FLOOD INSURANCE STUDY

ULSTER COUNTY, NEW YORK

(ALL JURISDICTIONS)

PHASE 1 - AREAS OUTSIDE THE NEW YORK CITY WATERSHED

VOLUME 1 OF 2

COMMUNITY NAME	COMMUNITY NUMBER
ELLENVILLE, VILLIAGE OF	360975
ESOPUS, TOWN OF	360855
GARDINER, TOWN OF	360856
KINGSTON, CITY OF	360858
KINGSTON, TOWN OF	361218
LLOYD, TOWN OF	361012
MARBLETOWN, TOWN OF	361219
MARLBOROUGH, TOWN OF	361220
NEW PALTZ, TOWN OF	360859
NEW PALTZ, VILLAGE OF	361544
PLATTEKILL,TOWN OF	361221
ROCHESTER, TOWN OF	360861
ROSENDALE, TOWN OF	360862
SAUGERTIES, TOWN OF	360863
SAUGERTIES, VILLAGE OF	361504
SHAWANGUNK, TOWN OF	360865
ULSTER, TOWN OF	360866

PRELIMINARY
SEPTEMBER 29, 2007

EFFECTIVE:

Federal Emergency Management Agency

FLOOD INSURANCE STUDY NUMBER
36111CV000A

NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study (FIS) report may not contain all data available within the Community Map Repository. Please contact the Community Map Repository for any additional data.

The Federal Emergency Management Agency (FEMA) may revise and republish part or all of this FIS report at anytime. 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.

Selected Flood Insurance Rate Map panels for this community 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(s)	**New Zone**
A1 through A30	AE
B	X (shaded)
C	X

TABLE OF CONTENTS - Volume 1

FIGURES

TABLES

TABLE OF CONTENTS - Volume 2

EXHIBITS

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

PHASE 1 - FOR AREAS OUTSIDE OF THE NEW YORK CITY WATERSHED

1.0 INTRODUCTION

1.1 Purpose of Study

This countywide Flood Insurance Study (FIS) revises and supersedes the FIS reports and/or Flood Insurance Rate Maps (FIRMs) in the geographic area of Ulster County, NY, for communities that lie outside of the New York City Watershed, including the Towns of Esopus, Gardiner, Kingston, Lloyd, Marbletown, Marlborough, New Paltz, Plattekill, Rochester, Rosendale, Saugerties, Shawangunk, and Ulster, the Villages of New Paltz, Ellenville, and Saugerties, and the City of Kingston (hereinafter referred to collectively as Ulster County – Outside the NYC Watershed),

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

In some states or communities, floodplain management criteria or regulations may exist that are more restrictive or comprehensive than those on which these Federally-supported studies are based. These criteria take precedence over the minimum Federal criteria for purposes of regulating development in the floodplain, as set forth in the Code of Federal Regulations at 44 CFR, 60.3 (d). In such cases, however, it shall be understood that the state (or other jurisdictional agency) shall be able to explain these requirements and criteria.

1.2 Authority and Acknowledgments

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

This study was prepared to include all jurisdictions within Ulster County that lie outside the New York City Watershed area into a countywide FIS. Information on the authority and acknowledgments for each jurisdiction included in this countywide FIS, as compiled from their previously printed FIS reports, is provided below:

Ellenville, Village of:	The hydrologic analyses for this study were prepared by the U.S. Army Corps of Engineers. The hydraulic analyses were prepared by the Gannet Fleming Corddry and Carpenter, Inc., for the U.S. Army Corps of Engineers. That work was completed April 1981.
Esopus, Town of:	The hydrologic and hydraulic analyses for this study were prepared by the New York State Department of Environmental Conservation and Dewberry & Davis for

the Federal Emergency Management Agency, under contract No. H-4624. That work was completed in March 1983.

Gardiner, Town of: For the original, March 30, 1982, FIS report and September 30, 1982, FIRM, the hydrologic and hydraulic analyses were prepared by Ubitran Associates, Inc., for the Federal Emergency Management Agency (FEMA), under Contract No. H-4825. That work was completed in November 1980.

For the FIS dated July 16, 1997, revised hydrologic and hydraulic analyses for the Mara Kill were prepared by Kozma Associates Consulting Engineers, P.C., for FEMA, under Contract No. EMW-94-C-4379. That work was completed in July 1995.

Planimetric base map information was derived from U.S. Geological Survey (USGS) 1:000,000 scale Digital Line Graphs. Additional information may have been derived from other sources. The digital FIRM was produced in Universal Transverse Mercator coordinates referenced to the North American Datum of 1927 and the Clarke 1866 Spheroid.

Kingston, City of: The hydrologic and hydraulic analyses for this FIS were prepared by the New York State Department of Environmental Conservation (NYSDEC) and Dewberry & Davis for the Federal Emergency Management Agency (FEMA), under contract Nl. H-4624. That work was competed in May 1984.

Kingston, Town of: The hydrologic and hydraulic analyses for the April 5, 1988 FIS represent a revision of the original analyses prepared for the Federal Emergency Management Agency. The hydrologic and hydraulic analyses for the April 5, 1988 study were prepared using the U.S. Army Corps of Engineers (COE) Flood Plain Technical Services report on Saw Kill. The hydrologic analysis for that study was prepared by the COE. The hydraulic analysis for that study was prepared by Leonard Jackson Associates under subcontract to the COE. That work was completed in March 1985.

Lloyd, Town of: For the revision of the January 18, 1985 FIS report and the July 18, 1985 FIRM, the hydrologic and hydraulic analyses for the Hudson River were performed by Harris-Toups Associates during the preparation of the FIS for the Town of Poughkeepsie, New York. The Poughkeepsie study was completed in August 1977.

For the July 5, 2000 revision, the hydrologic and hydraulic analyses for Black Creek and Twaalfskill Creek were prepared by Leonard Jackson Associates for the Federal Emergency Management Agency, under Contract No. EMW-C-4692. This work was completed in February 1998.

Planimetric base map information was derived by scanning and vectorizing the previously published FIRM for the Town of Lloyd, New York. Additional information may have been derived from other sources. The digital FIRM was produced using Universal Transverse Mercator coordinates referenced to the North American Datum of 1927 and the Clarke 1866 spheroid.

Marbletown, Town of: The hydrologic and hydraulic analyses for this study were prepared by Kozma Associates Consulting Engineers, P.C., for the Federal Emergency management Agency under Inter-Agency Agreement No. EMW-86-C-2244. This work was completed in December 1989.

Marlborough, Town of: The hydrologic and hydraulic analyses for this study were performed by Harris-Toups Associates during the preparation of the Flood Insurance Study for the Town of Poughkeepsie, New York. The Poughkeepsie study was completed in August 1977.

New Paltz, Town of: The hydrologic and hydraulic analyses for this study represent a revision of the original analyses by the New York State Department of Environmental Conservation for the Federal Emergency Management Agency under Contract No. H-4547. The original work was completed in May 1980. An updated version prepared by Dewberry & Davis under agreement with FEMA was completed in July 1983. The hydrologic and hydraulic analyses for the Wallkill River were again revised by Dewberry & Davis; the second revision was completed in December 1984.

New Paltz, Village of: The hydrologic and hydraulic analyses for this study represent a revision of the original analyses by the New York State Department of Environmental Conservation for the Federal Emergency management Agency, under Contract No. H-4547. The original work was completed in May 1980. An updated version prepared by Dewberry & Davis under agreement with the Federal Emergency Management Agency was completed in July 1983. The hydrologic and hydraulic analyses for the Wallkill River were again revised by Dewberry & Davis; the second revision was completed in December 1984.

Rochester, Town of: The hydrologic analyses for the original study were performed by the U.S. Army Corps of Engineers, and hydraulic analyses were performed by Gannett Fleming Corddry and Carpenter, for the Federal Emergency Management Agency. The work for the original study was completed in April 1981.

For the updated study, additional hydrologic and hydraulic analyses for Rondout Creek, and hydrologic and hydraulic analyses for the other streams studied by detailed methods were prepared by Edwards and Kelcey Engineers, Inc., for FEMA, under Contract No. EMW-85-C-1887. This work was completed in March 1989.

Rosendale, Town of: The hydrologic and hydraulic analyses for the original study were prepared by the New York State Department of Environmental Conservation and Dewberry & Davis for the Federal Emergency Management Agency, under Contract No. H-4624. This work was completed in March 1983. The hydrologic and hydraulic analyses for the Wallkill River were revised by Dewberry & Davis. The revised work was completed in December 1984.

Saugerties, Town of: The hydrologic and hydraulic analyses for the original study were prepared by Dewberry & Davis for the Federal Emergency management Agency during the preparation of Flood Insurance Studies for the City of Kingston and the Town of Ulster. The work for the original study was completed in June 1984.

In the first revision, the hydraulic and hydrologic analyses were performed by the Buffalo District of the U.S. Army Corps of Engineers for FEMA under Inter-Agency Agreement No. EMW-88-E-2768, Project Order Nos. 1A and 1B. The work for the first revision was completed in June 1989. In the next revision, the hydraulic analyses were prepared by Dewberry & Davis. The work for the second revision as completed in July 1991.

Saugerties, Village of: The hydrologic and hydraulic analyses in the February 5, 1985 study represent a revision of the analyses done by the original contractor for the Federal Emergency Management Agency. The updated version was prepared by Dewberry & Davis for FEMA during the course of preparing the Flood Insurance Studies for the City of Kingston and the Town of Ulster. This work was completed in June 1984.

Shawangunk, Town of: The hydrologic and hydraulic analyses for the original study were prepared by Urbitran Associates, Inc. for the Federal Emergency Management Agency, under Contract No. H-4825. This work was completed in November 1980.

Ulster, Town of: The hydrologic and hydraulic analyses for the original study were prepared by the New York State Department of Environmental Conservation and Dewberry & Davis for the Federal Emergency Management Agency, under Contract No. H-4624. This work was completed in May 1984.

No FIS reports were previously prepared for the Town of Plattekill in Ulster County.

The NYSDEC and FEMA entered into a Cooperative Technical Partners (CTP) Agreement to collaboratively produce this countywide FIS. Revised hydrologic and hydraulic analyses for all approximate studies and for detailed studies on the Saw Kill, Twaalfskill, and Rondout Creek were prepared by Gomez and Sullivan Engineers, P.C. and PAR Government Services for the NYSDEC. This work was completed in September 2007.

The digital base map information shown on the FIRMs was provided by the NYSDEC. This information was derived from the New York State Office of Cyber Security & Critical Infrastructure Coordination from photography dated April 2004.

The projection used for the preparation of the digital FIRMs was Universal Transverse Mercator (UTM), Zone 18. The horizontal datum was NAD 83, GRS1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of the FIRMs.

1.3 Coordination

The purpose of an initial Consultation Coordination Officer's (CCO) meeting is to discuss the scope of the FIS. A final CCO meeting is held to review the results of the detailed study.

The dates of the initial and final CCO meetings held for prior FISs for the incorporated communities within Ulster County, outside the NYC watershed, are shown in Table 1.

TABLE 1 - INITIAL AND FINAL CCO MEETING DATES

Community Name	Initial CCO Meeting	Final CCO Meeting
Ellenville, Village of	June 12, 1980	August 9, 1982
Gardiner, Town of	June, 1978	November 12, 1981
Hurley, Town of	*	August 27, 1984
Kingston, City of	May 25, 1977	April 18, 1983
Kingston, Town of	September 18, 1986	April 20, 1987
Lloyd, Town of	*	August 29, 1984
Marbletown, Town of	October 11, 1990	January 24, 1991
Marlborough, Town of	*	July 16, 1984
New Paltz, Town of	May 26, 1977	May 5, 1981
New Paltz, Village of	May 26, 1977	May 5, 1981
Rochester, Town of	September 25, 1984	March 8, 1990
Rosendale, Town of	May 26, 1977	August 10, 1983
Saugerties, Town of	*	*
Saugerties, Village of	*	*
Shawangunk, Town of	June, 1978	November 6, 1981
Ulster, Town of	May 25, 1977	April 18, 1983
Wawarsing, Town of	June 12, 1980	September 2, 1982
Woodstock, Town of	May, 1987	October 18, 1990

* Data Not Available

Initial CCO meetings for this countywide FIS were held in 2004 with representatives of the NYSDEC and local officials from all the communities listed above, and the Town of Plattekill.

