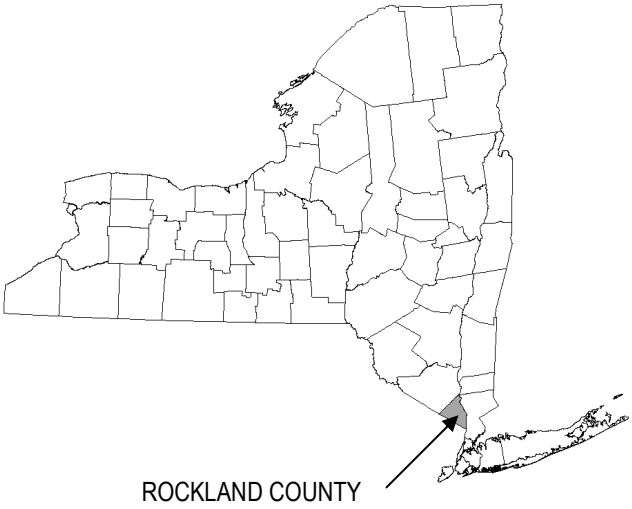
FLOOD INSURANCE STUDY

Volume 1 of 3

ROCKLAND COUNTY, NEW YORK (ALL JURISDICTIONS)

COMMUNITY NAME	COMMUNITY NUMBER
AIRMONT, VILLAGE OF	360140
CHESTNUT RIDGE, VILLAGE OF	361615
CLARKSTOWN, TOWN OF	360679
GRAND VIEW-ON-HUDSON, VILLAGE OF	360680
HAVERSTRAW, TOWN OF	360681
HAVERSTRAW, VILLAGE OF	360682
HILLBURN, VILLAGE OF	360683
KASER, VILLAGE OF	365376
MONTEBELLO, VILLAGE OF	361617
NEW HEMPSTEAD, VILLAGE OF	361618
NEW SQUARE, VILLAGE OF	360684
NYACK, VILLAGE OF	360685
ORANGETOWN, TOWN OF	360686
PIERMONT, VILLAGE OF	360687
POMONA, VILLAGE OF	360688
RAMAPO, TOWN OF	365340
SLOATSBURG, VILLAGE OF	360690
SOUTH NYACK, VILLAGE OF	360691
SPRING VALLEY, VILLAGE OF	365344
STONY POINT, TOWN OF	360693
SUFFERN, VILLAGE OF	360694
UPPER NYACK, VILLAGE OF	360695
WESLEY, HILLS, VILLAGE OF	361616
WEST HAVERSTRAW, VILLAGE OF	360696



Effective:
March 3, 2014

Federal Emergency Management Agency

FLOOD INSURANCE STUDY NUMBER
36087CV001A

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. Please contact the Community Map Repository for any additional data.

Selected Flood Insurance Rate Map (FIRM) panels for the communities in Rockland County contain information that was previously shown separately on the corresponding Flood Boundary and Floodway Map panels (e.g., floodways, cross sections). In addition, former flood hazard zone designations have been changed as follows:

Old Zone	New Zone
A1 through A30	AE
V1 through V30	VE
B	X
C	X

The Federal Emergency Management Agency (FEMA) may revise and republish part or all of this FIS at any time. In addition, FEMA may revise part of this FIS report by the Letter of Map Revision process, which does not involve republication or redistribution of the FIS report. Therefore, users should consult with community officials and check the Community Map Repository to obtain the most current FIS report components. A listing of the Community Map Repositories can be found on the Index Map.

Initial Countywide FIS Effective Date: March 3, 2014

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EXHIBITS

Exhibit 1 – Flood Profiles

EXHIBITS

FLOOD INSURANCE STUDY
ROCKLAND COUNTY, NEW YORK (ALL JURISDICTIONS)

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study (FIS) report revises and updates information on the existence and severity of flood hazards in the geographic area of Rockland County, including the Towns of Clarkstown, Haverstraw, Orangetown, Ramapo and Stony Point; and the Villages of Airmont, Chestnut Ridge, Grand View-on-Hudson, Haverstraw, Hillburn, Kaser, Montebello, New Hempstead, New Square, Nyack, Piermont, Pomona, Sloatsburg, South Nyack, Spring Valley, Suffern, Upper Nyack, Wesley Hills, and West Haverstraw (hereinafter referred to as Rockland County).

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 and to assist the community in its efforts to promote sound floodplain management. Minimum floodplain management requirements for participation in the National Flood Insurance Program (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.

This FIS was prepared to include all jurisdictions within Rockland County into a countywide format FIS. Information on the authority and acknowledgments for each jurisdiction with a previously printed FIS report are included in this countywide FIS is shown below.

Chestnut Ridge, Village of:	For the September 16, 1988 FIS, the hydrologic and hydraulic analyses were prepared by Leonard Jackson Associates during the preparation of the FIS for the Town of Ramapo. That study, which was completed May 1986, covered all significant flooding in the Village of Chestnut Ridge (Reference 1).

Clarkstown, Town of:	For the original September 2, 1982 FIS and March 2, 1983 FIRM, the hydrologic and hydraulic analyses were prepared by Goodkind & O'Dea, Inc., for the Federal Emergency Management Agency (FEMA), under Contract No. H-4550. This work was completed in December 1980. For the March 1, 1984 FIS the hydrologic and hydraulic analyses represented a revision of the original analyses by Goodkind and O'Dea, Inc., for FEMA. That work was completed in April 1983. For the May 18, 2000 revision, the hydrologic and hydraulic analyses for Demarest Kill were prepared by Leonard Jackson Associates for FEMA, under Contract No. EMW-93-C4145. That study, which was completed in September 1997, covered all significant flooding in the Town of Clarkstown (Reference 2).
Grand View-on-Hudson, Village of:	For the April 15, 1981 FIS, the hydrologic and hydraulic analyses were performed by Goodkind & O'Dea, Inc., for the Federal Insurance Administration (FIA), under Contract No. H-4550. That study, which was completed November 1979, covered all significant flooding in the Village of Grand View-on-Hudson (Reference 3).
Haverstraw, Town of:	For the July 6, 1981 FIS, the hydrologic and hydraulic analyses were prepared by Goodkind and O'Dea for FEMA, under Contract No. H-4550. That study, which was completed in December 1979, covered all significant flooding in the Town of Haverstraw (Reference 4).
Haverstraw, Village of:	For the March 2, 1981 FIS, the hydrologic and hydraulic analyses were prepared by Goodkind and O'Dea for the FIA, under Contract No. H-4550. That study, which was completed in November 1979, covered all significant flooding in the Village of Haverstraw (Reference 5).

Hillburn, Village of:	For the original, July 6, 1981 FIS and January 6, 1982 FIRM, the hydrologic and hydraulic analyses were prepared by Goodkind and O'Dea, Inc., for the FIA, under Contract No. H4550. That work was completed in February 1980. For the September 20, 1996 revision to the FIS, the hydraulic analysis was prepared by Leonard Jackson Associates for FEMA, under Contract No. EMW-93-C-4l45. That study, which was completed in May 1994, covered all significant flooding in the Village of Hillburn (Reference 6).
Montebello, Village of:	The Village of Montebello, New York, became an incorporated entity in 1986; this area was previously mapped on the 1976 Town of Ramapo FIRM. For the January 18, 1989 revision to the FIS, the hydrologic and hydraulic analyses were prepared by Leonard Jackson Associates during the preparation of the FIS for the Town of Ramapo. That study, which was completed in May 1986, covered all significant flooding in the Village of Montebello (Reference 7).
New Hempstead, Village of:	The Village of New Hempstead, New York, became an incorporated entity in 1983; this area was previously mapped on the 1976 Town of Ramapo FIRM. For the December 16, 1988 FIS, the hydrologic and hydraulic analyses were prepared by Leonard Jackson Associates during the preparation of the FIS for the Town of Ramapo. That study, which was completed in May 1986, covered all significant flooding in the Village of New Hempstead (Reference 8).
Nyack, Village of:	For the December 4, 1985 FIS, the hydrologic and hydraulic analyses were performed by Goodkind & O'Dea, Inc., during the course of

	the FIS for the Village of South Nyack. That study, which was completed in December 1979, covered all significant flooding in the Village of Nyack (Reference 9).
Orangetown, Town of:	For the February 2, 1982 FIS, the hydrologic and hydraulic analyses were prepared by Goodkind & O'Dea, Inc., for FEMA, under Contract No. H-4550. That study, which was completed in November 1979, covered all significant flooding in the Town of Orangetown (Reference 10).
Piermont, Village of:	For the May 17, 1982 FIS, the hydrologic and hydraulic analyses were prepared by Goodkind & O'Dea, Inc., for the FIA, under Contract No. H-4550. That study, which was completed in December 1979, covered all significant flooding in the Village of Piermont (Reference 11).
Pomona, Village of:	For the October 15, 1981 FIS, the hydrologic and hydraulic analyses were performed by Goodkind & O'Dea, Inc., for FEMA, under Contract No. H-4550. That study, which was completed in September 1979, covered all significant flooding in the Village of Pomona (Reference 12).
Ramapo, Town of:	For the February 2, 1989 FIS, the hydrologic and hydraulic analyses were prepared by Leonard Jackson Associates for FEMA, under Contract No. EMW-83-C-1190. That study, which was completed in May 1986, covered all significant flooding in the Town of Ramapo (Reference 13).
Sloatsburg, Village of:	For the July 6, 1981 FIS, the hydrologic and hydraulic analyses were prepared by Goodkind and O'Dea, Inc., for FEMA under Contract No. H-4550. That study, which was completed in February, 1980, covered all significant flooding in the Village of Sloatsburg (Reference 14).

South Nyack, Village of:	For the May 4, 1981 FIS, the hydrologic and hydraulic analyses were performed by Goodkind & O'Dea, Inc., for the FIA, under Contract No. H-4550. That study, which was completed in December 1979, covered all significant flooding in the Village of South Nyack (Reference 15).
Spring Valley, Village of:	For the August 16, 1988 FIS, the hydrologic and hydraulic analyses were prepared by Leonard Jackson Associates for FEMA, under Contract No. EMW-83-C-1190. That study, which was completed in May 1986, covered all significant flooding in the Village of Spring Valley (Reference 16).
Stony Point, Town of:	For the March 30, 1981 FIS, the hydrologic and hydraulic analyses were prepared by Goodkind and O'Dea, Inc., for the FIA under Contract No. H-4550. That study, which was completed in December 1979, covered all significant flooding in the Town of Stony Point (Reference 17).
Suffern, Village of:	For the May 28, 1981 FIS, the hydrologic and hydraulic analyses were performed by the U.S. Army Corps of Engineers, New York District, for the FIA, under Inter-Agency Agreement No.IAA-H-7-76, Project Order No. 11. This work, which was completed in August 1978, covered all significant flooding sources affecting the Village of Suffern (Reference 18).
Wesley Hills, Village of:	For the September 16, 1988 FIS, the hydrologic and hydraulic analyses were prepared by Leonard Jackson Associates during the preparation of the FIS for the Town of Ramapo. That study, which was completed in May 1986, covered all significant flooding in the Village of Wesley Hills (Reference 19).
West Haverstraw, Village of:	For the March 30, 1981 FIS, the hydrologic and hydraulic analyses were prepared by Goodkind and O'Dea for the FIA under Contract No. H-4550. That study, which was completed in September 1979, covered all significant flooding

in the Village of West Haverstraw (Reference 20).

There are no previous FIS Reports published for the Villages of Airmont, Kaser, New Square, and Upper Nyack; therefore, the previous authority and acknowledgements are not included in this FIS.

The New York State Department of Environmental Conservation (NYSDEC) and FEMA entered into a Cooperative Technical Partners (CTP) Agreement to collaboratively produce this countywide FIS. The revised hydrologic and hydraulic analyses were prepared by URS Corporation. URS and PAR performed this work under Contract No. DOS1427 to the New York State Office of General Services. This work was completed in March 2011.

Base map information shown on the FIRMs was provided in digital format by NYSDEC. The information was derived from New York State Office of Cyber Security & Critical Infrastructure Coordination from 30-centimeter resolution orthophotography dated 2007.

The coordinate system used for the production of this FIRM is New York State Plane, East Zone (FIPS 3101), North American Datum of 1983 (NAD 83) GRS 1980 Spheroid.

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 an FIS, and to identify the streams to be studied by detailed methods. A final CCO meeting is held typically with the same representatives to review the results of the study.

The dates of the pre-countywide initial and final CCO meetings held for the communities within Rockland County are shown in Table 1, "Initial and Final CCO Meeting Dates".

TABLE 1 - INITIAL AND FINAL CCO MEETING DATES

Community Name	Initial/Intermediate CCO Date(s)	Final CCO Date(s)
Chestnut Ridge, Village of	February 1987	October 14, 1987
Clarkstown, Town of	June 6, 1977	March 30, 1982
	N/A	August 28, 2008
Grand View, Village of	June 8, 1977	October 14, 1980

TABLE 1 - INITIAL AND FINAL CCO MEETING DATES- CONTINUED

Community Name	Initial/Intermediate CCO Date(s)	Final CCO Date(s)
Haverstraw, Town of	May 31, 1977	January 26, 1981
Haverstraw, Village of	May 31, 1977	August 10, 1980
Hillburn, Village of	August 25, 1976	January 28, 1981
	N/A	August 5, 1994
Montebello, Village of	February 1987	March 1, 1988
New Hempstead, Village of	February 1987	January 6, 1988
Nyack, Village of	*	December 13, 1984
Orangetown, Town of	June 1, 1977	July 31, 1981
Piermont, Village of	June 1, 1977	August 18, 1980
Ramapo, Village of	November 1979	October 4, 1987
Sloatsburg, Village of	August 25, 1976	February 17, 1981
South Nyack, Village of	June 1, 1977	September 23, 1980
Spring Valley, Village of	November 1979	May 6, 1987
Stony, Point, Village of	May 31, 1977	November 12, 1980
Suffern, Village of	May 5, 1976	March 7, 1979
Wesley Hills, Village of	February 6, 1987	October 14, 1987
West Haverstraw, Village of	May 31, 1977	October 25, 1980

* Data Not Available

For this countywide FIS, initial CCO meetings were held on December 19 and 20, 2005. These meetings were attended by representatives of the communities and NYSDEC. Final CCO meetings were held on June 14 and 15, 2011 and attended by representatives of the communities and NYSDEC.

2.0 AREA STUDIED

2.1 Scope of Study

This FIS covers the geographic area of Rockland County, New York.

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 included on the Flood Profiles (Exhibit 1) and on the FIRM (Exhibit 2).

TABLE 2 - FLOODING SOURCES STUDIED BY DETAILED METHODS

Antrim Creek	North Branch Pascack Brook
Brian Brook	Pascack Brook
Cedar Pond Brook	Pine Brook
Crumm Creek	Ramapo River
Demarest Kill	South Branch Minisceongo Creek
East Branch Hackensack River	Sparkill Creek
East Branch Saddle River	Spook Rock Brook
Golf Course Brook	Spook Rock Brook Left Channel
Hackensack River	Stony Brook
Hudson River	Tributary to Cedar Pond Brook
Hungry Hollow Brook	Tributary 1 to Hudson River
Mahwah River	Tributary 1 to Nakoma Brook
Mill Creek	Tributary 1 to Ramapo River
Minisceongo Creek	Tributary 2 to Ramapo River
Montebello Creek	Tributary to West Branch Saddle River
Muddy Creek	West Branch Hackensack River
Nakoma Brook	West Branch Saddle River
Nauraushaun Brook	Willow Tree Brook

For this countywide FIS, updated or new analyses were included for the flooding sources shown in Table 3, "Scope of Study."

TABLE 3 - SCOPE OF STUDY

Stream Name	Limits of Detailed Study
Demarest Kill	From the confluence with West Branch Hackensack River to 30 feet upstream of Little Tor Road.
East Branch Hackensack River	From the confluence with Lake DeForest to approximately 600 feet downstream of Rockland Lake.
Golf Course Brook	From the confluence with the Mahwah River to 100 feet upstream of Spook Rock Road.
Hackensack River	From the Orangetown/Clarkstown border to the Lake DeForest dam.
Minisceongo Creek	From the confluence with the Hudson River to approximately 1,000 feet upstream of Thiells Ivy Road.
Nauraushaun Brook	From the confluence with Hackensack River to approximately 200 feet upstream of Smith Road.
North Branch Pascack Brook	From the confluence with Pascack Brook to approximately 250 feet upstream of Greenridge Way.
Pascack Brook	From NY/NJ border to approximately 100 feet upstream of Viola Road.
Sparkill Creek	From the confluence of the Hudson River to Erie Street.
West Branch Hackensack River	From the confluence with Lake DeForest to the Clarkstown/Ramapo Border.
West Branch Saddle River	From approximately 30 feet upstream of the NY / NJ border to approximately 280 feet upstream of the Olympia Lane.

The areas studied by detailed methods were selected with priority given to known flood hazard areas and areas of projected development and proposed construction throughout Rockland County.

Some flood sources have been renamed in this countywide study. The name changes are shown in Table 4 – Flooding Source Name Changes.

TABLE 4 – FLOODING SOURCE NAME CHANGES

Previous Name	Current Name
Nakoma Brook Tributary	Tributary 1 to Nakoma Brook
Ramapo River Tributary	Tributary 2 to Ramapo River
Tributary to the Ramapo River	Tributary 1 to Ramapo River

For this countywide FIS, floodplain boundaries of streams that have been previously studied by detailed methods were redelineated based on more up-to-date topographic mapping.

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, NYSDEC, and Rockland County.

This countywide FIS incorporates the determination of LOMR's listed in the Table 5 – Incorporated Letters of Map Revision.

TABLE 5 - INCORPORATED LETTERS OF MAP REVISION

Case Number	Date	Stream Name
02-91-37	January 6, 1993	East Branch Saddle River
99-02-009P	December 1, 1999	Ramapo River, Nakoma Brook
02-02-043P	July 2, 2003	Ramapo River Tributary
04-02-043P	August 4, 2005	Tributary to Pascack Brook

2.2 Community Description

Rockland County is located 12 miles north-northwest of New York City. It is part of the New York Metropolitan Area. It is bordered to the north by Orange County, to the east by the Hudson River and Westchester County, and to the south by Passaic and Bergen Counties, New Jersey. As of the 2000 Census, the population of Rockland County was 286,761 (Reference 21). The county seat is New City. Rockland County is New York State's southernmost county west of the Hudson River. It is suburban in nature, with a considerable amount of scenic designated parkland. The area of the County is approximately 176 square miles.

The climate of the region is continental with moderate winters and summers. The area is characterized by frequent changes in the weather during the spring and fall. Temperatures range from an average monthly temperature of 29 degrees Fahrenheit (^{o}F) (-1.7 degrees Celsius [^{o}C]) in January to an average monthly temperature 74 ^{o}F (23.3 °C) in the summer. The average annual precipitation is approximately 46 inches (117 centimeters), uniformly distributed throughout the year. The average annual snowfall is 38 inches (61 centimeters) (Reference 22)

The Palisades cliff runs between the Town of Haverstraw and the Town of Clarkstown along the Hudson River until it curves away from the river to the west of the Villages of Upper Nyack and Nyack. The eastern slopes of the Palisades rise sharply from the river and drop off to gradual slopes in the western side of the county. Portions of the County west of the Palisades are characterized by rolling terrain with gentle ridges and hills. Major portions of the County are underlain by Triassic (Newark Group) strata composed of sandstone, shale, and conglomerate. The Palisades and some ridge lines along the north are composed of diabase and some intrusives (Reference 23).

2.3 Principal Flooding Problems

Flooding can occur in Rockland County during any season of the year, but most likely occurs from rainfall associated with tropical or extratropical events and northeasters (nor'easters) (Reference 22).

Recent Flooding Events

Hurricanes

Rockland County has an active history of hurricanes and tropical storms. According to NOAA historical records, 25 hurricane or tropical storm tracks have passed within 65 miles of Rockland County since 1861. This includes four Category 1 hurricanes; two Category 2 hurricanes; and 19 tropical storms.

Of the 25 recorded storm events, five tracks traversed directly through Rockland County: Tropical Storm Agnes in 1972 and four unnamed tropical storms between 1863 and 1915. NOAA additionally records a tropical depression which passed through the County in 1988.

Rockland County was more recently impacted by the remnants of Hurricane Floyd in September 1999, Hurricane Ivan in September 2004, and Tropical Storm Hanna, in September 2008, all of which were Tropical Depressions by the time they reached Rockland County. Selected events for which some details or descriptions are available are as follows:

September 1975

Rockland County was included in areas eligible for both Individual and Public Assistance under Disaster Declaration DR-0487, following the impacts of the remnants of Hurricane Eloise. Heavy rainfall caused riverine flooding and an estimated $300 million in damage across the northeastern United States.

July 13, 1996

Hurricane Bertha originally made landfall in North Carolina, but had weakened to a Tropical Storm by the time it reached the New York City area. It passed Long Island, producing torrential rain and strong gusty winds. Torrential rain caused flooding of low lying and poor drainage areas, streams, and rivers across the area. The heaviest rain fell

in a band to the northwest of Bertha's track over the Lower Hudson Valley. The Mahwah River at Suffern in Rockland County rose above its 4 foot flood stage from 11:30 am EST on July 13th through 10:15 am on July 14th. The crest stage was 5.75 feet at 1:15 pm on July 13th. The Saw Mill River in Westchester County also flooded. Rainfall amounts recorded in Rockland County ranged from 3.25 inches at West Nyack to 4.65 inches at Pomona.

