.
Stratford, Borough of:	the hydrologic and hydraulic analyses for the FIS report dated March 1980 were performed by the USACE, Philadelphia District, for the FIA, under Inter-Agency Agreement No. IAA-H-10-77, Project Order No. 9. That work was completed in March 1979.
Voorhees, Township of:	the hydrologic and hydraulic analyses for the FIS report dated March 1978 were performed by the USACE, Philadelphia District, for the FIA, under Inter-Agency Agreement No. IAA-H-7-76, Project Order No. 11, Amendment 1. That work was completed in May 1977.
Winslow, Township of:	the hydrologic and hydraulic analyses for the FIS report dated July 20, 1981, were performed by the Gannett, Fleming, Corddry, and Carpenter, Inc. under subcontract to the State of New Jersey for FEMA, under Contract No. H-4546. That work was completed in April 1980.
Woodlynne, Borough of:	the hydrologic and hydraulic analyses for the FIS report dated June 1, 1981, were performed by the New Jersey Department of Environmental Protection, Division of Water Resources, Bureau of Floodplain Management, for the FIA, under Contract No. H-4623. That work was completed in January 1980.

The authority and acknowledgments for the Boroughs of Audubon, Audubon Park, Barrington, Berlin, Chesilhurst, Clementon, Haddon Heights, Hi-Nella, Laurel Springs, Magnolia, Merchantville, Mount Ephraim, Oaklyn, Pine Hill, Pine Valley, Tavistock, and the Townships of Berlin and Waterford are not available because no FIS reports were published for these communities.

For the September 28, 2007, countywide FIS, updated hydrologic and hydraulic analyses were performed for the following flooding sources: Millard Creek, Newton Creek, Nicholson Branch, North Branch Cooper River, Tributary No. 3 to Barton Run, and South Branch Newton Creek by Leonard Jackson Associates for FEMA under Contract No. EMN-1999-CO-0563. This work was completed in August 2005.

In addition for the September 28, 2007 FIS, updated hydrologic and hydraulic analyses were performed for the Cooper River by URS Group, Inc., for FEMA under Contract No. EMW-2000-CO-0247. For this same FIS, floodplains for the following flooding sources were redelineated using updated topographic data prepared by URS: Big Timber Creek, Four Mile Branch, Great Egg Harbor River, North Branch Newton Creek, North Fork of Tributary 1 to Cooper River, Pennsauken Creek, Pines Run, Pochack Creek, Pump Branch, Signey Run, South Branch Big Timber Creek, South Branch Pennsauken Creek, Tindale Run, Tributary No. 1 to Cooper River, Tributary No. 2 to Cooper River, Tributary No. 3 to Cooper River, Tributary No. 4 to Cooper River, Tributary 1 to North Branch Cooper River, and Tributary 2 to North Branch Cooper River.

For the June 16, 2009 revision, updated hydrologic and hydraulic analyses were performed for the following flooding sources: Mason Run and North Branch Big Timber Creek by Leonard Jackson Associates for FEMA under Contract No. EMN-1999-CO-0563. This work was completed in August 2005.

Base map information shown on the June 16, 2009 FIRMs was provided in digital format by the State of New Jersey Office of Information Technology. This information was derived from digital orthophotos produced at a scale of 1:2,400 with 1-foot pixel resolution from photography dated April 2002.

For this August 17, 2016 revision, a storm surge analysis on the Delaware River was studied as part of a FEMA Region III project to update the coastal storm surge elevations within the states of Virginia, Maryland, and Delaware, and the District of Columbia including the Atlantic Ocean, Chesapeake Bay including its tributaries, and the Delaware Bay. The study replaces outdated coastal storm surge stillwater elevations for all FIS reports in the study area, including Region II Counties in New Jersey along the Delaware River such as Camden County and serves as the basis for updated FIRMs. Study efforts were initiated in 2008 and concluded in 2012.

The storm surge study was conducted for FEMA by the USACE and its project partners under Project HSFE03-06-X-0023, "NFIP Coastal Storm Surge Model for Region III" and Project HSFE03-09-X-1108, "Phase II Coastal Storm Surge Model for FEMA Region III". The work was performed by the Coastal Processes Branch (HF-C) of the Flood and Storm Protection Division (HF), U.S. Army

Engineer Research and Development Center – Coastal & Hydraulics Laboratory (ERDC-CHL).

Coastal analyses involving transect layout, field reconnaissance, erosion analysis, and overland wave modeling including wave setup, wave height analysis and wave runup for the Delaware River were performed by Risk Assessment, Mapping, and Planning Partners (RAMPP), a joint venture of Dewberry, URS, and ESP, under its Risk MAP phase of the National Flood Insurance Program. This work was completed in March 2014.

Base map information shown on these August 17, 2016 FIRMs was provided in digital format by the New Jersey Office of Information Technology (NJOIT), Office of Geographic Information Systems (OGIS). The aerial photography was captured at a scale of 1:2,400 with a 1 foot pixel resolution in March and April of 2012.

The coordinate system used in the preparation of this FIRM was New Jersey State Plane FIPS Zone 2900. The horizontal datum was NAD83, GRS80 spheroid. Flood elevations on this FIRM are referenced to the North American Vertical Datum of 1988. Differences in datum, spheroid, projection or State Plane zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences across jurisdiction boundaries. These differences do not affect the accuracy of the FIRM.

1.3 Coordination

The initial Consultation and Coordination Officer's (CCO) meeting is typically held with representatives of FEMA, the community, and the study contractor to explain the nature and purpose of a FIS and to identify the streams to be studied by detailed methods. A final CCO meeting is typically held with representatives of FEMA, the community, and the study contractor to review the results of the study.

The dates of the initial and final CCO meetings held for jurisdictions within Camden County are shown in Table 1, “Initial and Final CCO Meetings.”

TABLE 1 - INITIAL AND FINAL CCO MEETINGS

Community Name	Initial CCO Meeting	Final CCO Meeting
Borough of Bellmawr	September 8, 1976	November 28, 1978
Borough of Brooklawn	September 8, 1976	September 14, 1978
City of Camden	December 9, 1977	September 30, 1980
Township of Cherry Hill	*	March 29, 1976
Borough of Collingswood	June 3, 1975	August 11, 1977
Borough of Gibbsboro	December 9, 1977	November 17, 1980
City of Gloucester	September 8, 1976	September 7, 1978
Township of Gloucester	September 9, 1976	December 27, 1979
Township of Haddon	*	March 30, 1981
Borough of Haddonfield	*	December 29, 1975
Borough of Lawnside	May 21, 1975	August 10, 1977
Borough of Lindenwold	September 14, 1976	October 15, 1979
Township of Pennsauken	*	January 28, 1976
Borough of Runnemede	September 9, 1976	January 30, 1979
Borough of Somerdale	May 21, 1975	July 27, 1977
Borough of Stratford	September 14, 1976	August 16, 1979
Township of Voorhees	May 21, 1975	August 22, 1977
Township of Winslow	June 1977	February 4, 1981
Borough of Woodlynne	*	December 4, 1980

*Data not available

For the September 28, 2007, FIS, the communities were informed by letter dated August 25, 2005. The final CCO meeting was held on December 5, 2006, and was attended by representatives of the Boroughs of Audubon, Barrington, Berlin, Clementon, Gibbsboro, Haddonfield, Laurel Springs, Lindenwold, Magnolia, Merchantville, Mount Ephraim, Pine Hill, Pine Valley, Somerdale, the Cities of Camden and Gloucester, Camden County, the Townships of Cherry Hill, Gloucester, Pennsauken, and Winslow, Dewberry, Michael Baker Jr., Inc, State, and FEMA.

For the June 16, 2009 revision, the final CCO meeting was held on April 3, 2008, and was attended by representatives of the Township of Gloucester, the County of Camden, FEMA, the State, Leonard Jackson Associates, and Dewberry.

For this August 17, 2016 revision, the final CCO meeting was held on January 13, 2015, and was attended by representatives of the communities, FEMA, the State, and RAMPP.

2.0 AREA STUDIED

2.1 Scope of Study

This FIS covers the geographic area of Camden County, New Jersey.

The areas studied by detailed methods were selected with priority given to all known flood hazard areas and areas of projected development and proposed construction. All or portions of the flooding sources listed in Table 2, "Flooding Sources Studied by Detailed Methods," were studied by detailed methods. Limits of detailed study are indicated on the Flood Profiles (Exhibit 1) and on the FIRM (Exhibit 2).

TABLE 2 - FLOODING SOURCES STUDIED BY DETAILED METHODS

Big Timber Creek	North Branch Newton Creek	South Branch Pennsauken Creek
Cooper River	North Fork of Tributary No. 1 to Cooper River	Tindale Run
Delaware River	Pennsauken Creek	Tributary No. 3 to Barton Run
Four Mile Branch	Pines Run	Tributary No. 1 to Cooper River
Great Egg Harbor River	Pochack Creek	Tributary No. 2 to Cooper River
Mason Run	Prossers Branch	Tributary No. 3 to Cooper River
Millard Creek	Pump Branch	Tributary No. 4 to Cooper River
Newton Creek	Signey Run	Tributary No. 1 to North Branch Cooper River
Nicholson Branch	South Branch Big Timber Creek	Tributary No. 2 to North Branch Cooper River
North Branch Big Timber Creek	South Branch Newton Creek	Wildcat Branch
North Branch Cooper River		

For the June 16, 2009 revision, updated analyses were included for Mason Run, from its confluence with North Branch Big Timber Creek to a point approximately 100 feet upstream of Blackwood-Clementon Road/County Route 534, and also North Branch Big Timber Creek, from the confluence of Mason Run to a point approximately 2,240 feet upstream of East Atlantic Avenue/County Route 727.

For this August 17, 2016 revision, the Delaware River has been restudied and the resultant coastal flood hazards have been remapped. Flood profiles for Big Timber Creek/South Branch Big Timber Creek, Cooper River, Newton Creek, North Branch Big Timber Creek, North Branch Newton Creek, Pennsauken Creek, Pines Run, Pochack Creek, South Branch Newton Creek, and South Branch Pennsauken Creek were included in the June 16, 2009 FIS, however all or portions of these profiles have been omitted from this August 17, 2016 revision because the coastal flooding from the Delaware River controls these riverine flooding reaches.

Numerous streams were studied by approximate methods. Approximate analyses were used to study those areas having a low development potential or minimal flood hazards. The scope and methods of study were proposed to, and agreed upon by, FEMA and Camden County.

2.2 Community Description

Camden County is located in southwestern New Jersey. In Camden County, there are 34 communities.

Camden County is bordered to the north by the City of Philadelphia, Pennsylvania, and to the north and east by the Borough of Palmyra and the Townships of Cinnaminson, Evesham, Maple Shade, Medford, and Mt. Laurel in Burlington County. To the west, the county is bordered by the Borough of Westville, and the Townships of Deptford, Monroe, Washington, and West Deptford in Gloucester County. To the south, the county is bordered by the Borough of Folsom and the Township of Hammonton in Atlantic County.

Camden County, named for Charles Pratt, the Earl of Camden, was formed out of land ceded from Gloucester County in 1844. The earliest known residents of the area today known as Camden County were the Lenape (or Delaware) Indians. With the influx of Europeans to the New World during the seventeenth century, came English Quaker immigrants to the area. (Greenburg, 2014)

According to the U.S. Census Bureau, the estimated population of the county as of 2010 was 513,657 with a land area of 221 square miles and 6 square miles of water (U.S. Census Bureau, 2010). The City of Camden, the county seat, is a major population center in the county. Camden County is the one of the most populated counties in southern New Jersey due to its close proximity to the City of Philadelphia.

The climate in the county is moderated by the Appalachian Mountains to the west and the Atlantic Ocean to the east. The average high temperature in July is 87 degrees Fahrenheit (ºF), and in January is 41ºF. The average low temperature in July is 67ºF and in January is 24ºF. The annual precipitation averages approximately 46 inches (The Weather Channel, 2014).

The floodplains of major rivers and streams in the county such as the Delaware River, Cooper River and Newton Creek are generally flat and broad, which is typical for streams subject to tidal action. The Delaware River in the vicinity of the City of Camden has highly industrialized floodplains, while most other streams fall along residential and park areas.

2.3 Principal Flood Problems

In addition to being susceptible to fluvial flood events caused by runoff from rainfall, the area is also subject to tidal flooding from the Delaware River and the lower reaches of its tributaries. Portions of the county are also susceptible to coincident conditions of high tides and fluvial flooding.

A major flood event occurred in August 1933 as a result of a tropical hurricane. In addition to tidal flooding along the Delaware River, heavy rainfall produced a large amount of runoff through the Delaware River basin. The flood reached a tide stage of 8.6 feet on the Delaware River near the mouth of Big Timber Creek, and was primarily the result of tidal conditions on the Delaware River augmented by heavy rain. This flood had a recurrence interval of approximately 4-percent annual chance. Hurricane-induced heavy rainfall resulted in serious flooding throughout the Delaware River basin.

In September 1940, a localized storm covering Camden, Burlington, Gloucester, Cumberland, and Salem Counties created an excessive amount of runoff, causing numerous dam failures in the watershed. Flood destruction was estimated to have been between $5 and $7 million throughout the 5-county area. During this flood a high water mark of 18.0 feet was recorded along South Branch Pennsauken Creek at the Coles Avenue bridge. The top of road elevation at that location was estimated to be 16.2 feet.

Other large floods on Big Timber and Little Timber Creeks occurred in November 1950 and August 1955 (USACE 1969). During the 1950 event, flooding occurred in the county as a result of tidal conditions along the Delaware River. A tide stage of 8.5 feet was recorded near the confluence of Big Timber Creek and the Delaware River. This extreme high tide on the Delaware River caused Newton and Little Timber Creeks to overtop their banks in several locations throughout the area.