2.0 AREA STUDIED

2.1 Scope of Study

This FIS (Phase 1) covers the geographic areas of Ulster County, NY that lie outside of the New York City Water Supply Watershed.

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

TABLE 2 - FLOODING SOURCES STUDIED BY DETAILED METHODS

Black Creek	Rochester Creek Tributary No. 1
Dwaar Kill East	Rondout Creek
Dwaar Kill West	Sandburg Creek
Esopus Creek	Saw Kill
Hudson River	Shawangunk Kill
Kate Yaeger Kill	Twaalfskill Brook
Mara Kill	Twaalfskill Creek
Mill Brook	Verkeerder Kill
Mill Brook Tributary No. 1	Wallkill River
Rochester Creek	

The areas studied were selected with priority given to all flood hazard areas and areas of projected development and proposed construction. In addition, one stream segment was studied by limited detailed methods, and 109 streams were studied by approximate methods. Section 3.2 provides a comprehensive definition of limited detailed and approximate flood hazard designations.

2.2 County Description

Ulster County is located in south-eastern New York approximately 75 miles north of the New York City metropolitan area. It is bordered on the north by Delaware and Greene Counties, on the south by Orange County, on the east by Dutchess County and Columbia Counties, and on the west by Sullivan County. Ulster County has the Hudson River as its eastern county line.

The largest city in Ulster County is the county seat, Kingston, with a population of 23,456. Other incorporated areas in the county include the Towns of Denning[1], Esopus, Gardiner, Hardenburgh[1], Hurley[1], Kingston, Lloyd, Marbletown, Marlborough, New Paltz, Olive[1], Plattekill, Rochester, Rosendale, Saugerties, Shandaken[1], Shawangunk, Ulster, Wawarsing[1], and Woodstock[1], and the Villages of New Paltz, Ellenville, and

[1] Community not included in this FIS

Saugerties. The total 2000 Census population of Ulster County is 177,749 (Reference 28).

The climate in south-east New York is humid continental, characterized by short, mild summers and long, cold winters. The varied terrain induces numerous microclimates with variations in temperature, wind channeling, vertical currents, relative humidity, and precipitation. The mean temperature is 25.2 degrees Fahrenheit (°F) in January and 70.8 °F in July. The annual precipitation is typically between 40 and 50 inches. The average annual snowfall is approximately 62 inches (Reference 3).

The Hudson River runs along the eastern border of Ulster County. Other major streams in Ulster County are Rondout Creek, Wallkill River, Saw Kill, and Esopus Creek. The Hudson River originates near Mt. Marcy in Essex County in northeast New York and flows south for 315 miles to Upper New York Bay, in the southeast corner of New York State. The drainage area of the Hudson River at the northern portion of Ulster County (near the Esopus Creek confluence) is approximately 10,500 square miles.

Rondout Creek originates in the New York State Catskill Mountains adjacent to Peekamoose Mountain. The creek flows southwest to southeast for 25 miles to Napanock and the foothills of the Shawangunk Mountains. The valley has steeply wooded slopes and an average width of 700 to 1,500 feet. Beyond this point, the creek then turns northeast and meanders along the base of the Shawangunk Mountains to High Falls then through a narrow, steep banked valley to Rosendale, where it crosses the mountains at Lefevre Falls and flows to its confluence with the Wallkill River. The creek continues to Kingston where it joins the Hudson River.

The Wallkill River originates at the outlet of Lake Mohawk at Sparta, New Jersey. The river generally flows northwest through northern New Jersey into southeast New York State. In Ulster Country, New York, the Wallkill River flows through the Towns of Shawangunk, Gardiner, New Paltz, Rosendale and Esopus before emptying into Rondout Creek.

Esopus Creek originates at the outlet of Winnisook Lake in the New York State Catskill Mountains. The stream flows north to Big Indian, New York, where it joins Birch Creek and turns to the east. Esopus Creek then flows approximately 4.2 miles to Allaben, New York, which is the location of the Shandaken Tunnel discharge chamber. After receiving discharges from the tunnel at Allaben, the creek flows southeast for 11.8 miles where it enters Ashokan Reservoir (drainage area – 256 square miles, storage capacity – 130.5 billion gallons). The creek continues southeast for 7 miles and then turns to the northeast where it flows through the Town of Ulster and then into the Town of Saugerties for approximately 4.2 miles, eventually discharging into the Hudson River. The main channel of Esopus Creek is lined with trees and consists of wooded areas interspersed with areas of short grasses and brush or cropland.

2.3 Principal Flood Problems

Flooding can occur in Ulster County during any season of the year, but is most likely to occur in the late winter-early spring months when severe or long-duration precipitation events combine with melting snow. Late summer flooding is also a possibility due to thunderstorms and tropical storms/hurricanes carrying abundant amounts of rain as they travel up the eastern seaboard.

2.4 Flood Protection Measures

Several communities within Ulster County have constructed flood control structures to mitigate flooding. The following paragraphs describe some of the more significant measures.

Kingston Flood Control Project – (Esopus Creek)

This improvement to the right bank of Esopus creek is located between State Route 28 / Interstate Route 587 and Washington Avenue. The design flow is 37,400 cfs, which at the time represented the 100-year flood and is 10-percent greater than the largest known flood with a discharge of 34,000 cfs. Current hydrology has put the 100-year discharge at 45,452 cfs. The COE, New York District, has certified that the levee is able to provide protection against the 100-year flood under the current hydrology; therefore, the Kingston Flood Control Project is assumed to withstand the current 100-year flood event and offers flood protection behind its walls.

Ellenville Flood Control Project - (Sandburg Creek)

As a result of the extensive damage inflicted on the Village of Ellenville during the 1955 flooding, a local flood protection project for North Ellenville, Beer Kill and Fantine Kill was initiated by the COE. This project, as authorized by the 1962 Flood Control Act, provides local works for the protection of Ellenville from the overflow of Beer Kill and Fantine Kill. Flooding in this area is the result of the closeness with which the streams discharge into Sandburg Creek, thereby causing their waters to sweep over the low-lying ground which separates the mouths of these streams. The improvement is designed to protect part of North Ellenville against a recurrence of a flood greater than the flood of 1955. Total protective works along Beer Kill and Fantine Kill extend approximately 16,130 feet with 7,440 feet on the right bank of Beer Kill, 3,860 feet on the left bank of Beer Kill, 280 feet of flume near Main Street, and 275 feet of channel improvement. The protective works along Fantine Kill include 380 feet of channel improvement, a new channel 1,200 feet in length, and levees of 1,400 feet in length on the left bank and 1,300 feet in length on the right bank. Protective works consist of levees, walls, concrete flume, channel improvement, interior drainage and diversion ditches, ponding areas, the raising or replacement of bridges, abutments and approaches to the bridges, the removal of a dam, and the relocation of utility facilities and other structures. This flood control project is not mapped as providing protection against the 1-percent-annual chance flood.

Rosendale Flood Control Project – (Rondout Creek)

The Rosendale flood control project consists of channel improvements, walls, levees, interior structures, ponding areas, pumping station, road raising and removal of buildings. The channel excavation consisted of deepening and widening for 11,300 feet, starting 1,000 feet upstream of the New York State thruway bridge and terminating 450 feet upstream of the James Street Bridge. The existing channel was widened and deepened through the gorge at Lefevre Falls for a distance of approximately 500 feet. This flood control project is not mapped as providing protection against the 1-percent-annual chance flood.

Ashokan Reservoir – (Esopus Creek)

The Ashokan Reservoir, although not specifically designed for flood control, has historically provided some storage during floods. The reservoir is located on Esopus Creek 1.6 miles south of Ashokan and 9.1 miles northwest of the City of Kingston in Ulster County. The reservoir drains 256 square miles of land and has had water levels recorded daily since 1913. Ashokan Reservoir is formed by the masonry Olive Bridge dam across Esopus Creek and a series of earth embankments between hills. The reservoir is divided into two basins separated by a weir containing a gate house. The initial filling of the reservoir began September 9, 1913. Usable capacity of the west basin is 47,180 million gallons between a minimum operating level of 495.5 feet and the crest of the spillway to the east basin at an elevation of 590.0 feet. Dead storage below the minimum operating level is 2,237 million gallons. The east basin operates at a minimum level of 500.0 feet to the spillway crest elevation at 587.1 feet. Usable capacity of the east basin is 80,678 million gallons, with no dead storage. The reservoir impounds water for diversion into Catskill Aqueduct for the New York City water supply. Any flood spillage enters the Esopus Creek channel below the Olive Bridge Dam.

Rondout Reservoir – (Rondout Creek)

The reservoir is located at the release chamber at Merriman Dam on Rondout Creek, 1.1 miles upstream from Brandy Brook, and 1.3 miles northwest of Lackawack in Ulster County. The reservoir drains 94.4 square miles of land, and, the water levels have been recorded since 1851. Rondout Reservoir is formed by an earthfill rockfaced dam. The reservoir was initially filled to capacity (crest of spillway) March 28, 1955 approximately 4 years after its storage began May 10, 1951. The minimum operating level, elevation 720.0 feet and crest of spillway, elevation 840 feet will yield a usable storage capacity of 50,048 million gallons. The dead storage below the minimum operating level is approximately 2,387 million gallons. The reservoir impounds water from the following sources: Rondout Creek; the Cannonsville Reservoir diverted through the West Delaware Tunnel; the Pepacton Reservoir diverted through the East Delaware Tunnel; and the Neversink Reservoir diverted through the Neversink-Grahamsville Tunnel. Water is also diverted from Rondout Reservoir for the New York City water supply through the West Tunnel of the Delaware Aqueduct

3.0 ENGINEERING METHODS

For the flooding sources studied by detailed methods in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude that 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-, or 500-year floods, have a 10-, 2-, 1-, and 0.2-percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long-term, average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood that equals or exceeds the 1-percent-annual-chance flood in any 50-year period is approximately 40 percent (4 in 10); for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish peak discharge-frequency relationships for each flooding source studied by detailed or limited detailed methods. Detailed revisions were carried out for: 1) Rondout Creek in the Towns of Rosendale, Esopus, Ulster, and in the City of Kingston, and; 2) the Saw Kill in the Towns of Woodstock, Kingston, and Ulster. A new detailed study is provided for Twaalfskill Brook in the City of Kingston, formerly studied by approximate methods. Limited detailed methods were used to study a portion of the Esopus Creek located immediately downstream of Ashokan Reservoir in the Towns of Olive and Marbletown, a reach formerly studied by approximate methods.

Rondout Creek

In the previous effective studies, the hydrologic analysis for Rondout Creek was performed in two parts. These parts consisted of the portions above and below the confluence of the Wallkill River with Rondout Creek.

Above the confluence of the Wallkill River, the previous effective study for Rondout Creek was performed using a log-Pearson Type III analysis (Reference 6) based on USGS gage No. 01367500 on Rondout Creek at Rosendale, New York using the period of record from 1927 to 1981. The previous study also performed a log-Pearson Type III analysis using only the thirty eight years of regulated record (1944 to 1981) to reflect the operation of the Rondout Reservoir, located approximately 35 stream miles upstream of the Rosendale gage. The results of the regulated-only analysis were almost identical to the analysis of the entire record. Therefore, the effects of regulation or diversion were deemed negligible at the gage site.