September 16, 1999

The remnants of Hurricane Floyd passed over Long Island from 7 pm to 9 pm on September 16, 1999. In Rockland County, a 53-year old man died around midnight on the 17th when he was swept into the Pearl River while walking in Orangetown. Serious widespread flooding of low-lying and poor drainage areas resulted in the closure of many roads and basement flooding across the entire region. The Mahwah River at Suffern was above its flood stage of 4 ft. from 1:30 pm on the 16th until 3 am on the 18th. The crest stage was about 9.7 feet. Orange, Putnam, Rockland, and Westchester Counties were declared disaster areas, under Disaster Declaration DR-1296. For these four counties, the initial cost estimates of damage were $14.6 million. Local sources report that this event caused road closures, culvert collapses, and significant property damage in the Village of Upper Nyack. In the Village of Wesley Hills, the Willow Tree Road Bridge had to be replaced due to damage incurred during the storm.

August 21, 2011

Hurricane Irene formed from a tropical wave on August 21, 2011 in the tropical Atlantic Ocean. It moved west-northwestward, before becoming a hurricane, Irene struck Puerto Rico as a tropical storm. Hurricane Irene steadily strengthened to reach peak winds of 120 mph on August 24. Irene then gradually weakened and made landfall on the Outer Banks of North Carolina with winds of 85 mph on August 27. It slowly weakened over land and re-emerged into the Atlantic on the following day. Later on August 28, Irene was downgraded to a tropical storm and made two additional landfalls, one in New Jersey and another in New York.

Irene produced heavy damage over much of New York, totaling to $296 million. The storm is ranked as one of the costliest in the history of New York, after Hurricane Agnes in 1972. Much of the damage occurred due to flooding, both from heavy rainfall in inland areas and storm surge in New York City and on Long Island. Tropical storm force winds left at least 3 million residents without electricity in New York and Connecticut. Ten fatalities are directly attributed to the hurricane.

September 2011

The twelfth named storm and thirteenth system overall of the 2011 Atlantic hurricane season, developing from a broad tropical disturbance over the Gulf on September 1. It was designated as Tropical Storm Lee the next day. Heavy rain from the remnants of Lee brought flooding to the Susquehanna River valley, dropping 10-12 inches of precipitation. Record flooding was observed along the Susquehanna and Chenango

Rivers. USGS river gauges recorded water levels as high as 17 feet above flood stage, topping previous record heights achieved in the Mid-Atlantic United States flood of 2006

Property damage far exceeded the flood of 2006, despite precautions taken in the wake of that natural disaster. Across eight counties in New York, an early tally estimated initial losses at $562.2 million. In the Triple Cities urban core, over 7,000 properties were damaged. Damages in Broome County alone were estimated to be $513 million, while in Tioga County, estimated losses were $478 million. Two deaths were blamed on the storm

October 29, 2012

Hurricane Sandy was the deadliest and most destructive hurricane of the 2012 Atlantic hurricane season, as well as the second-costliest hurricane in United States history. Classified as the eighteenth named storm, tenth hurricane and second major hurricane of the year. Hurricane Sandy made landfall in the United States about 8 p.m. EDT Oct. 29, striking near Atlantic City, N.J., with winds of 80 mph. A full moon made high tides 20 percent higher than normal and amplified Sandy's storm surge.

Hurricane Sandy affected 24 states, including the entire eastern seaboard from Florida to Maine and west across the Appalachian Mountains to Michigan and Wisconsin, with particularly severe damage in New Jersey and New York. Its storm surge hit New York City on October 29, flooding streets, tunnels and subway lines and cutting power in and around the city. Damage in the US is estimated at over $100 billion (2013 USD).[1]

Nor'easters

Rockland County has a lengthy history of significant impacts wrought by nor'easters. The principal impacts have been damages caused by the effects of extreme wind, heavy rainfall and flooding. Recent events include:

December 21, 1992

This nor'easter, which caused widespread flooding and damage to commercial and residential properties, utilities, roads, and other infrastructure, resulted in Disaster Declaration 0974, under which Rockland County became eligible for both Public and Individual Assistance.

April 15-16, 2007

A nor'easter occurred during Sunday and Monday, April 15th and 16th, which brought heavy rain and high winds that caused widespread and significant river, stream, and urban flooding of low-lying and poor drainage areas. Rockland County was among the counties eligible for Individual and Public Assistance under the resulting Federal Disaster Declaration DR-1692. Costs to repair disaster damages to roads and drainage structures in Rockland County were estimated at $5,000,000.

Historic Flooding Events

Historic, community-specific flood problems are described in the following sections:

Chestnut Ridge, Village of

Flooding in the community generally occurs during the spring and fall seasons. In the spring, snowmelt adds to heavy rains to produce increased runoff; in the fall, flooding can occur due to hurricane activity.

The most notable floods occurred in September 1999 (Tropical Storm Floyd) and April 2007. Flood problems are generally caused by inadequate channel capacities and culvert sizes (Reference 1).

Clarkstown, Town of

Floods have been a recurring problem in the Hackensack River basin. The flood of April 9 and 10, 1980, was the previous flood of record for the Hackensack River in West Nyack. However, this flood has been surpassed five times since 1980. Because of the amount of storage available in Lake DeForest, the maximum stage was not produced at the time of the maximum discharge recorded at the West Nyack gage, downstream of Lake DeForest. The discharge measured at the West Nyack gage during the April 1980 flood was 1,060 cubic feet per second (cfs) (U.S. Department of the Interior, Geological Survey, personal communication from Eric D. Bresee, Hydrologist, June 14, 1980 (unpublished)) (Reference 2).

Grand View-on-Hudson, Village of

The Village of Grand View-on-Hudson is subject to flooding from the Hudson River in an area along the shore where approximately forty homes are located. These homes sustain periodic damage from floods caused by strong easterly winds combined with high tides. Heavy rains produce high runoff from the old railroad grade, U.S. Route 9W, and the hillside, which cause flooding on River Road. A drainage project to alleviate this problem was completed in 1977 (Reference 3).

Haverstraw, Town of

The Town of Haverstraw is presently subject to flooding in areas adjacent to Minisceongo Creek and its tributaries in the vicinity of Letchworth Village and Thiells-Mount Ivy Road. The Hudson River often causes flooding in Bowling Park. The Mahwah River causes occasional flooding in the vicinity of Deer Mountain Day Camp.

Storms of significant intensity occurred during July 1947, March 1951, August 1955, October 1955, August 1960 and November 1977. These storms caused flood damage to both private and public property (Reference 4).

Haverstraw, Village of

The Village of Haverstraw is presently subject to flooding in areas adjacent to the Hudson River. Minisceongo Creek floods along the northern corporate limits and in the lowland areas east of Samsondale Avenue near the confluence with the Hudson River.

Storms of significant intensity occurred during July 1947, March 1951, August 1955, October 1955, August 1960 and November 1977. These storms caused flood damage to both private and public property (Reference 5).

Hillburn, Village of

Floods have been a recurring problem along the Ramapo River. Some of the most significant floods took place during October 1903, March 1936, September 1938, July 1945, March 1951, August and October 1955, February 1966, May 1968, August and September 1971, June 1972, December 1973, and September 1975.

The Village of Hillburn is presently subject to flooding from the Ramapo River along its length through the village. The Creelman Road area and areas in the vicinity of the Conrail station are particularly susceptible to flooding (Reference 6).

Montebello, Village of

Flooding in the community generally occurs during the spring and fall seasons. In the spring, snowmelt adds to heavy rains to produce increased runoff; in the fall, flooding can occur due to hurricane activity.

The most notable floods occurred in November 1973 and April 1984, when record stream discharges were recorded. Flood problems are generally caused by inadequate channel capacities and culvert sizes (Reference 7).

New Hempstead, Village of

Flooding in the community generally occurs during the spring and fall seasons. In the spring, snowmelt adds to heavy rains to produce increased runoff; in the fall, flooding can occur due to hurricane activity.

The most notable floods occurred in November 1973 and April 1984, when record stream discharges were recorded. Flood problems are generally caused by inadequate channel capacities and culvert sizes (Reference 8).

Nyack, Village of

Nyack is subject to limited flooding from the Hudson River under conditions of high tides and strong easterly winds. Shallow flooding affects the southwestern corner of the village, just west of Interstate 287. This flooding occurs as a result of rainfall runoff from the mountainous terrain during heavy rains (Reference 9).

Orangetown, Town of

The Town of Orangetown is presently subject to flooding from Sparkill Creek in the eastern portion of town and from Muddy Creek in the west. These flooding problems are a result of inadequate drainage facilities and the increased urbanization of the area. The three areas of Orangetown along Sparkill Creek that usually suffer the most severe

problems are: the area west of Greenbush Road in the vicinity of Spruce and Hickery Streets, along State Route 303 in the Orangeburg Road area, and the area in the vicinity of State Route 340 and Valentine Avenue.

In the Spruce and Hickery Street area, major obstructions lie in the undersized culvert at Spruce Street and in a small private culvert across an access road, north of Spruce Street. Along State Route 303 in the Orangeburg area, the channel is narrow and encroached upon by various structures. Additional problems have been created by the filling of portions of the areas north of State Route 303 and between Orangeburg Road and Conrail where ponding has occurred during major storms. The fire house pumping station, a church and various residences in the vicinity of Valentine Avenue, William Street, and State Route 340 experience frequent flooding due to an undersized and deteriorating culvert under Valentine Avenue, along with a narrow winding channel upstream of Valentine Avenue. In addition to being undersized, the Valentine Avenue culvert experiences frequent debris jams during high flows, which further aggravates flooding.

Muddy Creek inundates several areas along State Route 304 between Jefferson and Hillside Avenues during severe storms. In this area the creek is contained in a rectangular channel (Reference 10).

Piermont, Village of

Piermont is presently subject to flooding from Sparkill Creek and the Hudson River. Tidal marshlands adjacent to the Hudson River are subject to flooding from both Sparkill Creek and the Hudson River.

The low drawbridge on Bridge Street has frequently been overtopped by Sparkill Creek stormwaters. Paradise Avenue, downstream of the Bridge Street Bridge, is also subject to flooding from Sparkill Creek. The parking areas of the Continental Can Company on the waterfront are often flooded by the Hudson River.

Due to the gullies and sheet flow draining into the Hudson River, flooding problems exist east of Ash Street, east of State Route 9W, and between Ritie and Hester Streets (Reference 11).

Pomona, Village of

There are presently no serious flooding problems in the Village of Pomona. Some potential for flooding does exist in the vicinity of Camp Hill Road and South Branch Minisceongo Creek (Reference 12).

Ramapo, Town of

Flooding in the community generally occurs during the spring and fall seasons. In the spring, snowmelt adds to heavy rains to produce increased runoff, and, in the fall, flooding can occur due to hurricane activity.

The most notable floods occurred in November 1973 and April 1984, when record stream discharges were recorded. Flood problems in the town are generally caused by inadequate channel capacities and culvert sizes (Reference 13).

Sloatsburg, Village of

Floods have historically been a recurring problem along the Ramapo River. Some of the most significant floods occurred in October 1903, March 1936, September 1938, July 1945, March 1951, August and October 1955, February 1966, May 1968, August and September 1971, June 1972, December 1973, and September 1975.

Stony Brook causes flooding in the vicinity of the Waldron Terrace Bridge, with the areas downstream being flooded by either Stony Brook or the Ramapo River. Eagle Valley Road experiences flooding from Nakoma Brook upstream of Nakoma Brook Tributary (Reference 14).

South Nyack, Village of

The Village of South Nyack is subject to limited flooding from the Hudson River under conditions of high tides and strong easterly winds. Some flooding occurs on the steep slopes west of the New York State Thruway due to sheet flow caused by heavy downpours (Reference 15).

Spring Valley, Village of

Flooding in the study area generally occurs during the spring and fall seasons. In the spring, snowmelt adds to heavy rains to produce increased runoff, and in the fall flooding can occur due to hurricane activity.

The most notable floods occurred in November of 1973 and in April of 1984 when record flood discharges were measured. Flood problems in the Village of Spring Valley are generally caused by inadequate channel capacities and culvert sizes (Reference 16).

Stony Point, Town of

The Town of Stony Point is presently subject to flooding from the Hudson River, Cedar Pond Brook and Tributary to Cedar Pond Brook. The area southwest of Stony Point State Park has existing development and flooding problems from the Hudson River. Cedar Pond Brook has no serious flooding problems because it has very steep side slopes, except in the areas east of U. S. Route 9W, where Cedar Pond Brook has a wide flood plain.

Flooding occurs along the entire length of Tributary to Cedar Pond Brook due to the high runoff caused by the considerable development of the surrounding areas. The primary areas in which flooding occurs are in the vicinity of Sullivan, Lewis, and Sengstacken Drives (Reference 17).

Suffern, Village of

The Ramapo River flows through a broad floodplain within the village and affects residential and commercial structures. Severe losses were experienced in recent years when a commuter parking area in the floodplain was inundated, resulting in the loss and damage to approximately 100 vehicles.

The Mahwah River flows through broad lakes and between steep banks through most of the village. The floodplain in the southerly reach of the river has been partially filled in and developed extensively with single-family dwellings, which are subject to periodic flooding.

Antrim and Montebello Creeks, located in the northeastern part of the village, flow through sparsely developed areas. Antrim Creek is relatively flat with a broad floodplain. Montebello Creek is steep, having a narrow floodplain, with high flow velocities that cause erosion of the channel (Reference 18).

Wesley Hills, Village of

Flooding in the community generally occurs during the spring and fall seasons. In the spring, snowmelt adds to heavy rains to produce increased runoff; in the fall, flooding can occur due to hurricane activity. The most notable floods occurred in November 1973 and April 1984, when record stream discharges were recorded. Flood problems are generally caused by inadequate channel capacities and culvert sizes (Reference 19).

West Haverstraw, Village of

The Village of West Haverstraw is presently subject to flooding in areas adjacent to Minisceongo Creek, especially in the vicinity of Suffern Lane, Railroad Avenue, Grassy Point Road and east of Samsondale Avenue.

Storms of significant intensity occurred during July 1947, March 1951, August 1955, October 1955, August 1960 and November 1977. These storms caused damage to both private and public property (Reference 20).

2.4 Flood Protection Measures

The following municipalities have flood protection measures:

Clarkstown, Town of

To protect residences in the neighborhood surrounding Klein Avenue from major floods, the Town of Clarkstown constructed an earthen levee along the west bank of the Hackensack River, from the New York State Thruway to a point southeast of Theresa Drive. The Klein Avenue levee provides less than 1 foot of freeboard above the 1-percent-annual-chance (100-year) flood, and therefore the area behind the levee is classified as a Special Flood Hazard Area.

Ramapo, Town of

Trapezoidal channel improvements were made to sections of Pascack Brook in the area between Mirror Lake Road and Eckerson Road. A spillway and dam were constructed at Lake Suzanne to control flood flows on Pascack Brook. Detention ponds with outlet structures designed for flood control are located on North Branch Pascack Brook upstream of State Route 45 and on Spook Rock Brook in the vicinity of South Park Drive. Finally, inadequate sized culverts on Interstate Route 87 and 287 act as routing structures and attenuate flood flows along Hungry Hollow Brook and the East and West Branch Saddle River.

Suffern, Village of

Flows along the Mahwah River are attenuated by the presence of Lake Antrim, the controls affected by the rubble dam at the lower segment of the lake, and the New York State Thruway constriction at the upper segment. The effect of Lake Antrim is to reduce the peak flows on the Mahwah River, thereby reducing the already serious flooding problems existing downstream in the southern section of the Village of Suffern.

3.0 ENGINEERING METHODS

For the flooding sources studied by detailed methods in Rockland County, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. 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 one year are considered. For example, the risk of having a flood that equals or exceeds the 1-percent-annual-chance flood (1-percent chance of annual exceedance) in any 50-year period is about 40 percent (four in ten), and for any 90-year period, the risk increases to about 60 percent (six in ten). The analyses reported here reflect flooding potentials based upon 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

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for each flooding source studied in detail affecting Rockland County.

Information on the methods used to determine peak discharge-frequency relationships for the streams studied by detailed methods is shown below.

Pre-Countywide Analysis

For each community within Rockland County that has a previously printed FIS report, the hydrologic analyses described in those reports that are not updated in this study have been compiled and are summarized below.

Clarkstown, Town of

For streams where gage data were not available and the drainage area was larger than approximately 1 square mile, the discharges were calculated using regional relationships in Special Report 38 (Reference 24). This analysis takes into consideration drainage area, channel slope, surface storage, and man-made impervious land cover. The analysis was developed from a regression equation of 103 stream gaging stations throughout New Jersey. Special Report 38 was used because all the streams studied by detailed methods are located in the Hackensack or Passaic River basins. The Special Report 38 regression analysis used 22 gages in the Passaic River basin and 9 gages in the Hackensack River basin regression analysis. Peak discharges for Crumm Creek and Mill Creek were computed using Special Report 38 where drainage areas are greater than 1 square mile.

For streams with drainage areas less than approximately 1 square mile, the rational method was used to determine the discharges. The rational method uses the formula:

$$Q=CIA$$

where Q is the discharge in cfs, C is the runoff coefficient depending on drainage basin characteristics, I is the rainfall intensity in inches per hour, and A is the drainage area in acres. The rational method was used to compute flows for the upper portions of Crumm Creek and Mill Creek.

Haverstraw, Town of

Peak discharges for South Branch Minisceongo Creek and the Mahwah River were determined using two methods. Special Report 38 was utilized for drainage basins approximately one square mile or larger. For flooding sources with a drainage basin less than one square mile the Rational Method was used.

Hillburn, Village of

Discharges for the Ramapo River were adopted using the contiguous FIS for the Village of Suffern.

Discharges for Tributary 1 to the Ramapo River were calculated using regional relationships contained in Special Report 38 developed by the U.S. Geological Survey in cooperation with the State of New Jersey, Department of Environmental Protection, Division of Water Resources.

Montebello, Village of

The hydrologic analysis for the Mahwah River was computed from gage data. A Log-Pearson Type III (LP3) flood frequency analysis was performed to determine the 10-, 2-, 1-, and 0.2-percent-annual-chance flood event discharges. The gage is located in the vicinity of Kingsgate Park and the computed peaks were transferred upstream and downstream using the ratio of the drainage areas raised to the 0.75 power.

For Spook Rock Brook, the hydrologic analysis was determined utilizing the computational method described in Special Report 38. To properly account for future development, permeability indices were selected based upon the assumption of full development within existing zoning regulations.

New Hempstead, Village of

The hydrologic analysis for Willow Tree Brook was obtained from the FIS for the Town of Ramapo.

Orangetown, Town of

Two methods of determining peak discharge-frequency relationships were employed for Muddy Creek. Where the drainage areas are approximately one square mile or more, the method outlined in Special Report 38 was used to determine peak discharges. For flooding sources where the drainage basins were less than one square mile in area, the rational method was used to determine discharges. The peak discharges on Muddy Creek decrease between Washington Avenue and West Crooked Hill Road because of the large amount of storage available.

Ramapo, Town of

The hydrologic analysis for the Mahwah River was computed from gage data. A Log-Pearson Type III flood frequency analysis was performed to determine peak 10-, 2-, 1-, and 0.2-percent-annual-chance flood event discharges. The gage is located in the center of the community, and the computed peaks were transferred upstream and downstream using the ratio of the drainage areas raised to the 0.75 power.

It was discovered that culverts under Interstate Routes 87 and 287 act as routing control structures on the East Branch Saddle River and Hungry Hollow Brook. To determine the effect of these culverts on peak discharges, a modified puls flood routing analysis was performed utilizing the HEC-1 computer program (Reference 25).

For the remaining streams studied by detailed methods, the hydrologic analysis was determined utilizing the computational method described in Special Report 38. To properly account for future development within the town, permeability indices were selected based upon the assumption of full development within existing zoning regulations.

Sloatsburg, Village of

For the Ramapo River, where gage records were available, the discharges were determined by using an LP3 analysis of the annual peak flows. The flows at the crest-stage gage at Sloatsburg (Gage No. 01387250, 10 years of record) were evaluated, and it was determined that the period of record was too short and inconsistent. Instead, LP3 discharges were developed at the Mahwah, New Jersey, gage (Gage No. 81387500, 67 years of record) in accordance with Water Resources Council Bulletin No. 17B (Reference 26). The flows at the gage were then transferred upstream to Sloatsburg in proportion to, the discharge-drainage area formula:

$$Q_1/Q_2 = (A_1/A_2)^n$$

where the subscripts represent the two target drainage areas.

For Stony Brook, Nakoma Brook, and Nakoma Brook Tributary, the discharges were developed using regional relationships contained in Special Report 38. For Tributary 1 to the Ramapo River, the discharges were developed using the Rational Method.

Stony Point, Town of

For streams studied by detailed methods, two methods of determining peak frequency-discharge relationships were employed. For flooding sources where the drainage basins are approximately one square mile or larger, Special Report 38 was used to determine peak discharges. For flooding sources with drainage basins less than one square mile, the rational method was used to determine discharges.

On Tributary 1 to the Hudson River, it was necessary to route flows through the Conrail railroad culvert in Stony Point State Park. The railroad embankment is sufficiently high to contain a substantial portion of upstream flows, thus limiting downstream flows to only those which pass through the culvert.

Suffern, Village of

The 10-, 2-, 1-, and 0.2-percent-annual-chance flood flows for the Ramapo River were determined by analyzing the peak flows for the Ramapo River at the Mahwah gage and deducting the corresponding coincidental peak discharge of the Mahwah River, which enters the Ramapo River just below the study area. The peak discharge versus frequency curve for the gage was determined by a LP3 statistical analysis of the peak flows.

