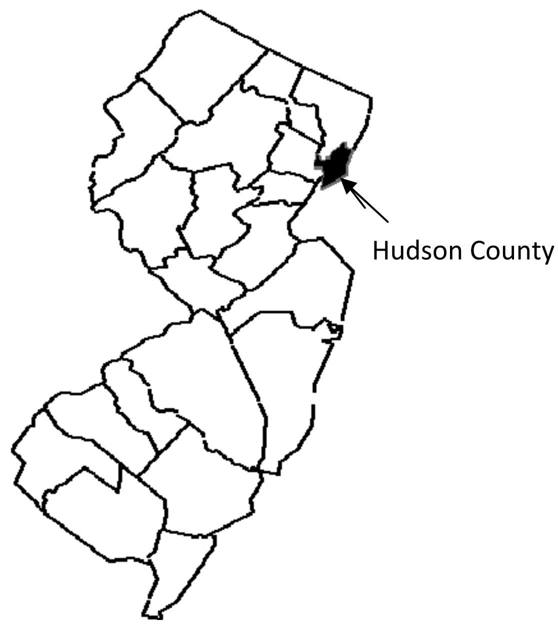
FLOOD INSURANCE STUDY

HUDSON COUNTY, NEW JERSEY
(ALL JURISDICTIONS)



COMMUNITY NAME	COMMUNITY NUMBER
BAYONNE, CITY OF	340218
EAST NEWARK, BOROUGH OF	340219
GUTTENBERG, TOWN OF	340220
HARRISON, TOWN OF	340221
HOBOKEN, CITY OF	340222
JERSEY CITY, CITY OF	340223
KEARNY, TOWN OF	340224
NORTH BERGEN, TOWNSHIP OF	340225
SECAUCUS, TOWN OF	340226
UNION CITY, CITY OF	340058
WEEHAWKEN, TOWNSHIP OF	340228
WEST NEW YORK, TOWN OF	340229

PRELIMINARY

REVISED: **DECEMBER 20, 2013**

Federal Emergency Management Agency

FLOOD INSURANCE STUDY NUMBER
34017CV000B

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) report may not contain all data available within the Community Map Repository. Please contact the Community Map 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: August 16, 2006

Revised Countywide FIS Date: TBD - To add Base Flood Elevations and Special Flood Hazard Areas; to change Base Flood Elevations, Special Flood Hazard Areas and zone designations; to update roads and road names; and to reflect updated topographic information.

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

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study (FIS) revises and updates a previous FIS/Flood Insurance Rate Map (FIRM) for the geographic area of Hudson County, including the Borough of East Newark; Cities of Bayonne, Hoboken, Jersey City and Union City; Towns of Guttenberg, Harrison, Kearny, Secaucus, and West New York; and the Townships of North Bergen and Weehawken (hereinafter referred to collectively as Hudson County). Please note that the New Jersey Meadowlands Commission[1] lies within Hudson County and Bergen County. The portion in Hudson County will be shown as an Area Not Included. Flood hazard information for the New Jersey Meadowlands Commission, is shown in its entirety on the FIS and FIRM for Bergen County (All Jurisdictions). Also, Ellis Island and Liberty Island in Hudson County will be shown as an Area Not Included, and will be shown in their entirety on the FIS and FIRM for the City of New York, New York.

This FIS aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood risk data for various areas of the community that will be used to establish actuarial flood insurance rates. This information will also be used by Hudson County to update existing floodplain regulations as part of the Regular Phase of the National Flood Insurance Program (NFIP), and 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 the Code of Federal Regulations at 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.

Information on the authority and acknowledgments for each jurisdiction with a previously printed FIS report included in this countywide FIS is shown on the following pages.

[1] On August 27, 2001, the Hackensack Meadowlands Commission was renamed the New Jersey Meadowlands Commission

Bayonne, City of:	the hydrologic and hydraulic analyses from the original February 15, 1983, FIS report were prepared by the New Jersey Department of Environmental Protection (NJDEP), Division of Water Resources, for the Federal Emergency Management Agency (FEMA), under Contract No. H-4623. That work was completed in January 1981. Part of the hydrologic and hydraulic analyses for that study was performed by Harris - Toups Associates under subcontract to the NJDEP.
East Newark, Borough of:	the hydrologic and hydraulic analyses from the September 1977 FIS report, were performed by the NJDEP, Division of Water Resources, Bureau of Floodplain Management, and Tippetts - Abbett - McCarthy - Stratton, Engineers and Architects for FEMA, formerly the Federal Insurance Administration (FIA), under contract No. 3855. That work was completed in November 1976.
Guttenberg, Town of:	the hydrologic and hydraulic analyses from the January 16, 1984, FIS report, were performed by Camp, Dresser and McKee, under subcontract to the New York State Department of Environmental Conservation (NYSDEC), during the FIS for the City of New York, dated May 16, 1983.
Harrison, Town of:	the hydrologic and hydraulic analyses from the September 1977 FIS, were performed by Tippetts - Abbett - McCarthy - Stratten, Engineers and Architects, for FEMA, under Contract Number H-3855. That work was completed in December 1976.
Hoboken, City of:	the hydrologic and hydraulic analyses from the May 17, 1982, FIS report, were prepared by the NJDEP, Division of Water Resources, for FEMA, under Contract No. H-4623. That work was completed in January 1981. Part of the hydrologic and hydraulic analyses for that study was performed by Harris - Toups Associates under subcontract to the NJDEP.

Jersey City, City of:	the hydrologic and hydraulic analyses from the September 1, 1983, FIS report, were prepared by the NJDEP, Division of Water Resources, for FEMA, under Contract No. H-4623. That work was completed in January 1981. Part of the hydrologic and hydraulic analyses for that study was performed by Harris - Toups Associates under subcontract to the NJDEP.
Kearny, Town of:	the hydrologic and hydraulic analyses from the February 1977 FIS report, were performed by the NJDEP, and Tippetts - Abbett - McCarthy - Stratton, Engineers and Architects for the FIA, under contract No. 3855. That work was completed in December 1976.
North Bergen, Township of:	the hydrologic and hydraulic analyses from the March 30, 1982, FIS, were prepared by the NJDEP for FEMA, under Contract No. 4546. That work was completed in November 1979. Part of the hydrologic and hydraulic analyses for that study was conducted by URS/MSR Engineers under subcontract to the NJDEP. The 1982 wave height analysis for that study was prepared by Dewberry and Davis under contract No. EMW-C-0543.
Weehawken, Township of:	the hydrologic and hydraulic analyses from the November 1, 1983, FIS report, were performed by Camp, Dresser and McKee, under subcontract to the NYSDEC, for FEMA, during the FIS for the City of New York, dated May 16, 1983.
West New York, Town of:	the hydrologic and hydraulic analyses from the November 1, 1988, FIS report, were performed by Camp, Dresser and McKee, under subcontract to the NYSDEC, for FEMA, during the FIS for the City of New York, dated May 16, 1983.