As described in the previous study for the Town of Rosendale:

> "The hydrologic analysis below the confluence of the Wallkill River is complicated by the fact that the Wallkill River basin is approximately twice as large as the Rondout Creek basin at the confluence of the two streams, but the discharges of the Wallkill River are lower due to the geologic conditions in the basin (Reference 1). Therefore, a drainage area-discharge transfer using the Rosendale gage would not be reliable, and a different method of analysis was required. The methodology in a regional frequency study by the COE was selected for this application (Reference 2). Basin characteristics for each stream were averaged using information from USGS gages Nos. 01367500 on Rondout Creek at Rosendale and 01371500 on the Wallkill River at Gardiner, New York. Discharges for Rondout Creek were then developed and modified to closely relate to the August 1955 and October 1955 floods, which are the floods of record for Rondout Creek and the Wallkill River."

The previous study for the Town of Rosendale also mentions that the discharges on the Wallkill River are influenced by topographic constrictions in the Perrin's Bridge area and large amounts of available storage upstream of Perrin's Bridge. As described in that report:

> "Discharges for the Wallkill River were developed using the HEC-1 Modified Puls storage routing model. The flood of October 1955 at the USGS gage in Gardiner, New York, was assigned a recurrence interval of 100 years in the USGS Report No. 78-322 (Reference 3). Discharge ratios used in deriving the discharges for the different frequencies in the HEC-1 analysis were taken from the information provided in the above mentioned report. Surveyed cross-section data and USGS

> topographic maps were used to determine the storage-elevation relationships for the Wallkill River. A rating curve of elevation-discharge was developed from the COE HEC-2 model. The October 1955 hydrograph, discharge ratios, storage-elevation relationships, and the elevation-discharge rating curve were incorporated into the HEC-1 model. The derived discharges were then used in the HEC-2 model, and the model was adjusted to match the observed elevations of the October 1955 flood."

For the present study, the hydrological analysis of Rondout Creek is divided into two parts, upstream and downstream of the confluence with the Wallkill River, as it was in the previous study.

<u>Rondout Creek upstream of the confluence with the Wallkill River:</u>

A Log-Normal Graphical Analysis was conducted for the USGS Gage 1367500, located at Rosendale on Rondout Creek. This analysis was performed graphically since the record includes the possible effects of regulation by the Rondout Reservoir. The graphical analysis was performed for the period of record after 1943, when the NYC Rondout Reservoir became operational. The contributing area at the Rosendale gage is 383 square miles, and the regulated period of record consists of 61 years (1944 to 2004).

In addition, two Log-Pearson Type III analyses were conducted for the regulated period (1944 to 2004), and for the entire period of record (1927 to 2004). The results of these two new analyses are similar, indicating that the effects of regulation appear to be negligible, as the previous FIS concluded.

The effective discharges are more conservative than the newly computed discharges and the regulated results vary by less than 15%. Therefore, the effective discharges are nominated for new Hydraulic Studies at the Rosendale USGS gage location. Additional nominations were transferred from the Rosendale gage location using a discharge-area relationship derived from the 1991 USGS regression equations, or by interpolation based on relative drainage areas.

<u>Rondout Creek downstream of the confluence of the Wallkill River:</u>

There is no USGS gage record at or below the confluence of the Wallkill River with Rondout Creek. To obtain a relationship for the combined contribution of the drainage areas (1,173 sq. mi.), a timing analysis was conducted using 15-minute interval hydrographs for two USGS Gages. The gage at Rosendale on Rondout Creek (383 square miles of drainage area at Rosendale), is near the confluence. However, the gage at Gardiner on the Wallkill River (695 square miles of drainage area at Gardiner), is roughly 15 miles upstream of the confluence, and has a difference of approximately 91 square miles of contributing drainage area (695 vs. 786 mi^2). The results of the gage analysis at Gardiner were transferred downstream using the discharge-area relationship derived from the USGS Regression Equation for NYS Region 4 (Reference 4).

Peak flows for Rondout Creek below the confluence with the Wallkill River were estimated by combining hydrographs from the two streams. An estimate of the lag time between the arrival of the two hydrographs at the confluence is required to combine the two hydrographs. A range of lag times were estimated from general channel and flood conditions. These estimates were applied to 15-minute interval hydrographs from the Rosendale and Gardiner gages for a November 2005 event. The 15-minute interval hydrograph for Gardiner was transferred downstream, taking into consideration the additional 91 mi^2 of contributing area. Various lag times were assumed and graphically combined with the 15 minute interval hydrograph for Rosendale. This resulted in the combined peak discharges equal to a fraction (between 0.91 and 0.99) times the sum of the peak discharges of each hydrograph. These relationships were applied to the updated gage analyses for Rosendale and Gardiner to estimate the 10%, 2%, 1%, and 0.2% annual-chance discharges.

The previous effective discharges compare well with the newly estimated discharges for the confluence of the Wallkill River with Rondout Creek, and the previous effective discharges are the more conservative estimates. Therefore, the previous effective discharges are nominated for the reach of Rondout Creek below the confluence with the Wallkill River. The results of the analysis were transferred downstream using the discharge area relationship derived from the USGS regression equations Region 4 (Reference 4).

The nominated discharges for Rondout Creek are presented in Table 3, "Summary of Discharges."

Esopus Creek

This FIS includes a Limited Detailed Study on Esopus Creek of approximately 7.3 miles, proceeding immediately downstream from Ashokan Reservoir. This reach was mapped previously as an approximate study; therefore, discharges were not reported. In the previous FIS, a detailed study was carried out for locations farther downstream on Esopus Creek, and flow nominations were reported at several locations, including the Mount Marion gage site (USGS 01364500), the City of Kingston, and the downstream corporate limits of the Town of Hurley. Peak flow nominations were also reported for the 100 year return period at the downstream corporate limit of the Town of Marbletown. These effective flows were determined using a HEC-1 analysis which was a revision of an earlier HEC-1 analysis used in the original FEMA Flood Insurance Study. The original modeling was based on the assumption that Ashokan Reservoir would be at spillway crest at the time of the flooding event. However, subsequent observations of reservoir levels during actual flooding events suggested that the full-reservoir scenario was less likely than first assumed. Therefore the HEC-1 model was updated in the previous FIS to anticipate some storage capacity in the reservoir. Printouts of the revised HEC-1 model for Esopus Creek were obtained from NYS DEC and compared to the effective discharges obtained from the previous FIS reports.

This FIS compares the previous effective flows, based on the revised HEC-1 model, to an analysis of three gage records. The comparison is based on records for the Mount Marion gage on the Esopus Creek (USGS 01364500), the Coldbrook gage (USGS 01362500) which provides a record of inflow to the Ashokan Reservoir, and the spill and release records for the Ashokan Reservoir (New York City Department of Environmental Protection). The analysis provides an estimate of probable reservoir storage, based on inflow and outflow from the reservoir, recorded for several of the larger events. The drainage area at Coldbrook is 192 sq. mi., the drainage area for the Ashokan Reservoir is 256 sq. mi., and the drainage area at Mount Marion is 419 sq. mi. For all of the larger events that are available at all three locations, the available storage capacity of Ashokan Reservoir appears to be a key factor in the resulting discharge below the reservoir.

The Mount Marion gage record provides historic flows for the years of 1908 to1915 and 1971 to 2004. It does not include the years between 1915 and 1971. The Coldbrook gage record was used to estimate the historical inflows to Ashokan Reservoir for the years of 1932 to 2004. The probability-peak discharge analyses for both the Mount

Marion gage and the Ashokan Reservoir spill and release data used graphical plotting techniques in consideration of the influence of regulation from Ashokan Reservoir. The updated analysis for the Mount Marion gage indicates peak flows considerably lower than the HEC-1 analysis used in the FIS study. These results again suggest that the contribution of the regulation at Ashokan Reservoir is significant. This supports the assumptions and revisions of the US Army Corps of Engineers (USACE) HEC-1 model, as presented in the 1992 Saugerties FIS, that attempted to take into account the available storage capacity of the Ashokan Reservoir.

To determine the validity of the 1992 Saugerties FIS an analysis of eighteen large flood events was conducted. This analysis compared the gage records for Coldbrook (estimate of the inflows to the reservoir) and the spill and release records for Ashokan Reservoir (estimate of outflows of the reservoir) to determine the effect of reservoir storage on flood events. This storage effect analysis was then used to determine the reservoir outflow discharges for the 10, 2, 1, and 0.2 percent annual-chance events for the corresponding inflows at the Coldbrook USGS gage. The resulting values are consistent with the modeled outflows of the Ashokan Reservoir obtained from the revised HEC-1 model printouts.

Printouts of the revised HEC-1 model output for Esopus Creek were obtained from NYS DEC. The modeled flows were extracted from those printouts and used to develop discharge nominations for the Limited Detailed Study on Esopus Creek. The modeled outflows for the Ashokan Reservoir are nominated at the upstream end of the Limited Detail Study. The effective discharge, from the Marbletown FIS, is nominated for the downstream end of the Limited Detail Study, at Hurley Mountain Road.

A portion of Esopus Creek upstream of the confluence with the East Ashokan Reservoir Spillway is not affected by reservoir outflows. Peak flows for this upstream section were nominated using the USGS regression equations for New York State.

The nominated discharges for Esopus Creek are presented in Table 3, “Summary of Discharges.”

Twaalfskill Brook

Twaalfskill Brook in the City of Kingston was formerly mapped as an approximate study, and no discharges were reported.

In the present study, Twaalfskill Brook is studied by detailed methods. Discharges were determined using the 1991 USGS regression equations for New York State (Reference 4). This method is applicable since the stream is unregulated, and urbanization is minor (less than 15 percent of the contributing drainage area is classified as impervious).

The nominated discharges for Twaalfskill Brook are presented in Table 3, “Summary of Discharges.”

Saw Kill

Previous studies of Saw Kill are mentioned in the FIS reports for the Towns of Kingston (1988) and Woodstock (1991). Saw Kill also passes through the Town of Ulster (1984), where it has a confluence with Esopus Creek, but no mention is made of it, and no nominations are given in the Town of Ulster FIS. The Woodstock FIS indicates that two older methods, based on regional regression analyses, were used to nominate peak flows within the community. These are the Stankowski Method and the 1979 USGS Regression Equations for New York. However, it was not stated which method was used to make specific peak flow nominations along the Saw Kill. Nominations were given for only the 1% annual-chance event. The Kingston FIS lists nominations based on a USACE HEC-1 study of the Saw Kill basin in the Towns of Kingston, Ulster, and Woodstock (Reference 5).

The present study compares previous nominations from the Kingston FIS (which were obtained using the USACE HEC-1 model) to peak flows estimated using the 1991 USGS Regression Equations for New York State. At a location with approximately thirty five square miles of drainage area, regression equation peak flows were within 13% of the previously nominated values. The 95% confidence interval for Region 4 of the regression equations is 56.6%. Since the regression equation estimates are within the recommended confidence limits, and considering the greater level of detail used in the USACE HEC-1 analysis, the previous peak flows were nominated for Saw Kill.

Unfortunately, the peak flows in the previous study as reported in the Kingston FIS were shown for only two locations and for only the 100-year return period. Records of a HEC-2 run from the previous study for the Saw Kill 100-year event were used to determine in detail the locations and discharge values used for the 1% annual event in the present study. These locations and discharges were duplicated in the updated hydraulic modeling for the present study. Also, discharges for the 10%, 2%, and 0.2% annual chance discharges were taken from archived engineering notes listing the 100-year discharges and locations consistent with those in the HEC-2 model run, along with the discharges for the 10-, 50-, and 500-year return periods. These notes were presumed to document discharges and locations from the HEC-1 study.

The nominated discharges for Saw Kill are presented in Table 3, “Summary of Discharges.”