The peak discharges for the Mahwah River, Antrim Creek, and Montebello Creek were determined from LP3 analyses.

Hudson River

The Stillwater elevations have been determined for the 10-, 2-, 1-, and 0.2-percent annual chance floods for the flooding sources studied by detailed methods and are summarized in Table 6, “Summary of Stillwater Elevations

TABLE 6 - SUMMARY OF STILLWATER ELEVATIONS

FLOODING SOURCE AND LOCATION	STILLWATER ELEVATION (feet-NAVD88) 10-Percent	2-Percent	1-Percent	0.2-Percent	Zone	Base Flood Elevation
HUDSON RIVER						
Entire shoreline within county, except Village of Piermont	5.1	6.1	6.7	7.9	AE	7
Village of Piermont	5.1	6.1	6.7	7.9	AE/VE	7-9

Countywide Analyses

Demarest Kill

The peak flows were calculated using 2006 New York regional regression equations (Reference 27) combined with the USGS Water-Supply Paper (WSP) 2207 urban regression equations (Reference 28), and using the rational method for watersheds of less than one square mile drainage area.

East Branch Hackensack River

A gage record exists for USGS 01376690 located on the East Branch Hackensack River at Congers, downstream of the Congers Lake Dam. Twelve years are recorded between 1968 and 1980, and one historic record is reported for 1960. The gage location is on the regulated portion of the study stream downstream of the dam; therefore, the record was analyzed using the graphical plotting LP3 technique.

To account for storage in Congers Lake, outflow discharges determined in the previous FIS were reused at the location of the Congers Lake Dam. Downstream of this location, additional discharge resulting from drainage area downstream of the lake was added to this lake outflow discharge. The contributing drainage basin downstream of the lake was analyzed using the 2006 New York regression equations and the USGS urban regression adjustment equations described in USGS WSP 2207.

Golf Course Brook

Flows were calculated using the 2006 New York regional regression equations combined with the USGS WSP 2207 urban regression equations, and considering the rational method for watersheds of less than one square mile drainage area.

Hackensack River

For this countywide FIS, the gage analysis of USGS 01376800, a currently active gage, was updated using the available 47 years of record (1960–2006). The LP3 analysis was performed using a graphical technique because the flow at this gage site is regulated by Lake DeForest Dam. Discharge values at the gage location were transferred upstream to the dam and intermediate locations according to the equation:

$$Q_1 = Q_2(A_1/A_2)^n$$

The exponent, n, is obtained from the Drainage-only Regression Equation reported in USGS SIR 2006-5112 (Reference 27) for the appropriate return period and hydrologic region 2. Downstream of the gage location, regression equation analysis was carried out to account for the drainage area downstream of the gage location. Peak flow values for the added drainage area (below the gage), were added to the gage analysis peak values to determine the total peak flow at downstream locations.

For the updated analysis, it was not appropriate to weight the regulated gage analysis with the 2006 New York regression equations. Instead, the regression equations were used downstream of the gage location, adding to the gage analysis values the effects of the drainage area downstream of the gage site.

Minisceongo Creek

The peak flow nominations were determined using the 2006 New York Regression Equations and the urban regression equations described in USGS WSP 2207

Nauraushaun Brook

The proposed peak flow nominations were calculated using the 2006 USGS New York Regional Regression Equations, and the urban regression equations described in USGS Water-Supply Paper 2207. The Rational Method was used for drainage basins of less than 1 square mile in area. These nominations show values similar to peak flow profiles for Nauraushaun Brook reported in USGS Water-Resources Investigations Report 84-4049 (Reference 29). These profiles are based on calibrated runoff modeling in several urbanized watersheds in Rockland County. These nominations represent increases of 37 percent to 90 percent over the values previously reported in the Clarkstown FIS. Increases may be expected because the 2000 Clarkstown FIS did not update the Nauraushaun Brook hydrology, which was originally completed in 1983.

North Branch Pascack Brook

For the countywide study, peak flows were calculated using the 2006 USGS New York Regional Regression Equations adjusted with the urban regression equations described in USGS Water-Supply Paper 2207. The Rational Method was used for drainage basins of less than 1 square mile in area.

Pascack Brook

For the countywide study, the 2006 New York regression equations were used with the urban adjustment of USGS WSP-2207 for the downstream portion of Pascack Brook with drainage areas greater than 4 square miles. The increase in flow value over the previous FIS represents increase in development since the 1980s. Previous FIS peak flow values are reused in the upstream portion, since the regression and rational method values are not significantly different from the previous FIS values.

Sparkill Creek

The present study made use of the 2006 New York regression equations and the urban regression equations adjustment described in USGS Water-Supply Paper 2207 to determine the peak flow nominations upstream of the confluence with Sparkill Brook. The Rational Method was used where the drainage area is less than one square mile. Downstream of Sparkill Brook the profiles presented in USGS WRIR 84-4049 (Reference 29) were used to determine peak discharges. This study contains the best available documentation of the attenuation of flood flows downstream of the Sparkill Brook tributary, and the values presented are generally higher than the effective FIS values. The value calculated using the 2006 New York regression equations and the WSP 2207 urbanized adjustment was extended from the vicinity of the Sparkill Brook confluence to downstream locations without attenuation because the 500-year profile was not determined in WRIR 84-4049.

West Branch Hackensack River

This revision makes use of the gage USGS 01376600 at Brookside Park. USGS reports only five peak flow records in a period of 19 years between 1960 and 1980; however, the record also includes the additional 17 records as peak stages. A simple stage-discharge relationship was constructed from the five peak flow records, and this was used to estimate peak discharge from the 17 stage records. An LP3 analysis was then applied to the 19 recorded and estimated discharge values using the USGS PeakFQ software. At the gage location, peak flow values were determined by weighting the LP3 analysis values with values obtained using the urban regression equations provided in USGS WSP 2207 with the New York regression equations.

To determine peak flow nominations for locations upstream of the gage to the confluence with Demarest Kill and downstream to the confluence with Lake DeForest, the gage analysis values were weighted with regression equation values according to relative drainage area and effective years of record using the weighting technique described in USGS SIR 2006-5112. Upstream of Demarest Kill the USGS urban adjustment of the New York regression equations was compared to the effective peak flow values from the 2000 Clarkestown FIS (Reference 2). The Rational Method was used for this comparison for locations with drainage areas less than one square mile.

West Branch Saddle River

The peak flow nominations were calculated using the 2006 New York regression equations and the USGS WSP 2207 urban regression adjustment were used to determine peak discharges where the contributing drainage basins were greater than one square mile. For smaller basins, peak flows were calculated using the Rational Method. Similar to the previous study, Modified Puls routing was performed using HEC-HMS at the Route 87-287 culvert. This routing produced flows that were considerably lower than flows from the Rational Method, demonstrating the attenuating affect of the structure. The values from this analysis were used in this area to nominate peak discharges immediately downstream of the culvert, and were transferred to nominate flows a short distance downstream using the area-ratio weighting method.

A summary of area-peak discharge relationships for the streams studied by detailed methods is shown in Table 7, "Summary of Discharges."

TABLE 7 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-Percent Annual Chance	2-Percent Annual Chance	1-Percent Annual Chance	0.2-Percent Annual Chance
ANTRIM CREEK					
At mouth	0.10	55	110	140	250
BRIAN BROOK					
At confluence with Mahwah River	0.56	290	400	460	580
Approximately 250 feet downstream of US Route 202	0.32	200	263	300	390
CEDAR POND BROOK					
At Conrail bridge	17.70	1,535	2,465	3,010	4,580
Upstream of confluence of Tributary to Cedar Pond Brook	16.30	1,425	2,300	2,810	4,290

TABLE 7 - SUMMARY OF DISCHARGES - continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-Percent Annual Chance	2-Percent Annual Chance	1-Percent Annual Chance	0.2-Percent Annual Chance
CRUMM CREEK					
At confluence with the Hackensack River	2.26	555	895	1,095	1,645
At Old Phillips Road	1.43	335	550	680	1,030
At Buena Vista Drive	0.50	205	270	310	410
DEMAREST KILL					
At confluence with Hackensack River	6.13	1,338	2,139	2,612	3,764
At Heritage Drive	3.58	1,018	1,631	1,974	2,825
At Main Street	2.91	857	1,375	1,659	2,374
At Middletown Road	0.91	402	524	594	716
At White Birch Court	0.56	333	441	484	591
EAST BRANCH HACKENSACK RIVER					
At confluence with Lake DeForest	6.99	857	1,383	1,666	2,412
At USGS 01376690 - Congers	6.81	859	1,386	1,669	2,416
Downstream of Kings Highway	6.03	653	1,064	1,280	1,868
Approximately 680 feet upstream from railroad	5.53	530	867	1,041	1,528
Downstream of Congers Lake outlet	4.33	180	310	375	585
At Congers Lake	4.30	180	310	375	585
At State Route 303	3.60	288	467	568	863
Approximately 280 feet upstream of Patricks Place	2.69	188	309	451	578

TABLE 7 - SUMMARY OF DISCHARGES - continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-Percent Annual Chance	2-Percent Annual Chance	1-Percent Annual Chance	0.2-Percent Annual Chance
EAST BRANCH SADDLE RIVER					
At Town of Ramapo corporate limits	2.29	710	1,090	1,300	1,860
Approximately 554 feet upstream of South Monsey Road	1.38	480	730	870	1,230
Approximately 425 feet downstream of Regina Road	0.68	450	560	620	740
Approximately 585 feet upstream of Regina Road	0.57	280	310	340	380
Approximately 320 feet downstream of Interstate Routes 87 and 287	0.30	240	250	260	280
GOLF COURSE BROOK					
At confluence with Mahwah River	1.79	570	900	1100	1620
Approximately 260 feet upstream of Nottingham Drive	1.65	480	762	930	1370
Approximately 110 feet downstream of Brigadoon Drive	0.96	410	640	780	1150
Approximately 90 feet upstream of Mile Road	0.85	381	530	660	970
At west border of Spook Rock Golf Course	0.51	320	450	520	670

TABLE 7 - SUMMARY OF DISCHARGES - continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-Percent Annual Chance	2-Percent Annual Chance	1-Percent Annual Chance	0.2-Percent Annual Chance
HACKENSACK RIVER					
At the Town of Clarkstown-Town of Orangetown corporate limits	34.73	1,619	2,436	2,824	3,765
At USGS 01376800 West Nyack	30.90	1,254	1,850	2,106	2,702
Approximately 200 feet upstream of I-87	29.65	1,219	1,800	2,050	2,632
At Old Mill Rd	27.51	1,157	1,712	1,951	2,509
HUNGRY HOLLOW BROOK					
At confluence with Pine Brook	0.53	230	310	390	500
At confluence with Pine Brook Approximately 490 feet from 1st crossing of Hungry Hollow Road	0.45	210	280	350	470
Approximately 55 feet upstream of Sparrow Avenue	0.39	190	250	310	420
Approximately 1,035 feet upstream of Sparrow Avenue	0.34	160	210	270	370
Approximately 440 feet from 2nd crossing of Hungry Hollow Road	0.29	140	180	240	320
Approximately 100 feet upstream of Madeline Terrace	0.24	110	140	200	270
Approximately 625 feet upstream of Madeline Terrace	0.20	90	110	160	230
Downstream of Interstate Routes 87 and 287	0.15	60	70	120	180

TABLE 7 - SUMMARY OF DISCHARGES - continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-Percent Annual Chance	2-Percent Annual Chance	1-Percent Annual Chance	0.2-Percent Annual Chance
MAHWAH RIVER					
At Downstream Corporate Limits (reported in Village of Suffern FIS)	21.60	1,470	2,880	3,670	6,610
At New York State Thruway (reported in Village of Suffern FIS)	19.50	1,370	2,686	3,418	6,161
At Village of Suffern- Village of Montebello corporate Limits	19.50	1,810	3,400	4,320	7,200
Upstream of confluence of Montebello Creek	17.30	1,650	3,100	3,940	6,580
Upstream of confluence of Golf Course Brook	14.20	1,420	2,680	3,400	5,680
At U. S. Route 202	12.30	1,278	2,404	3,054	5,096
At Grandview Avenue Mill remains	11.20	1,190	2,240	2,850	4,750
Upstream of confluence of Willow Tree Brook	6.38	780	1,470	1,870	3,120
Upstream of confluence of Wilder Road tributary	4.97	740	1,290	1,600	2,540
Approximately 600 feet downstream of Cottage Lane	3.95	630	1,091	1,353	2,150
Upstream of confluence of Brian Brook	2.63	460	800	1,000	1,580
At Haverstraw/Ramapo corporate limits	2.07	195	335	415	655
Downstream of File Factory Hollow	1.76	175	295	370	585

TABLE 7 - SUMMARY OF DISCHARGES - continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-Percent Annual Chance	2-Percent Annual Chance	1-Percent Annual Chance	0.2-Percent Annual Chance
MAHWAH RIVER- continued					
At Deer Mountain Day Camp	0.63	165	240	255	325
MILL CREEK					
At confluence with Hackensack River	2.40	475	770	945	1,430
At Germonds Road	1.00	275	400	455	600
MINISCEONGO CREEK					
At Town and Village of Haverstraw and Village of West Haverstraw corporate limits	18.54	2,158	3,539	4,367	6,575
Village of Haverstraw - Village of West Haverstraw corporate limits	17.84	2,045	3,365	4,139	6,250
At Town and West Haverstraw corporate limits	16.77	1,887	3,097	3,815	5,753
Approximately 430 feet downstream of Rosman Rd	14.69	1,580	2,595	3,188	4,818
Downstream of confluence with South Branch Minisceongo Creek	13.59	1,386	2,295	2,823	4,290
MONTEBELLO CREEK					
At confluence with Mahwah River	2.20	255	505	640	1,555
MUDDY CREEK					
At downstream corporate limits	1.70	227	377	463	705
Approximately 800 feet upstream of Margaret Keaton Road	1.00	248	410	505	769

TABLE 7 - SUMMARY OF DISCHARGES - continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-Percent Annual Chance	2-Percent Annual Chance	1-Percent Annual Chance	0.2-Percent Annual Chance
NAKOMA BROOK					
At the confluence with the Ramapo River	5.50	415	695	860	1,340
Upstream of the confluence with Nakoma Brook Tributary	1.90	205	355	440	705
At the Sloatsburg corporate limits	1.30	120	215	270	445
NAURAUSHAUN BROOK					
At confluence with Hackensack River	5.92	1,157	1,863	2,264	3,274
At abandoned Erie-Lackawanna railroad	5.10	1,054	1,682	2,044	2,966
At Town Line Road	4.45	915	1,467	1,781	2,576
At Lake Nanjet	4.27	790	1,280	1,557	2,261
Approximately 750 feet upstream of abandoned RR	2.78	559	906	1,097	1,590
At North Middletown Road	2.21	454	734	888	1,290
At Smith Road	1.12	354	571	685	976
NORTH BRANCH PASCACK BROOK					
Downstream of State Rte 59	2.13	709	1,129	1,363	1,931
At corporate limits of the Town of Clarkstown	1.55	541	862	1,038	1,472
Approximately 1,270 feet downstream from Northbrook Dr	1.53	534	852	1,026	1,458
Approximately 110 feet upstream from Mirror Lake Rd	1.41	466	748	901	1,282

TABLE 7 - SUMMARY OF DISCHARGES - continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-Percent Annual Chance	2-Percent Annual Chance	1-Percent Annual Chance	0.2-Percent Annual Chance
NORTH BRANCH PASCACK BROOK-continued					
Approximately 430 feet downstream from Eckerson Rd	1.28	406	655	788	1,124
Approximately 1,070 feet downstream from Dwight Ave	1.10	341	555	667	954
Approximately 400 feet downstream of Dwight Ave	1.09	339	551	663	948
Approximately 100 feet downstream of Fletcher Ct	0.55	240	390	480	690
Approximately 150 feet downstream of N. Main St	0.44	230	350	420	540
At private drive	0.32	230	300	350	440
Approximately 475 feet downstream from Greenridge Way	0.24	190	260	290	370
At Rensseler Dr	0.07	100	140	150	190
PASCACK BROOK					
At the NY-NJ border	10.42	2,282	3,653	4,451	6,412
At the Town of Orangetown-Village of Chestnut Ridge Corporate Limits	9.73	2,030	3,263	3,979	5,752
Approximately 85 feet downstream of Grotke Rd	8.95	2,006	3,221	3,938	5,684
Approximately 1060 feet downstream of Lillian Drive	8.35	1,885	3,035	3,696	5,350

TABLE 7 - SUMMARY OF DISCHARGES - continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-Percent Annual Chance	2-Percent Annual Chance	1-Percent Annual Chance	0.2-Percent Annual Chance
PASCACK BROOK- continued					
Approximately 180 feet downstream of S. Pascack Rd	4.61	983	1,600	1,940	2,831
Approximately 300 feet downstream of Dutch Ln	4.45	957	1,557	1,895	2,749
Downstream of Maple Ave Extension	4.16	857	1,400	1,698	2,487
Approximately 175 feet upstream from Linden Ave	3.09	730	1,110	1,320	1,880
Approximately 100 feet downstream of Union Rd	2.07	580	910	1,100	1,590
Approximately 630 feet downstream of Lake Suzanne spillway	1.53	440	690	840	1,210
Approximately 600 feet upstream of Francis Place	0.60	390	530	620	770
Approximately 500 feet downstream of Rita Avenue	0.56	290	380	440	560
Approximately 620 feet downstream of Grosser Lane	0.22	200	270	300	350
PINE BROOK					
At Borough of Upper Saddle River NJ – Village of Chestnut Ridge Corporate Limits	2.86	690	1,070	1,290	1,860

TABLE 7 - SUMMARY OF DISCHARGES - continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-Percent Annual Chance	2-Percent Annual Chance	1-Percent Annual Chance	0.2-Percent Annual Chance
PINE BROOK- continued					
Approximately 370 feet downstream of Pine Brook Road	2.15	550	860	1,030	1,490
Upstream of confluence with Hungry Hollow Brook	1.50	360	570	690	1,000
Approximately 100 feet downstream of driveway opposite School House Road	1.28	320	500	610	880
Approximately 771 feet from Lakeside School Dam	1.03	270	420	510	740
Approximately 1,581 feet from Lakeside School Dam	0.38	150	190	220	280
Approximately 1,640 feet downstream from New York State Thruway	0.33	100	120	140	180
Approximately 100 feet downstream from New York State Thruway	0.16	54	58	63	80
RAMAPO RIVER					
At County Boundary	92.00	5,340	9,785	12,455	20,340
At upstream corporate limits of Village of Hillburn	89.00	5,200	9,545	12,030	19,815
At the downstream corporate limits of Village of Sloatsburg	80.30	4,760	8,745	11,020	18,145

TABLE 7 - SUMMARY OF DISCHARGES - continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-Percent Annual Chance	2-Percent Annual Chance	1-Percent Annual Chance	0.2-Percent Annual Chance
RAMAPO RIVER- continued					
At the upstream corporate limits of Village of Sloatsburg	58.80	3,700	6,800	8,600	14,000
SOUTH BRANCH MINISCEONGO CREEK					
At confluence with Minisceongo Creek	6.20	325	545	660	1,010
At Village of Pomona - Town of Haverstraw corporate limits	5.74	300	500	610	935
At Quaker Road	5.35	295	495	600	920
At Haverstraw/Ramapo corporate limits	4.70	275	455	560	855
SPARKILL CREEK					
At confluence with Hudson River	13.00	660	1,050	1,300	2,716
At the corporate limits of the Village of Piermont	12.29	773	1,190	1,430	2,716
Upstream of the railroad at the state boundary	5.61	974	1,566	1,888	2,716
Approximately 200 feet downstream of Oak Tree Rd	5.25	920	1,477	1,786	2,577
Upstream of Route 303	4.57	796	1,282	1,555	2,236
At State Rte 303 upstream of Rte 340	2.47	572	919	1,103	1,567
At Orangeburg Rd and Old School Ln	1.95	434	701	841	1,196
Upstream of tributary	1.46	327	532	636	909
Downstream of Spruce St	0.86	341	451	495	605
At Erie Street	0.21	168	215	235	286

TABLE 7 - SUMMARY OF DISCHARGES - continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-Percent Annual Chance	2-Percent Annual Chance	1-Percent Annual Chance	0.2-Percent Annual Chance
SPOOK ROCK BROOK					
At confluence with Willow Tree Brook	1.20	440	700	860	1,280
Approximately 230 feet downstream of Margaret Ann Lane	0.85	420	680	810	1,000
Approximately 910 feet downstream of Quince Lane	0.58	400	540	630	800
Approximately 390 feet downstream of Viola Road	0.46	320	430	490	630
Approximately 330 feet downstream of Rockland Community College entrance drive	0.27	200	270	310	390
SPOOK ROCK BROOK-LEFT CHANNEL					
At its confluence with Spook Rock Brook	0.36	210	340	405	500
STONY BROOK					
At the confluence with Ramapo River	18.50	1,005	1,650	2,015	3,120
At the Sloatsburg corporate limits	18.00	975	1,600	1,960	3,040
TRIBUTARY TO CEDAR POND BROOK					
At confluence with Cedar Pond Brook	0.94	420	570	645	770
At Village of West Haverstraw corporate limits	0.19	105	145	155	195