The authority and acknowledgments for the Town of Secaucus and City of Union City is not available because no FIS report was ever published for the communities.

For the August 16, 2006, countywide FIS, all jurisdictions within Hudson County were combined into a countywide format FIS.

For the [*date*] countywide FIS revision, the hydrologic and hydraulic analyses for Passaic River, and coastal wave height analysis along Hackensack River, Hudson River, Kill Van Kull, Newark Bay, Passaic River, and Upper New York Bay were prepared by Risk Assessment Mapping and Planning Partners (RAMPP) for FEMA under contract No.HSFEHQ-09-D-0369, task order HSFE02-09-J-0001. This work was completed in March 2013.

For the [*date*] countywide FIS revision, the base map information is from New Jersey Office of Information Technology (NJOIT), Office of Geographic Information Systems (OGIS). This information was derived from digital orthophotos produced at a scale of 1:2400 (1”=200’) with a 1 foot pixel resolution from photography dated 2012.

The projection used in the preparation of this map was State Plane New Jersey FIPS Zone 2900. The horizontal datum was North America Datum 1983 (NAD 83), Geodetic Reference System 1980 (GRS 80) spheroid. Differences in datum, spheroid, projection, or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdictional boundaries. These differences do not affect the accuracy of this FIRM.

1.3 Coordination

Consultation Coordination Officer's (CCO) meetings may be held for each jurisdiction in this countywide FIS. An initial CCO meeting is held typically 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 held typically 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 Hudson County and the incorporated communities within its boundaries are shown in Table 1, "CCO Meeting Dates for Precountywide FISs.”

TABLE 1 - CCO MEETING DATES FOR PRECOUNTYWIDE FISs

Community Name	Initial CCO Date	Final CCO Date
City of Bayonne	February 15, 1978	October 5, 1982
Borough of East Newark	May 16, 1975	November 9, 1976
Town of Guttenberg	*	June 21, 1983
Town of Harrison	May 16, 1975	November 30, 1976
City of Hoboken	February 9, 1978	December 23, 1981
City of Jersey City	February 17, 1978	August 8, 1982
Town of Kearny	May 16, 1975	December 16, 1976
Township of North Bergen	May 1979	November 3, 1981
Township of Weehawken	*	June 21, 1983
Town of West New York	*	June 21, 1983

*Data not available

For the August 16, 2006, countywide FIS, no initial CCO meeting was held. The communities were informed by letter dated August 26, 2005.

For the August 16, 2006, countywide FIS, a final CCO meeting was held on December 21, 2005, and was attended by representatives of the City of Bayonne, Town of Harrison, Township of North Bergen, Town of Secaucus, NJDEP, Medina, Dewberry, and FEMA.

For the [*date*] countywide FIS revision, an initial CCO meeting was held on November 15, 2011, and attended by representatives of NJDEP, RAMPP, FEMA, and local officials. The Flood Risk Review (FRR) meeting was held on September 12, 2013.

2.0 AREA STUDIED

2.1 Scope of Study

This FIS covers the incorporated areas of the geographic area of Hudson County, New Jersey.

The flooding in Hudson County is primarily attributed to riverine and tidal flooding from coastal including Hackensack River, Hudson River, Kill Van Kull, Passaic River and Upper New York Bay.

For the August 16, 2006, countywide FIS, the Hackensack, Hudson, and Passaic Rivers, Kill Van Kull, and Upper New York Bay were studied by detailed methods.

For the [*date*] countywide FIS revision, Hackensack River, Hudson River, Kill Van Kull, Newark Bay, Passaic River and Upper New York Bay were studied by detailed methods. Please note the updated coastal analyses conducted for this revision supersedes the riverine hydrologic and hydraulic analyses along the Passaic River.

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.

2.2 Community Description

Hudson County is located in northeastern New Jersey. Hudson County is comprised of 12 incorporated communities. The City of Bayonne is located in the southern portion of the county. The City of Union City, Towns of Guttenberg, Secaucus and West New York, New Jersey, and Townships of North Bergen and Weehawken are located in the northern portion of the county. The Borough of East Newark, City of Jersey City, and Towns of Kearny and Harrison are located in central Hudson County.

To the north, Hudson County is bordered by Bergen County Boroughs of Carlstadt, Cliffside Park, East Rutherford, Edgewater, Fairview, North Arlington, Ridgefield, and Rutherford and the Township of Lyndhurst. To the west, the Hudson County is bordered by Essex County, the City of Newark City and the

Township of Belleville, as well as the City of Elizabeth City in Union County. To the east, the Hudson River is the dividing border between the City of New York, New York, and the Hudson County area of the City of Hoboken, the northern portion of the City of Jersey City, the Towns of Guttenberg and West New York, New Jersey, and the Townships of North Bergen and Weehawken. Upper Bay borders the southern portion of the City of Jersey City. To the south, Hudson County is bordered by the City of New York, New York, where Kill Van Kull is the dividing border.

According to the 2010 U.S. Census, the land area in Hudson County was 46 square miles and the population of Hudson County was 634,266 (U.S. Census Bureau, 2013).

The topography of Hudson County varies from gentle rolling hills to flat lowland areas. Vegetation consists of planted lawns, trees, and shrubbery and is typical of residential, commercial areas. The climate of the county is characteristic of the Middle Atlantic seaboard. The climate in Hudson County is variable, with the winters characterized by cold dry air masses which have their origin over sub-polar continental regions, and summers characterized by warm, humid air masses from sub-tropical regions, modified by their passage over land surfaces. During the spring and fall, maritime polar air masses become increasingly influential. The average annual rainfall is approximately 42.4 inches and snowfall averages about 30 inches per year. The average annual temperature is approximately 55 degrees Fahrenheit (°F), with the lowest average temperature (32.2°F) in January and the highest average temperature (77.9°F) in July (National Oceanic and Atmospheric Administration (NOAA) - NOWData, 2013).

2.3 Principal Flood Problems

Flooding in Hudson County is caused primarily by tidal flooding, from such sources as the Upper New York Bay, New York Bay and Kill Van Kull. These sources in turn affect the riverine sources as the Hudson River, Hackensack River and Passaic River. Throughout Hudson County, low-lying surface flooding and interior shallow ponding occurs as a result of heavy rainfall accompanied by high tides. Concave coastal areas are prone to flooding caused by high tides and wind driven currents. Interior flooding is primarily due to inadequate capacity of combined storm and sanitary sewers (Haven and Emerson, Inc., 1979a, b, c; Malcolm Pirnie, Inc., 1979a, b, c).