Floods occurring in 1962, 1966, 1971, 1972, and 1973 on the Cooper River have been responsible for property damage and inundation of roads and highways in various sections of Camden County. Major floods have occurred during all seasons of the year. Flooding along the Cooper River was recorded by U.S. Geological Survey (USGS) gauge number 01467150 in Haddonfield on August 28, 1971. The discharge was recorded as 2,940 cubic feet per second, with a flood height of 13.55 feet, NAVD88. The flooding event recorded on the above-mentioned gauge was the cumulative effect of a 24-hour period of drenching rain followed by the passage of Hurricane Doria. From August 26 to 27, 1971, five to six inches of antecedent rainfall saturated the soil in the area and brought river stages to crest or just past crest levels. The estimated recurrence interval for a flood of this magnitude at the Haddonfield USGS gauging station is greater than a 1-percent annual chance.

On July 13, 2004, heavy rains severely impacted southern New Jersey, including Camden and Burlington Counties. Rainfall depths of more than 13 inches in less than 24 hours resulted in significant localized flooding in both counties. Flooding along the Cooper River was recorded by USGS gauge 01467150 to be 3,300 cubic feet per second, with a flood height of 14.36 feet, NAVD88. From a frequency analysis performed on the Cooper River at this gauge (Watson, 2009), the estimated recurrence interval for a flood of this magnitude is 0.70-percent annual chance.

Camden County was affected by Hurricanes Irene (2011) and, to a lesser extent, Sandy (2012). During Irene, USGS gauge 01467150 recorded a flood height on the Copper River of 13.95 feet, NAVD88, on August 28, 2011. This corresponds

to an estimated peak discharge of 2,900 cubic feet per second. The estimated recurrence interval for a flood of this magnitude at the Haddonfield USGS gauging station is greater than a 1-percent annual chance, second only to the July 12, 2004 event. During Sandy, the Admiral Wilson Boulevard in Camden was flooded and closed. More recently, a short-duration, intense rainfall in the afternoon of July 28, 2013 flooded major roadways in western Camden County and trapped motorists in their vehicles for hours. (NOAA, 2014)

Records for USGS stream gauge 01411000 along the Great Egg Harbor River at Folsom indicate that severe floods occurred along the river in September 1940, April 2007, and August 2011. From a frequency analysis performed on the Great Egg Harbor River at this gauge (Watson, 2009), these storms correspond to floods of 0.35-, 0.70-, 0.41-percent annual chance recurrence intervals, respectively.

2.4 Flood Protection Measures

Flood warnings and anticipated weather conditions are issued by the National Oceanic and Atmospheric Administration and the National Weather Service to local officials and the news media for dissemination to the residents of the area. Flood warnings are also carried out by the New Jersey Department of Operations and Public Safety in conjunction with the Camden County Civil Defense Office.

Within the Township of Pennsauken, an existing levee along the Delaware River and Pennsauken Creek does not protect against the 1-percent annual chance flood. Chandlers Run, a tributary of the Cooper River, is subject to tidal flooding from the Cooper River in the lower reaches and fluvial flooding caused by runoff in the upper reaches. These flooding problems have been studied at the request of the Township of Pennsauken and are discussed in the "Report on Chandlers Run Drainage, Township of Pennsauken, County of Camden, New Jersey" (Remington & Boyd Engineers 1972).

The dams on the Great Egg Harbor River forming New Brooklyn Lake and on Pump Branch forming Hobb Lake will act to dampen peak discharges. This was taken into account in the hydrologic analyses for these flooding sources.

In an effort to reduce impacts from flooding, the NJDEP, Division of Land Use Regulation (DLUR) has created regulations for development within floodplains. The most recent regulations can be found on the NJDEP website at www.state.nj.us/dep/landuse/fha_main.html.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the county, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this FIS. Flood events of a magnitude which are expected to be equaled or exceeded once on the average during any 10-, 2-, 1-, and 0.2-percent-annual-chance flood period (recurrence interval) have been selected as having special significance for floodplain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10-, 2-, 1-, and 0.2-percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long term, probabilistic

period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (1-percent chance of annual exceedence) in any 50-year period is approximately 40 percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the county at the time of completion of this FIS. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Riverine Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for the flooding sources studied in detail affecting the county.

Each incorporated community within Camden County with the exception of the Boroughs of Audubon, Audubon Park, Berlin, Chesilhurst, Clementon, Haddon Heights, Hi-Nella, Laurel Springs, Magnolia, Mount Ephraim, Oaklyn, Pine Hill, and Pine Valley, and the Townships of Berlin and Waterford, has a previously printed FIS report. The hydrologic analyses described in those reports have been compiled and are summarized below.

Precountywide Analyses

Statistical analyses of the records at the Haddonfield gauge were used to develop discharge-frequency relationships for the Cooper River according to the analytical method described in Statistical Methods in Hydrology (USACE 1962) for the following tributaries of the Cooper River: North Fork of Tributary 1 to Cooper River, Tributary No.1 to Cooper River, Tributary No.2 to Cooper River, Tributary No. 3 to Cooper River, Tributary No.4 to Cooper River, Tributary 1 to North Branch Cooper River, Tributary 2 to North Branch Cooper River. Because of the short period of record (from 1963 to the present) at the Haddonfield gauge, regional-frequency computations correlating other streams in the area with the Cooper River were also performed (USACE 1972). Hydrology for the streams listed above was developed by extrapolation of discharge-versus-drainage area relationships obtained from the Cooper River hydrologic analysis discussed above.

For Four Mile Branch, North Branch Newton Creek, Pennsauken Creek, Pump Branch, and Tindale Run, the methodology described in the Special Report 38, Magnitude and Frequency of Floods in New Jersey with Effects of Urbanization was used to establish peak discharge-frequency relationships (USGS 1974). This method of estimating flood peak magnitudes was developed through a regression analysis considering flood frequency relationships for 103 gauging stations in New Jersey determined using the log-Pearson Type III method of statistical analysis (Water Resources Council 1976). Peak discharges for Pennsauken Creek were calculated at the confluence with the Delaware River. Located upstream of the Township of Pennsauken within the Pennsauken Creek watershed are two current USGS stream gauges. Gauge No.01467081 is on South Branch Pennsauken Creek in Cherry Hill, with a drainage area of 8.98 square miles. Gauge No. 01467069 is on North Branch Pennsauken Creek in Moorestown, with a drainage area of 12.8 square miles. Peak frequency discharges were determined for each gauge in

accordance with USGS Bulletin No. 17B (USGS 1981). The discharge-frequency relationships of the study area are consistent with the upstream gauge records.

Hydrology for Pochack Creek and South Branch Pennsauken Creek was based on the Regional Frequency Method (USACE 1974). This method uses regional coefficients in the development of flood flows.

Recorded flood flow frequency data for the Great Egg Harbor River was based on statistical analysis of discharge records covering a 51-year period at the Folsom gauging station (No. 01411000) operated by the USGS (1951-1976). This analysis followed the standard log-Pearson Type III method as outlined by the Water Resources Council (1976). Flood discharges were transferred to the study site by application of the equation:

$$Q_1 / Q_2 = (A_1 / A_2)^{0.5}$$

in which Q represents the discharge in cubic feet per second and A the drainage areas in square miles.

The hydrologic analyses for Big Timber Creek, Pines Run, Signey Run, and South Branch Big Timber Creek were developed using the two USGS gauges located in the Big Timber Creek Basin. USGS Gauge No. 01467330 is located along the South Branch Big Timber Creek at Blackwood, New Jersey. This gauge has a drainage area of 19.6 square miles and has been in operation since 1964. USGS Gauge No. 01467351 is located along North Branch Big Timber Creek at Laurel Springs, New Jersey. This gauge has a drainage area of 7.2 square miles and has been in operation since 1975. Because of the short period of record for both gauges, a regional frequency analysis utilizing the Generalized Skew Study for the State of New Jersey was used to develop adopted frequency-discharge curves at the gauge locations (USACE 1977). In conjunction with these data, frequency-discharge curves for Signey Run and other streams within the basin were generated by a rainfall-runoff model of the Big Timber Creek Basin using the HEC-1 computer program (USACE 1973).

Discharges for the 0.2% annual chance flood for Pochack Creek and South Branch Pennsauken Creek were determined using a discharge-frequency curve. Frequency-discharge drainage area relationships calculated for Pochack Creek, and South Branch Pennsauken Creek are shown in Figure 1, "Frequency Discharge, Drainage Area Curves." Discharges for the 0.2-percent annual chance flood for all other streams were determined from a linear extrapolation of a log-probability curve of flood discharges computed for frequencies up to 100 years.

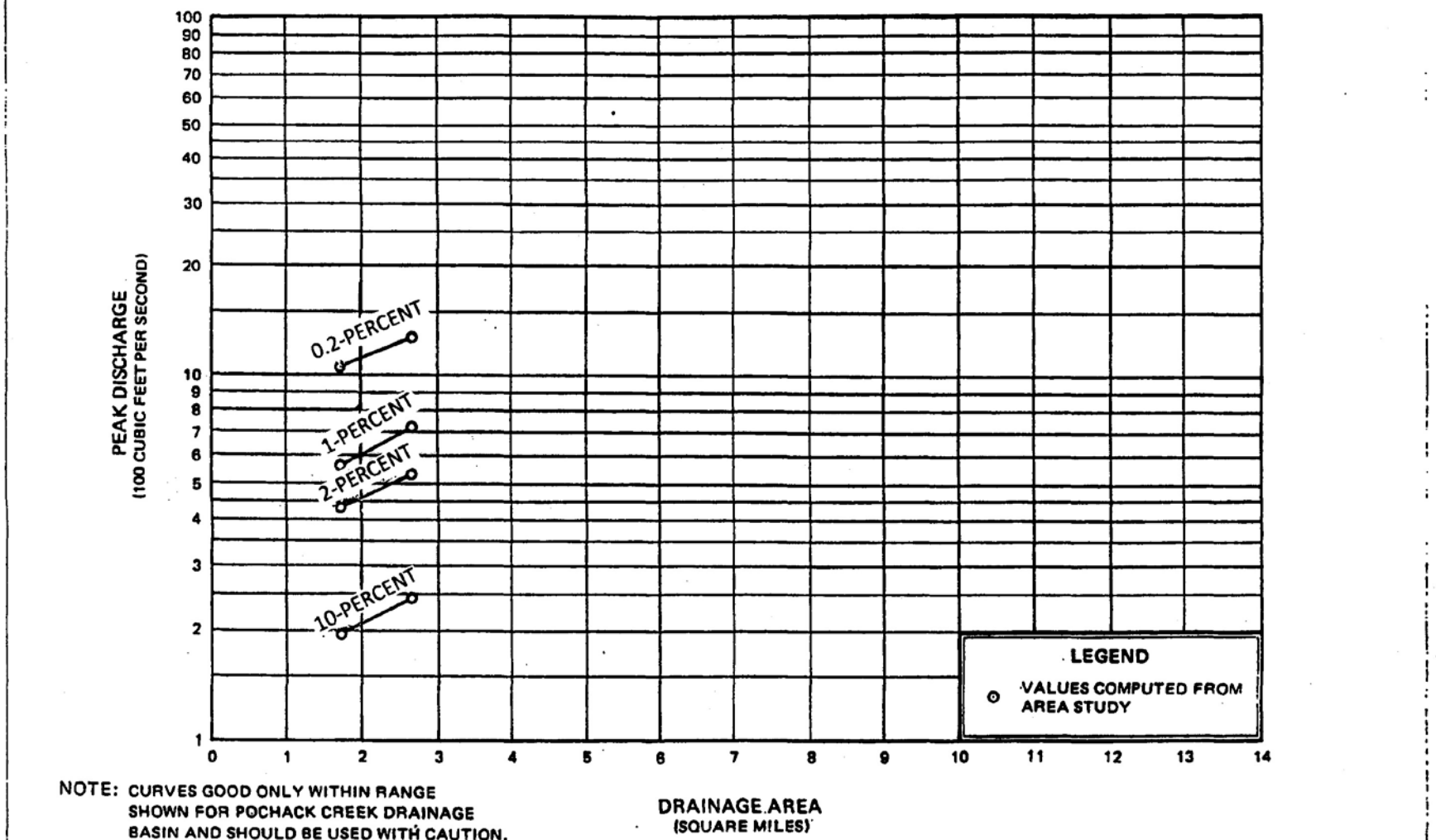
Countywide Analyses

For the September 28, 2007 countywide analyses, Millard Creek, Nicholson Branch and North Branch Cooper River, peak discharges were calculated utilizing the USACE's HEC-HMS software program.

For Newton Creek and Tributary No. 3 to Barton Run peak discharges were determined using regression equations and procedures outlined in the report titled Magnitude and Frequency of Floods in New Jersey with Effects of Urbanization:

Special Report 38, published by the New Jersey Department of Environmental Protection (New Jersey Department of Environmental Protection 1974).

Peak flow discharges for Cooper River were developed based on gauge analyses for annual peak flow data collected at USGS stream gauges 1467150 at Haddonfield and 1467130 at Kirkwood. The results of the gauge analyses were transferred to specific locations by the drainage area-discharge transfer equation method mentioned earlier.



NOTE: CURVES GOOD ONLY WITHIN RANGE SHOWN FOR POCHACK CREEK DRAINAGE BASIN AND SHOULD BE USED WITH CAUTION.

FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, NJ
(ALL JURISDICTIONS)

FREQUENCY DISCHARGE, DRAINAGE AREA CURVES

POCHACK CREEK

Revised Analyses (June 16, 2009)

For the June 16, 2009 revision, Mason Run and North Branch Big Timber Creek peak discharges were determined using regression equations and procedures outlined in the report titled Special Report 38: Magnitude and Frequency of Floods in New Jersey with Effects of Urbanization, published by the New Jersey Department of Environmental Protection (New Jersey Department of Environmental Protection 1974).

A summary of the drainage area-peak discharge relationships for all streams studied by detailed methods is shown in Table 3, "Summary of Discharges."