TABLE 7 - SUMMARY OF DISCHARGES - continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-Percent Annual Chance	2-Percent Annual Chance	1-Percent Annual Chance	0.2-Percent Annual Chance
TRIBUTARY 1 TO THE HUDSON RIVER					
At confluence with the Hudson River	1.48	225	385	480	760
At Wayne Avenue	0.95	165	285	360	575
TRIBUTARY 1 TO NAKOMA BROOK					
At the confluence with Nakoma Brook	3.50	250	430	535	840
TRIBUTARY 1 TO NAKOMA BROOK-continued					
At the Sloatsburg corporate limits	3.20	225	385	475	755
TRIBUTARY 1 TO THE RAMAPO RIVER					
At the confluence with Ramapo River	170	270	455	570	895
Approximately 1,400 feet upstream of Brook Street	0.97	160	275	345	545
TRIBUTARY 2 TO THE RAMAPO RIVER					
At the confluence with Ramapo River	1.30	230	325	350	445
At the Sloatsburg corporate limits	0.70	135	185	200	250
TRIBUTARY TO WEST BRANCH SADDLE RIVER					
At Borough of Upper Saddle River-Town of Ramapo corporate limits	0.78	420	570	660	820
Approximately 250 feet downstream from Rustic Drive	0.63	360	490	560	710
Approximately 100 feet downstream from Smith Hill Road	0.38	230	310	360	450

TABLE 7 - SUMMARY OF DISCHARGES - continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-Percent Annual Chance	2-Percent Annual Chance	1-Percent Annual Chance	0.2-Percent Annual Chance
WEST BRANCH HACKENSACK RIVER					
At Ridge Road	14.44	1,912	3,007	3,622	5,193
At Route 304	13.88	1,837	2,874	3,455	4,938
At USGS Gage 01376600 - Brookside Pk	12.94	1,700	2,643	3,169	4,495
Downstream of confluence with Demarest Kill	12.74	1,696	2,643	3,169	4,510
Upstream of confluence with Demarest Kill	6.17	1,064	1,763	2,143	3,170
Upstream end of Lake Lucillea	2.37	805	1,280	1,570	2,330
At Little Tor Road	2.11	700	1,115	1,370	2,045
Approximately 280 feet upstream of Little Tor Rd	1.77	650	1,035	1,270	1,900
Approximately 400 feet downstream of private drive	1.70	545	875	1,070	1,605
At private drive	0.95	350	580	715	1,080
At Town of Ramapo / Town of Clarkstown corporate limits	0.84	340	555	685	1,040
WEST BRANCH SADDLE RIVER					
At Town of Ramapo corporate limits	1.58	428	699	843	1,219
Approximately 1,220 feet downstream of Beaver Hollow Lane	1.38	394	642	773	1,112

TABLE 7 - SUMMARY OF DISCHARGES - continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-Percent Annual Chance	2-Percent Annual Chance	1-Percent Annual Chance	0.2-Percent Annual Chance
WEST BRANCH SADDLE RIVER-continued					
Approximately 1,097 feet upstream of Christmas Hill Road	0.93	292	412	464	607
Approximately 950 feet upstream of East Blossom Road	0.68	248	314	338	401
Approximately 120 feet downstream of Interstate 87 and 287	0.55	163	202	213	249
Upstream of culvert entrance at Interstate 87 and 287	0.55	180	249	272	357
WILLOW TREE BROOK					
At confluence with Mahwah River	3.80	780	1,230	1,490	2,180
Approximately 610 feet downstream from first of three Grandview Avenue crossings	2.44	740	1,130	1,270	1,570
Approximately 10 feet downstream from second of three Grandview Avenue crossings	1.93	500	780	960	1,400
Approximately 95 feet downstream from Forshay Road	1.42	390	620	760	1,110
Approximately 585 feet downstream from third of three Grandview Avenue crossings	0.88	380	530	610	780

TABLE 7 - SUMMARY OF DISCHARGES - continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-Percent Annual Chance	2-Percent Annual Chance	1-Percent Annual Chance	0.2-Percent Annual Chance
WILLOW TREE BROOK- continued					
Approximately 160 feet downstream from State Route 306	0.62	330	450	520	650
Approximately 90 feet downstream from third of three Grandview Avenue crossings	0.39	240	320	370	470

3.2 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 base flood elevations (BFEs) 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.

Cross section data for the streams studied by detailed methods were field surveyed. Cross sections were located at close intervals above or below bridges and culverts in order to compute the significant backwater effects of these structures. All bridges, dams and culverts were surveyed to obtain elevation data and structural 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 FIRM (Exhibit 2).

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

Pre-Countywide Analyses

Information on hydraulic analyses pertaining to the detailed streams that were conducted prior to this countywide study has been compiled from previous FIS Reports and is summarized below.

Cross section Surveys

Unless otherwise noted, cross section data for the streams studied by detailed methods in previous FIS reports were obtained from photogrammetric surveys. The underwater portions of cross sections and measurements of all bridges and culverts were surveyed to obtain elevation data and structural geometry. Field reconnaissance provided data utilized in verifying the limits of flooding delineated in this study.

Clarkstown, Town of

For Crumm Creek and Mill Creek, water-surface elevations of floods of the selected recurrence intervals were computed using the U.S. Army Corps of Engineers (USACE) HEC-2 step-backwater computer program (Reference 30). Water-surface elevations for Lake DeForest were calculated using rating curves obtained from the Hackensack River Company. Flood profiles were drawn showing computed water-surface elevations for floods of the selected recurrence intervals.

Starting water-surface elevations for Crumm Creek and Mill Creek were determined from normal depth flow calculations.

Haverstraw, Town of

Starting water-surface elevations for South Branch Minisceongo Creek were obtained from the water-surface elevations of Minisceongo Creek at the confluence of the two streams calculated for the 1981 study. Starting water-surface elevations for the Mahwah River were calculated by hydraulic section analysis to determine depth of flow. Water-surface elevations of the selected recurrence intervals were developed using HEC-2.

Hillburn, Village of

Water-surface elevations of floods of the selected recurrence intervals were computed using HEC-2. The starting water-surface elevation for the Ramapo River was the water-surface elevation of the first cross section of the HEC-2 modeling used to prepare the 1982 FIS.

Montebello, Village of

Starting water-surface elevations for the Mahwah River were obtained from the 1981 FIS for the Village of Suffern. Starting water-surface elevations for Spook Rock Brook and Willow Tree Brook were determined using normal depth calculations. Starting water-surface elevations for Montebello Creek were taken from its confluence with the Mahwah River obtained from the FIS for the Village of Wesley Hills.

Orangetown, Town of

The starting water-surface elevation for Muddy Creek was obtained from the FIS for the Borough of Montvale, New Jersey.

Piermont, Village of

The FIRM was revised on November 17, 1982 to include the effects of wave action in the Hudson River. A Zone V5 (changed to Zone VE) at elevation 9 feet NAVD 88 was created, as well as a transitional Zone AE at elevation 8 feet NAVD.

Ramapo, Town of

Water-surface elevations of floods of the selected recurrence intervals were computed using HEC-2. Starting water-surface elevations for Brian Brook, Hungry Hollow Brook, Tributary to West Branch Saddle River, Spook Rock Brook, and Willow Tree Brook were determined using normal depth calculations. Starting water-surface elevations for the Mahwah River were obtained from the FIS for the Village of Suffern. Starting water-surface elevations for the East Branch Saddle River were obtained from the FIS for the Borough of Upper Saddle River, NJ.

Sloatsburg, Village of

Starting water-surface elevations for the Ramapo River were obtained from the FIS for the Village of Hillburn. Starting water-surface elevations for Tributary 1 to Ramapo River, Stony Brook, and Nakoma Brook were determined using the 2.33-year (mean annual) water-surface elevations on the Ramapo River unless exceeded by normal depth water-surface elevations on the tributaries. Starting water-surface elevations for Tributary 1to Nakoma Brook were determined from mean annual water-surface elevations on Nakoma Brook unless exceeded by the tributary normal depths.

Stony Point, Town of

Riverine flood elevations for Cedar Pond Brook and Tributary 1 to the Hudson River were calculated using a mean annual tide elevation (2.33-year recurrence interval) of 3.7 feet (NAVD88) as a starting condition at the mouth of each stream on the Hudson River. Starting water-surface elevations for Tributary to Cedar Pond Brook were taken as the elevations computed for Cedar Pond Brook at their point of confluence.

Suffern, Village of

Water-surface elevations of floods of the selected recurrence intervals were computed through use of HEC-2.

Countywide Analyses

Cross section geometries for the flooding sources studied by detailed methods were obtained from a combination of photogrammetric data and field surveys. All bridges, dams, and culverts were field surveyed to obtain elevation data and structural geometry. The channel sections were located at close intervals upstream and downstream of structures. 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 FIRM (Exhibit 2).

The hydraulic model used for this FIS was the USACE Hydraulic Engineering Center River Analysis Stream, version 3.1.3 (HEC-RAS 3.1.3) (Reference 31). The models were developed using recently acquired photogrammetric land data, field measurements of hydraulic structure information, and updated hydrologic data. The models were run for the peak 10-, 2-, 1-, and 0.2-percent-annual-chance frequency storm discharges.

Starting conditions for the hydraulic models were set to normal depth using starting slopes calculated from water surface elevation values taken from the photogrammetric data.

Starting water-surface elevations for the West Branch Hackensack River and East Branch Hackensack River were determined using water-surface elevations from Lake DeForest.

Hackensack River

Two models were created for the Hackensack River to reflect the impacts of the levee downstream of Interstate 87/287. The analysis revealed that the levee did not provide adequate freeboard (less than 1 foot) above the with-levee BFE. The without-levee model was used to determine the BFE behind the levee in the even of levee failure. The results of the analysis indicated that the without-levee BFE behind the levee was less than 0.5 feet less than the with-levee condition. Therefore, no separate BFE was noted behind the levee.

Sparkill Creek

The Sparkill Creek detailed study reach included a portion of the creek in New Jersey. A continuous model was developed; however, the floodplains in New Jersey are not reflected on the FIRMs.

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

Roughness coefficients (Manning's "n") used in the hydraulic computations were chosen based on field observation. Table 8, "Manning's "n" Values" provides a summary of the Manning's roughness coefficients used for the detailed studies.

TABLE 8 - MANNING'S "n" VALUES

Stream	Channel “n”	Overbank “n”
Antrim Creek	0.040	0.080
Brian Brook	0.045-0.055	0.120-0.150
Cedar Pond Brook	0.020-0.030	0.060-0.080
Crumm Creek	0.015-0.045	0.080-0.100
Demarest Kill	0.013-0.165	0.011-0.180
East Branch Hackensack River	0.025-0.140	0.030-0.165
East Branch Saddle River	0.020-0.035	0.060-0.150
Golf Course Brook	0.015-0.050	0.08-0.15
Hackensack River	0.030-0.045	0.039-0.150
Hungry Hollow Brook	0.015-0.050	0.030-0.100
Mahwah River	0.020-0.060	0.060-0.160
Mill Creek	0.018-0.040	0.060-0.080
Minisceongo Creek	0.030-0.050	0.02-0.20
Montebello Creek	0.040	0.080
Muddy Creek	0.030-0.045	0.090-0.130
Nakoma Brook	0.040-0.045	0.060-0.100
Nauraushaun Brook	0.015-0.045	0.02-0.20
North Branch Pascack Brook	0.013-0.090	0.017-0.180
Pascack Brook	0.015-0.050	0.02-0.20
Pine Brook	0.015-0.035	0.050-0.100
Ramapo River	0.035-0.045	0.080
South Branch Minisceongo Creek	0.018-0.045	0.010-0.100
Sparkill Creek	0.033-0.045	0.050-0.200
Spook Rock Brook	0.015-0.045	0.05-0.100

TABLE 8 - MANNING'S "n" VALUES- CONTINUED

Stream	Channel "n"	Overbank "n"
Spook Rock Brook Left Channel	0.040-0.045	0.100
Stony Brook	0.040	0.080
Tributary to Cedar Pond Brook	0.015-0.040	0.060-0.080
Tributary 1 to Hudson River	0.015-0.045	0.060-0.100
Tributary 1 to Nakoma Brook	0.040-0.045	0.080
Tributary 1 to Ramapo River	0.045	0.080
Tributary 2 to Ramapo River	0.045	0.080
Tributary to West Branch Saddle River	0.015-0.050	0.030-0.150
West Branch Hackensack River	0.030-0.550	0.035-0.179
West Branch Saddle River	0.030-0.090	0.060-0.120
Willow Tree Brook	0.015-0.050	0.030-0.150

For FIRM panels dated July 16, 2004, or later, 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 the 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 NSRS inclusion criteria.

To obtain 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 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 in use for newly created or revised FIS reports 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 county must, therefore, be referenced to NAVD 88. It is important to note that adjacent counties may be referenced to NGVD 29. This may result in difference in BFEs across the county boundaries between the counties.

Ground, structure, and flood elevations may be compared and/or referenced to NGVD 29 by applying a standard conversion factor. The conversion factor was determined at specific points within Rockland County using the USACE Corpscon conversion program (NAVD 88 = NGVD 29 + Conversion Factor). Table 9 – Conversion Factors for Detailed Flooding Sources, provides the conversion factor used for each of the detailed study streams.

TABLE 9 - CONVERSION FACTORS FOR DETAILED FLOODING SOURCES

FLOODING SOURCE	CONVERSION FACTOR (NGVD 29 TO NAVD 88) (FT)
Antrim Creek	-0.90
Brian Brook	-0.89
Cedar Pond Brook	-0.98
Crumm Creek	-0.96
Demarest Kill	-0.97
East Branch Hackensack River	-0.97
East Branch Saddle River	-0.93
Golf Course Brook	-0.91
Hackensack River	-0.97
Hudson River	-0.99
Hungry Hollow Brook	-0.94
Lake Deforest	-0.97
Mahwah River	-0.88
Mill Creek	-0.97
Minisceongo Creek	-0.97
Montebello Creek	-0.90
Muddy Creek	-0.97
Nakoma Brook	-0.83
Nauraushaun Brook	-0.96
North Branch Pascack Brook	-0.94
Pascack Brook	-0.95

TABLE 9- CONVERSION FACTORS FOR DETAILED FLOODING SOURCES- CONTINUED

FLOODING SOURCE	CONVERSION FACTOR (NGVD 29 TO NAVD 88) (FT)
Pine Brook	-0.94
Ramapo River	-0.85
South Branch Minisceongo Creek	-1.08
Sparkill Creek	-0.99
Spook Rock Brook	-0.91
Spook Rock Brook Left Channel	-0.91
Stony Brook	-0.84
Tributary 1 to Hudson River	-0.98
Tributary 1 to Nakoma Brook	-0.81
Tributary 1 to Ramapo River	-0.87
Tributary 1 to West Branch Saddle River	-0.93
Tributary 2 to Ramapo River	-0.84
Tributary to Cedar Pond Brook	-0.97
West Branch Hackensack River	-0.97
West Branch Saddle River	-0.93
Willow Tree Brook	-0.90

Users who wish to convert to the elevations in this FIS to NVGD 29 should apply the stated conversion factor(s) (Table 9) 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 more information regarding conversion between the NGVD 29 and NAVD 88, 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 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 floodplains; 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 report, including Flood Profiles, Floodway Data Table and Summary of Stillwater Elevations Table. Users should reference the data presented in the FIS report, as well as additional information that may be available at the local 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 community. For each stream studied by detailed methods, 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 Geographic Information System (GIS) software and a Digital Elevation Model for this countywide FIS.

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, AO, 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.

The floodplain boundaries for the streams studied by detailed methods as port of this countywide study, as well as the those streams previously studied by detailed methods that have been redelineated have been creating using 2-foot contour data terrain information developed from 1" = 1200' foot scale photography in the Palisades Interstate Park area, and

1" = 750' in the remainder of Rockland County, which was collected in 2002 (Reference 32).

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, provided that hazardous velocities are not produced. The floodways in this study 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 study 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 in Table 10, “Floodway Data.” The computed floodways are shown on the revised 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.

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 10, “Floodway Data.” 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.

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 10 for certain downstream cross sections are lower than the regulatory flood elevations in that area, which must take

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
ANTRIM CREEK								
A	440[1]	24	183	0.8	302.9	302.9	303.5	0.6
B	640[1]	24	164	0.9	302.9	302.9	303.5	0.6
C	860[1]	24	136	1.0	302.9	302.9	303.6	0.7
D	1,560[1]	35	186	0.8	302.9	302.9	303.7	0.8
E	2,240[1]	24	45	3.1	302.9	302.9	303.9	1.0
BRIAN BROOK								
A	730[1]	150	404	1.1	398.8	395.1[4]	396.1	1.0
B	1,370[1]	30	57	5.3	404.4	404.4	404.4	0.0
C	1,640[1]	14	37	8.1	418.4	418.4	418.6	0.2
D	2,090[1]	16	37	8.1	442.6	442.6	442.6	0.0
E	2,460[1]	14	47	6.4	451.7	451.7	452.4	0.7
CEDAR POND BROOK								
A	205[2]	161	1,093	2.7	7.6	7.6	7.6	0.0
B	1,140[2]	345	715	4.1	7.6	7.6	7.6	0.0
C	2,240[2]	299	1,144	2.5	10.5	10.5	10.9	0.4
D	2,980[2]	44	314	9.3	12	12	12.9	0.9
E	3,745[2]	56	249	11.7	18.6	18.6	18.7	0.1
F	4,590[2]	80	316	9.2	25.9	25.9	26.4	0.5
CRUMM CREEK								
A	270[3]	27	99	10.5	122.8	122.8	122.8	0.0
B	1,700[3]	27	96	10.8	148.4	148.4	148.4	0.0
C	3,150[3]	39	108	9.6	170.3	170.3	170.3	0.0
D	5,430[3]	27	109	8.3	207.9	207.9	208.4	0.5
E	6,970[3]	32	97	9.3	223.5	223.5	223.5	0.0
F	8,830[3]	45	160	5.7	237.2	237.2	237.4	0.2

[1] Feet above confluence with Mahwah River
[2] Feet above confluence with Hudson River
[3] Feet above confluence with West Branch Hackensack River
[4] Elevation computed without consideration of backwater effects from Mahwah River

TABLE 10

FEDERAL EMERGENCY MANAGEMENT AGENCY

ROCKLAND COUNTY, NY
(ALL JURISDICTIONS)

FLOODWAY DATA

ANTRIM CREEK – BRIAN BROOK – CEDAR POND BROOK – CRUMM 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
CRUMM CREEK (CON'T)								
G	10,010	32	89	10.2	247.4	247.4	247.4	0.0
H	11,215	35	90	8.5	271.3	271.3	271.3	0.0
I	12,530	21	74	8.0	289.3	289.3	289.5	0.2
J	14,050	35	75	8.1	308.0	308.0	308.0	0.0
K	14,675	30	78	7.8	318.3	318.3	318.4	0.1
L	16,585	30	60	7.8	355.5	355.5	355.5	0.0
M	18,185	34	69	6.8	419.8	419.8	420.0	0.2
N	19,810	24	93	3.8	430.5	430.5	431.1	0.6
DEMAREST KILL								
A	910	178	796	3.3	98.8	98.8	99.4	0.6
B	1,523	163	790	3.3	100.1	100.1	100.7	0.6
C	2,052	69	503	5.2	101.3	101.3	101.8	0.5
D	2,645	92	449	5.8	102.6	102.6	103.2	0.6
E	3,445	140	827	3.2	105.0	105.0	105.7	0.7
F	4,578	46	462	5.7	107.0	107.0	107.7	0.8
G	5,112	47	446	5.9	107.6	107.6	108.5	0.9
H	5,823	62	485	5.4	109.8	109.8	110.3	0.5
I	6,565	41	385	6.8	112.7	112.7	113.2	0.4
J	7,175	65	521	5.0	114.6	114.6	115.1	0.5
K	8,102	77	548	4.8	117.5	117.5	118.2	0.6
L	8,689	49	356	5.5	118.4	118.4	119.0	0.6
M	9,618	59	441	4.5	123.4	123.4	123.6	0.2
N	9,752	81	463	4.3	123.5	123.5	123.7	0.2
O	10,308	35	341	5.8	126.6	126.6	126.8	0.2
P	10,861	48	488	4.1	127.3	127.3	127.7	0.4
Q	11,236	52	294	6.7	127.6	127.6	128.0	0.5
R	12,004	65	465	4.3	133.2	133.2	134.0	0.7

[1] Feet above confluence with West Branch Hackensack River

TABLE 10

FEDERAL EMERGENCY MANAGEMENT AGENCY

ROCKLAND COUNTY, NY
(ALL JURISDICTIONS)

FLOODWAY DATA

CRUMM CREEK – DEMAREST KILL

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
DEMAREST KILL (CON'T)								
S	12,510[1]	92	542	3.6	134.1	134.1	134.9	0.8
T	14,052[1]	33	196	8.5	147.1	147.1	147.9	0.8
U	14,949[1]	56	254	6.5	156.6	156.6	156.8	0.2
V	15,686[1]	75	164	10.1	166.2	166.2	166.2	0.0
W	16,408[1]	76	314	5.3	179.1	179.1	179.1	0.1
X	16,901[1]	45	212	7.8	183.0	183.0	183.0	0.0
Y	17,376[1]	29	136	12.2	186.4	186.4	186.3	0.0
Z	17,758[1]	38	301	5.5	191.9	191.9	192.1	0.2
AA	18,527[1]	36	188	8.8	195.6	195.6	195.7	0.0
AB	19,364[1]	62	253	6.6	202.8	202.8	202.9	0.1
AC	19,942[1]	58	274	6.1	210.0	210.0	210.0	0.0
AD	20,971[1]	108	606	2.7	228.6	228.6	228.7	0.1
AE	21,417[1]	96	209	7.9	234.5	234.5	234.5	0.0
AF	21,979[1]	30	137	12.1	244.6	244.6	244.5	0.0
EAST BRANCH HACKENSACK RIVER								
A	642[2]	296	3,128	0.5	88.4	88.4	88.5	0.0
B	1,323[2]	124	1,178	1.4	88.4	88.4	88.4	0.0
C	1,972[2]	49	395	4.2	89.6	89.6	90.0	0.4
D	2,597[2]	32	144	11.6	92.4	92.4	92.5	0.1
E	3,059[2]	55	162	10.3	96.9	96.9	96.9	0.0
F	3,586[2]	31	221	7.6	100.2	100.2	100.5	0.3
G	4,656[2]	88	745	2.2	117.0	117.0	117.6	0.5
H	5,228[2]	50	410	4.1	117.1	117.1	117.6	0.5