TABLE 3 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (square miles)	PEAK DISCHARGES (cfs)			
		10-Yr.	50-Yr.	100-Yr.	500-Yr.
BLACK CREEK					
At Pancake Hollow Road	16.6	1,178	2,019	2,462	3,767
DWAAR KILL EAST					
At confluence with Wallkill River	25.0	1,063	1,683	2,000	3,150
DWAAR KILL WEST					
At confluence with Shawangunk Kill	10.9	1,216	2,108	2,579	3,750
18,000 feet upstream of Shawangunk Kill	3.4	487	840	1,023	1,485
ESOPUS CREEK					
At Glasco Turnpike	419.0	13,814	34,270	54,913	149,802
At Interstate Route 587 / State Route 28	319.0	10,462	30,573[1]	45,452	109,230
350 feet downstream of Hurley Mountain Road	279.7	10,600	30,640	44,700	107,000
From Hurley Mountain Rd upstream to the confluence with Ashokan East Spillway Channel	256.0	10,600	30,250	44,250	101,000
Upstream of the confluence with Ashokan East Spillway Channel	11.6	1,570	2,730	3,310	4,930
KATE YAEGER KILL					
At Band Camp Road	5.9	*	*	3,080	*
Approximately 1.12 miles downstream of Kate Yaeger Road	5.4	*	*	2,890	*
Approximately 0.57 miles downstream of Kate Yaeger Road	4.3	*	*	2,890	*
Approximately 1,200 feet downstream of Kate Yaeger Road[1]	4.0	*	*	4,090[1]	*
Approximately 0.55 miles upstream of Brady Road[1]	3.7	*	*	4,220[1]	*
MARA KILL					
At County Road No. 7	7.8	930	1,570	1,880	2,740
Upstream of U.S. Route 44 and State Route 55	5.9	710	1,200	1,440	2,100
Downstream of School House Road	4.4	520	880	1,060	1,540
Approximately 3,500 feet upstream of School House Road	1.3	320	620	780	1,250
Downstream of Sparkling Ridge Road	0.2	90	190	240	420
MILL BROOK					
Mouth	19.8	1,805	3,020	3,675	*
Upstream of Tributary 1	17.7	1,673	2,803	3,395	*
TRIBUTARY 1 TO MILL BROOK					
Mouth	2.1	200	327	391	*

TABLE 3 - SUMMARY OF DISCHARGES (continued)

ROCHESTER CREEK					
Mouth	52.6	4,950	8,454	10,320	*
Upstream of Tributary 1	49.1	4,700	8,030	9,820	*
Upstream of Mill Brook	26.1	2,490	4,210	5,112	*
TRIBUTARY 1 TO ROCHESTER CREEK					
Mouth	3.3	348	573	686	*
RONDOUT CREEK					
At confluence with Hudson River	1,197.0	33,977	51,844	60,980	86,537
Upstream of confluence with Twaalfskill Brook	1,187.6	33,743	51,511	60,599	86,028
Downstream of confluence with Wallkill River	1,173.0	33,377	50,990	60,002	85,233
Upstream of confluence with Wallkill River	386.0	22,260	33,651	39,126	53,404
At Rosendale USGS Gage 01367500	383.0	22,109	33,430	38,871	53,061
Downstream of confluence with Coxings Kill	377.1	21,813	32,996	38,371	52,388
Approximately 13,900 feet upstream of County Route 29A	322.0	19,850	31,870	37,940	*
At Accord	300.0	18,700	30,500	36,400	52,300
At East Wawarsing below the confluence of Vernooy Kill	241.0	15,600	26,700	32,100	47,300
Below the confluence of Sandburg Creek	213.0	14,200	24,000	28,900	42,000
Above the confluence of Sandburg Creek	113.0	8,100	12,800	15,000	20,900
SANBURG CREEK					
At the confluence with Rondout Creek	100.0	6,900	13,800	17,900	29,500
At Ellenville	56.7	4,050	8,200	10,700	17,200
SAW KILL					
At confluence with Esopus Creek	41.9	4,213	8,525	11,346	20,346
Approximately 100 feet downstream of Sawkill Road at Sawkill	38.6	4,123	8,403	11,223	20,086
350 feet downstream of Kingston Reservoir #1 Dam	33.4	4,120	8,371	10,958	18,539
100 feet downstream of Zena Road (County Route 52)	23.3	3,873	7,951	10,456	17,235
SHAWANGUNK KILL					
At confluence with Wallkill River	142.0	9,335	16,570	20,795	33,910
Downstream of confluence of Verkeerder Kill	86.0	5,380	9,825	12,490	20,850
TWAALFSKILL BROOK					
At confluence with Rondout Creek	2.5	420	770	950	1,500
TWAALFSKILL CREEK					
At Tillison Avenue	5.9	781	1,492	1,900	3,196

TABLE 3 - SUMMARY OF DISCHARGES (continued)

VERKEERDER KILL					
At confluence with Shawangunk Kill	14.3	1,542	2,672	3,271	5,525
WALLKILL RIVER					
At upstream Esopus corporate limits	764.0	18,940	28,400	33,222	46,564
At downstream Gardiner corporate limits	719.0	16,740	26,610	31,110	43,580
Upstream of USGS Gage at Gardiner	568.0	13,815	22,220	26,295	37,730

* Data not computed

[1] Discharges increase due to storage effects

3.2 Hydraulics Analyses

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

In this countywide analysis, water surface elevations for floods of the selected recurrence intervals for detailed, limited detail, and approximate studies were computed using the USACE Hydrologic Engineering Center River Analysis System (HEC-RAS) river modeling software program (Version 3.1.3). The HEC-RAS model for each flooding source is based on cross section geometry generated using manual and semi-automated methods derived from GIS techniques and data.

Cross section elevations were extracted from a Digital Elevation Model (DEM). The DEM was generated by combining overbank elevation data from an aerial Light Detection and Ranging (LiDAR) survey with data from a traditional field survey of the stream channel and the immediate over bank areas. For detailed studies, cross sections were field surveyed at close intervals just upstream and downstream of bridges, culverts, dams, and other hydraulic obstructions, at natural control sections along the stream length, and at significant changes in ground relief, land use, or land cover. Detailed structural geometry for bridges and culverts was also obtained from NYSDOT as-built drawings where they were available.

A stream centerline was located using geographically rectified aerial photography and the DEM. The centerline served as a base line to define hydraulic model distances along the stream channel as indicated on the Flood Profile and the Floodway Data Tables. Selected cross sections used in the detailed hydraulic analysis are located on the Flood Profiles (Exhibit 1) and on the FIRM and are relative to distances along this base line.

Roughness factors (Manning's "n") used in the hydraulic model were chosen by engineering judgment and are based on field observations and semi-automated methods supported by GIS-based techniques. Table 4 provides a summary of the Manning's "n" values used in the hydraulic computations for the channel and overbank areas.

TABLE 4 - MANNING'S "N" VALUES

Flooding Source	Channel "n" Values	Overbank "n" Values
Black Creek	data not available	0.060 – 0.070
Englishmans Creek	0.030 – 0.040	0.080
Esopus Creek	0.030 – 0.045	0.020 – 0.080
Esopus Creek (LD)	0.035 – 0.065	0.060 – 0.200
Dwaar Kill	0.030 – 0.040	0.060 – 0.080
Kate Yaeger Kill	0.030 – 0.040	0.040 – 0.100
Preymaker Brook	0.030 – 0.040	0.080
Rondout Creek	0.029 – 0.100	0.050 – 0.198
Saw Kill	0.034 – 0.064	0.049 – 0.180
Shawangunk Kill	0.030 – 0.040	0.060 – 0.080
Twaalfskill Brook	0.030 – 0.070	0.030 – 0.178
Tannery Brook	0.035	0.060 – 0.120
Wallkill River	0.015 – 0.065	0.060 – 0.080

In accordance with FEMA's Guidelines and Specifications, starting water surface elevations for the hydraulic models were determined using normal depth. For reaches where the hydraulic analysis indicated supercritical flow conditions, critical depth was assumed for the flood elevations.

The hydraulic analyses for this study were based on unobstructed flow. The flood elevations shown on the Flood Profiles (Exhibit 1) are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

Rondout Creek

This detailed restudy begins at the confluence with the Hudson River in the City of Kingston/Town of Esopus and extends upstream approximately 12.5 miles to the Lawrenceville Road Bridge in the Towns of Rosendale.

Twaalfskill Brook

Prior to this countywide analysis, Twaalfskill Brook was studied by approximate methods. For this new detailed study, the reach begins at the confluence with Rondout Creek and extends upstream approximately one half mile to the Brook Street crossing in the City of Kingston

Saw Kill

Prior to this countywide analysis, Saw Kill Creek was studied by approximate methods in the Town of Ulster, and detailed methods in the Towns of Kingston and Woodstock. This detailed study/restudy for Saw Kill begins at the confluence with the Esopus Creek in the Town of Ulster, extends upstream approximately 8.46 miles and ends approximately 2,020 feet above the dam at Kingston Reservoir #2.

Esopus Creek (Limited Detailed)

Prior to this countywide analysis, this reach of Esopus Creek was studied by approximate methods. This new limited detailed (enhanced approximate) study begins approximately 350' downstream of the County Route 5 (Hurley Mountain Road) bridge (Town of Marbletown) and extends upstream approximately 7.5 miles, into the Town of Olive to a location approximately 350' upstream of the covered bridge on the SUNY New Paltz – Ashokan Field Campus.

As discussed previously, certain flooding sources were studied using limited detailed and approximate methods. These methods are discussed below.

Limited Detail "Enhanced approximate floodplains": This category is assigned to areas where "unnumbered" A-zones are shown on the effective maps, and communities have requested new/upgraded studies, but the level of projected development does not warrant a detailed study. It is also applied to lakes that do not have level gauge data, and will be included in a hydraulic model. The level of effort includes collection of an orthophoto, LIDAR and limited survey of structures, nomination of flow rates, and the development of HEC-RAS hydraulic models.

For the purposes of this document "limited survey" refers to the survey of man-made hydraulic obstructions, such as dams, bridges and culverts, and to the survey of the outlet channels of lakes with natural outlet controls. The purpose of collecting "limited survey" is to enhance the accuracy of the hydraulic model thus allowing the development and publication of "Advisory Base Flood Elevations (BFEs)." Engineering drawing plans and Department of Transportation (DOT) hydraulic studies may be substituted for limited survey, where appropriate and available.

For the Esopus Creek Limited Detail study, two (2) bridges were surveyed and modeled in the study reach. The structures were located at the downstream and upstream segments of the study reach. In addition to the two man-made structures surveyed, a survey of the Esopus Creek channel was performed to further enhance the accuracy of the hydraulic model. The 1% annual chance Advisory Base Flood Elevations for selected modeled cross sections of the Esopus Creek are provided in Table 5, "Limited Detailed Flood Hazard Data. These cross sections will also be shown on the FIRM. Because the base flood elevations are "advisory", the published values need not be used to enforce floodplain management ordinances as outlined in 44 CFR 60.3(c)(10), but should be used as base flood elevations data according to 44 CFR 60.3(b)(4). Development in Special Flood Hazard Areas that are designated Zone A but which have advisory flood elevations should comply with the elevation standards, but may not have to develop an analysis of increases in water-surface elevations, unless required by the local community.

***Approximate* (A) "A-Zones":** - This category is assigned where "unnumbered" A-zones are shown on the effective maps, but the anticipated level of development does not warrant the collection of field survey; or where communities have requested an approximate study where there was currently no study at all.. The desktop analysis approach to be applied to approximate studies is defined in Appendix C, Section 4.3 of the Guidelines and Specifications for Flood Hazard Mapping Partners. The level of effort includes orthophoto collection, LIDAR and stream breakline collection, use of engineering drawing plans and DOT studies (where appropriate and available), nomination of flow rates, and the development of HEC-RAS hydraulic models.