Flooding in the Township of Weehawken, and Towns of Guttenberg and West New York is caused primarily by tidal flooding of the Hudson River in the low- lying areas along the shore.

In the Cities of Bayonne, Hoboken, and Jersey City the most severe flooding events were due to hurricanes. The flood of record for these cities occurred during Hurricane Donna on September 12, 1960. The water level at East Newark applicable to Newark Bay during September 12, 1960, flood reached 8.4 feet at high tide, a level of 5.5 feet above the normal high tide. The significant storm surge occurred in the Hackensack estuary occurred on November 25, 1950, when the water-surface elevation increased 9 feet above low tide, reaching an elevation of 6.5 feet. If this surge would have occurred at high tide, the resultant flood elevation would have reached 12 feet (FEMA, 2006).

The Towns of Kearny and Harrison are subject to tidal flooding from the Passaic River. The flooded areas run adjacent to the Passaic River. Flooding usually occurs when the annual peak rainfall coincides with a high tide in the Passaic River. A maximum recorded tide level of 8.33 feet was measured on the Passaic River at East Newark on September 12, 1960; it had a 20-year recurrence interval. The flood of record for the Passaic River was in October 1903 (FEMA, 2006). More recent floods in 1968, 1971, 1972, 1973, two in 1975, 1984, 1992, 1999, 2005, 2007, 2010, and 2011 were sufficiently devastating to warrant Federal Disaster declarations (USACE, 2013a).

In the Township of North Bergen, flooding results from the tidal stages of Newark Bay which affect the Hackensack River and, in turn, Bellmans Creek, Cromakill Creek, and Penhorn Creek, which wind their way through the Hackensack Estuary. Tidal elevation from the Hackensack River also affects the New Jersey Meadowlands Commission district with the Township from North Bergen.

The storm of record for the Hackensack River occurred during the April 15 – 18, 2007. The historical peak of record for the Hackensack River was recorded at U.S. Geological Survey (USGS) gage located at New Milford, New Jersey, (01378500) on April 16, 2007, with a discharge of 11,600 cubic feet per second (cfs) and a gage height of 12.22 ft (NOAA, 2013). This gage stopped operating during the flood when the water level submerged the equipment in the gage-house. High-water marks were retrieved after the flood receded (USGS, 2013).

For the [*date*] countywide FIS revision, recent storms which caused damages to the areas in Hudson County include; Hurricane Floyd in 1999, Hurricane Irene in 2011, and Hurricane Sandy in 2012 (FEMA, 2013).

Hurricane Floyd originally made landfall at Cape Fear, North Carolina as a Category 2 hurricane on September 16, 1999. The storm crossed over North Carolina and southeastern Virginia, before briefly entering the western Atlantic Ocean. The storm reached New Jersey on September 17, 1999. Record breaking flooding was recorded throughout the State of New Jersey. The Newark Bay and Hackensack River experienced flood level increases of up to 8.5 feet. A Federal Emergency Declaration was issued on September 17, 1999. Overall damage estimates for Hurricane Floyd, in the State of New Jersey are estimated around $250 million dollars (in 1999 dollars). The northern portion of the State of New Jersey, including Hudson County, experienced rainfall amounts between 8 to 14 inches.

Hurricane Irene came ashore at Little Egg Inlet in Southern New Jersey on August 28, 2011, having earlier been downgraded to a tropical storm. In anticipation of the storm, Governor Chris Christy declared a state of emergency on August 25, 2011. President Obama formally declared New Jersey a disaster area on August 31, 2011. Mandatory evacuations were ordered throughout the State of New Jersey. Wind Speeds were recorded at 75 mph and rain totals reached over 10 inches in many parts of the state. North Jersey and Central Jersey experienced widespread flooding and significant damage. Along the Hudson River, in parts of the Cities of Jersey City and Hoboken, flood waters rose as much as 5 feet. One week after Hurricane Irene passed through New Jersey all rivers in the state remained at moderate flooding levels. During the storm, 1.46 million customers lost power. Overall damage estimates, for the State of

New Jersey, came to over $1 billion dollars (in 2011 dollars); with over 200,000 homes and buildings damaged.

Hurricane Sandy ("Superstorm Sandy") came ashore as an immense tropical storm at Brigantine, New Jersey, on October 29, 2012. On October 30, 2012, President Obama approved a Major Disaster Declaration (FEMA-4086-DR-NJ) for the State of New Jersey. Rainfall amounts associated with Hurricane Sandy in New Jersey were between 2 to 4 inches, while the storm produced almost a foot of rain in states to the south. A full moon made the high tides 20 percent higher than normal and amplified the storm surge. The New Jersey shore suffered the most damage, battered by 14-foot waves and wind gusts up to 88 miles per hour. Governor Chris Christy declared a state of emergency on October 31, 2013. In Hudson County facilities, roadways, vehicles, and computer wiring were damaged and destroyed as a result of the storm. The estimated property damage to Hudson County facilities and vehicles is estimated at than $9 million in damages (Conte, 2012).

Massive power outages as a result of Hurricane Sandy occurred in the Cities of Bayonne, Jersey City and Hoboken and in the Townships of North Bergen and Weekawken. The power outages resulted in the evacuation of medical centers in both the City of Jersey City and the Township of North Bergen. Half of the City of Jersey City lost power, while large sections of the city's downtown flooded and had to be evacuated. As high tide approached, the Hudson River overflowed the wall at Exchange Place. Around the same time, Liberty Harbor spilled into the southern part of Marin Boulevard. Both breaches caused water to rush down Columbus Drive and Marin Boulevard where they met near the Historic District. From there, flood waters spread through the low lying areas of the City of Jersey City. Half of the City of Hoboken was flooded and the city government evacuated two of its fire stations. By late night October 31, 2012, an estimated 20,000 people were stranded in the City of Hoboken, surrounded by water. The severe flooding experienced during Hurricane Sandy in the City of Hoboken exceeded the 1821 flood of record (DiChiaro, 2013).

In the Township of Weehawken, the downtown neighborhood known as the Shades incurred terrible damage, with nearly every resident forced to temporarily relocate after 7 feet of water rushed through the streets. As the Township of Weehawken's topographical low point, Hurricane Sandy hit the Shades harder than almost any other area of Hudson County (DiChiaro, 2013).

2.4 Flood Protection Measures

Presently, there are no flood control measures that would alter flood hazards due to coastal flooding within Hudson County. Residents throughout the county depend on the usual warnings issued through the radio, television, and local newspapers for information concerning possible flood conditions. Flood warnings and predicted flood peaks are issued by NOAA, Flood Forecasting Center, located at Mount Holly, New Jersey.