[1] Feet above confluence with West Branch Hackensack River
[2] Feet above confluence with Lake DeForest

TABLE 10

FEDERAL EMERGENCY MANAGEMENT AGENCY

ROCKLAND COUNTY, NY
(ALL JURISDICTIONS)

FLOODWAY DATA

DEMAREST KILL – EAST BRANCH HACKENSACK 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
EAST BRANCH HACKENSACK RIVER (CON'T)								
I	5,844[1]	44	240	7.0	117.7	119.6	118.1	0.4
J	6,451[1]	55	416	3.1	119.6	120.2	119.8	0.2
K	7,182[1]	48	440	2.9	120.2	120.4	120.4	0.2
L	7,648[1]	34	348	3.0	120.4	123.4	120.6	0.2
M	8,698[1]	79	683	1.5	123.5	123.5	124.2	0.8
N	9,208[1]	64	404	2.6	123.5	124.7	124.3	0.8
O	9,705[1]	37	154	6.8	124.7	129.6	125.1	0.4
P	10,188[1]	72	566	1.8	129.6	129.8	129.9	0.3
Q	10,861[1]	62	376	2.8	130.1	130.1	130.1	0.3
R	11,434[1]	48	248	4.2	135.0	135.0	130.4	0.3
S	11,949[1]	74	521	2.0	136.2	136.2	135.7	0.7
T	13,225[1]	779	2,833	0.1	136.2	136.2	136.2	0.0
U	14,052[1]	846	3,077	0.1	136.2	136.2	136.2	0.0
V	15,026[1]	1,566	5,719	0.1	136.2	136.2	136.2	0.0
W	15,574[1]	1,633	5,964	0.1	136.2	136.2	136.2	0.0
X	16,168[1]	1,517	5,535	0.1	136.2	136.2	136.2	0.0
Y	16,692[1]	680	2,477	0.2	144.0	136.2	136.2	0.0
Z	17,358[1]	43	312	1.2	147.2	143.9	144.0	0.1
AA	17,833[1]	315	1,265	0.5	147.2	147.1	147.2	0.0
AB	18,632[1]	786	3,227	0.2	147.2	147.2	147.2	0.0
AC	19,326[1]	1,154	4,630	0.1	147.2	147.2	147.2	0.0
AD	20,086[1]	56	345	1.7	150.2	150.2	150.5	0.2
AE	20,606[1]	46	326	1.7	150.7	150.7	151.0	0.2
EAST BRANCH SADDLE RIVER								
A	382[2]	34	164	7.9	289.6	289.6	289.9	0.3

[1] Feet above confluence with Lake Deforest
[2] Feet above state and county boundary

TABLE 10

FEDERAL EMERGENCY MANAGEMENT AGENCY

ROCKLAND COUNTY, NY
(ALL JURISDICTIONS)

FLOODWAY DATA

EAST BRANCH HACKENSACK RIVER – EAST BRANCH SADDLE 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
EAST BRANCH SADDLE RIVER (CON'T)								
B	550[1]	240	226	5.8	297.5	297.5	297.5	0.0
C	1,032[1]	50	175	7.4	299.3	299.3	299.6	0.3
D	1,600[1]	40	148	8.8	307.0	307.0	307.7	0.7
E	1,942[1]	37	276	4.7	316.3	316.3	316.6	0.3
F	2,520[1]	40	188	6.9	319.4	319.4	319.4	0.0
G	2,915[1]	100	258	5.0	326.6	326.6	327.4	0.8
H	3,600[1]	60	167	7.8	334.2	334.2	334.3	0.1
I	4,280[1]	40	160	5.5	345.6	345.6	346.3	0.7
J	4,800[1]	55	172	5.1	353.3	353.3	354.3	1.0
K	5,420[1]	43	159	5.5	363.0	363.0	363.9	0.9
L	6,130[1]	41	179	4.8	371.1	371.1	372.1	1.0
M	7,180[1]	27	105	5.9	385.7	385.7	386.0	0.3
N	7,740[1]	115	175	3.5	396.6	396.6	397.0	0.4
O	8,260[1]	25	52	6.5	399.7	399.7	400.7	1.0
GOLF COURSE BROOK								
A	107[2]	253	442	2.5	318.1	318.1	318.6	0.5
B	412[2]	354	1,031	1.1	319.4	319.4	320.2	0.8
C	933[2]	260	867	1.3	320.5	320.5	321.2	0.7
D	1,499[2]	175	647	1.7	322.1	322.1	322.7	0.6
E	1,738[2]	235	861	1.3	322.6	322.6	323.4	0.8
F	2,096[2]	149	468	2.0	323.0	323.0	323.8	0.8
G	2,324[2]	150	571	1.6	325.7	325.7	326.0	0.3
H	2,608[2]	65	340	2.7	325.9	325.9	326.0	0.1
I	2,952[2]	155	518	1.8	326.2	326.2	327.1	0.9

[1] Feet above state and county boundary
[2] Feet above confluence with Mahwah River

TABLE 10

FEDERAL EMERGENCY MANAGEMENT AGENCY

ROCKLAND COUNTY, NY
(ALL JURISDICTIONS)

FLOODWAY DATA

EAST BRANCH SADDLE RIVER – GOLF COURSE BROOK

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
GOLF COURSE BROOK (CON'T)								
J	3,574[1]	50	228	4.1	327.3	327.3	327.9	0.6
K	4,199[1]	61	153	6.1	338.1	338.1	338.2	0.1
L	4,341[1]	38	135	6.9	342.9	342.9	343.0	0.1
M	4,683[1]	34	135	6.9	353.7	353.7	354.0	0.3
N	4,858[1]	241	118	7.9	359.0	359.0	359.0	0.0
O	4,977[1]	399	208	4.5	364.2	364.2	364.2	0.0
P	5,084[1]	315	158	5.9	366.0	366.0	366.0	0.0
Q	5,334[1]	44	123	5.4	375.0	375.0	375.0	0.0
R	5,946[1]	197	1,113	0.6	391.8	391.8	391.8	0.0
S	6,652[1]	226	1,369	0.5	403.8	403.8	403.8	0.0
T	6,837[1]	144	872	0.8	403.8	403.8	403.8	0.0
U	7,501[1]	21	77	8.6	419.0	419.0	419.2	0.2
V	7,633[1]	32	83	8.0	423.0	423.0	423.3	0.3
W	7,704[1]	42	157	4.2	424.2	424.2	424.9	0.7
X	7,889[1]	61	258	2.0	430.3	430.3	430.3	0.0
Y	8,223[1]	69	107	4.9	437.3	437.3	437.4	0.1
Z	8,788[1]	30	67	7.8	450.9	450.9	450.9	0.0
AA	9,146[1]	75	114	4.6	461.5	461.5	461.5	0.0
AB	9,726[1]	130	1,020	0.5	474.9	474.9	474.9	0.0
AC	10,039[1]	20	58	9.0	482.1	482.1	482.2	0.1
AD	10,550[1]	28	75	6.9	492.3	492.3	492.4	0.1
HACKENSACK RIVER								
A	134[2]	169	1,007	2.8	58.2	58.2	59.0	0.8
B	1,087[2]	224	1,036	2.7	58.7	58.7	59.5	0.8
C	2,708[2]	447	1,767	1.6	59.3	59.3	60.2	0.9
D	3,216[2]	277	1,515	1.9	59.4	59.4	60.4	1.0
E	3,685[2]	146	1,079	2.6	59.5	59.5	60.5	1.0

[1] Feet above confluence with Mahwah River
[2] Feet above Clarkestown/Orangetown Corporate Limits

TABLE 10

FEDERAL EMERGENCY MANAGEMENT AGENCY

ROCKLAND COUNTY, NY
(ALL JURISDICTIONS)

FLOODWAY DATA

GOLF COURSE BROOK – HACKENSACK 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
HACKENSACK RIVER (CON'T)								
F	3,998[1]	93	653	4.3	59.5	59.5	60.4	0.9
G	4,364[1]	61	669	4.2	61.4	61.4	62.3	0.9
H	4,731[1]	504	3,222	0.9	62.6	62.6	63.3	0.7
I	5,807[1]	665	4,189	0.7	62.7	62.7	63.4	0.7
J	6,788[1]	468	3,540	0.8	62.8	62.8	63.5	0.7
K	7,296[1]	349	1,864	1.5	62.8	62.8	63.5	0.7
L	7,633[1]	244	1,329	2.1	62.9	62.9	63.5	0.6
M	8,080[1]	107	1,012	2.8	62.9	62.9	63.7	0.8
N	8,297[1]	120	920	3.1	62.9	62.9	63.8	0.9
O	8,579[1]	230	1,204	2.4	63.2	63.2	64.1	0.9
P	8,878[1]	176	1,004	2.8	63.3	63.3	64.2	0.9
Q	9,394[1]	399	1,670	1.7	63.8	63.8	64.7	0.9
R	9,777[1]	1,508	7,698	0.4	65.0	65.0	65.8	0.8
S	9,963[1]	1,472	8,380	0.3	65.0	65.0	65.8	0.8
T	10,748[1]	1,215	7,761	0.3	65.0	65.0	65.8	0.8
U	12,328[1]	624	4,131	0.5	65.0	65.0	65.8	0.8
V	12,672[1]	409	1,622	1.3	65.0	65.0	65.8	0.8
W	12,919[1]	119	1,050	2.0	65.3	65.3	66.1	0.8
X	13,446[1]	277	1,975	1.0	65.5	65.5	66.2	0.7
Y	13,649[1]	102	971	2.1	65.5	65.5	66.2	0.7
Z	14,152[1]	392	2,358	0.9	65.6	65.6	66.3	0.7
AA	14,399[1]	281	1,663	1.2	65.6	65.6	66.3	0.7
AB	14,979[1]	141	858	2.4	66.6	66.6	67.3	0.7
AC	15,139[1]	100	634	3.1	66.6	66.6	67.3	0.7
HUNGRY HOLLOW BROOK								
A	200[2]	19	44	8.8	360.4	360.4	360.4	0.0

[1] Feet above Clarkestown/Orangetown Corporate Limits
[2] Feet above confluence with Pine Brook

TABLE 10

FEDERAL EMERGENCY MANAGEMENT AGENCY

ROCKLAND COUNTY, NY
(ALL JURISDICTIONS)

FLOODWAY DATA

HACKENSACK RIVER – HUNGRY HOLLOW BROOK

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
HUNGRY HOLLOW BROOK (CON'T)								
B	790[1]	19	50	7.8	371.9	371.9	372.1	0.2
C	1,300[1]	33	112	3.5	377.7	377.7	378.7	1.0
D	1,675[1]	22	93	4.2	387.4	387.4	387.8	0.4
E	2,135[1]	26	79	4.4	397.3	397.3	398.2	0.9
F	2,700[1]	19	65	5.4	409.7	409.7	410.5	0.8
G	3,520[1]	25	67	4.6	420.5	420.5	421.5	1.0
H	4,140[1]	13	52	5.2	429.8	429.8	430.2	0.4
I	5,000[1]	13	34	7.1	443.8	443.8	443.8	0.0
J	5,580[1]	19	44	5.5	461.8	461.8	461.9	0.1
K	6,020[1]	24	50	4.0	468.6	468.6	468.7	0.1
L	6,322[1]	50	119	1.7	471.6	471.6	472.4	0.8
M	6,940[1]	50	14	2.2	474.7	474.7	475.7	1.0
MAHWAY RIVER								
A	720[2]	519	2,846	1.3	276.6	276.6	277.6	1.0
B	1,450[2]	522	2,099	1.7	276.8	276.8	277.8	1.0
C	2,170[2]	241	742	4.9	277.3	277.3	278.2	0.9
D	2,460[2]	242	1,597	2.3	282.5	282.5	282.7	0.2
E	3,140[2]	173	1,090	3.4	282.8	282.8	283.2	0.4
F	3,620[2]	96	551	6.7	283.4	283.4	284.0	0.6
G	4,000[2]	174	554	6.6	287.0	287.0	287.0	0.0
H	4,175[2]	65	594	6.2	290.8	290.8	290.8	0.0
I	4,620[2]	69	560	6.6	298.9	298.9	298.9	0.0
J	4,900[2]	140	1,795	2.0	299.4	299.4	299.4	0.0
K	5,550[2]	300	3,570	1.0	299.5	299.5	299.5	0.0
L	6,085[2]	68	526	6.5	300.9	300.9	301.2	0.3
M	6,700[2]	453	6,027	0.6	301.9	301.9	302.1	0.2

[1] Feet above confluence with Pine Brook
[2] Feet above state and county boundary

TABLE 10

FEDERAL EMERGENCY MANAGEMENT AGENCY

ROCKLAND COUNTY, NY
(ALL JURISDICTIONS)

FLOODWAY DATA

HUNGRY HOLLOW BROOK – MAHWAH 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
MAHWAH RIVER (CON'T)								
N	7,210	124	1,154	3.0	301.9	301.9	302.1	0.2
O	7,715	169	1,459	2.3	302.0	302.0	302.3	0.3
P	8,300	147	807	4.2	302.1	302.1	302.5	0.4
Q	8,725	118	467	7.3	303.0	303.0	304.0	1.0
R	11,130	558	6,110	0.6	308.4	308.4	309.3	0.9
S	13,400	461	3,631	1.1	308.5	308.5	309.5	1.0
T	15,070	61	397	9.9	316.5	316.5	316.8	0.3
U	16,980	174	1,309	3.0	321.3	321.3	321.8	0.5
V	19,220	553	3,308	1.0	322.9	322.9	323.7	0.8
W	21,620	600	3,172	1.1	323.3	323.3	324.3	1.0
X	23,800	170	801	3.8	327.7	327.7	328.6	0.9
Y	25,304	290	1,173	2.6	333.3	333.3	334.1	0.8
Z	26,838	183	508	6.0	337.4	337.4	337.8	0.4
AA	29,140	143	956	3.0	352.6	352.6	353.5	0.9
AB	30,910	115	823	3.5	355.4	355.4	356.4	1.0
AC	32,773	250	1,114	2.6	357.7	357.7	358.6	0.9
AD	34,820	200	1,140	1.6	360.2	360.2	361.2	1.0
AE	36,435	89	302	6.2	368.8	368.8	369.2	0.4
AF	38,430	94	445	4.2	384.4	384.4	385.3	0.9
AG	39,700	51	312	6.0	394.6	394.6	395.6	1.0
AH	41,190	250	1,889	0.8	397.6	397.6	398.4	0.8
AI	42,210	253	2,004	0.8	397.8	397.8	398.7	0.9
AJ	43,020	320	2,383	0.7	398.6	398.6	399.5	0.9
AK	45,280	300	1,966	0.7	398.7	398.7	399.7	1.0
AL	47,150	200	968	1.0	398.9	398.9	399.9	1.0
AM	48,265	85	249	4.0	406.1	406.1	407.1	1.0

[1] Feet above state and county boundary

TABLE 10

FEDERAL EMERGENCY MANAGEMENT AGENCY

ROCKLAND COUNTY, NY
(ALL JURISDICTIONS)

FLOODWAY DATA

MAHWAH 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
MAHWAH RIVER (CON'T)								
AN	49,200[1]	40	131	7.7	419.6	419.6	419.6	0.0
AO	49,940[1]	23	56	7.1	424.3	424.3	424.3	0.0
AP	50,900[1]	40	73	5.4	434.4	434.4	434.4	0.0
AQ	51,720[1]	33	47	8.3	445.4	445.4	445.4	0.0
AR	52,460[1]	20	57	5.4	453.0	453.0	453.0	0.0
AS	53,370[1]	18	37	8.4	458.3	458.3	458.3	0.0
MILL CREEK								
A	1,150[2]	40	154	5.6	65.4	63.7[4]	64.7	1.0
B	1,850[2]	19	118	7.3	67.4	67.4	68.2	0.8
C	2,600[2]	100	248	3.5	92.4	92.4	92.4	0.0
D	4,400[2]	37	93	9.2	111.9	111.9	111.9	0.0
E	5,200[2]	46	103	8.4	119.6	119.6	119.6	0.0
F	5,800[2]	27	129	6.7	131.0	131.0	131.3	0.3
G	6,520[2]	20	54	9.5	135.2	135.2	135.2	0.0
H	7,250[2]	30	72	7.1	144.2	144.2	144.5	0.3
I	8,265[2]	24	51	7.9	160.0	160.0	160.0	0.0
MINISCEONGO CREEK								
A	115[3]	140	1,197	3.7	7.3	7.3	8.3	1.0
B	501[3]	52	358	12.2	7.4	7.4	8.1	0.7
C	807[3]	53	549	8.0	10.7	10.7	10.7	0.0
D	1,092[3]	180	1,176	3.7	11.8	11.8	11.9	0.1
E	1,317[3]	140	884	4.9	11.9	11.9	12.1	0.2
F	1,474[3]	132	1,085	4.0	12.3	12.3	12.4	0.1
G	1,858[3]	102	1,092	4.0	13.6	13.6	13.8	0.2
H	2,502[3]	74	351	12.4	14.0	14.0	14.0	0.0

[1] Feet above state and county boundary
[2] Feet above confluence with Hackensack River
[3] Feet above mouth
[4] Elevation computed without consideration of backwater effects from the Hackensack River

TABLE 10

FEDERAL EMERGENCY MANAGEMENT AGENCY

ROCKLAND COUNTY, NY
(ALL JURISDICTIONS)

FLOODWAY DATA

MAHWAH RIVER – MILL CREEK – MINISCEONGO 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
MINISCEONGO CREEK (CON'T)								
I	2,696	62	330	13.3	16.1	16.1	16.1	0.0
J	2,854	118	626	7.0	18.7	18.7	18.7	0.0
K	3,534	54	472	9.2	22.1	22.1	22.1	0.0
L	3,982	64	375	11.7	25.2	25.2	25.3	0.1
M	4,456	102	511	8.5	30.9	30.9	30.9	0.0
N	4,806	70	342	12.8	34.1	34.1	34.2	0.1
O	5,825	59	431	10.1	46.7	46.7	46.7	0.0
P	6,095	59	428	10.2	48.9	48.9	48.9	0.0
Q	6,309	64	464	9.4	50.8	50.8	50.8	0.0
R	6,617	92	458	9.5	53.6	53.6	53.6	0.0
S	7,089	66	747	5.5	73.0	73.0	73.0	0.0
T	7,513	58	746	5.6	75.8	75.8	75.7	0.0
U	7,997	51	287	14.4	81.8	81.8	82.3	0.3
V	8,521	60	513	8.1	94.2	94.2	94.2	0.0
W	9,114	41	294	14.1	108.3	108.3	108.3	0.0
X	9,270	52	494	8.4	114.3	114.3	114.3	0.0
Y	9.384	53	303	13.6	114.3	114.3	114.3	0.0
Z	10.466	51	418	9.9	142.0	142.0	142.0	0.0
AA	10.977	46	290	14.3	142.9	142.9	142.9	0.0
AB	11.447	58	350	11.8	143.6	143.6	143.7	0.1
AC	12,076	68	353	11.7	156.2	156.2	156.5	0.3
AD	12,561	84	443	9.3	178.7	178.7	178.7	0.0
AE	13,131	164	1,923	2.2	178.7	178.7	178.8	0.1
AF	14,106	79	680	6.1	204.7	204.7	204.7	0.0
AG	14,654	64	332	12.5	204.9	204.9	204.9	0.0
AH	15,144	58	319	13.0	207.2	207.2	207.2	0.0
AI	15,651	46	498	8.3	213.5	213.5	213.5	0.0
AJ	16,022	318	1,977	2.1	218.9	218.9	219.0	0.1

[1] Feet above mouth

TABLE 10

FEDERAL EMERGENCY MANAGEMENT AGENCY

ROCKLAND COUNTY, NY
(ALL JURISDICTIONS)