TABLE 5 - LIMITED DETAILED (ENHANCED A-ZONES) FLOOD HAZARD DATA

Selected Cross Section	Flood Discharge (CFS)	1% Annual Chance Advisory Base Flood Elevation (Feet NAVD 88)	FIRM Panel Number
ESOPUS CREEK			
1	44,700	208.0	0445
2	44,250	213.1	0445
3	44,250	221.8	0445
4	44,250	230.7	0445
5	44,250	240.2	0445
6	44,250	244.2	0445
7	44,250	247.9	0445
8	44,250	256.3	0445
9	44,250	262.5	0445
10	44,250	274.8	0445
11	44,250	277.4	0445
12	44,250	282.3	0445
13	44,250	284.5	0445
14	44,250	286.2	0445
15	44,250	291.1	0445
16	44,250	296.8	0445
17	44,250	305.1	0445
18	44,250	309.7	0445
19	3,310	317.5	0445
20	3,310	317.6	0445
21	3,310	319.1	0440
22	3,310	325.2	0440
23	3,310	328.7	0440
24	3,310	332.7	0440
25	3,310	341.5	0440

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 (NGVD29). With the finalization of the North American Vertical Datum of 1988 (NAVD88), many FIS reports and FIRMs are being prepared using NAVD88 as the referenced vertical datum.

All flood elevations shown in this FIS report and on the FIRM are referenced to NAVD88. Structure and ground elevations in the community must, therefore, be referenced to NAVD88. It is important to note that adjacent communities may be referenced to NGVD29. This may result in differences in Base Flood Elevations (BFEs) across the corporate limits between the communities.

The BFEs shown on the FIRM represent whole-foot rounded values. For example, a BFE of 102.4 feet will appear as 102 on the FIRM and a BFE elevation of 102.6 feet will appear as 103. The elevations shown on the Flood Profiles and supporting data tables are shown at a minimum to the nearest 0.1 feet.

For more information on NAVD88, see the FEMA publication entitled *Converting the National Flood Insurance Program to the North American Vertical Datum of 1988* (FEMA, June 1992), or contact the Vertical Network Branch, National Geodetic Survey, Coast and Geodetic Survey, National Oceanic and Atmospheric Administration in Rockville, Maryland (Internet address http://www.ngs.noaa.gov).

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 the FIS report and FIRM for this county. Interested individuals may contact FEMA to access these data.

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The NFIP encourages State and local governments to adopt sound floodplain management programs. Therefore, each FIS provides 1-percent annual-chance flood elevations and delineations of the 1- and 0.2-percent annual-chance floodplain boundaries and 1-percent annual-chance floodways to assist communities in developing floodplain management measures. 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 determination.

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 a Digital Elevation Model prepared from LiDAR data provided by the NYSDEC.

The 1- and 0.2-percent-annual-chance floodplain boundaries are shown on the FIRM. On this map, the 1-percent-annual-chance floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones A, AE, V, 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 0.1-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 maps scale and/or lack of detailed topographic data.

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

4.2 Floodways

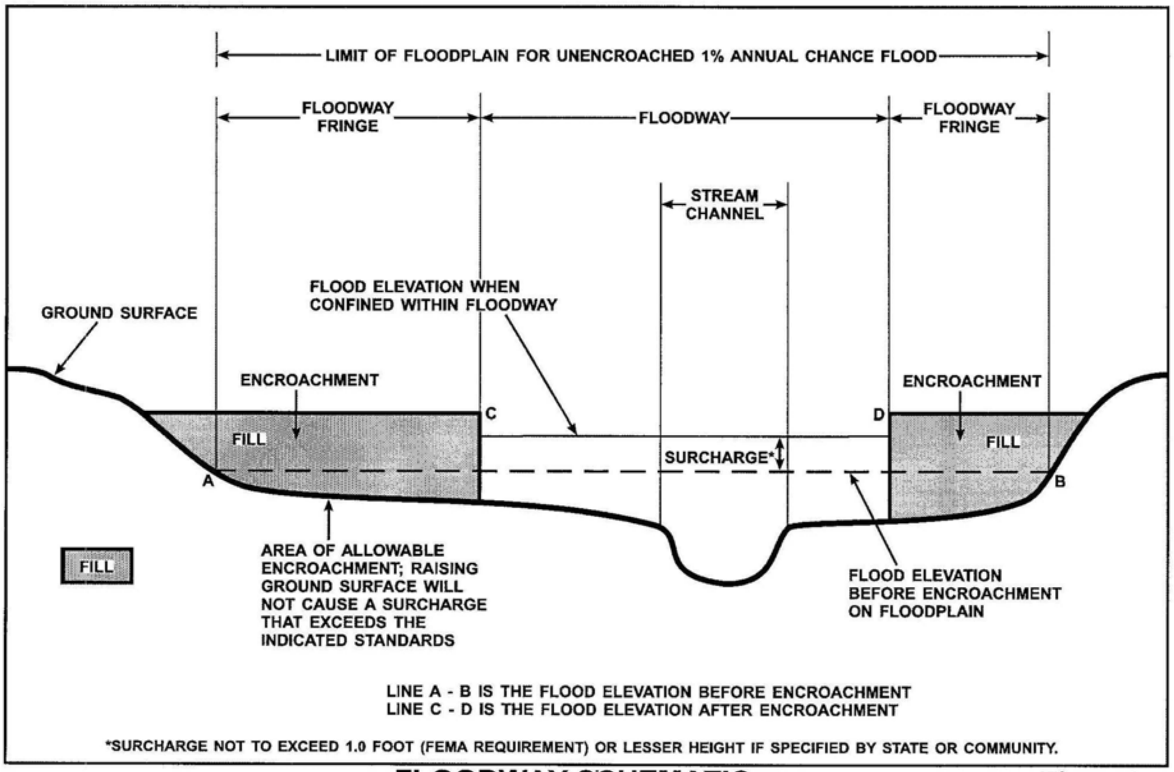
Encroachment on floodplains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development 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 standards of FEMA limit such increases in flood heights 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 floodway presented in this FIS report and on the FIRM was 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 have been tabulated for selected cross sections (Table 6). The computed floodway is shown on the FIRM. In cases where the floodway and 1-percent-annual-chace floodplain boundaries are either close together or collinear, only the floodway boundary has been 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 6, “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 6 for certain downstream cross sections are lower than the regulatory flood elevations in that area, which must take into account the 0.1-percent-annual-chance flooding due to backwater from other sources.

The area between the floodway and the 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 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 2.



FLOODWAY SCHEMATIC Figure 1

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
Black Creek								
A	200[1]	33	207	11.9	323.7	323.7	323.8	0.1
B	2,235[1]	79	971	2.5	348.9	348.9	349.0	0.1
C	6,230[1]	114	1,419	1.7	354.1	354.1	354.8	0.7
D	8,230[1]	218	2,169	1.1	354.2	354.2	355.0	0.8
E	10,300[1]	248	1,279	1.9	354.4	354.4	355.3	0.9
F	12,300[1]	398	2,777	0.9	355.0	355.0	355.8	0.8
G	14,300[1]	114	410	6.0	359.5	359.5	359.8	0.3
H	16,180[1]	138	518	4.7	374.0	374.0	374.7	0.7
I	18,120[1]	95	542	4.5	401.1	401.1	402.0	0.9
J	20,150[1]	177	932	2.6	409.5	409.5	410.5	1.0
K	22,140[1]	132	827	3.0	419.2	419.2	419.7	0.5
L	24,290[1]	213	572	4.3	425.5	425.5	426.4	0.9
M	26,540[1]	123	373	6.6	442.8	442.8	443.6	0.8
N	28,930[1]	41	228	10.8	468.8	468.8	468.8	0.0
O	31,020[1]	211	1,338	1.8	506.7	506.7	507.6	0.9
P	32,230[1]	117	875	2.8	512.7	512.7	513.3	0.6
Q	34,230[1]	242	931	2.6	514.6	514.6	515.6	1.0
Dwaar Kill East								
A	1,390[2]	67	288	8.8	233.3	228.6[3]	228.6	0.0
B	3,570[2]	74	356	5.6	234.7	234.7	235.0	0.3
C	4,435[2]	115	506	4.0	240.0	240.0	240.2	0.2
D	5,530[2]	50	235	8.5	254.2	254.2	254.2	0.0
E	6,070[2]	60	497	4.0	262.5	262.5	262.6	0.1
F	7,460[2]	60	500	4.0	263.2	263.2	263.5	0.3
G	8,710[2]	65	509	3.9	263.7	263.7	264.1	0.4
H	14,950[2]	115	729	2.7	266.5	266.5	267.0	0.5
I	18,590[2]	221	785	2.5	267.7	267.7	268.6	0.9
J	23,215[2]	125	702	2.8	272.8	272.8	273.4	0.6

[1]Feet above limit of detailed study
[2]Feet above confluence with Wallkill River
[3]Elevation computed without consideration of backwater effects from Wallkill River

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

ULSTER COUNTY, NY
(ALL JURISDICTIONS)

FLOODWAY DATA

BLACK CREEK – DWAAR KILL EAST

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
Dwaar Kill East (cont.)								
K	27,160[1]	74	282	5.7	292.3	292.3	292.5	0.2
L	30,560[1]	55	319	5.1	309.6	309.6	309.8	0.2
Dwaar Kill West								
A	1,475[2]	54	295	8.8	289.2	280.9[3]	281.2	0.3
B	3,445[2]	85	305	8.5	309.7	309.7	309.7	0.0
C	4,140[2]	75	579	4.5	313.4	313.4	313.8	0.4
D	6,800[2]	57	262	9.9	321.4	321.4	321.4	0.0
E	9,260[2]	75	547	4.7	347.6	347.6	347.6	0.0
F	11,320[2]	75	576	4.5	366.0	366.0	366.8	0.8
G	13,565[2]	57	436	5.9	369.9	369.9	370.8	0.9
H	15,540[2]	69	402	6.4	380.6	380.6	381.4	0.8
I	18,685[2]	116	1,023	1.0	396.0	396.0	396.0	0.0
J	20,570[2]	144	474	2.2	399.2	399.2	399.2	0.0
Esopus Creek								
A	8,000[4]	358	15,425	3.6	57.3	57.3	57.9	0.6
B	8,720[4]	687	26,661	2.1	58.0	58.0	58.6	0.6
C	11,040[4]	710	25,328	2.2	58.0	58.0	58.6	0.6
D	11,460[4]	350	11,005	5.0	58.4	58.4	59.0	0.6
E	12,655[4]	340	9,203	6.0	58.5	58.5	59.1	0.6
F	18,435[4]	295	8,036	6.8	59.9	59.9	60.6	0.7
G	24,495[4]	234	5,649	9.7	67.1	67.1	67.3	0.2
H	27,565[4]	271	6,836	8.0	76.1	76.1	77.0	0.9
I	29,825[4]	207	5,652	9.7	77.0	77.0	77.8	0.8
J	33,085[4]	345	3,162	17.4	120.5	120.5	120.5	0.0
K	34,748[4]	215	3,724	14.2	133.7	133.7	133.7	0.0
L	40,153[4]	233	5,494	9.6	141.6	141.6	142.4	0.8
M	47,519[4]	531	6,875	7.7	147.3	147.3	148.1	0.8

[1]Feet above confluence with Wallkill River
[2]Feet above the confluence with Shawangunk Kill
[3]Elevation computed without consideration of backwater effects from Shawangunk Kill
[4]Feet above confluence with Hudson River

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

ULSTER COUNTY, NY
(ALL JURISDICTIONS)