TABLE 3 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-PERCENT	2-PERCENT	1-PERCENT	0.2-PERCENT
BIG TIMBER CREEK					
Downstream of confluence with North Branch Big Timber Creek	44.5	2,400	4,460	5,580	7,800
COOPER RIVER					
Confluence with Cooper Lake	31.50	2,738	4,960	7,250	20,220
Approximately 37,171 feet above mouth/downstream of North Branch confluence	28.90	2,625	4,302	5,199	7,824
Approximately 40,399 feet above mouth/Haddonfield gauge	17.00	1,550	2,540	3,070	4,620
Approximately 1,800 feet upstream of New Jersey Turnpike	12.60	1,198	1,962	2,372	3,569
Approximately 2,400 feet upstream of New Jersey Turnpike	9.40	935	1,532	1,851	2,786
Upstream of Evesham Road	7.90	519	902	1,105	1,615
Upstream of Chews Landing Road	5.80	394	681	833	1,222
Upstream of Linden Lake	1.10	128	237	296	436
FOURMILE BRANCH					
At confluence with Great Egg Harbor River	7.6	221	384	475	770
Upstream face of unimproved road bridge	1.6	109	193	242	405

TABLE 3 - SUMMARY OF DISCHARGES - continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-PERCENT	2-PERCENT	1-PERCENT	0.2-PERCENT
GREAT EGG HARBOR RIVER					
At New Brooklyn Road	23.6	386	670	825	1,306
Railroad crossing	5.8	190	330	406	634
MASON RUN					
Upstream of confluence of North Branch Big Timber Creek	4.53	532	854	1,033	1,523
MILLARD CREEK					
Upstream of confluence of Cooper River	2.8	490	660	855	1,535
Upstream of confluence of Nicholson Branch	2.1	225	315	480	1,005
NEWTON CREEK					
At City of Gloucester/ Township of Haddon corporate limit	4.7	600	950	1140	1,610
Upstream of confluence of Peter Creek	3.4	470	750	910	1,320
Upstream of Bettlewood Avenue	2.6	360	590	710	1,050
At USGS Gauge/Upstream of Park Avenue	1.3	250	310	330	390
NICHOLSON BRANCH					
Upstream of confluence of Millard Creek	0.7	265	360	470	690
NORTH BRANCH BIG TIMBER CREEK					
Upstream of confluence with South Branch Big Timber Creek	19.1	1,100	2,000	2,500	4,100
Upstream of confluence of Mason Run	8.0	800	1,262	1,514	2,201
Upstream of Laurel Road	6.95	684	1,084	1,303	1,898
NORTH BRANCH COOPER RIVER					
At mouth	10.9	2,055	2,455	2,815	4,950
Approximately 21,950 feet above mouth	5.2	1,620	2,160	2,790	4,090
Approximately 38,280 feet above mouth	2.2	975	1,290	1,655	2,390

TABLE 3 - SUMMARY OF DISCHARGES - continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-PERCENT	2-PERCENT	1-PERCENT	0.2-PERCENT
NORTH BRANCH NEWTON CREEK					
At New Jersey Route 168 Bridge	1.28	210	340	410	580
NORTH FORK OF TRIBUTARY NO. 1 TO COOPER RIVER					
At mouth	0.47	62	115	155	415
PENNSAUKEN CREEK					
Upstream of confluence with Delaware River	35.7	1,580	2,460	2,930	4,000
PINES RUN					
At confluence with South Branch Big Timber Creek	2.9	375	650	860	1,290
Downstream of Blackhorse Pike bridge	2.1	303	520	690	1,030
Downstream of Hinder Lane bridge	1.2	210	340	460	690
PROSSERS BRANCH					
Approximately 0.38 mile upstream of confluence with Great Egg Harbor River	1.61	427	656	803	1116
PUMP BRANCH					
At Blue Anchor Road bridge	8.7	387	662	821	1,330
At Railroad crossing	1.9	255	436	541	874
SIGNEY RUN					
At confluence with North Branch Big Timber Creek	1.2	210	340	460	690
Approximately 4,330 feet above confluence with North Branch Big Timber Creek	0.7	145	235	320	480
SOUTH BRANCH BIG TIMBER CREEK					
Upstream of confluence with North Branch Big Timber Creek	25.4	1,400	2,580	3,250	5,400
At Good Intent Road	19.0	1,210	2,220	2,810	4,400
Upstream of confluence of Holly Run	8.5	709	1,330	1,660	2,650

TABLE 3 - SUMMARY OF DISCHARGES - continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq.miles)	PEAK DISCHARGES (cfs) 10-PERCENT	2-PERCENT	1-PERCENT	0.2-PERCENT
SOUTH BRANCH NEWTON CREEK					
At City of Gloucester/ Township of Haddon corporate limit	2.2	520	830	1,000	1,450
SOUTH BRANCH PENNSAUKEN CREEK					
At mouth	35.7	2,000	3,900	5,100	9,200
Approximately 3.37 miles upstream of mouth	15.6	970	2,060	2,850	5,650
Approximately 7.44 miles upstream of mouth	12.6	810	1,750	2,400	4,850
Approximately 8.67 miles upstream of mouth	8.6	600	1,350	1,850	3,750
Approximately 11.44 miles upstream of mouth	5.6	425	910	1,300	2,820
Approximately 12.79 miles upstream of mouth	2.9	225	550	800	1,750
TINDALE RUN					
Upstream of mouth	1.6	270	450	550	800
Approximately 0.57 mile upstream of mouth	1.0	180	300	370	530
TRIBUTARY NO. 3 TO BARTON RUN					
Upstream of Township of Evesham/Township of Voorhees corporate limit	3.0	340	570	690	1,040
Upstream of Victor Boulevard/Sunshine Park Lake Outlet	1.9	230	490	480	720
TRIBUTARY NO. 1 TO COOPER RIVER					
At mouth	3.5	310	730	1,050	2,570
Approximately 2.41 miles upstream of mouth	1.4	106	240	352	1,120
Approximately 2.76 miles upstream of mouth	1.0	82	178	255	800
Approximately 2.89 miles upstream of mouth	0.4	60	110	148	390
TRIBUTARY NO. 2 TO COOPER RIVER					
At mouth	0.7	55	130	190	625

TABLE 3 - SUMMARY OF DISCHARGES - continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-PERCENT	2-PERCENT	1-PERCENT	0.2-PERCENT
TRIBUTARY NO. 3 TO COOPER RIVER					
At mouth	0.45	60	110	150	400
TRIBUTARY NO. 4 TO COOPER RIVER					
At mouth	0.98	82	180	260	810
TRIBUTARY NO. 1 TO NORTH BRANCH COOPER RIVER					
At mouth	0.38	58	103	135	340
TRIBUTARY NO. 2 TO NORTH BRANCH COOPER RIVER					
At mouth	0.12	51	76	88	120
WILDCAT BRANCH					
Approximately 0.44 mile upstream of confluence with Great Egg Harbor River	0.27	177	347	428	733
Approximately 0.77 mile upstream of confluence with Great Egg Harbor River	0.21	87	175	182	314

3.2 Riverine Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals. Users should be aware that riverine flood elevations shown on the FIRM represent rounded whole-foot elevations and may not exactly reflect the elevations shown on the Flood Profiles or in the Floodway Data tables in the FIS report. For construction and/or floodplain management purposes, users are encouraged to use the flood elevation data presented in this FIS in conjunction with the data shown on the FIRM.

Precountywide Analyses

Each incorporated community within Camden County with the exception of the Boroughs of Audubon, Audubon Park, Berlin, Chesilhurst, Clementon, Haddon Heights, Hi-Nella, Laurel Springs, Magnolia, Mount Ephraim, Oaklyn, Pine Hill, and Pine Valley, and the Townships of Berlin and Waterford, has a previously printed FIS report. The hydraulic analyses described in those reports have been compiled and are summarized below.

A detailed hydraulic analysis was not performed for portions of Big Timber Creek, Newton Creek, North Branch Big Timber Creek, North Branch Newton Creek, and South Branch Newton Creek and the entirety of the Delaware River Back Channel and Little Timber Creek because all or portions of these streams are subject only to tidal action from the Delaware River (USACE 1969).

For the reaches of Big Timber Creek, North Branch Newton Creek, Pines Run, and South Branch Big Timber Creek that were not subject to tidal action, and for the entirety of Four Mile Branch, Great Egg Harbor River, North Fork of Tributary 1 to Cooper River, Pennsauken Creek, Pochack Creek, Pump Branch, Signey Run, Tindale Run, Tributary No. 1 to Cooper River, Tributary No. 2 to Cooper River, Tributary No. 3 to Cooper River, Tributary No. 4 to Cooper River, Tributary No. 1 to North Branch Cooper River, Tributary No. 2 to North Branch Cooper River, South Branch Pennsauken Creek, water surface elevations of the selected recurrence intervals were computed using the HEC-2 step-backwater computer program (USACE, 1984).

Starting water surface elevations for Big Timber Creek, North Branch Newton Creek, Pennsauken Creek, Pochack Creek and South Branch Big Timber Creek were developed by the USACE, Philadelphia District, from coincident analyses of tidal and fluvial events along the Delaware River (USACE 1964). The 1-year tide elevation on the Delaware River was used to start all profiles.

Starting water surface elevations for Mason Run, North Branch Big Timber Creek, Pines Run, and Signey Run were determined using the HEC-1 computer program (USACE 1973). The 0.2-percent, 1-percent, 2-percent and 10-percent annual chance floods for the main stems and their respective tributaries were routed simultaneously. Using the flood hydrographs produced, the water surface elevations on the main stems, which were coincident with the peak flow of their respective tributaries, were determined. These elevations were used to start the backwater computations for the floods of the selected recurrence intervals.

Starting water surface elevations for North Fork of Tributary 1 to Cooper River, Tributary No. 1 to Cooper River, Tributary No. 2 to Cooper River, Tributary No. 3 to Cooper River, and Tributary No. 4 to Cooper River were obtained using backwater computations from the Cooper River.

Starting water surface elevations for Tributaries Nos.1 and 2 to North Branch Cooper River were obtained using backwater computations from North Branch Cooper River.

Starting water surface elevations for Pump Branch and Tindale Run were obtained using normal depth computations. Starting water surface elevations for the Great Egg Harbor River assumed normal depth downstream of New Brooklyn Road. For Four Mile Branch, elevations were calculated based on normal depth downstream of its confluence with the Great Egg Harbor River.

Starting water surface elevations for South Branch Pennsauken Creek were developed by the USACE, Philadelphia District.

Cross sections for Pennsauken Creek and Tindale Run were obtained by photogrammetry using aerial photography (Buchart-Horn, Inc. 1989). Composite cross sections for the backwater analyses of the Great Egg Harbor River, Pump Branch and Four Mile Branch were obtained from aerial photographs flown in December 1977, at a scale of 1:12,000 (Good Aerial Survey, Inc. 1977).

Cross sections for Big Timber Creek, North Branch Newton Creek, North Fork of Tributary No. 1 to Cooper River, Pines Run, Pochack Creek, Signey Run, South Branch Big Timber Creek, South Branch Pennsauken Creek, Tributary No. 1 to Cooper River, Tributary No. 2 to Cooper River, Tributary No. 3 to Cooper River, Tributary No. 4 to Cooper River, Tributary No. 1 to North Branch Cooper River, and Tributary No. 2 to North Branch Cooper River were field surveyed. All bridges, dams, and culverts were field surveyed to obtain elevation data and structural geometry.

Countywide Analyses

For the September 28, 2007 countywide analyses, Millard Creek, Newton Creek, Nicholson Branch, North Branch Cooper River, and South Branch Newton Creek, Tributary No. 3 to Barton Run water-surface elevations of floods of the selected recurrence intervals were computed using the USACE HEC-RAS step-backwater computer software (USACE 2004). Flood profiles were drawn showing computed water surface elevations for floods of the selected recurrence intervals.

Water-surface elevations for the Cooper River were developed using the USACE HEC-RAS hydraulic model, version 3.1.3. Field survey and LiDAR data collected in 2004 were the base data sources used in the development of cross-sections for the hydraulic analyses. The main channel area, from channel bank to channel bank, consisted primarily of field surveyed data, with LiDAR data used to complete the geometry in overbank areas. Survey data from effective HEC-2 data were also incorporated into the cross-section geometry and used in the analyses where needed. The HEC-2 portion of the low-flow or channel bank to channel bank region were combined with the LiDAR data to complete a cross section's geometry.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway was computed (Section 4.2), selected cross-section locations are also shown on the revised FIRM (Exhibit 2).

Flood profiles were drawn showing the computed water-surface elevations for floods of the selected recurrence intervals.

Roughness factors (Manning's "n") used in the hydraulic computations were chosen by engineering judgment and were based on field observations of the streams and floodplain areas. Roughness factors for all streams studied by detailed methods are shown in Table 4, "Manning's "n" Values."

TABLE 4 – MANNING'S "n" VALUES

Stream	Channel "n"	Overbank "n"
Big Timber Creek	0.035-0.045	0.070-0.090
Cooper River	0.035-0.070	0.070-0.120
Four Mile Branch	0.030-0.065	0.050-0.090
Great Egg Harbor River	0.030-0.065	0.050-0.090
Mason Run	0.025-0.045	0.075-0.100
Millard Creek	0.030	0.040-0.120
Newton Creek	0.035-0.040	0.040-0.090
Nicholson Branch	0.030	0.120
North Branch Big Timber Creek	0.025-0.045	0.075
North Branch Cooper River	0.030-0.045	0.045-0.100
North Branch Newton Creek	0.020-0.060	0.05-0.130
North Fork of Tributary No. 1 to Cooper River	0.030-0.050	0.065-0.10
Pennsauken Creek	0.040	0.070
Pines Run	0.025-0.042	0.025-0.135
Pump Branch	0.030-0.065	0.050-0.090
Signey Run	0.035	0.090-0.120
South Branch Big Timber Creek	0.020-0.070	0.070-0.130
South Branch Newton Creek	0.035-0.080	0.015-0.080
South Branch Pennsauken Creek	0.010-0.050	0.050-0.140
Tindale Run	0.020-0.060	0.020-0.080
Tributary No. 3 to Barton Run	0.030-0.035	0.035-0.120
Tributary No. 1 to Cooper River	0.010-0.050	0.050-0.140
Tributary No. 2 to Cooper River	0.010-0.050	0.050-0.140
Tributary No. 3 to Cooper River	0.04-0.050	0.05-0.10
Tributary No. 4 to Cooper River	0.030-0.050	0.065-0.10
Tributary No. 1 to North Branch Cooper River	0.030-0.050	0.065-0.10
Tributary No. 2 to North Branch Cooper River	0.030-0.050	0.065-0.10

For Pochack Creek, channel and overbank "n" values were derived from USACE reports (USACE 1984, USACE, undated).