FLOODWAY DATA

MINISCEONGO 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
MINISCEONGO CREEK (CON'T)								
AK	16,537[1]	82	581	6.6	227.0	227.0	227.0	0.0
AL	17,109[1]	274	1,663	2.3	239.7	239.7	240.0	0.3
AM	17,685[1]	330	1,871	2.0	249.7	249.7	249.7	0.0
AN	18,193[1]	59	298	12.8	259.8	259.8	259.8	0.0
AO	18,802[1]	118	576	6.6	269.9	269.9	269.9	0.0
AP	19,424[1]	158	447	8.5	278.1	278.1	278.1	0.0
AQ	19,781[1]	80	334	11.4	283.2	283.2	283.3	0.1
AR	20,576[1]	121	480	7.9	295.8	295.8	295.9	0.1
AS	21,121[1]	75	320	11.9	306.8	306.8	306.8	0.0
AT	21,621[1]	76	321	11.9	317.6	317.6	317.6	0.0
AU	22,121[1]	61	303	12.6	322.6	322.6	322.6	0.0
AV	22,707[1]	47	270	11.8	327.9	327.9	328.2	0.3
AW	23,121[1]	52	254	12.6	332.7	332.7	333.3	0.6
AX	23,621[1]	50	303	10.5	336.9	336.9	337.0	0.1
AY	24,364[1]	57	262	12.2	340.8	340.8	340.8	0.0
AZ	24,877[1]	326	439	7.3	348.1	348.1	348.1	0.0
BA	25,680[1]	61	332	9.6	348.8	348.8	348.8	0.0
BB	26,365[1]	45	271	11.8	349.6	349.6	349.7	0.1
MONTEBELLO CREEK								
A	1,715[2]	82	161	4.0	323.6	323.6	323.9	0.3
B	2,040[2]	23	66	9.6	333.4	333.4	334.3	0.9
C	2,565[2]	17	85	7.5	340.0	340.0	340.7	0.7
MUDDY CREEK								
A	98[3]	29	174	2.8	212.8	212.8	212.8	0.0
B	460[3]	21	93	5.2	213.1	213.1	213.1	0.0
C	870[3]	38	179	2.7	214.1	214.1	214.5	0.4

[1] Feet above mouth
[2] Feet above confluence with Mahwah River
[3] Feet above state and county boundary

TABLE 10

FEDERAL EMERGENCY MANAGEMENT AGENCY

ROCKLAND COUNTY, NY
(ALL JURISDICTIONS)

FLOODWAY DATA

MINISCEONGO CREEK – MONTEBELLO CREEK – MUDDY 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
MUDDY CREEK (CON'T)								
D	1,490[1]	20	83	5.9	217.1	217.1	217.1	0.0
E	1,815[1]	27	143	3.4	218.1	218.1	218.4	0.3
F	1,881[1]	27	179	2.7	218.8	218.8	219.0	0.2
G	2,150[1]	12	75	6.5	218.8	218.8	219.1	0.3
H	2,280[1]	12	93	5.2	220.4	220.4	220.6	0.2
I	2,410[1]	12	97	5.0	220.7	220.7	221.1	0.4
J	2,571[1]	12	101	4.8	221.1	221.1	221.7	0.6
K	2,685[1]	12	99	4.9	221.4	221.4	222.3	0.9
L	3,215[1]	74	415	1.2	222.4	222.4	223.1	0.7
M	3,810[1]	28	122	4.0	222.4	222.4	223.1	0.7
N	4,925[1]	159	838	0.6	225.0	225.0	225.4	0.4
O	5,420[1]	293	1,050	0.5	225.0	225.0	225.4	0.4
P	6,420[1]	90	184	2.6	225.3	225.3	225.7	0.4
Q	6,700[1]	30	120	4.0	226.7	226.7	227.2	0.5
R	7,300[1]	19	73	6.6	232.6	232.6	233.0	0.4
S	8,225[1]	13	45	10.7	244.4	244.4	245.1	0.7
T	8,511[1]	15	63	7.7	251.1	251.1	251.9	0.8
NAKOMA BROOK								
A	1,330[2]	65	229	3.8	338.7	336.5[3]	336.9	0.4
B	2,980[2]	40	179	4.8	340.3	339.5[3]	340.1	0.6
C	3,530[2]	50	133	3.0	343.3	343.3	343.3	0.0
D	3,870[2]	25	75	5.3	347.1	347.1	347.1	0.0

[1] Feet above state and county boundary
[2] Feet above confluence with Ramapo River
[3] Elevation computed without backwater effects from Ramapo River

TABLE 10

FEDERAL EMERGENCY MANAGEMENT AGENCY

ROCKLAND COUNTY, NY
(ALL JURISDICTIONS)

FLOODWAY DATA

MUDDY CREEK – NAKOMA BROOK

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
NAKOMA BROOK (CON'T)								
E	4,490[1]	55	74	5.4	356.7	356.7	356.7	0.0
F	5,470[1]	77	404	1.0	378.0	378.0	378.0	0.0
G	5,920[1]	21	38	8.2	381.1	381.1	381.1	0.0
H	6,250[1]	19	66	4.7	385.5	385.5	386.2	0.7
I	6,975[1]	20	91	3.4	392.9	392.9	393.5	0.6
J	7,495[1]	20	56	5.5	396.2	396.2	396.3	0.1
K	8,260[1]	26	45	6.9	403.8	403.8	403.9	0.1
NAURAUSHAUN BROOK								
A	214[2]	44	230	9.9	57.3	57.3	57.3	0.0
B	711[2]	31	228	9.9	62.0	62.0	62.1	0.1
C	965[2]	51	199	11.4	64.7	64.7	64.8	0.1
D	1,128[2]	43	217	10.4	71.1	71.1	71.1	0.0
E	1,380[2]	44	183	12.4	75.0	75.0	75.0	0.0
F	1,621[2]	51	419	5.4	84.4	84.4	84.4	0.0
G	1,956[2]	48	184	12.3	85.0	85.0	85.0	0.0
H	2,481[2]	33	199	11.4	94.1	94.1	94.2	0.1
I	2,945[2]	35	173	13.1	104.4	104.4	104.4	0.0
J	3,391[2]	38	227	10.0	111.4	111.4	111.4	0.0
K	3,701[2]	45	215	10.6	114.7	114.7	114.8	0.1
L	4,007[2]	31	224	10.1	118.2	118.2	118.7	0.5
M	4,646[2]	38	193	11.7	126.2	126.2	126.4	0.2
N	5,061[2]	65	291	7.8	132.3	132.3	132.3	0.0
O	5,358[2]	220	1,369	1.7	144.1	144.1	144.1	0.0
P	5,717[2]	109	295	7.7	146.4	146.4	146.4	0.0
Q	6,202[2]	46	290	7.8	150.7	150.7	150.7	0.0
R	6,896[2]	59	215	10.5	158.2	158.2	158.2	0.0
S	7,168[2]	49	208	9.9	162.8	162.8	162.8	0.0
T	7,542[2]	46	221	9.3	167.2	167.2	167.2	0.0

[1] Feet above confluence with Ramapo River
[2] Feet above confluence with Hackensack River

TABLE 10

FEDERAL EMERGENCY MANAGEMENT AGENCY

ROCKLAND COUNTY, NY
(ALL JURISDICTIONS)

FLOODWAY DATA

NAKOMA BROOK – NAURAUSHAUN BROOK

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
NAURAUSHAUN BROOK (CON'T)								
U	8,105	50	228	9.0	172.9	172.9	173.0	0.1
V	8,353	47	281	7.3	175.6	175.6	175.9	0.3
W	9,024	41	174	11.7	183.2	183.2	183.2	0.0
X	9,527	31	222	9.2	189.6	189.6	190.3	0.7
Y	10,032	38	206	9.9	194.8	194.8	195.1	0.3
Z	10,680	51	278	7.4	199.8	199.8	200.2	0.4
AA	10,881	47	369	4.8	202.0	202.0	202.5	0.5
AB	11,368	48	233	7.6	203.1	203.1	203.3	0.2
AC	11,945	44	238	7.5	205.8	205.8	206.2	0.4
AD	12,619	36	134	11.6	210.2	210.2	210.2	0.0
AE	13,543	56	432	3.4	230.0	230.0	230.0	0.0
AF	14,354	125	859	1.7	242.7	242.7	243.7	1.0
AG	14,524	73	502	2.9	242.7	242.7	243.7	1.0
AH	14,710	87	396	3.7	243.1	243.1	244.0	0.9
AI	14,980	49	281	3.9	243.5	243.5	244.4	0.9
AJ	15,173	71	289	3.8	244.0	244.0	244.7	0.7
AK	15,893	57	210	5.2	247.8	247.8	248.6	0.8
AL	16,278	29	115	9.5	251.1	251.1	251.3	0.2
AM	16,735	27	127	8.6	257.8	257.8	258.0	0.2
AN	16,989	31	200	5.5	263.3	263.3	263.8	0.5
AO	17,396	53	124	8.9	265.9	265.9	265.9	0.0
AP	17,610	47	181	6.1	268.6	268.6	268.6	0.0
AQ	17,891	52	215	5.1	271.5	271.5	271.5	0.0
AR	18,138	120	417	2.6	272.5	272.5	272.5	0.0
AS	18,396	74	137	8.0	274.6	274.6	274.6	0.0
AT	18,675	47	275	4.0	277.3	277.3	277.6	0.3
AU	18,909	46	239	4.6	278.3	278.3	278.6	0.3
AV	19,324	46	210	5.2	280.9	280.9	281.3	0.4

[1] Feet above confluence with Hackensack River

TABLE 10

FEDERAL EMERGENCY MANAGEMENT AGENCY

ROCKLAND COUNTY, NY
(ALL JURISDICTIONS)

FLOODWAY DATA

NAURAUSHAUN BROOK

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
NAURAUSHAUN BROOK (CON'T)								
AW	19,484[1]	113	490	2.2	282.2	282.2	282.9	0.7
AX	20,156[1]	52	371	3.0	284.5	284.5	284.9	0.4
AY	20,740[1]	43	231	4.7	284.8	284.8	285.2	0.4
AZ	23,058[1]	562	2,607	0.3	289.0	289.0	289.4	0.4
BA	23,442[1]	315	1,180	0.8	289.0	289.0	289.5	0.5
BB	23,825[1]	83	377	2.4	289.1	289.1	289.5	0.4
BC	24,442[1]	302	1,151	0.8	289.3	289.3	289.9	0.6
BD	25,668[1]	266	2,702	0.3	296.9	296.9	297.6	0.7
BE	26,226[1]	390	3,930	0.2	296.9	296.9	297.6	0.7
BF	26,667[1]	466	3,405	0.3	296.9	296.9	297.6	0.7
BG	27,028[1]	659	3,954	0.2	296.9	296.9	297.7	0.8
BH	27,367[1]	627	4,468	0.2	296.9	296.9	297.7	0.8
BI	27,932[1]	379	2,809	0.3	296.9	296.9	297.7	0.8
BJ	28,431[1]	242	1,444	0.6	297.0	297.0	297.7	0.7
BK	29,085[1]	67	391	1.8	297.0	297.0	297.7	0.7
NORTH BRANCH PASCACK BROOK								
A	941[2]	38	257	5.3	357.7	357.7	357.6	0.0
B	1,274[2]	69	625	2.2	364.0	364.0	364.0	0.1
C	1,863[2]	46	305	4.5	364.2	364.2	364.4	0.1
D	2,427[2]	30	156	8.7	366.1	366.1	366.4	0.3
E	2,965[2]	38	232	5.9	369.4	369.4	370.1	0.7
F	3,446[2]	53	306	4.5	377.0	377.0	377.1	0.1
G	4,063[2]	57	406	3.4	382.8	382.8	383.6	0.8

[1] Feet above confluence with Hackensack River
[2] Feet above confluence with Pascack Brook

TABLE 10

FEDERAL EMERGENCY MANAGEMENT AGENCY

ROCKLAND COUNTY, NY
(ALL JURISDICTIONS)

FLOODWAY DATA

NAURAUSHAUN BROOK – NORTH BRANCH PASCACK BROOK

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 BRANCH PASCACK BROOK (CON'T)								
H	4,466[2]	32	221	6.2	384.9	384.9	385.2	0.3
I	5,198[2]	23	132	10.3	397.2	397.2	397.7	0.5
J	5,746[2]	26	95	10.8	410.3	410.3	410.3	0.0
K	6,210[2]	27	96	10.7	419.6	419.6	419.6	0.0
L	6,527[2]	34	209	4.9	426.2	426.2	426.8	0.6
M	6,910[2]	55	339	3.0	433.2	433.2	433.4	0.2
N	7,494[2]	31	212	4.2	434.3	434.3	435.0	0.8
O	7,905[2]	19	113	8.0	435.9	435.9	436.3	0.4
P	8,237[2]	28	184	4.9	438.8	438.8	439.1	0.3
Q	8,848[2]	22	76	10.4	440.8	440.8	440.8	0.0
R	9,318[2]	44	210	3.8	446.5	446.5	447.1	0.6
S	10,016[2]	30	155	5.1	449.4	449.4	449.7	0.3
T	10,655[2]	30	192	4.1	452.1	452.1	452.4	0.3
U	11,058[2]	30	150	4.5	453.5	453.5	453.7	0.2
V	11,672[2]	38	195	3.4	455.4	455.4	455.4	0.1
W	11,879[2]	51	311	2.1	457.6	457.6	457.7	0.1
X	12,197[2]	44	328	2.0	460.1	460.1	460.1	0.1
Y	12,629[2]	58	328	2.0	461.9	461.9	462.0	0.1
Z	13,546[2]	18	102	4.7	464.2	464.2	464.3	0.1
AA	13,956[2]	30	111	4.3	468.7	468.7	468.7	0.0
AB	14,543[2]	23	70	6.9	481.1	481.1	481.1	0.0
AC	16,491[2]	50	297	1.2	510.9	510.9	510.9	0.0
AD	16,992[2]	27	85	3.4	512.1	512.1	512.1	0.1
AE	17,339[2]	19	56	5.1	513.4	513.4	513.6	0.1
PASCACK BROOK								
A	168[2]	101	489	9.1	206.2	206.2	206.2	0.0
B	788[2]	58	432	10.3	210.2	210.2	210.2	0.0

[1] Feet above confluence with Pascack Brook
[2] Feet above state and county boundary

TABLE 10

FEDERAL EMERGENCY MANAGEMENT AGENCY

ROCKLAND COUNTY, NY
(ALL JURISDICTIONS)

FLOODWAY DATA

NORTH BRANCH PASCACK BROOK – PASCACK BROOK

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
PASCACK BROOK (CON'T)								
C	1,529	96	463	9.6	220.0	220.0	220.1	0.1
D	1,951	102	848	5.3	226.6	226.6	227.0	0.4
E	2,500	158	578	7.7	231.4	231.4	231.4	0.0
F	3,000	118	643	6.9	236.5	236.5	236.5	0.0
G	3,500	142	627	7.1	240.5	240.5	240.9	0.4
H	4,000	63	370	10.8	245.1	245.1	245.1	0.0
I	4,500	139	557	7.1	250.1	250.1	250.1	0.0
J	4,981	122	686	5.8	253.5	253.5	253.7	0.2
K	5,290	66	405	9.8	256.7	256.7	256.8	0.1
L	5,866	111	558	7.1	261.6	261.6	261.7	0.1
M	7,289	109	635	6.2	279.6	279.6	279.8	0.2
N	7,543	99	705	5.6	280.4	280.4	281.3	0.9
O	7,968	78	526	7.5	281.3	281.3	281.9	0.6
P	8,627	73	415	9.5	284.1	284.1	284.8	0.7
Q	9,053	42	393	10.0	288.8	288.8	289.3	0.5
R	9,668	47	310	12.7	294.2	294.2	294.5	0.3
S	10,271	52	383	10.3	300.3	300.3	300.4	0.1
T	10,658	69	530	7.4	305.2	305.2	306.2	1.0
U	11,000	139	665	5.9	308.4	308.4	308.6	0.2
V	12,064	85	616	6.0	314.6	314.6	315.6	1.0
W	12,316	55	587	6.3	319.7	319.7	320.4	0.7
X	12,953	153	529	7.0	323.4	323.4	323.4	0.0
Y	13,500	67	504	7.3	327.5	327.5	327.5	0.0
Z	14,080	98	861	4.3	329.2	329.2	329.7	0.5
AA	14,692	93	1,027	3.6	329.8	329.8	330.3	0.5
AB	15,126	100	950	3.9	330.0	330.0	330.5	0.5
AC	15,734	71	368	10.0	331.6	331.6	331.7	0.1
AD	15,846	146	1,269	2.9	333.8	333.8	334.8	1.0

[1] Feet above state and county boundary

TABLE 10

FEDERAL EMERGENCY MANAGEMENT AGENCY

ROCKLAND COUNTY, NY
(ALL JURISDICTIONS)

FLOODWAY DATA

PASCACK BROOK

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
PASCACK BROOK (CON'T)								
AE	17,153	149	921	4.0	334.9	334.9	335.9	1.0
AF	17,822	71	480	7.7	337.0	337.0	338.0	1.0
AG	18,285	96	680	5.4	339.0	339.0	339.8	0.8
AH	18,787	181	2,053	1.8	343.0	343.0	343.0	0.0
AI	19,145	175	1,498	2.5	343.1	343.1	343.1	0.0
AJ	19,525	130	900	4.1	343.1	343.1	343.1	00.
AK	19,685	112	718	5.2	342.9	342.9	343.4	0.5
AL	20,086	75	454	8.1	343.9	343.9	344.5	0.6
AM	20,426	111	643	5.8	346.4	346.4	346.6	0.2
AN	21,469	196	1,182	3.1	348.3	348.3	348.8	0.5
AO	21,857	225	1,649	2.2	350.7	350.7	351.2	0.5
AP	22,031	254	1,640	2.3	350.9	350.9	351.4	0.5
AQ	22,223	271	1,189	3.1	351.0	351.0	351.4	0.4
AR	22,579	176	585	3.3	351.6	351.6	352.4	0.8
AS	23,111	48	187	10.4	358.8	358.8	358.8	0.0
AT	23,500	52	209	9.3	365.1	365.1	365.1	0.0
AU	24,084	35	161	12.1	380.9	380.9	380.9	0.0
AV	24,500	38	187	10.4	388.1	388.1	388.3	0.2
AW	25,000	38	204	9.5	394.5	394.5	394.7	0.2
AX	25,342	38	165	11.8	405.6	405.6	405.6	0.0
AY	25,611	60	248	7.8	409.6	409.6	409.7	0.1
AZ	26,000	31	153	12.7	422.2	422.2	422.2	0.0
BA	26,491	29	234	8.1	428.2	428.2	429.0	0.8
BB	26,776	50	457	4.1	432.3	432.3	432.8	0.5
BC	27,031	34	357	5.3	432.5	432.5	433.1	0.6
BD	27,268	36	287	6.6	432.9	432.9	433.6	0.7
BE	27,826	81	854	2.2	441.1	441.1	441.2	0.1
BF	28,372	415	3,767	0.5	441.2	441.2	441.2	0.0

[1] Feet above state and county boundary

TABLE 10

FEDERAL EMERGENCY MANAGEMENT AGENCY

ROCKLAND COUNTY, NY
(ALL JURISDICTIONS)

FLOODWAY DATA

PASCACK BROOK

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
PASCACK BROOK (CON'T)								
BG	28,743	370	3,075	0.6	441.3	441.3	441.3	0.0
BH	29,078	390	3,218	0.6	441.3	441.3	441.3	0.0
BI	29,317	343	2,518	0.8	441.3	441.3	441.3	0.0
BJ	29,776	279	1,566	1.1	441.3	441.3	441.4	0.1
BK	30,086	93	533	3.2	441.4	441.4	441.4	0.0
BL	30,474	62	363	4.7	443.7	443.7	444.1	0.4
BM	30,619	52	258	6.6	443.8	443.8	444.1	0.3
BN	31,000	57	353	4.8	448.0	448.0	448.3	0.3
BO	32,000	99	525	3.2	455.9	455.9	455.9	0.0
BP	32,466	71	429	3.1	456.4	456.4	456.4	0.0
BQ	33,000	38	230	5.7	456.9	456.9	457.0	0.1
BR	33,434	46	152	8.7	459.1	459.1	459.5	0.4
BS	33,619	33	169	7.8	461.7	461.7	461.8	0.1
BT	34,166	69	145	7.6	466.5	466.5	466.5	0.0
BU	34,353	69	416	2.6	470.4	470.4	471.5	1.1
BV	34,819	55	296	3.7	470.7	470.7	471.5	0.8
BW	35,186	85	482	2.3	472.2	472.2	473.2	1.0
BX	35,634	34	206	4.1	472.5	472.5	473.3	0.8
BY	36,010	32	142	5.9	473.2	473.2	473.8	0.6
BZ	36,302	27	175	4.8	475.3	475.3	476.0	0.7
CA	36,796	714	352	2.4	482.4	482.4	482.5	0.1
CB	37,298	966	888	1.0	483.5	483.5	483.5	0.0
CC	37,686	646	475	1.8	484.2	484.2	484.3	0.1
CD	38,111	77	297	2.8	484.8	484.8	484.8	0.0
CE	38,333	22	181	4.6	485.6	485.6	485.6	0.0
CF	38,886	21	80	7.7	486.1	486.1	486.1	0.0
CG	41,933	117	983	0.5	559.3	559.3	560.1	0.8
CH	42,255	138	675	0.7	559.3	559.3	560.1	0.8

[1] Feet above state and county boundary

TABLE 10

FEDERAL EMERGENCY MANAGEMENT AGENCY

ROCKLAND COUNTY, NY
(ALL JURISDICTIONS)