FLOODWAY DATA

DWAAR KILL EAST – DWAAR KILL WEST – ESOPUS 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
Esopus Creek (cont.)								
N	51,369[1]	564	9,613	5.5	151.2	151.2	152.0	0.8
O	57,681[1]	800	9,891	4.7	152.7	152.7	153.6	0.9
P	67,666[1]	1,893	26,733	1.7	154.5	154.5	155.4	0.9
Q	69,276[1]	1,800	20,942	2.2	154.6	154.6	155.4	0.8
R	74,614[1]	366	7,759	5.9	154.9	154.9	155.8	0.9
S	78,346[1]	622	12,153	3.7	157.2	157.2	158.1	0.9
T	84,137[1]	609	13,529	3.4	160.4	160.4	161.2	0.8
U	85,072[1]	498	6,190	7.3	160.4	160.4	161.2	0.8
V	88,017[1]	624	7,848	5.8	162.7	162.7	163.4	0.7
W	94,772[1]	1,000	7,840	5.8	164.1	164.1	165.0	0.9
X	100,042[1]	1,000	7,810	5.8	167.7	167.7	168.6	0.9
Y	106,332[1]	1,050	12,740	3.6	174.8	174.8	175.8	1.0
Z	109.317[1]	975	9,236	4.8	176.1	176.1	177.1	1.0
AA	111,332[1]	1,150	12,680	3.5	179.0	179.0	179.6	0.6
AB	117,222[1]	750	9,758	4.6	187.3	187.3	187.9	0.6
AC	121,077[1]	1,370	18,825	2.4	191.9	191.9	192.5	0.6
AD	123,057[1]	524	5,140	8.7	193.6	193.6	194.1	0.5
AE	125,197[1]	519	7,794	5.7	198.0	198.0	198.6	0.6
AF	130,552[1]	259	3,039	14.7	207.0	207.0	207.7	0.7
Kate Yaeger Kill								
A	9,770[2]	195	1,302	2.4	340.3	340.3	341.3	1.0
B	10,915[2]	129	385	7.5	348.2	348.2	348.2	0.0
C	12,815[2]	77	317	9.1	373.4	373.4	373.4	0.0
D	16,260[2]	72	303	9.5	420.0	420.0	420.0	0.0
E	20,284[2]	228	976	4.2	432.1	432.1	432.4	0.3
F	22,095[2]	213	628	6.7	450.7	450.7	451.1	0.4
G	23,225[2]	220	1,034	4.1	481.1	481.1	481.5	0.4
H	24,930[2]	104	438	9.6	494.1	494.1	494.1	0.0

[1]Feet above confluence with Hudson River
[2]Feet above confluence with Plattekill Creek

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

ULSTER COUNTY, NY
(ALL JURISDICTIONS)

FLOODWAY DATA

ESOPUS CREEK – KATE YAEGER 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
Mara Kill								
A	145[1]	340	3,316	0.6	243.1	243.1	243.9	0.8
B	4,865[1]	155	802	2.3	244.3	244.3	245.3	1.0
C	6,730[1]	70	480	3.0	247.1	247.1	247.5	0.4
D	9,975[1]	140	718	2.0	248.4	248.4	249.4	1.0
E	11,260[1]	103	701	2.1	251.4	251.4	252.3	0.9
F	14,035[1]	121	869	1.2	253.4	253.4	254.1	0.7
G	15,640[1]	300	1,368	0.8	257.6	257.6	258.3	0.7
H	19,015[1]	70	340	3.1	263.0	263.0	264.0	1.0
I	21,795[1]	25	102	7.6	272.7	272.7	273.5	0.8
J	24,365[1]	14	72	10.8	322.8	322.8	323.4	0.6
K	25,440[1]	26	116	6.7	362.7	362.7	363.6	0.9
L	26,290[1]	46	268	0.9	395.0	395.0	395.9	0.9
M	27,175[1]	22	102	2.3	458.6	458.6	459.2	0.6
Mill Brook								
A	2,040[2]	179	422	8.7	268.2	268.2	268.2	0.0
B	4,860[2]	240	1,048	3.5	272.9	272.9	273.3	0.4
C	5,750[2]	160	1,085	3.4	275.1	275.1	275.7	0.6
D	7,592[2]	914	4,022	0.8	277.8	277.8	278.1	0.3
Tributary 1 To Mill Brook								
A	1,175[3]	124	869	0.4	280.0	280.0	280.4	0.4
B	2,840[3]	35	170	2.3	280.1	280.1	280.5	0.4

[1] Feet above County Route No. 7
[2] Feet above the confluence with Rochester Creek
[3] Feet above the confluence with Mill Brook

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

ULSTER COUNTY, NY
(ALL JURISDICTIONS)

FLOODWAY DATA

MARA KILL – MILL BROOK – TRIBUTARY 1 TO MILL 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
Rochester Creek								
A	4,100[1]	450	1,969	5.0	242.3	241.5[2]	241.9	0.4
B	9,940[1]	360	893	5.7	288.5	288.5	288.7	0.2
C	11,590[1]	360	867	5.9	307.0	307.0	307.5	0.5
Tributary 1 to Rochester Creek								
A	1,700[3]	50	113	6.1	251.6	251.6	252.1	0.5
B	2,000[3]	37	196	3.5	256.4	256.4	257.1	0.7
C	3,160[3]	22	94	7.3	271.1	271.1	271.4	0.3
D	3,840[3]	27	73	9.4	278.2	278.2	278.2	0.0
E	4,570[3]	40	83	8.3	296.9	296.9	297.5	0.6
Rondout Creek								
A	4,772[4]	600	10,378	5.9	8.2	5.2[5]	5.3	0.1
B	7,446[4]	383	9,735	6.3	8.2	6.8[5]	6.9	0.1
C	9,204[4]	732	14,005	4.4	8.2	7.8[5]	8.0	0.2
D	13,545[4]	351	9,283	6.6	9.6	9.6	9.9	0.3
E	14,876[4]	308	8,457	7.2	10.2	10.2	10.5	0.4
F	18,973[4]	1,319	23,117	2.6	13.0	13.0	13.5	0.5
G	21,427[4]	362	8,871	6.8	13.5	13.5	14.3	0.8
H	23,200[4]	512	14,111	4.3	18.4	18.4	18.5	0.1
I	28,863[4]	207	3,773	15.9	21.9	20.0	20.5	0.5
J	32,709[4]	309	7,912	7.6	26.1	26.1	26.3	0.2
K	34,446[4]	339	7,612	7.9	27.0	27.0	27.4	0.4
L	36,911[4]	372	5,763	10.4	29.1	29.1	29.5	0.4
M	40,766[4]	461	10,171	5.9	35.6	35.6	36.0	0.4
N	43,468[4]	300	7,112	5.5	36.9	36.9	37.6	0.7
O	45,757[4]	178	2,821	13.9	42.3	42.3	42.4	0.1
P	48,794[4]	288	5,843	6.7	52.7	52.7	53.0	0.3

[1] Feet above the confluence with Rondout Creek
[2] Elevation computed without consideration of backwater effects from Rondout Creek
[3] Feet above the confluence with Rochester Creek
[4] Feet above confluence with the Hudson River
[5] Elevation computed without consideration of backwater from the Hudson River

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

ULSTER COUNTY, NY
(ALL JURISDICTIONS)

FLOODWAY DATA

ROCHESTER CREEK - TRIBUTARY 1 TO ROCHESTER CREEK – RONDOUT 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
Rondout Creek (cont.)								
Q	50,864[1]	310	6,292	6.2	54.3	54.3	54.7	0.4
R	54,455[1]	318	6,112	6.4	58.4	58.4	59.0	0.6
S	55,691[1]	235	4,809	8.1	59.4	59.4	60.1	0.7
T	58,045[1]	288	5,922	6.6	66.3	66.3	67.1	0.8
U	59,821[1]	439	7,982	4.9	69.8	69.8	70.5	0.7
V	62,749[1]	903	12,597	3.1	85.5	85.5	85.6	0.1
W	64,454[1]	943	11,823	3.3	86.7	86.7	86.8	0.1
X	66,225[1]	318	4,523	8.5	91.0	91.0	91.0	0.0
Y	92,308[1]	280	3,317	11.7	194.9	194.9	195.2	0.3
Z	95,048[1]	880	9,742	4.0	204.7	204.7	204.8	0.1
AA	98,708[1]	550	3,779	10.2	205.7	205.7	206.0	0.3
AB	101,328[1]	253	3,346	11.5	212.3	212.3	212.7	0.4
AC	102,588[1]	400	2,897	13.3	217.2	217.2	217.2	0.0
AD	106,038[1]	294	5,489	7.0	228.1	228.1	228.4	0.3
AE	108,998[1]	154	3,202	12.1	229.1	229.1	229.6	0.5
AF	111,848[1]	603	9,066	4.3	232.0	232.0	232.7	0.7
AG	117,708[1]	2,240	17,336	2.2	232.8	232.8	233.5	0.7
AH	122,208[1]	1,630	10,352	3.7	233.7	233.7	234.3	0.6
AI	124,728[1]	973	9,237	4.1	234.5	234.5	235.2	0.7
AJ	127,758[1]	820	7,286	5.2	236.1	236.1	236.6	0.5
AK	136,440[1]	435	5,304	6.9	243.3	243.3	243.6	0.3
AL	137,648[1]	860	9,086	4.0	244.2	244.2	245.0	0.8
AM	140,088[1]	875	14,396	2.5	244.9	244.9	245.9	1.0
AN	141,188[1]	600	7,250	5.0	244.9	244.9	245.9	1.0
AO	143,688[1]	1,233	14,146	2.6	246.6	246.6	247.5	0.9
AP	145,916[1]	575	7,271	5.0	247.3	247.3	248.2	0.9
AQ	148,084[1]	275	5,035	7.2	248.7	248.7	249.5	0.8
AR	152,168[1]	795	8,013	4.5	251.5	251.5	252.4	0.9
AS	154,636[1]	200	4,577	8.0	252.8	252.8	253.6	0.8

[1] Feet above the confluence with Hudson River

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

ULSTER COUNTY, NY
(ALL JURISDICTIONS)

FLOODWAY DATA

RONDOUT 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
Rondout Creek (cont.)								
AT	154,856[1]	200	4,627	7.9	254.5	254.5	255.2	0.7
AU	155,856[1]	290	6,471	5.6	255.5	255.5	256.2	0.7
AV	157,556[1]	495	10,038	3.6	256.3	256.3	257.0	0.7
AW	158,276[1]	590	11,979	3.0	256.6	256.6	257.4	0.8
AX	159,104[1]	330	5,942	6.1	256.6	256.6	257.4	0.8
AY	159,480[1]	375	6,833	5.3	257.8	257.8	258.6	0.8
AZ	161,080[1]	750	10,031	3.6	258.9	258.9	259.6	0.7
BA	162,144[1]	950	12,778	2.8	259.2	259.2	259.9	0.7
BB	164,204[1]	1,510	7,708	4.2	259.6	259.6	260.2	0.6
BC	166,144[1]	1,010	8,181	3.9	260.4	260.4	261.2	0.8
BD	167,624[1]	1,610	17,633	1.8	261.2	261.2	261.9	0.7
BE	167,872[1]	1,360	15,256	2.1	261.3	261.3	262.1	0.8
BF	168,958[1]	1,011	6,528	5.1	261.3	261.3	262.1	0.8
BG	175,394[1]	990	8,619	3.4	269.6	269.6	270.4	0.8
BH	175,614[1]	1,060	9,427	3.1	270.0	270.0	270.7	0.7
BI	177,958[1]	450	4,534	6.4	271.2	271.2	271.9	0.7
BJ	179,358[1]	575	5,158	5.6	273.1	273.1	273.5	0.4
BK	181,478[1]	820	3,619	8.0	276.5	276.5	276.6	0.1
BL	182,798[1]	225	2,608	11.1	280.1	280.1	280.5	0.4
BM	182,978[1]	250	3,802	7.6	283.2	283.2	283.7	0.5
BN	184,830[1]	455	5,449	5.3	285.6	285.6	286.0	0.4
BO	187,750[1]	866	9,742	3.0	286.9	286.9	287.5	0.6
BP	190,042[1]	680	2,044	7.3	287.0	287.0	287.6	0.6
BQ	190,662[1]	500	1,718	8.7	291.4	291.4	291.7	0.3
BR	191,590[1]	185	1,618	9.3	296.2	296.2	296.6	0.4
BS	191,742[1]	158	1,938	7.7	298.9	298.9	298.9	0.0