For Prossers Branch and Wildcat Branch, channel and overbank values were derived from FEMA LOMR Case No. 04-02-011P.

Revised Analyses (June 16, 2009)

For the June 16, 2009 revision, Mason Run and North Branch Big Timber Creek, water-surface elevations of floods of the selected recurrence intervals were computed using the USACE HEC-RAS step-backwater computer software (USACE 2004). Flood profiles were drawn showing computed water surface elevations for floods of the selected recurrence intervals.

The hydraulic analyses for this FIS were based on unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

3.3 Coastal Analysis

For the August 17, 2016 countywide revision, the storm surge analysis on the Delaware River was studied as part of a FEMA Region III project to update the coastal storm surge elevations within the states of Virginia, Maryland, and Delaware, and the District of Columbia including the Atlantic Ocean, Chesapeake Bay including its tributaries, and the Delaware Bay. The study replaces outdated coastal storm surge stillwater elevations for all FIS reports in the study area, including Region II Counties in New Jersey along the Delaware River such as Camden County and serves as the basis for updated FIRMs. Study efforts were initiated in 2008 and concluded in 2012.

The storm surge study was conducted for FEMA by the USACE and its project partners under Project HSFE03-06-X-0023, "NFIP Coastal Storm Surge Model for Region III" and Project HSFE03-09-X-1108, "Phase II Coastal Storm Surge Model for FEMA Region III". The work was performed by the Coastal Processes Branch (HF-C) of the Flood and Storm Protection Division (HF), U.S. Army Engineer Research and Development Center – Coastal & Hydraulics Laboratory (ERDC-CHL).

The end-to-end storm surge modeling system includes the Advanced Circulation Model for Oceanic, Coastal and Estuarine Waters (ADCIRC) for simulation of 2-dimensional hydrodynamics (Luettich et. al, 2008). ADCIRC was dynamically coupled to the unstructured numerical wave model Simulating Waves Nearshore (unSWAN) to calculate the contribution of waves to total storm surge (USACE, 2012.). The resulting model system is typically referred to as SWAN+ADCIRC (USACE, 2012). A seamless modeling grid was developed to support the storm surge modeling efforts. The modeling system validation consisted of a comprehensive tidal calibration followed by a validation using carefully reconstructed wind and pressure fields from three major flood events for the Region III domain: Hurricane Isabel, Hurricane Ernesto, and extratropical storm Ida. Model skill was accessed by quantitative comparison of model output to wind, wave, water level and high water mark observations.

Camden County is a highly developed area and a significant portion of its 15 mile long shoreline is characterized by a hardened shoreline composed of seawalls and riprap revetments. Erosion was not computed as the county does not show any erodible features and is sheltered with a fetch less than 5 miles.

Coastal analysis, considering storm characteristics and the shoreline and bathymetric characteristics of the flooding sources studied, were carried out to provide estimates of the elevations of floods of the selected recurrence intervals along the shoreline. Users of the FIRM should be aware that coastal flood elevations are provided in Table 5, "Summary of Coastal Stillwater Elevations" table in this report. If the elevation on the FIRM is higher than the elevation shown in this table, a wave height, wave runup, and/or wave setup component likely exists, in which case, the higher elevation should be used for construction and/or floodplain management purposes.

The storm-surge elevations for the 10-, 2-, 1-, and 0.2- percent annual chance floods were determined for the Delaware River and are shown in Table 5,

"Summary of Coastal Stillwater Elevations." The analyses reported herein reflect the stillwater elevations due to tidal and wind setup effects.

TABLE 5 - SUMMARY OF COASTAL STILLWATER ELEVATIONS

FLOODING SOURCE AND LOCATION	ELEVATION (feet) NAVD88			
	10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance	0.2-Percent-Annual-Chance
DELAWARE RIVER				
At boundary between Camden and Gloucester Counties	7.6	8.5-8.6	9.1 - 9.2	11.6 - 11.7
At boundary between Camden and Burlington Counties	8.1	9.3	9.9 – 10.0	12.4

The methodology for analyzing the effects of wave heights associated with coastal storm surge flooding is described in a report prepared by the National Academy of Sciences (NAS, 1977). This method is based on three major concepts. First, depth-limited waves in shallow water reach maximum breaking height that is equal to 0.78 times the stillwater depth. The wave crest is 70 percent of the total wave height above the stillwater level. The second major concept is that wave height may be diminished by dissipation of energy due to the presence of obstructions, such as sand dunes, dikes and seawalls, buildings and vegetation. The amount of energy dissipation is a function of the physical characteristics of the obstruction and is determined by procedures prescribed in NAS Report. The third major concept is that wave height can be regenerated in open fetch areas due to the transfer of wind energy to the water. This added energy is related to fetch length and depth.

This coastal analysis involved transect layout, field reconnaissance, erosion analysis, and overland wave modeling including wave height analysis and wave runup analysis.

Wave heights were computed across transects that were located along the shoreline at the Delaware River of Camden County, as illustrated on the FIRMs. The transects were laid out with consideration given to existing transect locations and to the physical and cultural characteristics of the land so that they would closely represent conditions in the locality.

Each transect was taken perpendicular to the shoreline and extended inland to a point where coastal flooding ceased. Along each transect, wave heights and elevations were computed considering the combined effects of changes in ground elevation, vegetation, and physical features. The stillwater elevations for a 1% annual chance event were used as the starting elevations for these computations. Wave heights were calculated to the nearest 0.1 foot, and wave elevations were determined at whole-foot increments along the transects. The location of the 3-foot breaking wave for determining the terminus of the Zone VE (area with velocity wave action) was computed at each transect.

Wave height calculation methodologies used in this flood study are described in the FEMA guidance for coastal mapping (FEMA, 2007a). Wave setup is the increase in mean water level above the still water level due to momentum transfer to the water column by waves that are breaking or otherwise dissipating their energy (Dean et. al., 2005). For the Camden County study, total stillwater elevation was determined directly from the ADCIRC+SWAN model. The total stillwater elevation (SWEL) was then used for simulations of inland wave propagation conducted using FEMA's Wave Height Analysis for Flood Insurance Studies (WHAFIS) model Version 4.0 (FEMA, 2007b). WHAFIS is a one-dimensional model that was applied to each transect in the study area. The model uses the specified SWEL and the starting wave conditions as input. Simulations of wave transformations were then conducted with WHAFIS taking into account the storm-induced erosion and overland features of each transect. Output from the model includes the combined SWEL and wave height along each cross-shore transect allowing for the establishment of base flood elevations (BFEs) and flood zones from the shoreline to points inland within the study area.

Wave runup is defined as the maximum vertical extent of wave uprush on a beach or structure. FEMA's "Atlantic Ocean and Gulf of Mexico Coastal Guidelines" require the top 2% of 1% storm wave runup level be computed for the coastal feature being evaluated (cliff, coastal bluff, dune, or structure) (FEMA, 2007a). The 2-percent runup level is the elevation exceed by 2-percent of incoming waves affecting the shoreline during the 1-percent-annual-chance flood event. Each transect defined within the Region II study area was evaluated for the applicability of wave runup, and if necessary, the appropriate runup methodology was selected and applied to each transect. Runup elevations were then compared to WHAFIS results to determine the dominant process affecting BFEs and associated flood hazard levels. Based on wave runup rates, wave overtopping was computed, where applicable, following FEMA's "Atlantic Ocean and Gulf of Mexico Coastal Guidelines."

Figure 2, "Transect Location Map," illustrates the location of each transect. Along each transect, wave envelopes were computed considering the combined effects of changes in ground elevation, vegetation and physical features. Between transects, base flood elevations were interpolated using topographic maps, land-use and land-cover data, and engineering judgment to determine the aerial extent of flooding. The results of the calculations are accurate until local topography, vegetation, or cultural development within the community undergoes major changes. The flood hazard zone and base flood elevations for each transect flooding source is provided in Table 6, "Transect Data", along with the 10-, 2-, 1-, and 0.2-percent annual chance stillwater elevations for the respective flooding source.

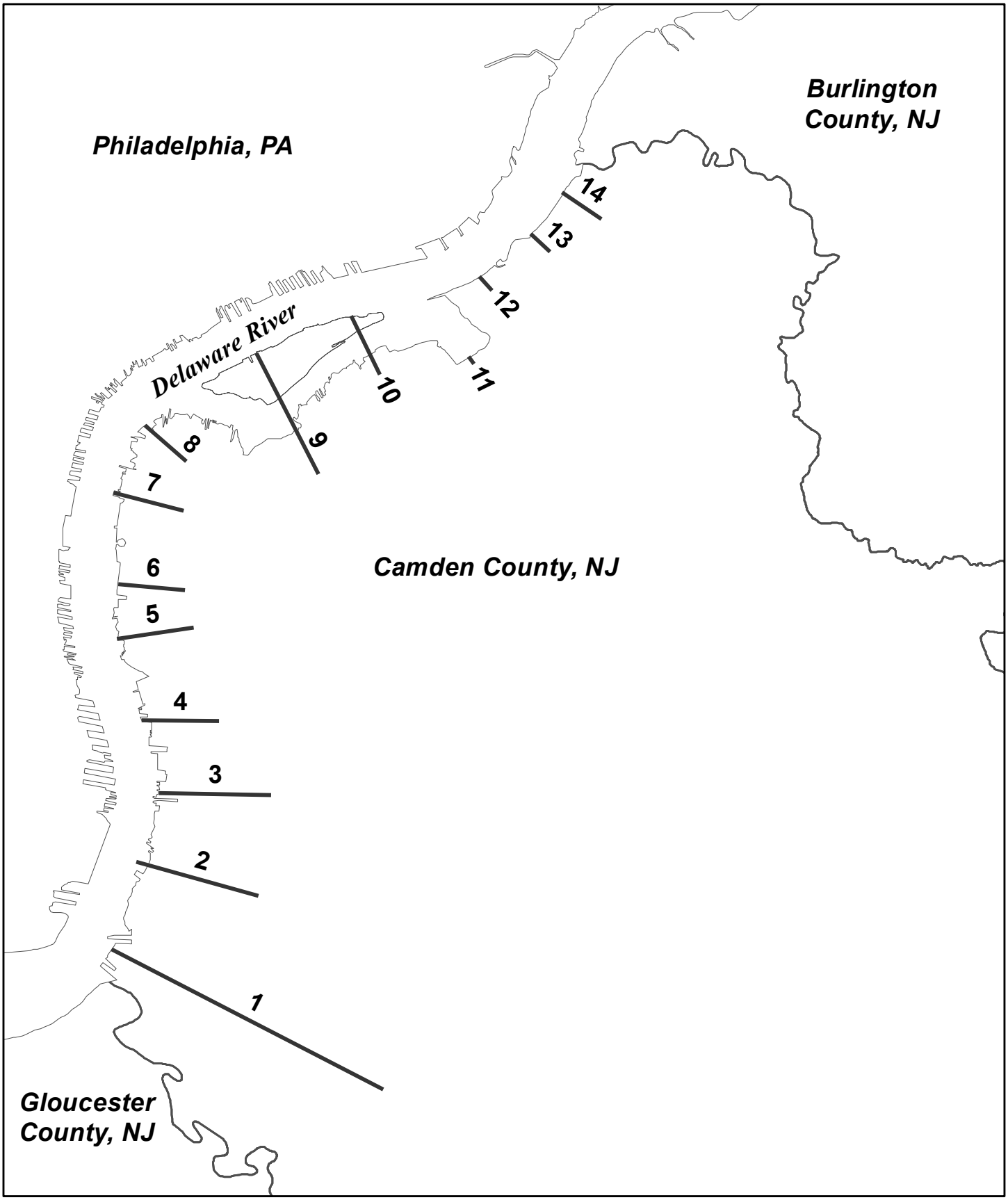


FIGURE 2	FEDERAL EMERGENCY MANAGEMENT AGENCY **CAMDEN COUNTY, NEW JERSEY** (ALL JURISDICTIONS)	Approximate Scale 0 0.75 1.5 Miles TRANSECT LOCATION MAP

TABLE 6 - TRANSECT DATA

Flood Source	Transect	Starting Wave Conditions for the 1% Annual Chance			Starting Stillwater Elevations (feet NAVD88) Range of Stillwater Elevations* (feet NAVD88)			
		Coordinates	Significant Wave Height (feet)	Peak Wave Period (sec)	10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Delaware River	1	N 39.888989 W 75.132570	1.88	2.63	7.6	8.6 8.5 - 8.6	9.1 9.1 - 9.2	11.6 11.6 - 11.7
Delaware River	2	N 39.900449 W 75.128473	1.63	2.47	7.6 7.6 - 7.7	8.6	9.2	11.6 11.6 - 11.7
Delaware River	3	N 39.909445 W 75.124778	1.79	2.31	7.7	8.6 8.6 - 8.7	9.3 9.2 - 9.3	11.7 11.7 - 11.8
Delaware River	4	N 39.918920 W 75.127725	1.90	2.56	7.7	8.7	9.3	11.8
Delaware River	5	N 39.929531 W 75.132083	1.97	2.74	7.7	8.7	9.3	11.8 11.8 - 11.9
Delaware River	6	N 39.936689 W 75.131945	2.16	2.75	7.8	8.8	9.4 9.3 - 9.4	11.8
Delaware River	7	N 39.948571 W 75.132803	2.06	2.84	7.8	8.8	9.4	11.9
Delaware River	8	N 39.957445 W 75.127514	1.92	2.97	7.9	8.9	9.5	11.9 11.9 - 12
Delaware River	9	N 39.966904 W 75.108772	2.02	2.74	7.9	9	9.6	12.1
Delaware River	10	N 39.971881 W 75.092712	2.20	2.79	8	9.1	9.7	12.2
Delaware River	11	N 39.966653 W 75.072735	1.49	2.35	8	9.2	9.8	12.3
Delaware River	12	N 39.977147 W 75.071006	1.93	2.46	8	9.2	9.9	12.3
Delaware River	13	N 39.982753 W 75.062349	1.78	2.37	8.1	9.3	9.9	12.4 12.3 - 12.4
Delaware River	14	N 39.988167 W 75.057013	1.73	2.40	8.1	9.3	10 9.9 - 10	12.4

*For Transects with a constant stillwater elevation, only one number is provided to represent both the starting value and the range.