The U.S. Army Corps of Engineers (USACE) have planned a project for the Passaic River Basin that would provide flood protection for the Towns of Harrison and Kearny and the Borough of East Newark. The planned project would consist of channel improvements, flood walls and levees, and flood impoundments. At the time of the [*date*] countywide FIS revision, the project is under re-evaluation and therefore not considered in this study (USACE, 2013b).

The New Jersey Meadowlands Commission authorized by state statute in January 1969, has jurisdiction over commercial development in the Hackensack Meadowlands District. In connection with New York District of the USACE, flood protection measures for the Hackensack River are being studied. Various plans for flood control have been presented by the USACE in their draft report and in their Environmental Impact Statement on the Hackensack River Basin (USACE, 1969; USACE, Unpublished).

Hudson County has no levee type structure that would require analysis of levee failure and removal under Section D.2.10.3.4.1 of the Draft Atlantic Ocean and Gulf of Mexico Coastal Guidelines update.

In alignment with standard practice used in other FEMA studies, all coastal armoring structures and beach stabilization structures have been included in the analysis without adjusting the analysis to remove the structure or reduce the effects of the structure.

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-, 50-, 100-, or 500-year 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 average 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 Hydrologic Analyses

For the [*date*] countywide FIS revision, detailed hydrologic analyses were carried out to establish peak discharge-frequency relationships for four frequencies for the Passaic River. The updated coastal analyses conducted for this revision supersede the riverine hydrologic analyses along the Passaic River.

3.2 Hydraulic Analyses

For the [*date*] countywide FIS revision, the updated coastal analyses supersede the riverine hydraulic analyses along the Passaic River.

Qualifying bench marks 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 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.

Bench marks 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 bench marks, 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 inclusion criteria.

To obtain current elevation, description, and/or location information for bench marks 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. Although these monuments are not shown on the FIRM, they may be found in the Technical Support Data Notebook associated with this FIS and FIRM. Interested individuals may contact FEMA to access this data.

3.3 Coastal Analyses

Coastal storm surge analyses was performed for the Hackensack and Hudson Rivers, Kill Van Kull, Newark Bay, Upper New York Bay and the all the bays and inlets within these areas.

The extent of coastal flooding due to hurricanes and northeasters is determined by three factors: 1) the nature of the storm with respect to intensity, duration, and path; 2) astronomical tide conditions at the time the storm-surge wave reaches the shore; and 3) the physical geometry and bathymetry of a particular area, which affects the time and passage of the surge wave.

The FEMA, Region II office, initiated a study in 2009 to update the coastal storm surge elevations within the states of New York and New Jersey including the Atlantic Ocean, the Barnegat Bay, the Raritan Bay, the Jamaica Bay, the Long Island Sound and their tributaries. The study replaces outdated coastal analyses as well as previously published storm surge stillwater elevations for all FIS Reports in the study area, including Hudson County, New Jersey, and serves as the basis for updated FIRMs.

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. ADCIRC was dynamically coupled to the unstructured numerical wave model Simulating Waves Nearshore (unSWAN) to calculate the contribution of waves to total storm surge (FEMA, 2010). The resulting model system is typically referred to as SWAN+ADCIRC (FEMA, 2010). 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 five major flood events for the Region II domain: the 1938 hurricane, Hurricane Ethel, Hurricane Gloria, and two extra-tropical storms, from 1991 and 1992. Two of the more recent storm events, Hurricane Irene and Hurricane Sandy were not used in this study for validation. Both Hurricane Irene and Hurricane Sandy occurred during the study or after this storm surge was completed. Hurricane Irene was a major rainfall event and did not produce major coastal tidal flooding. The climatology of Hurricane Sandy, at this time, is not well studied.

Model skill was assessed by quantitative comparison of model output to wind, wave, water level and high water mark observations. The model was then used to simulate 30 historical extra-tropical storms and 157 synthetic hurricanes to create a synthetic water elevation record from which the 10-, 2-, 1-, and 0.2- percent annual chance of exceedence elevations were determined.

Wave setup results in an increased water level at the shoreline due to the breaking of waves and transfer of momentum to the water column during hurricanes and severe storms. For the New York and New Jersey surge study, wave setup was determined directly from the coupled wave and storm surge model. The total stillwater elevation (SWEL) with wave setup was then used for the erosion and wave modeling.

The stillwater elevations for the 10-, 2-, 1-, and 0.2- percent annual chance floods determined for the primary sources of flooding in Hudson County: Hackensack River, Hudson River, Kill Van Kull, Newark Bay, Passaic River, and Upper New York Bay are shown in Table 2, "Transect Data." The analyses reported herein reflect the stillwater elevations due to tidal and wind setup effects. 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.