[1]Feet above confluence with Hudson River

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

ULSTER COUNTY, NY
(ALL JURISDICTIONS)

FLOODWAY DATA

RONDOUT 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
Sandburg Creek								
A	1,380[1]	1,040	10,319	1.7	287.7	287.7	288.7	1.0
B	2,180[1]	934	4,819	3.7	287.8	287.8	288.8	1.0
C	2,960[1]	800	4,326	4.1	289.1	288.8	290.1	1.0
D	3,760[1]	490	2,777	6.4	291.1	291.1	291.8	0.7
E	4,542[1]	505	2,213	8.1	295.4	295.4	295.4	0.0
F	5,328[1]	415	2,676	6.7	299.2	299.2	300.0	0.8
G	6,160[1]	277	1,260	8.5	303.4	303.4	303.4	0.0
H	6,955[1]	328	1,440	7.4	307.2	307.2	307.7	0.5
I	8,200[1]	166	1,108	9.7	312.0	312.0	312.9	0.9
J	8,470[1]	82	844	12.7	313.6	313.6	313.9	0.3
K	8,590[1]	130	1,193	9.0	316.9	316.9	316.9	0.0
L	8,788[1]	98	1,111	9.6	317.0	317.0	317.0	0.0
M	9,350[1]	96	930	11.5	319.4	319.4	319.4	0.0
N	10,070[1]	312	2,120	5.0	322.0	322.0	322.0	0.0
O	10,970[1]	160	1,338	8.0	323.4	323.4	323.7	0.3
P	11,220[1]	220	1,995	5.4	325.2	325.2	325.3	0.1
Q	11,770[1]	340	3,181	3.4	325.4	325.4	326.1	0.7
R	12,553[1]	563	3,393	3.2	325.7	325.7	326.6	0.9
S	13,453[1]	460	2,985	3.6	326.7	326.7	327.4	0.7
T	14,271[1]	260	2,069	5.2	327.3	327.3	328.2	0.9
U	15,093[1]	344	2,783	3.8	328.7	328.7	329.5	0.8
V	15,860[1]	545	3,766	2.8	329.4	329.4	330.4	1.0

[1]Feet above confluence with Rondout Creek

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

ULSTER COUNTY, NY
(ALL JURISDICTIONS)

FLOODWAY DATA

SANDBURG 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
Saw Kill								
A	1,790[1]	142	1,318	8.6	151.0	142.4[2]	142.5	0.1
B	5,558[1]	152	1,394	8.1	161.7	161.7	162.5	0.9
C	6,878[1]	105	1,210	9.4	168.5	168.5	168.9	0.3
D	8,291[1]	120	1,448	7.8	175.3	175.3	176.0	0.7
E	9,133[1]	98	876	12.8	179.2	179.2	179.6	0.4
F	11,321[1]	88	946	11.9	195.0	195.0	195.1	0.1
G	12,524[1]	85	741	15.1	200.4	200.4	201.0	0.6
H	15,168[1]	112	753	14.9	235.3	235.3	235.3	0.0
I	15,995[1]	435	1,971	5.6	241.7	241.7	242.2	0.5
J	16,681[1]	266	1,473	7.5	243.4	243.4	244.3	1.0
K	17,775[1]	150	1,010	11.0	248.6	248.6	249.4	0.8
L	21,440[1]	116	762	14.5	297.1	297.1	297.1	0.0
M	23,322[1]	202	1,602	6.9	311.0	311.0	312.0	1.0
N	25,049[1]	112	1,187	9.3	321.3	321.3	321.5	0.3
O	27,128[1]	391	4,875	2.3	360.8	360.8	361.0	0.1
P	29,014[1]	165	1,703	6.4	360.9	360.9	361.0	0.1
Q	30,636[1]	486	3,066	3.6	364.6	364.6	365.0	0.5
R	33,426[1]	282	1,465	7.5	372.9	372.9	373.3	0.4
S	35,342[1]	281	1,846	5.9	383.0	383.0	383.5	0.4
T	38,345[1]	129	1,576	7.0	400.8	400.8	401.7	0.9
U	39,148[1]	121	760	14.4	408.2	408.2	408.3	0.1
V	40,441[1]	327	1,694	6.5	418.0	418.0	419.0	1.0
W	42,404[1]	129	898	11.6	430.6	430.6	430.8	0.2
X	44,671[1]	258	1,995	5.2	462.1	462.1	462.4	0.3
Y	47,010[1]	146	1,109	9.6	475.8	475.8	475.8	0.0
Z	50,250[1]	93	804	13.3	496.6	496.6	496.8	0.2
AA	52,530[1]	317	1,499	6.2	522.5	522.5	523.4	0.9
AB	54,500[1]	148	1,124	8.2	553.6	553.6	553.7	0.1
AC	56,430[1]	427	1,653	5.6	588.3	588.3	589.2	0.9

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

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

ULSTER COUNTY, NY
(ALL JURISDICTIONS)

FLOODWAY DATA

SAW 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
Saw Kill (cont.)								
AD	60,300[1]	305	1,637	5.7	622.5	622.5	623.5	1.0
AE	63,060[1]	132	704	13.1	650.3	650.3	650.4	0.1
AF	65,270[1]	269	1,121	8.1	686.0	686.0	687.0	1.0
AG	67,191[1]	115	828	10.9	720.0	720.0	720.0	0.0
AH	68,590[1]	132	976	9.3	747.1	747.1	747.7	0.6
AI	69,590[1]	104	790	11.4	767.5	767.5	768.3	0.8
AJ	71,690[1]	128	911	9.9	807.5	807.5	808.5	1.0
AK	72,590[1]	98	643	14.0	825.7	825.7	826.1	0.4
AL	74,440[1]	116	698	11.1	875.5	875.5	875.8	0.3
AM	75,490[1]	198	995	7.8	909.5	909.5	910.4	0.9
AN	76,490[1]	130	794	9.8	941.9	941.9	942.2	0.3
Shawangunk Kill								
A	260[2]	310	3,102	6.7	203.2	202.7[4]	203.7	1.0
B	1,315[2]	155	2,629	7.9	204.4	204.4	205.1	0.7
C	2,210[2]	165	2,663	7.8	205.2	205.2	206.1	0.9
D	3,320[2]	140	1,649	12.6	205.8	205.8	206.5	0.7
E	3,520[2]	125	1,476	14.1	206.3	206.3	207.3	1.0
F	3,635[2]	200	2,138	9.7	209.4	209.4	209.4	0.0
G	3,710[2]	220	2,590	8.0	210.3	210.3	210.3	0.0
H	4,320[2]	225	2,197	9.5	211.8	211.8	211.8	0.0
I	715[3]	337	6,636	2.4	289.2	289.2	290.2	1.0
J	1,355[3]	224	4,624	3.4	289.3	289.3	290.3	1.0
K	5,835[3]	235	2,000	7.8	292.5	292.5	293.2	0.7
L	8,610[3]	153	1,645	9.5	301.9	301.9	301.9	0.0
M	12,610[3]	146	1,733	9.0	307.8	307.8	308.6	0.8
N	16,195[3]	185	1,908	8.2	315.7	315.7	316.1	0.4
O	19,820[3]	240	2,587	6.0	322.9	322.9	323.1	0.2

[1]Feet above confluence with Esopus Creek
[2]Feet above confluence with Wallkill River
[3]Feet above the confluence with Dwaar Kill West
[4]Elevation computed without consideration of backwater from Wallkill River

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

ULSTER COUNTY, NY
(ALL JURISDICTIONS)

FLOODWAY DATA

SAW KILL – SHAWANGUNK 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
Shawangunk Kill (cont.)								
P	21,175[3]	252	1,974	7.9	327.0	327.0	327.0	0.0
Q	21,720[3]	265	2,798	5.6	330.6	330.6	330.6	0.0
R	24,305[3]	283	2,992	5.2	333.5	333.5	333.8	0.3
S	28,990[3]	142	2,159	7.2	336.7	336.7	337.5	0.8
T	29,975[3]	103	1,675	7.5	338.5	338.5	338.8	0.3
U	33,925[3]	190	2,026	6.2	344.1	344.1	344.6	0.5
V	35,925[3]	242	2,352	5.3	347.2	347.2	347.9	0.7
W	38,560[3]	225	1,969	6.3	349.0	349.0	349.9	0.9
X	40,080[3]	119	1,570	8.0	355.6	355.6	355.7	0.1
Y	43,295[3]	210	2,590	4.8	358.8	358.8	359.6	0.8
Z	45,945[3]	126	1,617	7.7	360.2	360.2	361.1	0.9
Twaalfskill Brook								
A	933[1]	29	93	10.2	17.0	17.0	17.0	0.0
B	1,575[1]	34	189	5.0	30.0	30.0	30.3	0.3
C	1,877[1]	29	96	9.9	35.2	35.2	35.2	0.0
D	2,068[1]	32	96	9.9	39.5	39.5	39.5	0.0
E	2,425[1]	38	190	5.0	45.6	45.6	45.7	0.1
F	2,618[1]	30	95	10.0	49.3	49.3	49.3	0.0
Twaalfskill Creek								
A	200[2]	100	495	3.8	258.4	258.4	259.1	0.7
B	2,220[2]	40	180	10.6	297.4	297.4	297.4	0.0
C	4,340[2]	165	588	3.2	312.6	312.6	313.6	1.0
D	6,220[2]	153	2,174	0.9	335.3	335.3	336.0	0.7

[1]Feet above the confluence with Rondout Creek
[3]Feet above the confluence with Dwaar Kill West
[2] Feet above Limit of Detailed Study (approximately 140 feet downstream of Van Wagner Road)

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

ULSTER COUNTY, NY
(ALL JURISDICTIONS)

FLOODWAY DATA

SHAWANGUNK KILL – TWAALFSKILL BROOK – TWAALFSKILL 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
Verkeerder Kill								
A	680[1]	77	342	9.6	337.2	333.3[2]	333.3	0.0
B	3,155[1]	41	361	9.1	377.0	377.0	377.8	0.8
C	6,055[1]	104	772	4.2	386.3	386.3	387.0	0.7
D	6,455[1]	50	333	9.8	387.0	387.0	387.5	0.5
E	8,055[1]	110	867	3.8	408.3	408.3	408.3	0.0
F	8,930[1]	128	854	3.8	408.9	408.9	408.9	0.0
G	10,760[1]	83	568	5.8	412.2	412.2	412.9	0.7
H	11,790[1]	101	724	4.5	414.2	414.2	414.7	0.5
I	13,520[1]	60	408	8.0	417.2	417.2	417.9	0.7
J	15,600[1]	60	473	6.9	421.6	421.6	422.5	0.9
Wallkill River								
A	16,750[3]	386	2,373	7.7	181.3	181.3	181.8	0.5
B	22,492[3]	2,613	31,254	0.8	185.4	185.4	186.2	0.8
C	28,200[3]	2,033	24,785	1.0	185.6	185.6	186.3	0.7
D	35,062[3]	2,918	26,136	1.0	185.8	185.8	186.5	0.7
E	40,480[3]	2,114	19,275	1.3	186.1	186.1	186.8	0.7
F	44,300[3]	1,634	13,498	1.8	187.0	187.0	187.7	0.7
G	49,740[3]	2,050	16,497	1.8	188.1	188.1	188.9	0.8
H	51,990[3]	1,930	22,081	1.4	188.4	188.4	189.3	0.9
I	56,420[3]	1,950	21,920	1.4	189.2	189.1	190.1	0.9
J	57,150[3]	2,054	19,949	1.6	189.3	189.3	190.2	0.9
K	58,400[3]	2,350	23,058	1.3	189.4	189.4	190.3	0.9
L	58,900[3]	2,628	24,427	1.2	189.4	189.4	190.3	0.9
M	59,650[3]	2,375	21,912	1.4	189.5	189.5	190.4	0.9
N	59,908[3]	2,508	21,611	1.4	189.6	189.6	190.5	0.9
O	60,958[3]	2,486	22,141	1.4	189.7	189.7	190.6	0.9
P	64,608[3]	1,289	12,139	2.5	190.6	190.6	191.4	0.8
Q	68,208[3]	1,341	11,862	2.6	191.7	191.7	192.4	0.7