FLOODWAY DATA

PASCACK BROOK

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
PASCACK BROOK (CON'T)								
CI	42,671	72	346	1.3	565.2	565.2	565.7	0.5
CJ	42,971	33	130	3.4	569.5	569.5	569.7	0.2
CK	43,296	31	144	3.1	571.2	571.2	571.4	0.2
CL	43,835	24	68	6.4	572.4	572.4	572.4	0.0
CM	44,433	25	75	4.0	576.7	576.7	576.8	0.1
CN	44,796	44	122	2.5	581.0	581.0	581.0	0.0
CO	44,855	21	95	3.2	581.1	581.1	581.1	0.0
CP	45,102	56	462	0.7	586.5	586.5	587.5	1.0
PINE BROOK								
A	100	44	178	7.2	303.9	303.9	304.3	0.4
B	920	44	158	8.2	318.1	318.1	318.1	0.0
C	1,520	78	251	5.1	326.8	326.8	327.5	0.7
D	2,140	68	195	5.3	334.9	334.9	335.4	0.5
E	2,590	81	363	2.8	343.2	343.2	344.0	0.8
F	3,390	45	148	7.0	351.2	351.2	351.6	0.4
G	3,890	48	185	5.6	358.4	358.4	358.9	0.5
H	4,570	23	99	7.0	367.3	367.3	368.2	0.9
I	5,240	45	186	3.7	376.4	376.4	377.1	0.7
J	6,140	99	158	4.4	388.5	388.5	389.2	0.7
K	6,710	15	89	6.8	390.9	390.9	391.9	1.0
L	7,130	190	1,021	0.6	401.9	401.9	402.0	0.1
M	7,880	21	70	8.7	403.8	403.8	404.6	0.8
N	8,530	85	593	1.0	419.7	419.7	419.7	0.0
O	9,680	80	686	0.9	432.9	432.9	433.0	0.1
P	10,590	54	230	2.2	435.7	435.7	436.6	0.9

[1] Feet above state and county boundary

TABLE 10

FEDERAL EMERGENCY MANAGEMENT AGENCY

ROCKLAND COUNTY, NY
(ALL JURISDICTIONS)

FLOODWAY DATA

PASCACK BROOK – PINE BROOK

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
PINE BROOK (CON'T)								
Q	11,010	24	43	5.1	438.5	438.5	439.0	0.5
R	12,240	18	45	3.1	459.8	459.8	460.1	0.3
S	12,770	32	96	1.5	461.5	461.5	462.2	0.7
T	13,540	18	50	2.8	462.1	462.1	463.1	1.0
RAMAPO RIVER								
A	33	375	3,798	3.3	275.2	275.2	276.1	0.9
B	850	477	4,222	3.0	275.6	275.6	276.5	0.9
C	1,670	508	5,843	2.1	276.4	276.4	277.3	0.9
D	2,480	418	3,365	3.7	276.4	276.4	277.4	1.0
E	3,180	348	2,614	4.8	277.0	277.0	277.8	0.8
F	3,990	185	1,659	7.5	277.9	277.9	278.4	0.5
G	4,790	114	1,346	9.3	279.0	279.0	279.6	0.6
H	5,590	117	1,516	8.2	280.6	280.6	281.4	0.8
I	6,090	221	1,818	6.9	287.0	287.0	287.0	0.0
J	6,800	243	1,546	8.1	290.8	290.8	290.8	0.0
K	7,565	208	1,653	7.5	292.8	292.8	292.8	0.0
L	7,955	134	1,503	8.3	293.7	293.7	293.7	0.0
M	8,255	126	1,366	9.1	294.1	294.1	294.1	0.0
N	9,110	129	1,568	7.9	296.8	296.8	297.0	0.2
O	21,290	89	862	12.8	340.7	340.7	341.5	0.8
P	22,590	140	1,653	6.7	346.1	346.1	346.2	0.1
Q	23,150	194	1,788	6.4	349.7	349.7	349.8	0.1
R	24,040	350	2,854	3.8	354.2	354.2	354.5	0.3
S	25,070	275	2,339	3.8	358.5	358.5	358.7	0.2
T	26,910	150	822	10.7	362.6	362.6	362.9	0.3
U	28,170	90	607	14.5	375.8	375.8	375.8	0.0
V	29,135	100	900	9.6	385.6	385.6	385.7	0.1
W	30,680	300	3,414	2.5	389.9	389.9	390.6	0.7

[1] Feet above state and county boundary

TABLE 10

FEDERAL EMERGENCY MANAGEMENT AGENCY

ROCKLAND COUNTY, NY
(ALL JURISDICTIONS)

FLOODWAY DATA

PINE BROOK – RAMAPO 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
SOUTH BRANCH MINISCEONGO CREEK								
A	2,020[1]	215	516	1.2	377.0	377.0	377.2	0.2
B	3,050[1]	30	150	4.2	377.5	377.5	377.7	0.2
C	4,950[1]	35	98	6.5	383.7	383.7	383.9	0.2
D	6,030[1]	115	136	4.5	389.6	389.6	389.6	0.0
E	7,600[1]	40	196	3.1	392.9	392.9	393.3	0.4
F	8,040[1]	50	212	2.8	393.3	393.3	394.3	1.0
G	9,430[1]	55	255	2.3	394.1	394.1	394.8	0.7
H	18,600[1]	73	220	3.8	410.7	410.7	411.1	0.4
SPARKILL CREEK								
A	632[2]	773	1,830	0.7	6.7	3.6[3]	3.6	0.0
B	1,622[2]	932	1,679	0.8	6.7	3.7[3]	3.7	0.0
C	3,251[2]	132	809	1.6	6.7	3.8[3]	3.8	0.0
D	3,749[2]	132	799	1.6	6.7	3.9[3]	3.9	0.0
E	4,234[2]	63	305	4.3	6.7	4.2[3]	4.6	0.4
F	4,750[2]	70	216	6.1	6.7	5.2[3]	5.4	0.2
G	5,010[2]	35	135	9.6	6.7	6.3[3]	6.3	0.0
H	5,309[2]	24	178	7.3	14.3	14.3	14.9	0.6
I	5,799[2]	56	235	5.5	15.1	15.1	15.1	0.0
J	6,148[2]	72	313	4.2	16.0	16.0	16.0	0.0
K	6,516[2]	153	512	2.5	16.5	16.5	16.5	0.0
L	7,018[2]	172	899	1.5	16.9	16.9	16.9	0.0
M	7,518[2]	175	936	1.4	17.1	17.1	17.2	0.1
N	7,998[2]	159	774	1.7	20.4	20.4	20.4	0.0
O	8,272[2]	46	151	8.6	22.0	22.0	22.0	0.0
P	8,626[2]	60	506	2.8	27.2	27.2	27.2	0.0

[1] Feet above confluence with Minisceongo Creek
[2] Feet above mouth
[3] Elevation computed without consideration of backwater effects from the Hudson River

TABLE 10

FEDERAL EMERGENCY MANAGEMENT AGENCY

ROCKLAND COUNTY, NY
(ALL JURISDICTIONS)

FLOODWAY DATA

SOUTH BRANCH MINISCEONGO CREEK – SPARKILL 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
SPARKILL CREEK (CON'T)								
Q	9,020	96	866	1.7	27.4	27.4	27.4	0.0
R	9,517	77	685	2.1	27.5	27.5	27.5	0.0
S	10,276	64	596	2.4	27.6	27.6	27.7	0.1
T	10,804	247	1,808	0.8	27.7	27.7	27.8	0.1
U	11,306	263	1,313	1.1	27.7	27.7	27.9	0.2
V	11,841	418	2,208	0.7	27.8	27.8	28.1	0.3
W	12,514	459	2,867	0.5	27.9	27.9	28.2	0.3
X	12,815	28	234	6.1	27.7	27.7	28.0	0.3
Y	13,155	200	965	1.5	29.3	29.3	29.6	0.3
Z	13,887	505	2,676	0.5	29.5	29.5	29.9	0.4
AA	14,452	380	1,314	1.1	29.5	29.5	29.9	0.4
AB	15,054	378	1,308	1.1	29.6	29.6	30.2	0.6
AC	15,333	643	2,171	0.7	29.7	29.7	30.4	0.7
AD	15,687	573	2,351	0.6	29.8	29.8	30.5	0.7
AE	16,157	980	3,117	0.6	29.9	29.9	30.6	0.7
AF	16,741	142	580	3.3	30.6	30.6	31.4	0.8
AG	17,397	35	225	8.4	31.7	31.7	32.1	0.4
AH	18,063	247	1,370	1.4	34.6	34.6	35.1	0.5
AI	18,714	20	195	9.7	34.7	34.7	35.5	0.8
AJ	19,038	37	247	7.7	36.1	36.1	37.0	0.9
AK	19,475	132	727	2.6	37.6	37.6	38.5	0.9
AL	19,982	74	468	4.0	38.9	38.9	39.6	0.7
AM	20,373	158	588	3.2	39.5	39.5	40.2	0.7
AN	20,497	230	813	2.3	40.9	40.9	41.2	0.3
AO	20,916	74	327	5.5	41.9	41.9	42.3	0.4
AP	21,184	190	571	3.1	42.8	42.8	43.2	0.4

[1] Feet above mouth

TABLE 10

FEDERAL EMERGENCY MANAGEMENT AGENCY

ROCKLAND COUNTY, NY
(ALL JURISDICTIONS)

FLOODWAY DATA

SPARKILL 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
SPARKILL CREEK (CON'T)								
AQ	21,348	170	689	2.6	44.3	44.3	44.7	0.4
AR	21,557	128	671	2.7	44.7	44.7	45.0	0.3
AS	21,803	129	571	3.1	45.0	45.0	45.4	0.4
AT	22,168	114	805	2.2	45.4	45.4	45.8	0.4
AU	22,402	99	540	3.3	47.5	47.5	47.7	0.2
AV	22,847	108	369	4.8	48.4	48.4	48.5	0.1
AW	23,093	83	325	5.5	49.0	49.0	49.0	0.0
AX	23,347	54	187	9.5	50.3	50.3	50.3	0.0
AY	23,855	31	212	8.4	53.3	53.3	53.5	0.2
AZ	24,383	31	245	7.3	55.9	55.9	56.6	0.7
BA	24,717	41	307	5.8	56.8	56.8	57.6	0.8
BB	25,088	180	1,320	1.4	60.5	60.5	60.9	0.4
BC	25,653	76	579	2.7	60.6	60.6	61.1	0.5
BD	26,066	65	488	3.2	60.9	60.9	61.3	0.4
BE	26,434	200	1,601	1.0	62.2	62.2	62.7	0.5
BF	26,913	276	1,990	0.8	62.3	62.3	62.8	0.5
BG	27,413	404	2,540	0.6	62.3	62.3	62.9	0.6
BH	27,918	476	2,574	0.6	62.3	62.3	62.9	0.6
BI	28,422	148	741	2.1	62.3	62.3	62.9	0.6
BJ	28,777	118	678	2.3	62.4	62.4	63.1	0.7
BK	28,946	155	1,153	1.4	65.1	65.1	65.6	0.5
BL	30,073	344	1,595	1.0	65.4	65.4	65.9	0.5
BM	30,571	359	1,863	0.8	65.6	65.6	66.1	0.5
BN	30,831	193	391	4.0	65.6	65.6	65.6	0.0
BO	31,391	64	339	4.6	67.5	67.5	67.9	0.4
BP	31,909	83	339	4.6	68.6	68.6	69.0	0.4

[1] Feet above mouth

TABLE 10

FEDERAL EMERGENCY MANAGEMENT AGENCY

ROCKLAND COUNTY, NY
(ALL JURISDICTIONS)

FLOODWAY DATA

SPARKILL 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
SPARKILL CREEK (CON'T)								
BQ	32,456	46	278	5.6	69.8	69.8	70.2	0.4
BR	32,811	81	397	3.9	70.3	70.3	71.2	0.9
BS	33,178	32	276	5.6	71.9	71.9	72.6	0.7
BT	33,469	50	347	4.5	72.3	72.3	73.2	0.9
BU	33,899	58	306	5.1	75.4	75.4	76.0	0.6
BV	34,262	73	553	2.0	77.0	77.0	77.3	0.3
BW	34,567	49	490	2.3	77.7	77.7	78.1	0.4
BX	34,892	37	258	4.3	77.5	77.5	77.8	0.3
BY	35,218	83	596	1.4	78.2	78.2	79.0	0.8
BZ	35,472	118	757	1.1	78.3	78.3	79.1	0.8
CA	35,836	111	422	2.0	78.2	78.2	79.1	0.9
CB	36,228	36	343	2.5	80.9	80.9	81.7	0.8
CC	36,473	64	495	1.7	81.1	81.1	81.9	0.8
CD	36,732	78	594	1.4	81.1	81.1	81.9	0.8
CE	36,972	26	167	5.0	81.0	81.0	81.9	0.9
CF	37,246	36	171	4.9	81.7	81.7	82.5	0.8
CG	37,471	26	90	9.4	82.7	82.7	82.8	0.1
CH	37,724	26	148	4.3	84.5	84.5	85.1	0.6
CI	38,223	125	154	4.1	85.3	85.3	85.4	0.1
CJ	38,727	62	181	3.5	87.6	87.6	88.3	0.7
CK	39,193	76	125	5.1	92.8	92.8	92.9	0.1
CL	39,394	124	371	1.7	98.4	98.4	98.4	0.0
CM	39,566	103	208	2.4	98.4	98.4	98.4	0.0
CN	39,833	61	108	4.6	102.3	102.3	102.5	0.2
CO	40,031	131	184	2.7	105.2	105.2	105.3	0.1
CP	40,298	61	135	3.7	110.2	110.2	110.7	0.5

[1] Feet above mouth

TABLE 10

FEDERAL EMERGENCY MANAGEMENT AGENCY

ROCKLAND COUNTY, NY
(ALL JURISDICTIONS)

FLOODWAY DATA

SPARKILL 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
SPARKILL CREEK (CON'T)								
CQ	40,463[1]	105	273	1.8	113.0	113.0	113.1	0.1
CR	40,666[1]	60	134	3.7	115.8	115.8	115.8	0.0
CS	40,938[1]	88	238	2.1	118.2	118.2	118.4	0.2
CT	41,080[1]	64	107	4.6	119.1	119.1	119.1	0.0
CU	41,430[1]	70	131	3.8	123.4	123.4	123.4	0.0
CV	41,449[1]	46	78	6.3	123.6	123.6	124.1	0.5
SPOOK ROCK BROOK								
A	1,500[2]	140	538	1.6	385.1	385.0[3]	386.0	1.0
B	2,470[2]	120	212	4.1	399.0	399.0	399.3	0.3
C	3,270[2]	47	162	5.0	410.2	410.2	411.1	0.9
D	3,500[2]	90	207	3.9	418.8	418.8	419.7	0.9
E	4,120[2]	90	392	2.1	428.4	428.4	429.1	0.7
F	4,630[2]	32	136	6.0	434.9	434.9	435.9	1.0
G	5,730[2]	14	41	9.8	456.5	456.5	456.9	0.4
H	6,910[2]	70	140	4.5	485.4	485.4	486.2	0.8
I	8,150[2]	70	137	4.6	532.5	532.5	533.5	1.0
J	9,270[2]	20	89	5.5	559.3	559.3	560.2	0.9
K	9,650[2]	20	72	6.8	567.6	567.6	567.6	0.0
L	10,220[2]	20	119	2.6	580.0	580.0	580.0	0.0
M	10,310[2]	60	122	2.5	582.1	582.1	583.1	1.0
N	10,930[2]	60	110	2.8	587.6	587.6	588.3	0.7
O	11,150[2]	40	209	1.5	588.5	588.5	589.5	1.0
P	12,070[2]	15	62	5.0	592.1	592.1	593.1	1.0
Q	12,790[2]	12	34	9.2	599.9	599.9	600.6	0.7

[1] Feet above mouth
[2] Feet above confluence with Willow Tree Brook
[3] Elevation computed without consideration of backwater effects from Willow Tree Brook

TABLE 10

FEDERAL EMERGENCY MANAGEMENT AGENCY

ROCKLAND COUNTY, NY
(ALL JURISDICTIONS)

FLOODWAY DATA

SPARKILL CREEK – SPOOK ROCK BROOK

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
SPOOK ROCK BROOK LEFT CHANNEL								
A	1,290[1]	16	48	8.4	462.7	462.7	463.7	1.0
STONY BROOK								
A	340[2]	130	355	5.6	355.0	352.0[4]	352.0	0.0
B	990[2]	53	239	8.3	356.0	356.0	356.4	0.4
C	1,900[2]	50	379	5.3	359.1	359.1	359.4	0.3
D	2,880[2]	40	181	11.0	365.9	365.9	366.0	0.1
E	4,570[2]	40	170	11.7	382.0	382.0	382.0	0.0
F	4,960[2]	60	261	7.6	388.2	388.2	388.2	0.0
TRIBUTARY TO CEDAR POND BROOK								
A	0[3]	120	431	6.8	50.1	50.1	50.3	0.2
B	790[3]	45	91	6.4	70.2	70.2	70.2	0.0
C	1,090[3]	32	133	4.4	75.3	75.3	75.5	0.2
D	1,390[3]	20	52	9.0	79.9	79.9	79.9	0.0
E	1,630[3]	14	106	4.4	92.7	92.7	92.7	0.0
F	1,900[3]	14	54	8.6	92.7	92.7	93.2	0.5
G	2,280[3]	45	71	6.5	105.9	105.9	105.9	0.0
H	2,950[3]	20	38	9.0	119.3	119.3	119.3	0.0
I	3,420[3]	40	137	2.5	122.6	122.6	123.5	0.6
J	4,270[3]	15	26	8.3	128.4	128.4	128.4	0.0
K	4,730[3]	8	23	9.8	133.1	133.1	133.1	0.0
L	5,700[3]	28	84	2.6	139.6	139.6	140.5	0.9

[1] Feet above confluence with Spook Rock Brook
[2] Feet above confluence with Ramapo River
[3] Feet above confluence with Cedar Pond Brook
[4] Elevation computed without consideration of backwater effects from the Ramapo River

TABLE 10

FEDERAL EMERGENCY MANAGEMENT AGENCY

ROCKLAND COUNTY, NY
(ALL JURISDICTIONS)

FLOODWAY DATA

SPOOK ROCK BROOK LEFT CHANNEL – STONY BROOK – TRIBUTARY TO CEDAR POND BROOK

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 1 TO HUDSON RIVER								
A	210[1]	19	44	3.9	6.7	4.7[4]	4.7	0.0
B	2,605[1]	20	46	8.9	23.6	23.6	23.6	0.0
C	2,980[1]	18	54	7.6	54.0	54.0	54.0	0.0
D	3,285[1]	20	47	8.7	81.0	81.0	81.0	0.0
E	3,420[1]	24	73	5.6	83.4	83.4	83.4	0.0
F	4,340[1]	24	107	3.8	103.5	103.5	103.5	0.0
G	4,600[1]	16	46	8.5	108.2	108.2	108.2	0.0
H	4,980[1]	21	44	8.8	117.9	117.9	117.9	0.0
I	5,430[1]	16	42	9.3	156.7	156.7	156.7	0.0
J	5,960[1]	24	50	7.8	211.2	211.2	211.2	0.0
TRIBUTARY 1 TO NAKOMA BROOK								
A	60[2]	30	95	5.3	341.0	341.0	341.0	0.0
B	500[2]	35	129	3.9	343.0	343.0	343.2	0.2
C	1,180[2]	30	109	4.7	348.7	348.7	348.8	0.1
D	1,610[2]	28	88	5.7	351.4	351.4	351.4	0.0
E	2,975[2]	39	54	9.3	367.3	367.3	367.3	0.0
TRIBUTARY 1 TO RAMAPO RIVER								
A	180[3]	20	117	4.4	277.3	271.9[5]	271.9	0.0
B	770[3]	24	65	7.9	277.3	274.4[5]	274.4	0.2
C	1,310[3]	20	154	3.3	280.1	280.1	280.1	0.0
D	1,970[3]	25	98	5.2	282.2	282.2	282.6	0.4
E	2,905[3]	19	55	7.2	287.1	287.1	287.1	0.0

[1] Feet above confluence with Hudson River
[2] Feet above confluence with Nakoma Brook
[3] Feet above confluence with the Ramapo River
[4] Elevation computed without consideration of backwater effects from the Hudson River
[5] Elevation computed without backwater effects from the Ramapo River

TABLE 10

FEDERAL EMERGENCY MANAGEMENT AGENCY

ROCKLAND COUNTY, NY
(ALL JURISDICTIONS)

FLOODWAY DATA

TRIBUTARY 1 TO HUDSON RIVER – TRIBUTARY 1 TO NAKOMA BROOK – TRIBUTARY 1 TO RAMAPO 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 1 TO RAMAPO RIVER (CON'T)								
F	4,075[1]	22	47	8.5	328.2	328.2	328.2	0.0
G	5,000[1]	35	67	6.0	351.9	351.9	351.9	0.0
TRIBUTARY 2 TO RAMAPO RIVER								
A	410[1]	23	54	6.4	385.5	385.5	385.8	0.3
B	1,480[1]	*	58	3.4	411.8	411.8	412.1	0.3
TRIBUTARY TO WEST BRANCH SADDLE RIVER								
A	500[2]	20	78	8.5	336.8	336.8	337.5	0.7
B	1,430[2]	20	71	9.4	369.3	369.3	369.3	0.0
C	2,440[2]	25	94	7.0	393.2	393.2	393.5	0.3
D	3,400[2]	20	114	4.9	409.4	409.4	409.7	0.3
E	4,270[2]	20	67	8.3	419.1	419.1	419.1	0.0
F	4,990[2]	29	102	3.5	425.6	425.6	425.9	0.3
G	5,640[2]	50	123	2.9	426.4	426.4	427.4	1.0
H	6,400[2]	60	154	2.3	428.8	428.8	429.4	0.6
I	7,000[2]	21	72	5.0	434.3	434.3	434.9	0.6

[1] Feet above confluence with Ramapo River
[2] Feet above confluence with West Branch Saddle River
* Floodway contained in channel

TABLE 10

FEDERAL EMERGENCY MANAGEMENT AGENCY

ROCKLAND COUNTY, NY
(ALL JURISDICTIONS)