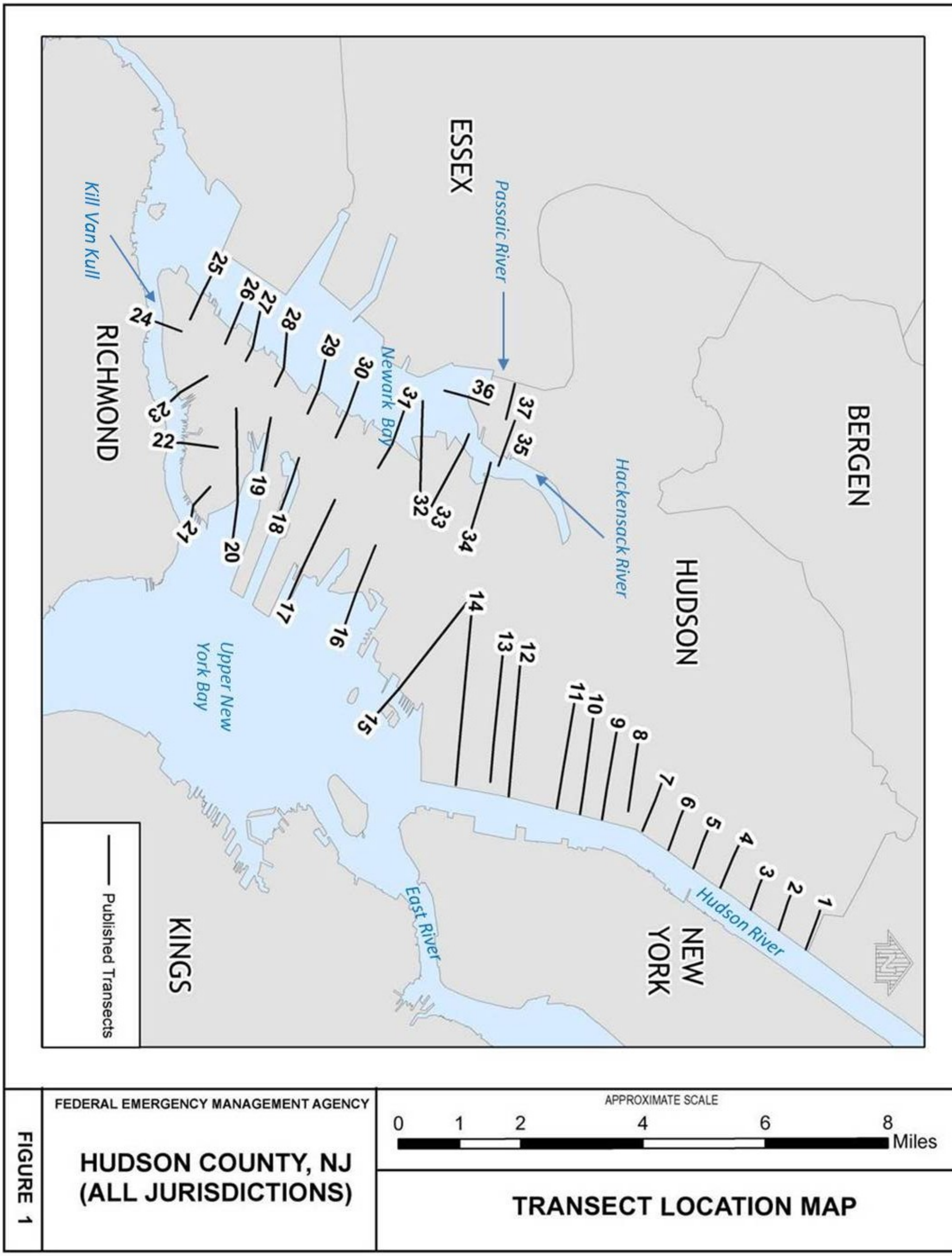
The Hackensack River, Hudson River, Kill Van Kull, Newark Bay, Passaic River, and Upper New York Bay are the primary flooding sources in Hudson County. Coastal flooding along Hackensack River in the western part of the county affects the Town of Kearny and City of Jersey City. Coastal flooding along Hudson River in the northeastern part of the county affects the City of Hoboken, Town of Guttenberg, Town of West New York, Township of North Bergen, and Township of Weehawken. Coastal flooding along Kill Van Kull in the southern part of the county affects the City of Bayonne. Coastal flooding along Newark Bay in the southwestern part of the county affects the City of

Bayonne and the City of Jersey City. Coastal flooding along Passaic River in the northwestern part of the county affects the Town of Kearny. Coastal flooding along Upper New York Bay in the eastern part of the county affects the Cities of Bayonne, Hoboken, and Jersey City. In Hudson County, the moderately sloped shoreline is comprised of high density residential, commercial and industrial areas. The shoreline along the southern portion of Upper New York Bay is comprised mostly of recreational parks and commercial areas.

The tidal surge in the Hackensack River, Hudson River, Kill Van Kull, Newark Bay, Passaic River, and Upper New York Bay affects 25 miles of Hudson County coastline, and that entire length was modeled for overland wave propagation. The fetch length across the Hackensack River, Kill Van Kull, and Passaic River varies from approximately 0.1 to 0.4 mile, across the Hudson River and Newark Bay varies from approximately 0.6 to 1.4 miles, and across the Upper New York Bay varies from approximately 0.9 to 4 miles.

The coastal hydraulic analysis for this revision involved transect layout, field reconnaissance, and overland wave modeling including wave setup, wave height and wave run-up analysis.

Transects represent the locations where the overland wave height analysis was modeled and are placed with consideration given to topography, land use, shoreline features and orientation, and the available fetch distance. Each transect was placed to capture the dominant wave direction, typically perpendicular to the shoreline and extended inland to a point where coastal flooding ceased. Along each transect, wave heights were computed considering the combined effects of changes in ground elevation, obstructions, and wind contributions. Transects were placed along the shoreline along all sources of primary flooding in Hudson County, as illustrated on the FIRMs and in the "Transect Location Map" provided in Figure 1. Transects also represent locations visited during field reconnaissance to assist in parameterizing obstructions and observing shore protection features.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Hackensack River
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Upper New York Bay
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Hudson River
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Published Transects
FEDERAL EMERGENCY MANAGEMENT AGENCY
HUDSON COUNTY, NJ (ALL JURISDICTIONS)
FIGURE 1
APPROXIMATE SCALE
0 1 2 4 6 8 Miles
TRANSECT LOCATION MAP

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) (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.

Simulations of inland wave propagation were 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 total stillwater and starting wave information extracted from the coupled wave and storm surge model. In Table 2, "Transect Data," the 10-, 2-, 1-, and 0.2-percent annual chance stillwater elevations for each transect are provided along with the starting wave height and period. Simulations of wave transformations were then conducted with WHAFIS taking into account the storm-induced erosion and overland features of each transect. The model outputs the combined flood elevation from the total 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 heights were calculated to the nearest 0.1 foot, and BFEs were determined at whole-foot increments along the transects.

Wave runup is defined as the maximum vertical extent of wave uprush on a beach or structure. FEMA's 2007 Guidelines and Specifications require the 2% wave runup level be computed for the coastal feature being evaluated (cliff, coastal bluff, dune, or structure) (FEMA, 2007a). The 2% runup level is the highest 2 percent of wave runup 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 (Kobayahi and Farhadzdeh, 2008; Dean, 2010). 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 following the FEMA 2007 Guidelines and Specifications.

The results of the overland wave height and runup calculations are accurate until local topography, vegetation, or cultural development within the community undergoes major changes. Consequently between transects, elevations were interpolated using topographic maps, land-use and land-cover data, and engineering judgment to determine the extent of coastal flood zones.