Areas of coastline subject to significant wave attack are referred to as Coastal High Hazard Areas (CHHA). The USACE has established the 3-foot breaking wave as the criterion for identifying the limit of coastal high hazard areas (USACE, 1975). The 3-foot wave has been determined to be the minimum size wave capable of causing major damage to conventional wood frame of brick veneer structures. The CHHA is depicted on the FIRMs as Zone VE, where the delineated flood hazard includes wave heights equal to or greater than three feet. Zone AE is depicted on the FIRMs where the delineated flood hazard includes wave heights less than three feet. A depiction of how the Zones VE and AE are mapped is shown in Figure 3, "Transect Schematic".

Post-storm field visits and laboratory tests have confirmed that, in Zone AE, wave heights as small as 1.5 feet can still cause damage to structures when designed without consideration to the coastal hazards. Additional flood hazards associated with coastal waves include floating debris, high velocity flow, erosion, and scour which can cause damage to Zone AE-type construction in these coastal areas. To help community officials and property owners recognize this increased potential for damage due to wave action in the AE zone, FEMA issued guidance in December 2008 on identifying and mapping the 1.5-foot wave height line, referred to as the Limit of Moderate Wave Action (LiMWA). While FEMA does not impose floodplain management requirements based on the LiMWA, the LiMWA is provided to help communicate the higher risk that exists in that area. The LiMWA also identifies a specific regulatory area for users of the International Building Code. Consequently, it is important to be aware of the area between this inland limit and the Zone VE boundary as it still poses a high risk, though not as high of a risk as Zone VE (see Figure 3).

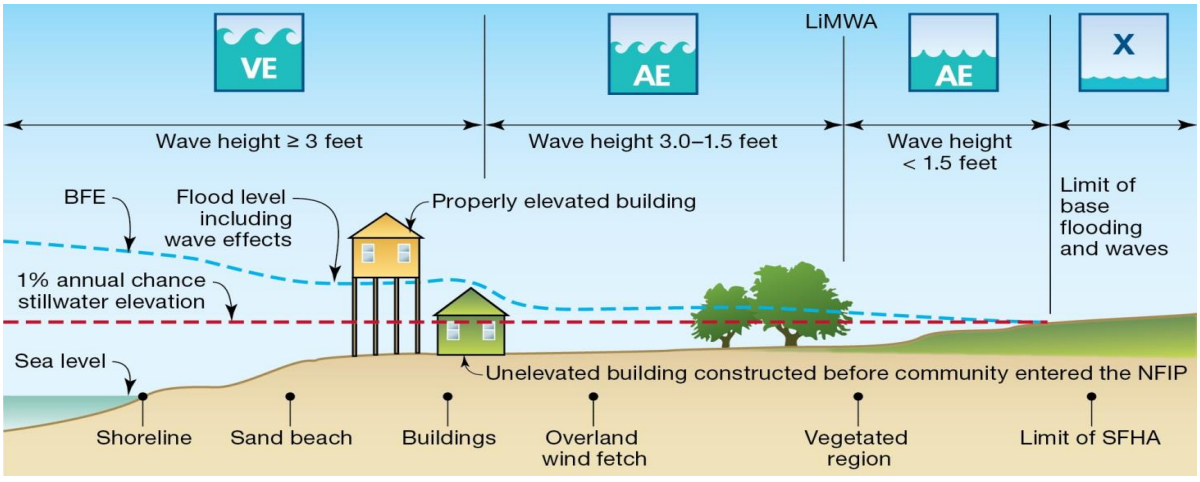


FIGURE 3: TRANSECT SCHEMATIC

3.4 Vertical Datum

All FIS reports and FIRMs are referenced to a specific vertical datum. The vertical datum provides a starting point against which flood, ground, and structure elevations can be referenced and compared. Until recently, the standard vertical datum used for newly created or revised FIS reports and FIRMs was the National Geodetic Vertical Datum of 1929 (NGVD29). With the completion of the North American Vertical Datum of 1988 (NAVD88), many FIS reports and FIRMs are now prepared using NAVD88 as the referenced vertical datum.

Flood elevations shown in this FIS report and on the FIRM are referenced to the NAVD88. These flood elevations must be compared to structure and ground elevations referenced to the same vertical datum. The datum conversion from NGVD29 to NAVD88 in Camden County can be expressed as the following equation:

NGVD29 – 1.2 feet = NAVD88

For additional information regarding conversion between the NGVD29 and NAVD88, visit the National Geodetic Survey website at www.ngs.noaa.gov, or contact the National Geodetic Survey at the following address:

NGS Information Services,
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

Qualifying benchmarks within a given jurisdiction that are cataloged by the National Geodetic Survey (NGS) and entered into the National Spatial Reference System (NSRS) as First or Second Order Vertical Survey Control Points and have a vertical stability classification of A, B, or C are shown and labeled on the FIRM with their 6-character NSRS Permanent Identifier.

Benchmarks cataloged by the NGS and entered into the NSRS vary widely in vertical stability classification. NSRS vertical stability classifications are as follows:

- Stability A: Monuments of the most reliable nature, expected to hold position/elevation well (e.g.; mounted in bedrock)
- Stability B: Monuments which generally hold their position/elevation well (e.g.; concrete bridge abutment)

- Stability C: Monuments which may be affected by surface ground movements (e.g.; concrete monument below frost line)

- Stability D: Mark of questionable or unknown vertical stability (e.g.; concrete monument above frost line, or steel witness post)

In addition to NSRS benchmarks, the FIRM may also show vertical control monuments established by a local jurisdiction; these monuments will be shown on the FIRM with the appropriate designations. Local monuments will only be placed on the FIRM if the community has requested that they be included, and if the monuments meet the aforementioned NSRS inclusion criteria.

To obtain current elevation, description, and/or location information for benchmarks shown on the FIRM for this jurisdiction, please contact the Information Services Branch of the NGS at (301) 713-3242, or visit their Web site at www.ngs.noaa.gov.

It is important to note that temporary vertical monuments are often established during the preparation of a flood hazard analysis for the purpose of establishing local vertical control.

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The NFIP encourages State and local governments to adopt sound floodplain management programs. To assist in this endeavor, each FIS provides 1-percent annual chance floodplain data, which may include a combination of the following: 10-, 2-, 1-, and 0.2-percent annual chance flood elevations; delineations of the 1- and 0.2-percent annual chance floodplains; and 1-percent annual chance floodway. This information is presented on the FIRM and in many components of the FIS, including Flood Profiles, Floodway Data tables, and Summary of Stillwater Elevation tables. Users should reference the data presented in the FIS as well as additional information that may be available at the local community map repository before making flood elevation and/or floodplain boundary determinations.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1-percent annual chance flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2-percent annual chance flood is employed to indicate additional areas of flood risk in the county. For the streams studied in detail, the 1- and 0.2-percent annual chance floodplain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using topographic maps, aerial photographs, and grading plans at various scales and contour intervals.

The 1- and 0.2-percent annual chance floodplain boundaries are shown on the FIRM (Exhibit 2). On this map, the 1-percent-annual-chance floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones A, AE, and VE), and the 0.2-percent annual chance floodplain boundary corresponds to the boundary of areas of moderate flood hazards. In cases where the 1- and 0.2-

percent annual chance floodplain boundaries are close together, only the 1-percent-annual-chance floodplain boundary has been shown. Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

Precountywide Mapping

For Little Timber Creek, Beaver Brook and the two unnamed tributaries of Big Timber Creek within the Borough of Bellmawr, the boundary of the 1-percent annual chance flood was approximated by field inspection of the area, examination of available topographic mapping (USGS 1967 and 1973), the use of the previously printed Flood Hazard Boundary Map (FHBM) for the Borough of Bellmawr (U.S. Department of Housing and Urban Development 1974), and the USACE's Floodplain Information report for Little Timber Creek (USACE 1969).

Within the Township of Cherry Hill, the boundaries of all streams studied by approximate methods were delineated using the previously printed FIS for the Township (FEMA 1984).

For all other communities featuring approximate 1-percent annual chance floodplains, floodplain boundaries were determined using a combination of field inspection, topographic mapping (USGS 1966, 1967, and 1973), engineering judgment, and/or previously printed FHBMs for each respective community (U.S. Department of Housing and Urban Development 1974, 1975, 1976 and 1977).

Countywide Analyses

For the September 27, 2007 countywide analyses, Newton Creek, North Branch Cooper River, Millard Creek, Nicholson Branch, South Branch Newton Creek, and Tributary No. 3 to Barton Run floodplain boundaries were delineated using topographic mapping with a contour interval of 2 feet, at a scale of 1"=200.' This mapping was derived from aerial photography flown in March 2003 (Leonard Jackson Associates, 2005).

Floodplain boundaries for the Cooper River are developed based on Triangulated Irregular Network (TIN) points derived from the bare-earth mass LiDAR points as collected in the fall of 2004. The accuracy of the LiDAR is outlined in the Camden and Burlington Counties, NJ Quantitative LiDAR Review -2004 report prepared by Dewberry & Davis LLC, dated February 2, 2005.

For all remaining streams that were previously studied in detail, 1 percent and 0.2 percent annual chance floodplains were redelineated using updated topography from 2004, derived from Light Detection and Ranging (LIDAR) technologies, and prepared by URS Group for FEMA under Contract Number EMW-2000-CO-0247.

Revised Analyses (June 16, 2009)

For the June 16, 2009 revision, Mason Run and North Branch Big Timber Creek floodplain boundaries were delineated using topographic mapping with a contour interval of 2 feet, at a scale of 1"=200'. This mapping was derived from aerial photography flown in March 2003 (Leonard Jackson Associates, 2005).

Revised Analyses (August 17, 2016)

For this August 17, 2016 revision, new floodplain boundaries were developed and mapped for the Delaware River coastal study using 10 foot resolution Digital Elevation Models (DEMs). The DEMs were created from 2011 LiDAR acquired by Laser Mapping Specialists, Inc.

For the streams studied by approximate methods, only the 1-percent annual chance floodplain boundary is shown on the FIRM (Exhibit 2).

4.2 Floodways

Encroachment on floodplains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the NFIP, a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of the 1-percent annual chance floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent floodplain areas, that must be kept free of encroachment so that the 1-percent annual chance flood can be carried without substantial increases in flood heights. Minimum Federal standards limit such increases to 1.0 foot, however, the State of New Jersey standards limit such increases to 0.2 feet, provided that hazardous velocities are not produced. The floodways in this FIS are presented to local agencies as minimum standards that can be adopted directly or that can be used as a basis for additional floodway studies.

The floodways presented in this FIS were computed for certain stream segments on the basis of equal conveyance reduction from each side of the floodplain.

Floodway widths were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. The results of the floodway computations are tabulated for selected cross sections (Table 7). The computed floodways are shown on the FIRM (Exhibit 2). In cases where the floodway and 1-percent annual chance floodplain boundaries are either close together or collinear, only the floodway boundary is shown.

Near the mouths of streams studied in detail, floodway computations are made without regard to flood elevations on the receiving water body. Therefore, "Without Floodway" elevations presented in Table 7 for certain downstream cross sections of Big Timber Creek, Millard Creek, Newton Creek, North Branch Big Timber Creek, North Branch Cooper River, North Branch Newton Creek, North Fork of Tributary No. 1 to Cooper River, Pennsauken Creek, Pines Run, Signey Run, South Branch Big Timber Creek, South Branch Newton Creek, Tindale Run, Tributary No. 1 to North Branch Cooper River, and Tributary No. 2 to North Branch Cooper River are lower than the regulatory flood elevations in that area, which must take into account the 1-percent annual chance flooding due to backwater from other sources.