FLOODWAY DATA

TRIBUTARY 1 TO RAMAPO RIVER – TRIBUTARY 2 TO RAMAPO RIVER – TRIBUTARY TO WEST BRANCH SADDLE 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
WEST BRANCH HACKENSACK RIVER								
A	1,025	1,022	10,392	0.4	87.8	87.8	87.8	0.0
B	1,609	229	2,799	1.3	87.8	87.8	87.8	0.0
C	2,833	180	1,257	2.8	88.1	88.1	88.0	0.0
D	3,400	87	819	4.2	88.3	88.3	88.3	0.0
E	3,988	65	770	4.5	88.7	88.7	88.8	0.1
F	4,525	162	1,014	3.4	89.0	89.0	89.1	0.1
G	5,013	365	1,668	2.1	89.5	89.5	89.7	0.1
H	6,018	201	1,605	2.2	96.5	96.5	96.5	0.0
I	6,568	119	1,058	3.3	96.9	96.9	97.0	0.1
J	6,965	407	3,228	1.0	97.2	97.2	97.4	0.2
K	7,929	384	2,962	1.1	97.3	97.3	97.5	0.2
L	8,381	365	2,779	1.1	97.3	97.3	97.5	0.2
M	8,954	432	3,356	0.9	97.4	97.4	97.7	0.2
N	9,377	574	3,501	0.9	97.5	97.5	97.7	0.3
O	9,963	603	3,796	0.8	97.5	97.5	97.9	0.3
P	10,847	526	2,781	1.1	97.7	97.7	98.0	0.3
Q	11,286	614	2,877	1.1	97.9	97.9	98.2	0.4
R	12,171	792	3,821	0.8	98.2	98.2	98.5	0.4
S	12,524	1,020	3,947	0.5	98.2	98.2	98.6	0.4
T	13,056	1,187	3,601	0.6	98.3	98.3	98.7	0.4
U	13,652	1,201	2,806	0.8	98.4	98.4	98.8	0.4
V	14,038	901	1,316	1.6	98.7	98.7	99.1	0.5
W	14,896	727	714	3.0	101.6	101.6	101.9	0.3
X	15,562	219	715	3.0	103.7	103.7	104.1	0.4
Y	16,237	44	293	7.3	104.0	104.0	104.3	0.3
Z	16,954	46	299	7.2	107.3	107.3	107.5	0.2
AA	17,736	62	644	3.3	114.9	114.9	116.2	1.0

[1] Feet above mouth at Lake DeForest

TABLE 10

FEDERAL EMERGENCY MANAGEMENT AGENCY

ROCKLAND COUNTY, NY
(ALL JURISDICTIONS)

FLOODWAY DATA

WEST BRANCH HACKENSACK 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
WEST BRANCH HACKENSACK RIVER (CON'T)								
AB	19,188	469	4,882	0.4	121.8	121.8	122.2	0.3
AC	19,700	556	5,714	0.4	121.8	121.8	122.2	0.3
AD	20,367	97	972	1.6	121.9	121.9	122.2	0.3
AE	20,946	34	189	8.3	122.5	122.5	122.9	0.3
AF	22,029	102	197	6.4	138.9	138.9	139.0	0.0
AG	22,533	51	152	8.4	148.0	148.0	154.7	0.1
AH	22,870	26	112	11.4	156.2	156.2	171.8	0.1
AI	23,224	42	133	9.6	174.0	174.0	189.0	0.0
AJ	23,522	112	630	1.7	199.2	199.2	200.1	0.8
AK	24,357	24	98	11.0	205.7	205.7	205.9	0.2
AL	25,009	28	101	10.6	222.6	222.6	222.7	0.1
AM	25,482	133	193	5.6	232.8	232.8	232.8	0.0
AN	26,196	27	76	9.4	264.4	264.4	264.5	0.1
AO	27,006	27	195	3.7	290.1	290.1	290.5	0.4
WEST BRANCH SADDLE RIVER								
A	24[2]	50	145	5.8	324.1	324.1	324.2	0.1
B	420[2]	50	164	5.1	330.4	330.4	330.7	0.3
C	678[2]	223	570	1.5	338.5	338.5	338.8	0.3
D	1,000[2]	147	366	2.3	338.7	338.7	339.0	0.3
E	1,502[2]	73	145	5.8	343.1	343.1	343.1	0.0
F	2,010[2]	19	75	11.2	354.3	354.3	354.5	0.2
G	2,199[2]	29	99	8.5	357.7	357.7	358.1	0.4
H	2,480[2]	59	238	3.5	364.2	364.2	364.4	0.2
I	2,862[2]	37	94	9.0	367.5	367.5	367.5	0.0
J	2,981[2]	82	247	3.4	372.7	372.7	373.1	0.4

[1] Feet above Rockland/Bergen County Boundary
[2] Feet above Limit of Study

TABLE 10

FEDERAL EMERGENCY MANAGEMENT AGENCY

ROCKLAND COUNTY, NY
(ALL JURISDICTIONS)

FLOODWAY DATA

WEST BRANCH HACKENSACK RIVER – WEST BRANCH SADDLE 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
WEST BRANCH SADDLE RIVER (CON'T)								
K	3,329	42	99	8.5	377.0	377.0	377.0	0.0
L	3,441	36	145	5.3	378.5	378.5	378.6	0.1
M	3,578	53	109	7.1	379.4	379.4	379.5	0.1
N	3,675	43	197	3.9	383.2	383.2	383.6	0.4
O	3,934	13	66	11.7	386.5	386.5	386.6	0.1
P	4,115	13	71	11.0	388.3	388.3	389.1	0.8
Q	4,290	34	224	3.5	390.9	390.9	391.8	0.9
R	4,512	41	214	3.6	391.1	391.1	392.0	0.9
S	4,715	37	500	1.5	406.8	406.8	406.8	0.0
T	4,949	65	609	1.3	406.8	406.8	406.8	0.0
U	5,448	34	86	9.0	408.3	408.3	408.3	0.0
V	5,849	26	78	9.9	416.5	416.5	416.5	0.0
W	6,087	173	1,277	0.6	424.0	424.0	424.9	0.9
X	6,229	155	1,046	0.7	432.5	432.5	432.5	0.0
Y	6,371	138	980	0.8	432.5	432.5	432.5	0.0
Z	6,472	130	589	1.3	432.5	432.5	432.5	0.0
AA	6,770	100	275	2.8	432.6	432.6	432.6	0.0
AB	7,086	27	67	6.9	436.0	436.0	436.2	0.2
AC	7,228	72	59	7.8	438.1	438.1	438.1	0.0
AD	7,377	26	148	3.1	440.7	440.7	440.7	0.0
AE	7,644	182	641	0.6	445.1	445.1	446.1	1.0
AF	7,779	112	120	3.4	448.0	448.0	448.3	0.3
AG	7,934	80	260	1.8	450.6	450.6	450.6	0.0
AH	8,150	31	59	7.9	450.6	450.6	450.6	0.0
AI	8,277	30	95	4.9	452.7	452.7	453.0	0.3
AJ	8,736	19	53	8.8	455.0	455.0	455.0	0.0
AK	8,908	56	187	2.5	460.4	460.4	461.0	0.6

[1] Feet above Limit of Study

TABLE 10

FEDERAL EMERGENCY MANAGEMENT AGENCY

ROCKLAND COUNTY, NY
(ALL JURISDICTIONS)

FLOODWAY DATA

WEST BRANCH SADDLE 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
WEST BRANCH SADDLE RIVER (CON'T)								
AL	9,245[1]	14	44	10.6	464.2	464.2	464.3	0.1
AM	9,388[1]	83	104	4.5	469.2	469.2	469.3	0.1
AN	9,539[1]	45	109	4.3	470.8	470.8	470.9	0.1
AO	9,843[1]	58	101	4.6	474.8	474.8	475.0	0.2
AP	10,007[1]	15	70	4.8	475.6	475.6	476.4	0.8
AQ	10,258[1]	22	42	8.1	478.5	478.5	478.5	0.0
AR	10,537[1]	19	78	4.4	487.2	487.2	487.2	0.0
AS	10,856[1]	21	41	8.2	490.2	490.2	490.2	0.0
AT	11,176[1]	19	41	8.3	496.7	496.7	496.7	0.0
AU	11,374[1]	21	92	3.7	501.7	501.7	501.8	0.1
AV	11,622[1]	13	35	9.6	504.1	504.1	504.1	0.0
AW	11,794[1]	18	40	8.5	508.5	508.5	508.6	0.1
AX	12,188[1]	130	1,079	0.5	519.0	519.0	519.6	0.6
AY	12,546[1]	10	27	10.1	521.2	521.2	521.2	0.0
AZ	13,008[1]	10	70	3.9	529.0	529.0	529.0	0.0
BA	13,201[1]	18	32	8.5	530.4	530.4	530.4	0.0
WILLOW TREE BROOK								
A	970[2]	60	310	4.8	363.7	363.7	364.1	0.4
B	1,170[2]	36	184	8.1	364.8	364.8	365.2	0.4
C	2,960[2]	184	921	1.6	381.6	381.6	381.6	0.0
D	5,700[2]	49	258	3.7	397.8	397.8	398.7	0.9
E	6,260[2]	47	140	6.9	411.6	411.6	411.7	0.1
F	6,520[2]	134	191	5.0	416.5	416.5	416.7	0.2

[1] Feet above Limit of Study
[1] Feet above confluence with Mahwah River

TABLE 10

FEDERAL EMERGENCY MANAGEMENT AGENCY

ROCKLAND COUNTY, NY
(ALL JURISDICTIONS)

FLOODWAY DATA

WEST BRANCH SADDLE RIVER – WILLOW TREE BROOK

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
WILLOW TREE BROOK (CON'T)								
G	7,020	35	155	6.2	426.0	426.0	426.8	0.8
H	7,740	30	114	8.4	439.7	439.7	439.7	0.0
I	7,970	95	355	2.7	449.8	449.8	450.0	0.2
J	8,780	30	102	9.4	458.4	458.4	458.9	0.5
K	9,780	32	94	8.1	476.5	476.5	476.9	0.4
L	10,760	16	96	7.9	501.0	501.0	501.0	0.0
M	11,880	53	132	5.8	512.2	512.2	513.0	0.8
N	12,700	39	197	3.8	522.2	522.2	523.1	0.9
O	13,450	90	330	1.8	525.4	525.4	526.4	1.0
P	14,080	75	219	2.8	531.1	531.1	531.8	0.7
Q	14,380	60	203	3.0	531.2	531.2	532.2	1.0
R	15,520	15	80	7.6	540.4	540.4	540.9	0.5
S	16,950	19	95	5.5	557.3	557.3	558.2	0.9
T	17,530	40	172	3.0	559.7	559.7	560.6	0.9
U	18,070	16	83	6.3	560.8	560.8	561.6	0.8
V	19,070	20	112	3.3	565.7	565.7	566.1	0.4

[1] Feet above confluence with Mahwah River

TABLE 10

FEDERAL EMERGENCY MANAGEMENT AGENCY

ROCKLAND COUNTY, NY
(ALL JURISDICTIONS)

FLOODWAY DATA

WILLOW TREE BROOK

into account the 1-percent-annual-chance flooding due to backwater from other sources. These streams include: Brian Brook, Mill Creek, Nakoma Brook, Sparkill Creek, Spook Rock Brook, Stony Brook, Tributary 1 to Hudson River, and Tributary 1 to Ramapo River.

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 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 1, "Floodway Schematic."

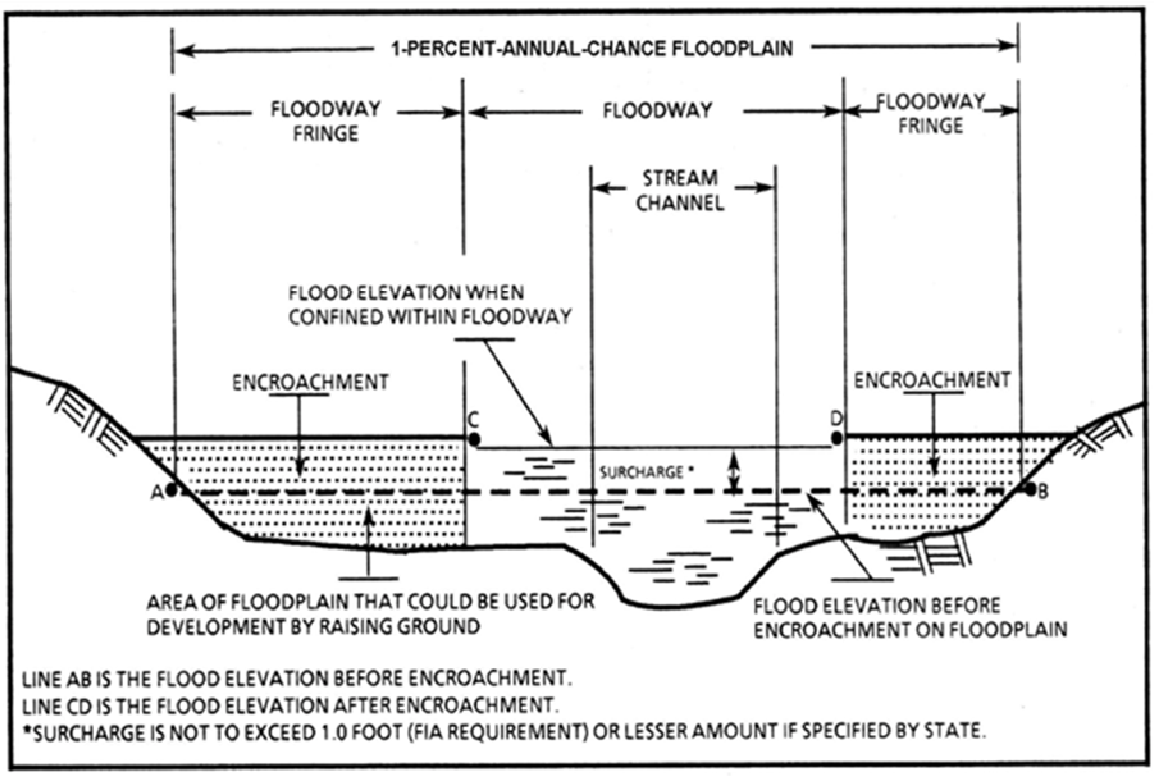

Figure 1 - FLOODWAY SCHEMATIC

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 BFEs 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 BFEs derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone AO

Zone AO is the flood insurance risk 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 base flood depths derived from the detailed hydraulic analyses are shown within this zone.

Zone VE

Zone VE is the flood insurance rate zone that corresponds to the 100-year 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 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 BFEs or depths are shown within this zone.

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 BFEs or average depths. Insurance agents use the zones and BFEs 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, 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 Rockland County. Previously, FIRMs were prepared for each incorporated community with identified flood hazards. This countywide FIRM also includes flood-hazard information that was presented separately on Flood Boundary and Floodway Maps, where applicable. Historical map dates relating to pre-countywide maps prepared for each community are presented in Table 11, "Community Map History."

7.0 OTHER STUDIES

FEMA has published FIS reports and/or FIRMs for the communities adjacent to the study area including:

Orange County, NY - Countywide FIS (Effective August 3, 2009)

Westchester County, NY - Countywide FIS (Effective September 28, 2007)

Bergen County, NJ - Countywide FIS (Effective September 30, 2005)

Passaic County, NJ - Countywide FIS (Effective September 28, 2007)

Information pertaining to revised and unrevised flood hazards for each jurisdiction within Rockland County has been compiled into this FIS. Therefore, this FIS supersedes all previously printed FIS reports, Wave Analysis Supplements to FIS Reports, FHBMs, FIRMs, and/or FBFMs for all of the jurisdictions within Rockland County.

This is a multi-volume FIS. Each volume may be revised separately, in which case it supersedes the previously printed volume. Users should refer to the Table of Contents in Volume 1 for the current effective date of each volume; volumes bearing these dates contain the most up-to-date flood hazard data.

8.0 LOCATION OF DATA

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

COMMUNITY NAME	INITIAL NFIP MAP DATE	FLOOD HAZARD BOUNDARY MAP REVISIONS DATE	INITIAL FIRM DATE	FIRM REVISIONS DATE
Airmont, Village of[1]				
Chestnut Ridge, Village of	August 31, 1973	None	August 31, 1973	July 1, 1974 May 14, 1976 September 16, 1988
Clarkstown, Town of	April 12, 1974	September 10, 1976 December 16, 1977 August 24, 1979	March 2, 1983	March 1, 1984 May 18, 2000 May 21, 2001
Grand View-on-Hudson	October 18, 1974	June 18, 1976	October 15, 1981	
Haverstraw, Town of	March 29, 1974	November 2, 1979	January 6, 1982	
Haverstraw, Village of	April 12, 1974	June 11, 1976 June 3, 1977	September 2, 1981	
Hillburn, Village of	March 15, 1974	August 6, 1976	January 6, 1982	September 20,1996

[1]This Community did not have a FIRM prior to the first countywide FIRM for Rockland County

TABLE 11

FEDERAL EMERGENCY MANAGEMENT AGENCY

ROCKLAND COUNTY, NY (ALL JURISDICTIONS)

COMMUNITY MAP HISTORY

COMMUNITY NAME	INITIAL NFIP MAP DATE	FLOOD HAZARD BOUNDARY MAP REVISIONS DATE	INITIAL FIRM DATE	FIRM REVISIONS DATE
Kaser, Village of[1]				
Montabello, Village of	August 31, 1973	None	August 31, 1973	July 1, 1974 May 14, 1976 January 18, 1989
New Hempstead, Village of	August 31, 1973	None	August 31, 1973	July 1, 1974 May 14, 1976 December 16, 1988
New Square, Village of[1]				
Nyack, Village of	December 4, 1985	None	December 4, 1985	
Orangetown, Town of	May 10, 1974	November 28, 1975 October 5, 1979	August 2, 1982	

[1]This Community did not have a FIRM prior to the first countywide FIRM for Rockland County

TABLE 11

FEDERAL EMERGENCY MANAGEMENT AGENCY

ROCKLAND COUNTY, NY (ALL JURISDICTIONS)

COMMUNITY MAP HISTORY

COMMUNITY NAME	INITIAL NFIP MAP DATE	FLOOD HAZARD BOUNDARY MAP REVISIONS DATE	INITIAL FIRM DATE	FIRM REVISIONS DATE
Piermont, Village of	March 15, 1974	September 17, 1976	August 3, 1981	November 17, 1982
Pomona, Village of	March 15, 1974	July 30, 1976	April 15, 1982	
Ramapo, Town of	August 31, 1973	None	August 31, 1973	July 1, 1974 May 14, 1976 February 2, 1989
Sloatsburg, Village of	March 22, 1974	June 25, 1976 August 26, 1977	January 6, 1982	
South Nyack, Village of	March 15, 1974	July 23, 1976	November 4, 1981	
Spring Valley, Village of	August 31, 1973	None	August 31, 1973	July 1, 1974 September 26, 1975 August 16, 1988

TABLE 11

FEDERAL EMERGENCY MANAGEMENT AGENCY

ROCKLAND COUNTY, NY (ALL JURISDICTIONS)

COMMUNITY MAP HISTORY

COMMUNITY NAME	INITIAL NFIP MAP DATE	FLOOD HAZARD BOUNDARY MAP REVISIONS DATE	INITIAL FIRM DATE	FIRM REVISIONS DATE
Stony Point, Town of	May 10, 1974	September 26, 1975 June 15, 1979	September 30, 1981	
Suffern, Town of	December 28, 1973	June 18, 1976	March 28, 1980	
Upper Nyack, Village of[1]				
Wesley Hills, Village of	August 31, 1973	None	August 31, 1973	July 1, 1974 May 14, 1976 September 16, 1988
West Haverstraw, Village of	May 31, 1974	June 4, 1976	September 30, 1981	

[1]This Community did not have a FIRM prior to the first countywide FIRM for Rockland County

TABLE 11

FEDERAL EMERGENCY MANAGEMENT AGENCY

ROCKLAND COUNTY, NY (ALL JURISDICTIONS)

COMMUNITY MAP HISTORY

9.0 BIBLIOGRAPHY AND REFERENCES

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2. Federal Emergency Management Agency, Flood Insurance Study, Town of Clarkstown, Rockland County, New York, Washington, D.C., May 18, 2000.

3. Federal Emergency Management Agency, Flood Insurance Study, Village of Grand View-on-Hudson, Rockland County, New York, Washington, D.C., April 15, 1981. (FIRM dated October 15, 1981.)

4. Federal Emergency Management Agency, Flood Insurance Study, Town of Haverstraw, Rockland County, New York, Washington, D.C., July 6. 1981. (FIRM dated January 6, 1982.)

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6. Federal Emergency Management Agency, Flood Insurance Study, Village of Hillburn, Rockland County, New York, Washington, D.C., September 20, 1996.

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15. Federal Emergency Management Agency, Flood Insurance Study, Village of South Nyack, Rockland County, New York, Washington, D.C., May 4, 1981. (FIRM dated November 4, 1981)

16. Federal Emergency Management Agency, Flood Insurance Study, Village of Spring Valley, Rockland County, New York, Washington, D.C., August 16, 1988.

17. Federal Emergency Management Agency, Flood Insurance Study, Town of Stony Point, Rockland County, New York, Washington, D.C., March 30, 1981. (FIRM dated September 30, 1981)

18. Federal Emergency Management Agency, Flood Insurance Study, Village of Suffern, Rockland County, New York, Washington, D.C., May 28, 1981. (FIRM dated March 28, 1980)

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