TABLE 2 – TRANSECT DATA

Flood Source	Transect	Starting Wave Conditions for the 1% Annual Chance			Starting Stillwater Elevations (ft NAVD88) Range of Stillwater Elevations* (ft NAVD88)			
		Coordinates	Significant Wave Height	Peak Wave Period	10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Hudson River	1	N 40.799803 W 73.993090	4.06	5.11	5.8	8.8	10.2	13.5
Hudson River	2	N 40.792746 W 73.996743	4.44	5.16	6.0	8.9 8.6 - 8.9	10.2 10.0 - 10.2	13.6
Hudson River	3	N 40.785869 W 74.000399	4.59	5.18	6.3	9.1 9.0 - 9.1	10.6 10.6 - 10.8	13.6 13.4 - 13.4
Hudson River	4	N 40.779791 W 74.007191	4.16	4.43	6.4 6.4 - 6.6	9.2 9.1 - 9.2	10.6 10.5 - 10.6	14.0 13.9 - 14
Hudson River	5	N 40.772585 W 74.010728	4.23	4.44	6.3 6.2 - 6.3	9.1 8.9 - 9.1	10.5 10.4 - 10.5	13.9
Hudson River	6	N 40.767208 W 74.016558	4.38	4.78	6.4 6.2 - 6.4	9.3 9.0 - 9.3	10.7 10.5 - 10.7	14.1
Hudson River	7	N 40.761365 W 74.020765	4.57	4.87	6.8 6.8 - 7.5	9.4	10.9 10.8 - 10.9	14.6 14.4 - 14.4
Hudson River	8	N 40.756197 W 74.026952	4.33	4.59	6.6 5 - 6.6	9.5 9.3 - 9.5	10.9 10.7 - 10.9	14.4 14.1 - 14.4
Upper New York Bay	9	N 40.749858 W 74.023334	4.38	5.06	6.6 5.5 - 7.4	9.4 9.0 - 9.7	10.8 10.4 - 10.8	14.2 14.0 - 14.2
Upper New York Bay	10	N 40.744340 W 74.022874	4.41	4.91	6.6 5.2 - 6.6	9.4 8.8 - 9.4	10.9 10.0 - 10.9	14.3 14.0 - 14.0
Upper New York Bay	11	N 40.739324 W 74.026765	4.48	4.89	6.7 4.2 - 6.7	9.6 8.8 - 9.7	10.8 9.9 - 10.8	14.3 14 - 14.3
Upper New York Bay	12	N 40.727407 W 74.030369	4.73	5.31	7.3 7.3 - 7.4	9.6 9.0 - 9.8	11 10.7 - 11	14.5 14.5 - 14.6
Upper New York Bay	13	N 40.723107 W 74.033990	4.70	5.25	6.8 6.4 - 7.4	9.8 9.0 - 9.8	11.2 10.7 - 11.2	14.7 14.5 - 14.6
Upper New York Bay	14	N 40.714939 W 74.033036	5.01	5.95	6.8 5.4 - 10.2	9.8 9.2 - 10.1	11.1 10.7 - 11.7	14.7 14.6 - 15.2
Upper New York Bay	15	N 40.700698 W 74.046940	4.35	4.03	7.0 6.5 - 7.5	10.0 9.8 - 10.7	11.5 11.2 - 11.7	15.1 14.6 - 15.0
Upper New York Bay	16	N 40.690577 W 74.069541	4.55	4.06	7.1 5.6 - 7.1	10.2 8.8 - 10.2	11.7 10.9 - 11.7	15.4 15.4 - 15.7

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

TABLE 2 – TRANSECT DATA (continued)

Flood Source	Transect	Starting Wave Conditions for the 1% Annual Chance			Starting Stillwater Elevations (ft NAVD88) Range of Stillwater Elevations* (ft NAVD88)			
		Coordinates	Significant Wave Height	Peak Wave Period	10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Upper New York Bay	17	N 40.677771 W 74.075341	5.35	4.51	7.1	10.2 9.8 - 10.2	11.7 11.5 - 11.8	15.3 15.4 - 15.6
Upper New York Bay	18	N 40.675218 W 74.096037	2.82	3.72	7.2 7.0 - 7.6	10.5 10.3 - 10.5	12.0 11.9 - 12.0	15.7
Upper New York Bay	19	N 40.669678 W 74.107298	2.38	3.64	7.3	10.5 10.4 - 10.5	11.9 11.8 - 11.9	15.5 15.4 - 15.4
Upper New York Bay	20	N 40.662518 W 74.091162	4.44	3.91	7.2 6.8 - 7.4	10.2 8.6 - 10.5	11.7 11.6 - 11.7	15.2 14.3 - 15.4
Kill Van Kull	21	N 40.652020 W 74.090368	3.20	3.40	7.1 6.9 - 7.5	10.0 10.0 - 10.2	11.4 11.4 - 11.6	14.7 14.7 - 15.2
Kill Van Kull	22	N 40.650039 W 74.104961	1.49	2.30	7.0 7.0 - 7.5	9.8	11.1 10.8 - 11.7	14.1 13.8 - 13.9
Kill Van Kull	23	N 40.648920 W 74.116977	1.42	2.26	7.3 7.3 - 9.9	10.0 9.8 - 10.4	11.1 10.8 - 11.7	14.0 14.1 - 14.3
Newark Bay	24	N 40.645166 W 74.132935	1.51	2.28	7.0 6.9 - 7.5	9.7 9.6 - 9.8	10.9 10.8 - 10.9	13.8 13.7 - 13.7
Newark Bay	25	N 40.654035 W 74.140136	3.31	3.26	7.0	9.6 9.1 - 9.6	10.8 10.6 - 10.8	13.8 13.5 - 13.6
Newark Bay	26	N 40.661236 W 74.132302	3.24	3.43	6.9	9.6	10.8	13.8 13.8 - 14.1
Newark Bay	27	N 40.666101 W 74.127592	3.23	3.43	6.9	9.6	10.8	13.7 13.7 - 13.9
Newark Bay	28	N 40.673435 W 74.122662	3.25	3.43	6.9	9.6	10.8	13.8 13.8 - 14.4
Newark Bay	29	N 40.681681 W 74.117757	3.29	3.32	6.9 6.8 - 6.9	9.6 9.4 - 9.6	10.8 10.7 - 10.8	13.9 13.9 - 14.2
Newark Bay	30	N 40.688402 W 74.112202	3.29	3.32	6.9 6.8 - 7.3	9.6 9.0 - 9.6	10.8 10.5 - 10.8	13.9 13.9 - 14.5
Newark Bay	31	N 40.699091 W 74.104850	3.20	3.27	6.8 6.7 - 6.8	9.5 9.3 - 9.5	10.8 10.6 - 10.8	13.8 13.8 - 13.9
Newark Bay	32	N 40.706025 W 74.106465	2.84	3.25	6.8 6.7 - 6.8	9.5 8.9 - 10.6	10.8 10.3 - 10.8	13.9 13.5 - 13.7
Hackensack River	33	N 40.715982 W 74.104166	2.59	3.06	6.7 6.6 - 6.7	9.5 8.2 - 9.7	10.7 9.9 - 11.7	13.8 13.4 - 13.5
Hackensack River	34	N 40.721675 W 74.097527	1.92	2.60	6.7 6.6 - 6.7	9.4 8.7 - 9.7	10.6 10.1 - 10.6	13.7 13.3 - 13.3
Hackensack River	35	N 40.724901 W 74.101617	1.18	1.94	6.6 6.3 - 6.7	9.3 9.1 - 9.5	10.6 10.5 - 10.8	13.6 13.6 - 13.7
Hackensack River	36	N 40.717139 W 74.115851	2.71	3.22	6.9 6.9 - 7.5	9.6 9.2 - 9.8	10.9 10.5 - 10.9	14.0 13.8 - 13.8
Passaic River	37	N 40.727787 W 74.117710	0.86	1.59	6.8 6.6 – 8.0	9.5 9.2 - 9.5	10.8 10.6 - 10.8	13.9

*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 zones. The USACE has established the 3-foot breaking wave as the criterion for identifying the limit of coastal high hazard zones. 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 one exception to the 3-foot wave criteria is where a primary frontal dune exists. The limit of the coastal high hazard area then becomes the landward toe of the primary frontal dune or where a 3-foot or greater breaking wave exists, whichever is most landward. The coastal high hazard zone 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 2.