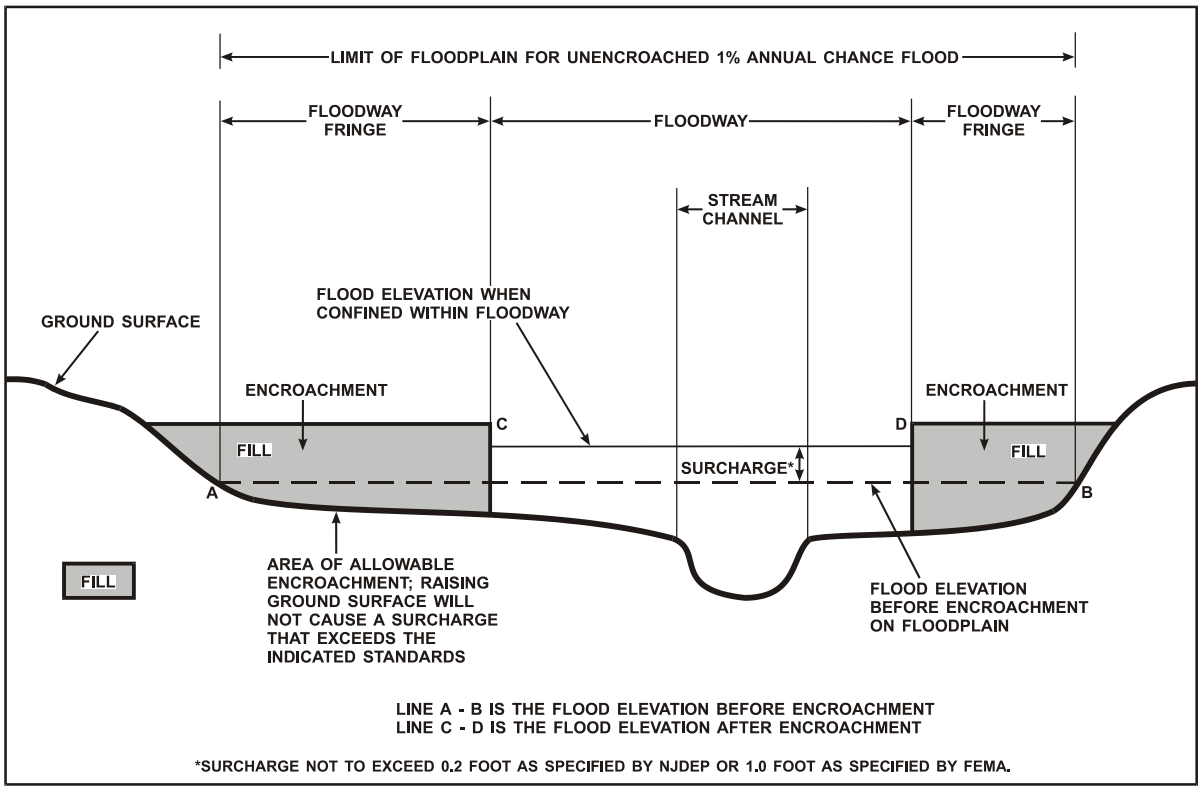
Floodways were not calculated for the Delaware River and the lower portion of Pochack Creek because these areas are affected by tidal flooding. Encroachments

were not calculated for the upper portion of Pochack Creek where the 1-percent annual chance flood is confined within a 1,000 foot long culvert. Because of the topography of the floodplain of the Cooper River, ponding of floodwater can occur in the vicinity of Cooper River Lake. Therefore, encroachment calculations for the Cooper River were not applicable for this area. For the South Branch Pennsauken Creek, the 1-percent annual chance tidal influence of the Delaware River extends to Fork Landing Road and the floodway begins upstream of this location.

The floodways for Four Mile Branch, Pennsauken Creek, Big Timber Creek, South Branch Big Timber Creek and South Branch Pennsauken Creek extend beyond the county boundary.

Encroachment into areas subject to inundation by floodwaters having hazardous velocities aggravates the risk of flood damage, and heightens potential flood hazards by further increasing velocities. A listing of stream velocities at selected cross sections is provided in Table 7, "Floodway Data." In order to reduce the risk of property damage in areas where the stream velocities are high, the community may wish to restrict development in areas outside the floodway.

The area between the floodway and 1-percent annual chance floodplain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the floodplain that could be completely obstructed without increasing the water-surface elevation of the 1-percent annual chance flood by more than 0.2 feet at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 4.



FLOODWAY SCHEMATIC Figure 4

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Big Timber Creek								
A	60[1]	133	1,626	3.5	*	7.1[4]	7.2	0.1
South Branch Big Timber Creek								
B	4,770[1]	240[3]	2,068	1.6	*	7.6[4]	7.7	0.1
C	10,460[1]	455[3]	4,071	0.7	*	8.0[4]	8.2	0.2
D	16,040[1]	438[3]	2,143	1.3	*	8.4[4]	8.6	0.2
E	20,560[1]	138[3]	836	3.2	16.8	16.8	17.0	0.2
F	24,040[1]	259[3]	1,602	1.6	23.7	23.7	23.7	0.0
G	32,360[1]	175[3]	681	3.4	31.4	31.4	31.5	0.1
H	41,340[1]	200[3]	1,463	1.1	66.8	66.8	66.8	0.0
I	47,040[1]	135[3]	876	1.4	85.6	85.6	85.8	0.2
J	50,850[1]	85[3]	218	1.4	100.4	100.4	100.5	0.1
K	54,870[1]	84[3]	209	1.5	123.4	123.4	123.4	0.0
Cooper River								
A	24,874[2]	880	12,260	0.6	11.5	11.5	11.7	0.2
B	27,725[2]	600	8,970	0.8	12.0	12.0	12.1	0.1
C	40,899[2]	190	1,003	3.1	14.7	14.7	14.9	0.2

[1]Feet above West Evesham Road
[2]Feet above Delaware River Back Channel
[3]Width extends beyond county boundary
[4]Elevation computed without consideration of backwater effects from Delaware River
* Controlled by coastal flooding – see Flood Insurance Rate Map for regulatory base flood elevation

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, NJ (ALL JURISDICTIONS)

FLOODWAY DATA

BIG TIMBER CREEK – SOUTH BRANCH BIG TIMBER CREEK – COOPER RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Cooper River (continued)								
D	40,937	190	983	3.1	16.0	16.0	16.2	0.2
E	42,116	317	990	3.1	16.8	16.8	16.9	0.1
F	43,750	296	1,452	2.1	19.5	19.5	19.5	0.0
G	43,856	98	352	8.7	19.5	19.5	19.5	0.0
H	44,108	131	1,020	3.0	21.6	21.6	21.6	0.0
I	53,420	40	244	9.7	27.4	27.4	27.6	0.2
J	53,602	53	554	4.3	34.3	34.3	34.3	0.0
K	60,898	129	547	3.4	38.7	38.7	38.8	0.1
L	61,071	97	796	2.3	40.7	40.7	40.8	0.1
M	65,462	100	168	6.6	44.9	44.9	44.9	0.0
N	65,681	137	546	2.0	46.2	46.2	46.4	0.2
O	66,513	59	312	3.5	48.5	48.5	48.7	0.2
P	72,849	40	199	4.2	55.7	55.7	55.8	0.1
Q	72,906	43	270	3.1	57.3	57.3	57.3	0.0
R	73,794	62	381	2.2	59.0	59.0	59.1	0.1
S	73,857	153	756	1.1	60.4	60.4	60.4	0.0
T	77,379	272	993	0.8	60.5	60.5	60.5	0.0
U	77,573	222	1,097	0.8	62.3	62.3	62.4	0.1
V	77,918	168	588	1.4	62.4	62.4	62.5	0.1
W	80,644	65	241	1.2	65.8	65.8	66.0	0.2
X	81,389	231	1,210	0.2	67.9	67.9	68.1	0.2
Y	83,046	135	269	1.0	71.6	71.6	71.8	0.2

[1]Feet above Delaware River Back Channel

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Four Mile Branch								
A	10[1]	545[3]	1,010	0.5	102.3	102.3	102.5	0.2
B	1,015[1]	37[3]	119	4.0	106.4	106.4	106.5	0.1
C	2,545[1]	269[3]	603	0.8	109.0	109.0	109.2	0.2
D	4,465[1]	368[3]	668	0.7	110.5	110.5	110.7	0.2
E	6,115[1]	713[3]	1,201	0.4	111.3	111.3	111.5	0.2
F	7,495[1]	535[3]	693	0.7	112.0	112.0	112.2	0.2
G	9,170[1]	489[3]	897	0.5	113.4	113.4	113.6	0.2
H	10,870[1]	46[3]	192	2.4	117.2	117.2	117.4	0.2
I	12,300[1]	313[3]	667	0.6	118.7	118.7	118.9	0.2
J	13,415[1]	421[3]	800	0.5	119.3	119.3	119.5	0.2
K	14,400[1]	77[3]	265	1.5	120.4	120.4	120.6	0.2
L	15,630[1]	631[3]	1,353	0.3	120.8	120.8	121.0	0.2
M	17,250[1]	179[3]	130	2.5	121.5	121.5	121.7	0.2
N	18,500[1]	462[3]	546	0.6	124.6	124.6	124.8	0.2
O	19,735[1]	119[3]	145	1.7	128.4	128.4	128.6	0.2
P	21,375[1]	275[3]	559	0.4	129.7	129.7	129.9	0.2
Q	22,825[1]	119[3]	202	1.2	130.5	130.5	130.7	0.2
Great Egg Harbor River								
A	285[2]	1,425	8,731	0.1	109.3	109.3	108.1	0.0
B	1,730[2]	1,757	6,188	0.1	109.3	109.3	108.1	0.0
C	2,950[2]	1,636	4,645	0.2	109.3	109.3	108.1	0.0
D	4,175[2]	1,228	2,173	0.4	109.3	109.3	108.1	0.0
E	5,150[2]	331	534	1.4	109.5	109.5	108.3	0.1

[1]Feet above confluence with Great Egg Harbor River

[2]Feet above 7 Causeways Road

[3]Width extends beyond county boundary

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, NJ (ALL JURISDICTIONS)

FLOODWAY DATA

FOUR MILE BRANCH – GREAT EGG HARBOR RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Great Egg Harbor River (continued)								
F	6,045[1]	872	419	1.8	110.6	110.6	109.4	0.2
G	7,205[1]	1,133	1,944	0.4	111.2	111.2	110.0	0.2
H	8,640[1]	90	200	3.6	111.7	111.7	110.5	0.2
I	9,790[1]	1,000	889	0.8	115.4	115.4	114.2	0.2
J	11,090[1]	584	938	0.8	116.9	116.9	115.7	0.2
K	12,010[1]	58	192	3.8	120.4	120.4	119.2	0.2
L	13,065[1]	284	662	1.1	122.4	122.4	121.2	0.2
M	13,805[1]	726	1,895	0.4	123.1	123.1	121.9	0.2
N	15,390[1]	642	1,144	0.6	123.3	123.3	122.1	0.2
O	17,050[1]	155	442	1.5	127.0	127.0	125.8	0.2
P	18,750[1]	1,513	3,524	0.2	127.2	127.2	126.0	0.2
Q	20,460[1]	429	800	0.8	127.3	127.3	126.1	0.2
R	22,365[1]	714	1,173	0.4	128.0	128.0	126.8	0.2
S	23,395[1]	450	625	0.7	128.3	128.3	127.1	0.2
T	24,720[1]	475	374	0.3	131.1	131.1	129.9	0.2
U	26,045[1]	133	254	0.5	133.5	133.5	132.3	0.2
V	27,455[1]	300	771	0.5	135.1	135.1	133.9	0.2
W	28,650[1]	166	132	3.1	137.3	137.3	136.1	0.0
Mason Run								
A	1,100[2]	112	534	1.9	18.7	18.7	18.9	0.2
B	3,270[2]	170	415	2.5	24.0	24.0	24.0	0.0
C	5,300[2]	184	1,270	0.8	30.0	30.0	30.2	0.2
D	7,520[2]	160	804	1.3	31.4	31.4	31.6	0.2

[1]Feet above 7 Causeways Road
[2]Feet above confluence with North Branch Big Timber Creek

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, NJ (ALL JURISDICTIONS)

FLOODWAY DATA

GREAT EGG HARBOR RIVER – MASON RUN

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Millard Creek								
A	1,200[1]	316	1,491	0.6	64.4	62.9[3]	63.0	0.1
B	3,000[1]	112	356	1.4	66.6	66.6	66.9	0.3
C	4,210[1]	139	158	3.0	67.9	67.9	67.9	0.0
D	5,000[1]	144	342	1.4	72.3	72.3	72.5	0.2
E	5,900[1]	227	1,715	0.3	76.3	76.3	76.4	0.1
Newton Creek								
A	985[2]	101	301	3.8	*	2.7[4]	2.8	0.1
B	3,165[2]	448	3,170	0.3	*	9.1	9.2	0.1
C	5,565[2]	403	3,838	0.2	9.2	9.3	9.3	0.0
D	7,585[2]	486	5,151	0.2	9.8	9.8	9.9	0.1
E	10,615[2]	367	2,525	0.3	10.0	10.0	10.1	0.1
F	11,430[2]	382	2,383	0.3	10.0	10.0	10.1	0.1
G	13,025[2]	275	2,223	0.3	10.0	10.0	10.2	0.2
H	13,240[2]	345	1,896	0.4	10.0	10.0	10.2	0.2
I	15,445[2]	40	262	2.7	15.4	15.4	15.4	0.0
J	15,855[2]	52	226	3.1	15.5	15.4	15.6	0.2
K	16,925[2]	99	253	2.8	19.8	19.8	20.0	0.2
L	18,085[2]	31	121	2.8	24.9	24.9	24.9	0.0
M	19,225[2]	131	1,090	0.3	39.9	39.9	39.9	0.0
N	20,195[2]	28	125	2.7	39.9	39.9	39.9	0.0
O	20,565[2]	36	106	3.2	40.1	40.1	40.2	0.1
P	21,285[2]	37	147	2.3	46.5	46.5	46.6	0.1

[1]Feet above confluence with Cooper River
[2]Feet above Limit of Floodway
(Limit of Floodway is approximately 330 feet downstream of Crescent Boulevard)
[3]Elevation computed without consideration of backwater effects from Cooper River
[4]Elevation computed without consideration of backwater effects from Delaware River
* Controlled by coastal flooding – see Flood Insurance Rate Map for regulatory base flood elevation

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, NJ (ALL JURISDICTIONS)