Post-storm field visits and laboratory tests have confirmed that wave heights as small as 1.5 feet can cause significant damage to structures when constructed 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. 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 2 "Transect Schematic".

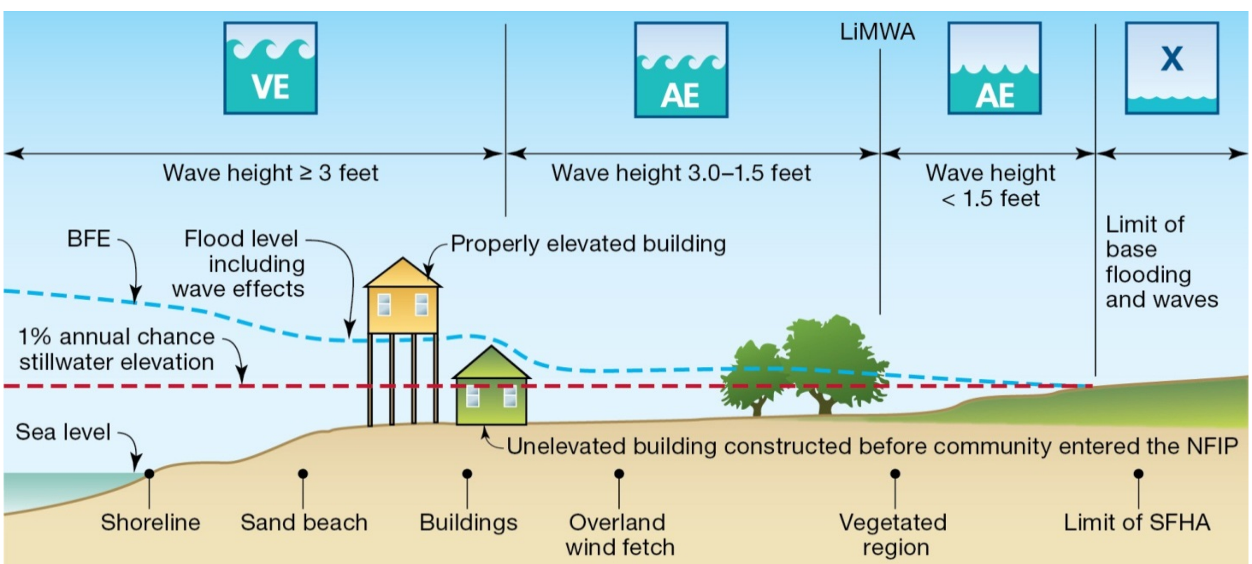

Figure 2 – Transect Schematic

3.4 Vertical Datum

All FISs 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 in use for newly created or revised FISs and FIRMs was the National Geodetic Vertical Datum of 1929 (NGVD 29). With the finalization of the North American Vertical Datum of 1988 (NAVD 88), many FIS reports and FIRMs are being prepared using NAVD 88 as the referenced vertical datum.

All flood elevations shown in this FIS report and on the FIRM are referenced to NAVD 88. Structure and ground elevations in the community must, therefore, be referenced to NAVD 88. It is important to note that adjacent communities may be referenced to NGVD 29. This may result in differences in base flood elevations across the corporate limits between the communities.

As noted above, the elevations shown in the FIS report and on the FIRM for Hudson County are referenced to NAVD 88. Ground, structure, and flood elevations may be compared and/or referenced to NGVD 29 by applying a standard conversion factor. The conversion factor to NGVD 29 is +1.1 (NAVD 88 = NGVD 29 – 1.1) . The BFEs shown on the FIRM represent whole-foot rounded values. For example, a BFE of 102.4 will appear as 102 on the FIRM and 102.6 will appear as 103. Therefore, users that wish to convert the elevations in this FIS to NGVD 29 should apply the stated conversion factor(s) to elevations shown on the Flood Profiles and supporting data tables in the FIS report, which are shown at a minimum to the nearest 0.1 foot.

For information regarding conversion between the NGVD and NAVD, 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
(301) 713-3242

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The N F I P encourages State and local governments to adopt sound floodplain management programs. To assist in this endeavor, each FIS provides one 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 one 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 (100-year) flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2-percent annual chance (500-year) flood is employed to indicate additional areas of flood risk in the community.

For the [*date*] countywide revision, the coastal boundaries were mapped using Light Detection and Ranging (LiDAR) data flown by Sanborn in 2006 and 2007 as part of the LiDAR acquisition initiative lead by the National Geospatial-Intelligence Agency (NGA) in 2006 for the metropolitan New Jersey area (NGA, 2006). Full details of the terrain development process can be found in the *Region II Coastal Terrain Processing Methodology Documentation Report* included as part of the Region II NY/NJ Storm Surge Study TSDN (RAMPP, 2011).

The 1- and 0.2-percent annual chance floodplain boundaries are shown on the FIRM (Exhibit 1). On this map, the 1-percent annual chance floodplain and boundaries correspond to the boundaries of the areas of special flood hazard (Zones VE, AE, AO and A), and the 0.2-percent annual chance floodplain boundaries correspond to the boundaries of areas of moderate flood hazard. In cases where the 1- and 0.2-percent annual chance floodplain are close together, only the 1-percent annual chance floodplain boundaries have 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.

New Jersey Flood Hazard Area Design Flood

The NJDEP is mandated to delineate and regulate flood hazard areas pursuant to N.J.S.A. 58:16A-50 et seq., the Flood Hazard Area Control Act. This Act authorizes the Department to adopt land use regulations for development within the flood hazard areas, to control stream encroachments and to integrate the flood control activities of the municipal, county, State and Federal Governments.

The State's Flood Hazard Area delineations are defined by the New Jersey Flood Hazard Area Design Flood. In 1974, the Water Policy and Supply Council passed a resolution stating that the New Jersey Flood Hazard Area Design Flood shall be equal to a design flood discharge 25 % greater in flow than the 100 year or 1- percent annual chance flood. In addition, the floodway shall be based on encroachments that produce no more than a 0.2 foot water surface rise above the 100 year or 1-percent annual chance flood. These flood hazard area delineations must be adopted by NJDEP.

4.2 Floodways

Encroachment on floodplains, such as artificial fill, reduces the flood-carrying capacity and increases flood heights, thus increasing flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from flood plain development against the resulting increase in flood hazard. For purposes of the National Flood Insurance Program, the concept of a floodway is used as a tool to assist local communities in this aspect of flood plain management. Under this concept, the area of the one percent annual chance flood is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus and adjacent flood plain areas, that must be kept free of encroachment in order that the one percent annual chance be carried without substantial increases in flood heights. Criteria adopted by the NFIP limit such increase to 1.0 foot, provided that hazardous velocities are not produced.

The area between the floodway and the boundary of the one percent annual chance flood is termed the floodway fringe. The floodway fringe thus encompasses the portion of the flood plain that could be completely obstructed without increasing the water-surface elevation of the one percent annual chance flood more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 3, "Floodway Schematic."

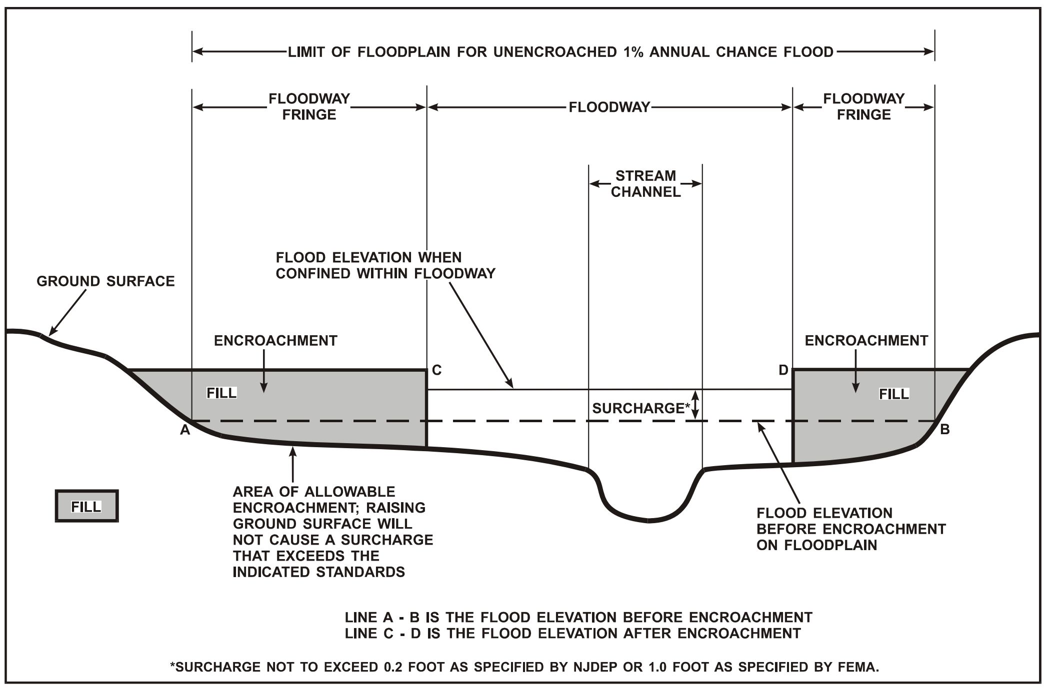

Figure 3 – Floodway Schematic

No floodways have been computed for this study as the coastal analyses supersedes the riverine analyses.

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 one percent annual chance floodplains that are determined in the FIS by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no BFEs or depths are shown within this zone.

Zone AE

Zone AE is the flood insurance rate zone that corresponds to the one percent annual chance floodplains that are determined in the FIS by detailed methods. In most instances, whole-foot BFEs 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 one percent annual chance shallow flooding (usually areas of ponding) where average depths are between 1 and 3 feet. Whole-foot BFEs 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 one 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 one 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 one percent annual chance or greater flood event.

Zone A99

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

Zone V

Zone V is the flood insurance rate zone that corresponds to the one percent annual chance coastal floodplains that have additional hazards associated with storm waves. Because approximate hydraulic analyses are performed for such areas, no BFEs are shown within this zone.

Zone VE

Zone VE is the flood insurance rate zone that corresponds to the one percent annual chance coastal floodplains that have additional hazards associated with storm waves. Whole-foot BFEs 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 areas of one percent annual chance flooding where average depths are less than 1 foot, areas of one percent annual chance flooding where the contributing drainage area is less than 1 square mile, and areas protected from the one percent annual chance flood by levees. No BFEs 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 one percent annual chance floodplains that were studied by detailed methods, shows selected whole-foot BFEs 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. On selected FIRM panels, the locations of selected coastal transects used in the coastal analyses are shown where applicable.

The current FIRM presents flooding information for the entire geographic area of Hudson County, excluding the New Jersey Meadowlands Commission areas of jurisdiction which are shown in their entirety on the Bergen County FIRMs only. Historical data relating to the maps prepared for each community are presented in Table 3, "Community Map History."

COMMUNITY NAME	INITIAL IDENTIFICATION	FLOOD HAZARD BOUNDARY MAP REVISIONS DATE	FIRM EFFECTIVE DATE	FIRM REVISIONS DATE
Bayonne, City of	May 17, 1974	September 17, 1976	August 15, 1983	
East Newark, Borough of	June 28, 1974	June 11, 1976	September 30, 1977	
Guttenberg, Town of	June 28, 1974	February 6, 1976	July 16, 1984	
Harrison, Town of	June 28, 1974	None	September 30, 1977	
Hoboken, City of	June 28, 1974	April 30, 1976	November 17, 1982	
Jersey City, City of	July 25, 1975	August 13, 1976	March 1, 1984	
Kearny, Town of	June 28, 1974	August 13, 1976	December 1, 1977	
North Bergen, Township of	June 28, 1974	October 31, 1975 August 13, 1976	September 30, 1982	
Secaucus, Town of	October 5, 1973	August 13, 1976	March 25, 1983	
Weehawken, Township of	August 2, 1974	March 5, 1976	May 1, 1984	
West New York, Town of	May 31, 1974	August 20, 1976	May 1, 1984	

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

HUDSON COUNTY, NJ
(ALL JURSIDICTIONS)

COMMUNITY MAP HISTORY

7.0 OTHER STUDIES

Information pertaining to revised and unrevised flood hazards for each jurisdiction within Hudson County has been compiled in this FIS. Therefore, this FIS supersedes all previously printed FIS reports, FIRMs, and/or FBFMs for all of the incorporated jurisdictions within Hudson County.

8.0 LOCATION OF DATA

Information concerning the pertinent data used in preparation of this FIS can be obtained by contacting FEMA, Federal Insurance and Mitigation Division, 26 Federal Plaza, Room 1351, New York, New York 10278.

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