FLOODWAY DATA

MILLARD CREEK – NEWTON CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Nicholson Branch								
A	430[1]	62	173	2.7	66.6	66.6	66.8	0.2
B	1,300[1]	28	58	8.1	71.5	71.5	71.5	0.0
C	2,300[1]	42	75	6.2	78.9	78.9	78.9	0.0
D	3,000[1]	19	59	8.0	81.8	81.8	81.8	0.0
E	3,700[1]	26	72	6.5	86.1	86.1	86.2	0.1
F	5,100[1]	48	104	4.5	94.5	94.5	94.6	0.1
G	6,100[1]	209	505	0.9	99.6	99.6	99.7	0.1
North Branch Big Timber Creek								
A	2,380[2]	261	2,171	1.2	*	7.5[3]	7.7	0.2
B	6,630[2]	263	1,777	1.4	*	8.0[3]	8.2	0.2
C	9,500[2]	265	3,364	0.7	14.7	14.7	14.7	0.0
D	12,270[2]	264	3,429	0.7	14.9	14.9	15.1	0.2
E	15,630[2]	260	2,927	0.9	15.0	15.0	15.2	0.2
F	18,520[2]	260	2,649	0.9	15.2	15.2	15.4	0.2
G	21,310[2]	257	1,698	1.5	15.8	15.8	16.0	0.2
H	23,390[2]	135	597	4.2	17.2	17.2	17.4	0.2
I	24,760[2]	114	482	3.1	18.6	18.6	18.8	0.2
J	26,760[2]	158	836	1.8	22.1	22.1	22.3	0.2
K	29,010[2]	298	2,638	0.5	30.6	30.6	30.6	0.0
L	30,910[2]	122	499	2.6	30.7	30.7	30.7	0.0
M	33,510[2]	79	598	2.2	36.1	36.1	36.3	0.2
N	36,110[2]	245	1,742	0.7	43.1	43.1	43.3	0.2

[1]Feet above confluence with Millard Creek
[2]Feet above confluence with Big Timber Creek
[3]Elevation computed without consideration of backwater effects from Delaware River
* Controlled by coastal flooding – see Flood Insurance Rate Map for regulatory base flood elevation

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, NJ (ALL JURISDICTIONS)

FLOODWAY DATA

NICHOLSON BRANCH – NORTH BRANCH BIG TIMBER CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
North Branch Cooper River								
A	395	241	885	3.2	13.5	8.5[2]	8.6	0.1
B	1,450	238	1,467	1.9	13.5	11.5[2]	11.6	0.0
C	2,250	244	1,299	2.2	13.5	11.9[2]	11.9	0.0
D	3,385	117	490	5.7	13.5	12.5[2]	12.7	0.2
E	3,740	71	488	5.8	14.2	14.2	14.4	0.2
F	4,730	191	1,050	2.7	16.0	16.0	16.1	0.1
G	5,970	227	1,293	2.2	17.8	17.8	18.0	0.2
H	7,590	212	1,070	2.6	18.6	18.6	18.8	0.2
I	9,020	264	1,125	2.5	20.3	20.3	20.5	0.2
J	10,260	312	1,150	2.4	21.8	21.8	22.0	0.2
K	11,610	201	850	3.3	24.9	24.9	25.0	0.1
L	12,370	207	1,307	2.2	29.2	29.2	29.4	0.2
M	12,730	162	1,268	2.2	29.3	29.3	29.5	0.2
N	13,140	143	1,491	1.9	34.9	34.9	35.0	0.1
O	13,725	116	1,854	1.5	42.8	42.8	42.8	0.0
P	14,700	243	4,290	0.7	42.9	42.9	42.9	0.0
Q	15,520	240	3,834	0.7	42.9	42.9	43.0	0.1
R	15,770	288	4,175	0.7	42.9	42.9	43.0	0.1
S	17,600	333	3,333	0.8	42.9	42.9	43.1	0.2
T	18,455	366	4,427	0.6	42.9	42.9	43.1	0.2
U	18,970	461	4,296	0.7	43.0	43.0	43.1	0.1
V	20,200	420	3,910	0.7	43.0	43.0	43.2	0.2
W	21,210	290	2,095	1.3	43.1	43.1	43.3	0.2
X	21,950	160	1,107	2.5	43.3	43.3	43.5	0.2
Y	22,920	313	2,513	1.1	45.8	45.8	46.0	0.2
Z	24,620	260	1,474	1.9	46.0	46.0	46.2	0.2

[1]Feet above confluence with Cooper River
[2]Elevation computed without consideration of backwater effects from Cooper River

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, NJ (ALL JURISDICTIONS)

FLOODWAY DATA

NORTH BRANCH COOPER RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
North Branch Cooper River (continued)								
AA	26,460[1]	159	810	3.4	48.1	48.1	48.3	0.2
AB	27,550[1]	236	1,396	2.0	51.4	51.4	51.6	0.2
AC	28,780[1]	286	1,339	2.1	52.3	52.3	52.5	0.2
AD	29,780[1]	281	1,017	2.7	54.2	54.2	54.4	0.2
AE	31,020[1]	274	1,220	2.3	56.2	56.2	56.4	0.2
AF	32,120[1]	222	969	2.9	58.0	58.0	58.2	0.2
AG	33,800[1]	193	1,004	2.8	61.6	61.6	61.8	0.2
AH	35,320[1]	174	780	3.6	63.8	63.8	64.0	0.2
AI	36,780[1]	247	1,424	2.0	68.2	68.2	68.4	0.2
AJ	38,280[1]	144	602	4.6	69.9	69.9	70.1	0.2
AK	39,230[1]	165	1,354	1.2	76.0	76.0	76.2	0.2
AL	40,130[1]	106	671	2.5	76.1	76.1	76.3	0.2
AM	40,890[1]	110	575	2.9	77.1	77.1	77.3	0.2
AN	42,430[1]	194	1,168	1.4	82.1	82.1	82.2	0.1
AO	43,300[1]	146	730	2.3	82.6	82.6	82.8	0.2
AP	45,080[1]	364	1,353	1.2	84.5	84.5	84.8	0.2
AQ	46,520[1]	287	986	1.7	86.4	86.4	86.6	0.2
North Branch Newton Creek								
A	1,507[2]	336	1,145	0.4	*	6.5[3]	6.7	0.2

[1]Feet above confluence with Cooper River

[2] Feet above Mt. Ephraim Avenue

[3]Elevation computed without consideration of backwater effects from the Delaware River

* Controlled by coastal flooding – see Flood Insurance Rate Map for regulatory base flood elevation

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, NJ (ALL JURISDICTIONS)

FLOODWAY DATA

NORTH BRANCH COOPER RIVER – NORTH BRANCH NEWTON CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
North Fork of Tributary No. 1 to Cooper River								
A	0[1]	110	80	2.0	87.5	86.5[5]	86.6	0.1
B	2,667[1]	190	100	1.6	100.4	100.4	100.4	0.0
Pennsauken Creek								
A	885[2]	623[4]	8,583	0.3	*	4.8[6]	4.8	0.0
B	3,405[2]	281[4]	3,597	0.8	*	4.8[6]	4.8	0.0
C	5,850[2]	267[4]	3,230	0.9	*	4.9[6]	4.9	0.0
D	7,540[2]	228[4]	2,388	1.2	*	4.9[6]	4.9	0.0
E	8,530[2]	291[4]	3,459	0.8	*	5.0[6]	5.0	0.0
F	10,030[2]	185[4]	1,656	1.8	*	5.2[6]	5.2	0.0
G	11,685[2]	226[4]	2,602	1.1	*	5.3[6]	5.3	0.0
H	13,445[2]	186[4]	2,278	1.3	*	5.4[5]	5.4	0.0
I	14,480[2]	204[4]	2,405	1.2	*	5.4[5]	5.4	0.0
J	16,245[2]	160[4]	1,748	1.7	*	6.0[5]	6.0	0.0
K	17,735[2]	378[4]	3,993	0.7	*	6.1[5]	6.1	0.0
Pines Run								
A	170[3]	182	982	0.3	*	6.8[6]	7.0	0.2
B	2,940[3]	138	924	0.9	12.7	12.7	12.7	0.0
C	7,600[3]	94	167	3.7	26.3	26.3	26.5	0.2
D	13,810[3]	261	1,399	0.3	54.9	54.9	54.9	0.0
E	15,450[3]	148	334	1.2	54.9	54.9	54.9	0.0

[1]Feet above confluence with Tributary No. 1 to Cooper River
[2]Feet above confluence with Delaware River
[3]Feet above confluence with South Branch Big Timber Creek
[4]Width extends beyond county boundary
[5]Elevation computed without consideration of backwater effects from Tributary No. 1 to Cooper River
[6]Elevation computed without consideration of backwater effects from the Delaware River
* Controlled by coastal flooding – see Flood Insurance Rate Map for regulatory base flood elevation

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, NJ (ALL JURISDICTIONS)

FLOODWAY DATA

NORTH FORK OF TRIBUTARY NO. 1 TO COOPER RIVER – PENNSAUKEN CREEK – PINES RUN

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Prossers Branch								
A	2,500[1]	603	905	0.9	130.2	130.2	130.2	0.0
B	3,500[1]	500	905	0.9	132.6	132.6	132.7	0.1
C	4,500[1]	443	875	0.9	133.9	133.9	133.9	0.0
D	5,000[1]	246	567	1.4	134.9	134.9	135.0	0.1
E	6,000[1]	284	819	1.0	137.1	137.1	137.2	0.1
F	7,500[1]	203	628	1.3	139.4	139.4	139.5	0.1
G	8,450[1]	182	587	1.4	141.5	141.5	141.6	0.1
H	9,000[1]	212	670	1.2	142.2	142.2	142.3	0.1
Pump Branch								
A	315[2]	757	5,011	0.2	101.9	101.9	102.0	0.1
B	1,515[2]	665	4,626	0.2	101.9	101.9	102.0	0.1
C	2,415[2]	610	3,718	0.2	102.7	102.7	102.8	0.1
D	3,460[2]	556	766	1.0	102.7	102.7	102.8	0.1
E	4,225[2]	400	1,011	0.7	103.3	103.3	103.5	0.2
F	5,560[2]	444	808	0.9	104.1	104.1	104.3	0.2
G	6,150[2]	443	1,535	0.5	105.7	105.7	105.9	0.2
H	7,080[2]	240	1,534	0.4	105.8	105.8	106.0	0.2
I	7,400[2]	180	286	2.3	105.8	105.8	106.0	0.2
J	7,700[2]	310	476	1.4	106.2	106.2	106.4	0.2
K	7,859[2]	457	606	1.1	111.3	111.3	111.4	0.1
L	8,072[2]	411	1,962	0.3	111.3	111.3	111.4	0.1
M	8,515[2]	242	843	0.8	111.3	111.3	111.4	0.1
N	9,290[2]	283	446	1.5	111.6	111.6	111.8	0.2
O	9,870[2]	268	310	2.0	112.7	112.7	112.9	0.2

[1]Feet above confluence with Great Egg Harbor River
[2]Feet above Waterford-Blue Anchor Road

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, NJ (ALL JURISDICTIONS)

FLOODWAY DATA

PROSSERS BRANCH – PUMP BRANCH

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Pump Branch (continued)								
P	10,810[1]	270	849	0.7	113.6	113.6	113.8	0.2
Q	11,345[1]	155	360	1.6	113.8	113.8	114.0	0.2
R	12,025[1]	161	393	1.5	116.4	116.4	116.6	0.2
S	12,265[1]	348	1,262	0.5	119.3	119.3	119.4	0.1
T	12,580[1]	460	3,197	0.2	121.5	121.5	121.7	0.2
U	13,160[1]	423	1,500	0.4	121.5	121.5	121.7	0.2
V	14,295[1]	221	470	1.2	121.8	121.8	121.9	0.1
W	15,560[1]	282	1,069	0.5	122.2	122.2	122.4	0.2
X	16,730[1]	218	351	1.6	122.6	122.6	122.8	0.2
Y	17,675[1]	404	723	0.8	123.6	123.6	123.8	0.2
Z	18,025[1]	343	242	2.2	124.0	124.0	124.2	0.2
Signey Run								
A	670[2]	190	300	1.5	15.2	11.6[4]	11.8	0.2
B	965[2]	132	131	3.5	15.2	13.6[4]	13.6	0.0
C	3,020[2]	87	138	3.3	28.6	28.6	28.7	0.1
D	4,330[2]	63	72	4.4	38.2	38.2	38.2	0.0
South Branch Newton Creek								
A	605[3]	84	301	3.3	*	2.6[5]	2.6	0.0
B	1,845[3]	485	1,798	0.6	*	3.4[5]	3.5	0.1
C	2,715[3]	396	1,450	0.7	*	3.5[5]	3.5	0.0
D	3,770[3]	444	4,473	0.2	11.0	11.0	11.0	0.0
E	4,500[3]	241	2,101	0.5	11.0	11.0	11.0	0.0
F	5,750[3]	125	1,133	0.9	11.3	11.3	11.5	0.2

[1]Feet above Waterford-Blue Anchor Road

[2]Feet above confluence with North Branch Big Timber Creek

[3]Feet above Limit of Floodway (Limit of Floodway is approximately 142 feet downstream of centerline of Crescent Boulevard)

[4]Elevation computed without consideration of backwater effects from North Branch Big Timber Creek

[5]Elevation computed without consideration of backwater effects from Delaware River

* Controlled by coastal flooding – see Flood Insurance Rate Map for regulatory base flood elevation

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, NJ (ALL JURISDICTIONS)

FLOODWAY DATA

PUMP BRANCH – SIGNEY RUN – SOUTH BRANCH NEWTON CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
South Branch Pennsauken Creek								
A	13,367[1]	340[3]	2,400	1.2	10.2	10.2	10.2	0.0
B	18,100[1]	200[3]	840	3.4	12.4	12.4	12.6	0.2
C	20,913[1]	200[3]	710	4.0	18.5	18.5	18.6	0.1
D	23,588[1]	220[3]	2,090	1.1	23.2	23.2	23.2	0.0
E	27,543[1]	460[3]	2,310	1.0	23.9	23.9	23.9	0.0
G	33,713[1]	110[3]	420	4.4	30.0	30.0	30.2	0.2
H	38,523[1]	180[3]	620	3.0	33.9	33.9	33.9	0.0
I	42,013[1]	290[3]	1,650	1.1	39.9	39.9	39.9	0.0
J	45,588[1]	552[3]	976	2.5	45.2	45.2	45.2	0.0
K	50,403[1]	94[3]	165	3.7	54.3	54.3	54.4	0.1
L	53,350[1]	155[3]	208	2.9	60.0	60.0	60.2	0.2
M	55,850[1]	87[3]	521	0.4	72.2	72.2	72.2	0.0
Tindale Run								
A	70[2]	273	239	2.3	22.3	16.7[4]	16.7	0.0
B	1,390[2]	117	436	1.3	22.8	22.8	22.9	0.1
C	3,135[2]	30	208	1.8	36.8	36.8	36.8	0.0
D	4,515[2]	41	180	2.1	40.1	40.1	40.2	0.1
E	5,400[2]	39	110	3.4	42.1	42.1	42.3	0.2
F	6,070[2]	56	131	2.8	44.2	44.2	44.4	0.2

[1]Feet above confluence with Pennsauken Creek
[2]Feet above confluence with Cooper River
[3] Width extends beyond county boundary
[4]Elevation computed without consideration of backwater effects from Cooper River

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, NJ (ALL JURISDICTIONS)

FLOODWAY DATA

SOUTH BRANCH PENNSAUKEN CREEK – TINDALE RUN

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Tributary No. 3 to Barton Run								
A	7,730	100	472	1.5	86.7	86.7	86.7	0.0
B	8,865	112	379	1.8	87.0	87.0	87.1	0.1
C	9,320	108	396	1.7	88.3	88.3	88.3	0.1
D	10,020	132	402	1.7	89.9	89.9	90.1	0.2
E	10,435	135	341	2.0	90.3	90.3	90.5	0.2
F	11,500	354	3,188	0.2	100.4	100.4	100.4	0.0
G	12,445	397	2,618	0.3	100.4	100.4	100.4	0.0
H	12,935	145	779	0.9	100.4	100.4	100.6	0.2
I	13,100	135	811	0.9	100.4	100.4	100.6	0.2
J	13,820	107	359	1.9	101.4	101.4	101.6	0.2
K	14,280	316	1,769	0.4	106.9	106.9	106.9	0.0
L	14,510	254	1,569	0.4	108.4	108.4	108.6	0.2
M	15,195	224	940	0.7	108.4	108.4	108.6	0.2
N	15,450	309	1,635	0.4	108.4	108.4	108.7	0.2
O	15,600	197	187	3.7	109.1	109.1	109.1	0.0
P	16,080	249	571	1.2	110.1	110.1	110.2	0.1
Q	16,670	84	418	1.7	115.9	115.9	116.1	0.2
R	16,975	128	1,057	0.5	117.3	117.3	117.5	0.2
S	17,500	383	3,345	0.1	117.3	117.3	117.5	0.2
T	18,000	1,068	8,781	0.1	123.1	123.1	123.1	0.0
U	18,410	149	497	1.0	123.1	123.1	123.1	0.0
V	19,200	101	89	5.4	124.2	124.2	124.3	0.0
W	19,745	192	754	0.6	133.5	133.5	133.5	0.0
X	20,040	149	721	0.7	133.5	133.5	133.5	0.0
Y	20,385	73	441	1.1	133.5	133.5	133.6	0.0

[1]Feet above confluence with Barton Run

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, NJ (ALL JURISDICTIONS)

FLOODWAY DATA

TRIBUTARY NO. 3 TO BARTON RUN

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Tributary No. 1 to Cooper River								
A	800[1]	150	890	1.2	39.0	39.0	38.8	0.2
B	2,420[1]	250	1,120	0.9	40.6	40.6	40.8	0.2
C	4,180[1]	200	190	5.7	43.4	43.4	43.4	0.0
D	450[2]	70	70	3.8	80.3	80.3	80.3	0.0
E	1,580[2]	100	110	1.3	86.2	86.2	86.3	0.1
F	3,440[2]	192	90	1.8	94.5	94.5	94.6	0.1
Tributary No. 2 to Cooper River								
A	700[1]	170	720	0.3	39.1	39.1	39.3	0.2
B*	2,950[1]	20	30	7.3	43.4	43.4	43.4	0.0
C*	4,540[1]	20	30	7.6	54.3	54.3	54.3	0.0
Tributary No. 3 to Cooper River								
A	1,020[1]	106	**	**	47.3	47.3	47.5	0.2
B	2,000[1]	90	60	2.5	55.4	55.4	55.4	0.0
Tributary No. 4 to Cooper River								
A	230[1]	370	1,040	0.3	53.1	53.1	53.3	0.2
B	1,160[1]	70	120	2.1	53.2	53.2	53.4	0.2
C	1,690[1]	50	80	3.4	54.6	54.6	54.7	0.1

[1]Feet above confluence with Cooper River
[2]Feet above Evesham Road
*The 1% annual chance flood event is within both banks
**Data not available

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, NJ (ALL JURISDICTIONS)

FLOODWAY DATA

TRIBUTARY NO. 1 TO COOPER RIVER – TRIBUTARY NO. 2 TO COOPER RIVER – TRIBUTARY NO. 3 TO COOPER RIVER – TRIBUTARY NO. 4 TO COOPER RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Tributary No. 1 to North Branch Cooper River								
A	250[1]	270	310	0.4	76.1	69.8[3]	70.0	0.2
B	1,920[1]	20	20	5.6	79.3	79.3	79.5	0.2
C	3,500[1]	20	30	5.2	96.1	96.1	96.1	0.0
Tributary No. 2 to North Branch Cooper River								
A	210[1]	90	90	1.0	82.2	76.7[3]	76.9	0.2
B	940[1]	60	50	2.0	82.2	81.9[3]	82.1	0.2
Wildcat Branch								
A	2,900[2]	320	520	1.0	130.3	130.3	130.4	0.1
B	3,400[2]	210	443	1.2	131.2	131.2	131.4	0.2
C	4,300[2]	320	1,090	0.1	134.0	134.0	134.0	0.0
D	5,200[2]	179	242	0.8	135.6	135.6	135.7	0.1
E	5,700[2]	157	324	0.6	136.1	136.1	136.2	0.1
F	7,060[2]	98	143	1.3	139.4	139.4	139.5	0.1

[1]Feet above confluence with North Branch Cooper River

[2]Feet above confluence with Great Egg Harbor River

[3]Elevation shown without consideration of backwater effects from North Branch Cooper River

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, NJ (ALL JURISDICTIONS)

FLOODWAY DATA

TRIBUTARY NO. 1 TO NORTH BRANCH COOPER RIVER – TRIBUTARY NO. 2 TO NORTH BRANCH COOPER RIVER – WILDCAT BRANCH

5.0 INSURANCE APPLICATIONS

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. The zones are as follows:

Zone A

Zone A is the flood insurance rate zone that corresponds to the 1-percent annual chance floodplains that are determined in the FIS by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no base flood elevations or depths are shown within this zone.

Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 1-percent annual chance floodplains that are determined in the FIS by detailed methods. In most instances, whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone AH

Zone AH is the flood insurance rate zone that corresponds to the areas of 1-percent annual chance shallow flooding (usually areas of ponding) where average depths are between 1 and 3 feet. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone AO

Zone AO is the flood insurance rate zone that corresponds to the areas of 1-percent annual chance shallow flooding (usually sheet flow on sloping terrain) where average depths are between 1 and 3 feet. Average whole-foot depths derived from the detailed hydraulic analyses are shown within this zone.

Zone AR

Area of special flood hazard formerly protected from the 1-percent annual chance flood event by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1-percent annual chance or greater flood event.

Zone A99

Zone A99 is the flood insurance rate zone that corresponds to areas of the 1-percent annual chance floodplain that will be protected by a Federal flood protection system where construction has reached specified statutory milestones. No base flood elevations or depths are shown within this zone.

Zone V

Zone V is the flood insurance rate zone that corresponds to the 1-percent annual

chance coastal floodplains that have additional hazards associated with storm waves. Because approximate hydraulic analyses are performed for such areas, no base flood elevations are shown within this zone.

Zone VE

Zone VE is the flood insurance rate zone that corresponds to the 1-percent annual chance coastal floodplains that have additional hazards associated with storm waves. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 0.2-percent annual chance floodplain, areas within the 0.2-percent annual chance floodplain, and to areas of 1-percent annual chance flooding where average depths are less than 1 foot, areas of 1-percent annual chance flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 1-percent annual chance flood by levees. No base flood elevations or depths are shown within this zone.

Zone D

Zone D is the flood insurance rate zone that corresponds to unstudied areas where flood hazards are undetermined, but possible.

6.0 FLOOD INSURANCE RATE MAP

The FIRM is designed for flood insurance and floodplain management applications.

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 1-percent annual chance floodplains that were studied by detailed methods, shows selected whole-foot base flood elevations or average depths. Insurance agents use the zones and base flood elevations in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For floodplain management applications, the map shows by tints, screens, and symbols, the 1- and 0.2-percent annual chance floodplains. Floodways and the locations of selected cross sections used in the hydraulic analyses and floodway computations are shown where applicable.

The current FIRM presents flooding information for the entire geographic area of Camden County. Previously, separate Flood Hazard Boundary Maps and/or FIRMs were prepared for each identified flood-prone incorporated community in the county. This countywide FIRM also includes flood hazard information that was presented separately on Flood Boundary and Floodway Maps (FBFMs), where applicable. Historical data relating to the maps prepared for each community are presented in Table 8 "Community Map History."

COMMUNITY NAME	INITIAL IDENTIFICATION	FLOOD HAZARD BOUNDARY MAP REVISIONS DATE	FIRM EFFECTIVE DATE	FIRM REVISIONS DATE
Audubon, Borough of	March 29, 1974	June 21, 1974 July 9, 1976	October 13, 1978	
Audubon Park, Borough of [1]	N/A	N/A	N/A	
Barrington, Borough of [1, 2]	N/A	N/A	N/A	
Bellmawr, Borough of	June 21, 1974	November 7, 1975	February 15, 1980	
Berlin, Borough of	June 14, 1974	February 6, 1976	May 13, 1977	
Berlin, Township of	June 7, 1974	April 16, 1976 March 4, 1977	February 24, 1978	
Brooklawn, Borough of	June 21, 1974	August 6, 1976	September 14, 1979	
Camden, City of	April 12, 1974	October 22, 1976	December 1, 1981	
Cherry Hill, Township of	February 21, 1975	None	August 15, 1978	March 1, 1984 January 2, 1992
Chesilhurst, Borough of [1]	N/A	N/A	N/A	
Clementon, Borough of	June 28, 1974	February 6, 1976	October 21, 1983	
Collingswood, Borough of	November 23, 1973	January 7, 1977	July 17,1978	December 5, 1980 March 19, 1982

[1] This community does not have map history prior to the first countywide mapping
[2] No Special Flood Hazard Areas identified

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, NJ (ALL JURISDICTIONS)

COMMUNITY MAP HISTORY

COMMUNITY NAME	INITIAL IDENTIFICATION	FLOOD HAZARD BOUNDARY MAP REVISIONS DATE	FIRM EFFECTIVE DATE	FIRM REVISIONS DATE
Gibbsboro, Borough of	April 4, 1975	None	October 15, 1981	
Gloucester, City of	June 28, 1974	June 4, 1976	September 14, 1979	
Gloucester, Township of	December 13, 1974	None	December 1, 1982	
Haddon, Township of	November 22, 1974	June 4, 1976	March 1, 1982	
Haddon Heights, Borough of [1]	N/A	N/A	N/A	
Haddonfield, Borough of	November 30, 1973	February 6, 1976	April 15, 1977	December 23, 1977
Hi-Nella, Borough of [1]	N/A	N/A	N/A	
Laurel Springs, Borough of	February 21, 1975	None	May 13, 1977	December 12, 1980
Lawnside, Borough of	November 12, 1976	None	September 1, 1978	
Lindenwold, Borough of	November 22, 1974	June 18, 1976	September 17, 1980	
Magnolia, Borough of	February 25, 1977	None	November 24, 1978	
Merchantville, Borough of [1, 2]	N/A	N/A	N/A	
Mount Ephraim, Borough of	June 21, 1974	June 4, 1976	September 1, 1978	
Oaklyn, Borough of	February 22, 1974	March 19, 1976	November 3, 1978	
Pennsauken, Township of	January 16, 1974	March 19, 1976	April 15, 1977	October 16, 1991

[1] This community does not have map history prior to the first countywide mapping
[2] No Special Flood Hazard Areas identified

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, NJ (ALL JURISDICTIONS)

COMMUNITY MAP HISTORY

COMMUNITY NAME	INITIAL IDENTIFICATION	FLOOD HAZARD BOUNDARY MAP REVISIONS DATE	FIRM EFFECTIVE DATE	FIRM REVISIONS DATE
Pine Hill, Borough of	June 21, 1974	June 25, 1976	February 24, 1978	
Pine Valley, Borough of [1]	N/A	N/A	N/A	
Runnemede, Borough of	December 7, 1973	June 24, 1977	January 2, 1980	
Somerdale, Borough of	September 14, 1973	None	February 1, 1979	
Stratford, Borough of	March 22, 1974	July 16, 1976	September 17, 1980	
Tavistock, Borough of [1]	N/A	N/A	N/A	
Voorhees, Township of	February 21, 1975	None	September 1, 1978	
Waterford, Township of	June 28, 1974	June 4, 1976	April 29, 1983	
Winslow, Township of	July 26, 1974	July 30, 1976	January 20, 1982	
Woodlynne, Borough of	June 28, 1974	April 16, 1976	December 1, 1981	

[1] This community does not have map history prior to the first countywide mapping

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

CAMDEN COUNTY, NJ (ALL JURISDICTIONS)

COMMUNITY MAP HISTORY

7.0 OTHER STUDIES

Information pertaining to revised and unrevised flood hazards for each jurisdiction within Camden County has been compiled into this FIS. Therefore, this FIS supersedes all previously printed FIS Reports, FHBMs, FBFMs, and FIRMs for all of the incorporated areas within Camden County.

8.0 LOCATION OF DATA

Information concerning the pertinent data used in preparation of this FIS can be obtained by contacting the Flood Insurance and Mitigation Division of the Federal Emergency Management Agency, Region II Office, 26 Federal Plaza, Room 1337, New York, New York 10278.

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