[1]Feet above the confluence with Shawangunk Kill
[2]Elevation computed without consideration of backwater effects from Shawangunk Kill
[3]Feet above confluence with Rondout Creek

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

ULSTER COUNTY, NY
(ALL JURISDICTIONS)

FLOODWAY DATA

VERKEERDER KILL – WALLKILL 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
Wallkill River (cont.)								
R	71,518[1]	524	6,996	4.4	193.0	193.0	193.7	0.7
S	75,418[1]	807	11,320	2.7	194.5	194.5	195.3	0.8
T	76,930[1]	558	8,215	3.8	195.6	195.6	196.6	1.0
U	79,705[1]	300	5,602	5.6	196.2	196.2	197.2	1.0
V	83,870[1]	700	10,801	2.9	198.1	198.1	199.1	1.0
W	85,750[1]	244	5,113	6.1	198.3	198.3	199.2	0.9
X	88,190[1]	572	7,171	4.3	199.0	199.0	199.9	0.9
Y	91,020[1]	532	5,626	5.5	199.8	199.8	200.5	0.7
Z	92,470[1]	940	11,356	2.7	200.8	200.8	201.7	0.9
AA	94,430[1]	1,030	13,133	2.4	201.1	201.19	202.0	0.9
AB	97,930[1]	340	5,744	5.4	201.5	201.5	202.4	0.9
AC	98,470[1]	482	5,425	5.7	201.9	201.9	202.8	0.9
AD	99,245[1]	400	5,911	5.3	202.9	202.9	203.5	0.6
AE	100,175[1]	562	8,135	3.8	203.4	203.4	204.1	0.7
AF	102,390[1]	525	6,185	4.3	203.8	203.8	204.7	0.9
AG	104,630[1]	534	9,405	2.8	204.7	204.7	205.5	0.8
AH	105,990[1]	259	4,079	6.4	204.8	204.8	205.6	0.8
AI	108,705[1]	427	5,382	4.9	206.7	206.7	207.4	0.7
AJ	110,920[1]	250	3,321	7.9	207.7	207.7	208.5	0.8
AK	113,130[1]	348	3,974	6.6	210.6	210.6	211.5	0.9
AL	116,370[1]	422	3,521	7.5	217.0	217.0	217.2	0.2
AM	119,170[1]	454	4,911	5.4	222.8	222.8	222.9	0.1
AN	121,350[1]	270	2,479	10.6	226.3	226.3	226.9	0.6
AO	122,570[1]	285	3,454	7.6	230.3	230.3	230.5	0.2
AP	124,210[1]	183	2,567	10.2	232.5	232.5	232.9	0.4
AQ	125,430[1]	273	3,792	6.9	235.3	235.3	235.7	0.4
AR	128,200[1]	250	2,484	10.1	237.1	237.1	237.4	0.3
AS	129,390[1]	339	3,709	6.8	239.2	239.2	239.7	0.5
AT	130,880[1]	255	2,268	11.1	241.6	241.6	242.0	0.4

[1]Feet above confluence with Rondout Creek

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

ULSTER COUNTY, NY
(ALL JURISDICTIONS)

FLOODWAY DATA

WALLKILL 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
Wallkill River (cont.)								
AU	132,630[1]	301	3,154	8 .0	253.4	253.4	253.4	0.0
AV	134,050[1]	367	4,633	5.4	259.6	259.6	259.6	0.0
AW	136,250[1]	545	7,473	3.4	260.5	260.5	260.6	0.1

[1]Feet above confluence with Rondout Creek

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

ULSTER COUNTY, NY
(ALL JURISDICTIONS)

FLOODWAY DATA

WALLKILL RIVER

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. These zones are as follows:

Zone A

Zone A is the flood insurance risk 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 base flood depths are shown within this zone.

Zone AE

Zone AE is the flood insurance risk 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 AH

Zone AH is the flood insurance risk zone that corresponds to the areas of 1-percent-annual-chance shallow flooding (usually areas of ponding) where average depths are between 1 and 3 feet. Whole-foot 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 AR

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

Zone A99

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

Zone V

Zone V is the flood insurance risk zone that corresponds to the 1-percent-annual-chance coastal floodplains that have additional hazards associated with storm waves. Because approximate hydraulic analyses are performed for such areas, no BFEs are shown within this zone.

Zone VE

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

Zone X

Zone X is the flood insurance risk zone that corresponds to areas outside the 0.2-percent-annual-chance floodplain, areas within the 0.2-percent-annual-chance floodplain, 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 base flood depths are shown within this zone.

Zone X (Future Base Flood)

Zone X (Future Base Flood) is the flood insurance risk zone that corresponds to the 1-percent-annual-chance floodplains that are determined based on future-conditions hydrology. No BFEs or base flood depths are shown within this zone.

Zone D

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

6.0 FLOOD INSURANCE RATE MAP

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

For flood insurance applications, the map designates flood insurance risk 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, floodways, and the locations of selected cross sections used in the hydraulic analyses and floodway computations.

The current FIRM presents flooding information for the geographic areas of Ulster County that lie outside of the New York City Watershed area. Previously, separate FIRMs were prepared for each identified flood-prone incorporated community. Historical data relating to the maps prepared for each community are presented in Table 7.

7.0 OTHER STUDIES

Flood Insurance Studies have been published for the following communities in Ulster County that lie outside the New York City Watershed: the City of Kingston, the Villages of Ellenville, Saugerties and New Paltz, and the Towns of Esopus, Gardiner, Kingston, Lloyd, Marbletown, Marlborough, New Paltz, Plattekill, Rochester, Rosendale, Saugerties, Shawangunk, and Ulster.

Because it is based on more up-to-date analyses, this FIS supersedes previously printed FISs for the listed communities in Ulster County, New York that lie outside the New York City Watershed. This FIS also supersedes the Flood Boundary and Floodway Maps for Ulster County that were printed as part of previous FIS's. The information from the superseded Flood Boundary and Floodway Maps has been added to the revised FIRM accompanying this FIS.

This report either supersedes or is compatible with all previous studies published on the streams studied in this report and should be considered authoritative for the purposes of the NFIP.

TABLE 7 - COMMUNITY MAP HISTORY

Community Name	Initial Identification	FIRM Effective Date	FIRM Revision Date
Ellenville, Village of	05/24/74	07/05/83	
Esopus, Town of	05/31/74	07/05/84	
Gardiner, Town of	05/31/74	09/30/82	07/16/97
Kingston, City of	05/17/74	05/01/85	05/01/85
Kingston, Town of	09/20/74	08/27/82	04/05/88
Lloyd, Town of	09/06/74	09/17/82	07/05/00
Marbletown, Town of	09/20/74	10/22/82	08/05/91
Marlborough, Town of	12/06/74	12/05/84	
New Paltz, Town of	05/17/74	09/30/82	11/01/85
New Paltz, Village of	01/24/75	04/15/82	10/15/85
Plattekill, Town of	12/06/74		
Rochester, Town of	06/21/74	03/16/83	02/06/91
Rosendale, Town of	05/31/74	11/01/85	
Saugerties, Town of	05/31/74	08/19/85	08/05/85
Saugerties, Village of	11/15/74	09/10/82	
Shawangunk, Town of	06/21/74	09/30/82	
Ulster, Town of	05/03/74	05/01/85	

8.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting the Flood Insurance and Mitigation Division, Federal Emergency Management Agency, 26 Federal Plaza, Rm. 1337, New York, NY 10278-0002.

9.0 BIBLIOGRAPHY AND REFERENCES

1. Urbitran Associates, Inc., Hydrologic Analysis Performed for the Flood Insurance Studies of the Towns of Crawford, Gardiner, and Shawangunk, New York, October 1979.

2. U. S. Army Corps of Engineers, Hydrologic Engineering Center, Regional Frequency Study, Upper Delaware and Hudson River Basins, New York District, New York, November 1974.

3. U. S. Department of the Interior, Geological Survey, Report No. 78-332, Discharge Gage Height and elevation of 100-year Floods in the Hudson River Basin, Albany, New York, April 1978.

4. U. S. Geological Survey. 1991. Regionalization of Flood Discharges for Rural, Unregulated Streams in New York, Excluding Long Island. Water Resources Investigations Report 90-9147. Richard Lumia, Author. Albany, New York.

5. U. S. Army Corps of Engineers, New York District, Flood Plain and Technical Services, Saw Kill, Towns of Kingston, Ulster and Woodstock, Ulster County, New York, New York, New York, March 1985.

6. Interagency Advisory Committee on Water Data, Office of Water Data Coordination, Hydrology Subcommittee, Bulletin No. 17B, Guidelines for Determining Flood Flow Frequency. September 1981, revised March 1982.

7. Federal Emergency Management Agency, Flood Insurance Study, Village of Ellenville, New York, January 5, 1983.

8. Federal Emergency Management Agency, Flood Insurance Study, Town of Gardiner, New York, March 30, 1982.

9. Federal Emergency Management Agency, Flood Insurance Study, Town of Hurley, New York, August 18, 1992.

10. Federal Emergency Management Agency, Flood Insurance Study, City of Kingston, New York, November 1, 1984.

11. Federal Emergency Management Agency, Flood Insurance Study, Town of Kingston, New York, April 5, 1988.

12. Federal Emergency Management Agency, Flood Insurance Study, Town of Lloyd, New York, July 5, 2000.

13. Federal Emergency Management Agency, Flood Insurance Study, Town of Marbletown, New York, August 5, 1991.

14. Federal Emergency Management Agency, Flood Insurance Study, Town of Marlborough, New York, November 21, 1984.

15. Federal Emergency Management Agency, Flood Insurance Study, Town of New Paltz, New York, November 1, 1985.

16. Federal Emergency Management Agency, Flood Insurance Study, Village of New Paltz, New York, October 15, 1985.

17. Federal Emergency Management Agency, Flood Insurance Study, Town of Rochester, New York, February 6, 1991.

18. Federal Emergency Management Agency, Flood Insurance Study, Town of Rosendale, New York, November 1, 1985.

19. Federal Emergency Management Agency, Flood Insurance Study, Town of Shandaken, New York, February 17, 1989.

20. Federal Emergency Management Agency, Flood Insurance Study, Town of Shawangunk, New York, March 30, 1982.

21. Federal Emergency Management Agency, Flood Insurance Study, Village of Saugerties, New York, February 5, 1985.

22. Federal Emergency Management Agency, Flood Insurance Study, Town of Saugerties, New York, September 30, 1992.

23. Federal Emergency Management Agency, Flood Insurance Study, Town of Ulster, New York, November 1, 1984.

24. Federal Emergency Management Agency, Flood Insurance Study, Town of Wawarsing, New York, March 15, 1984.

25. Federal Emergency Management Agency, Flood Insurance Study, Town of Woodstock, New York, September 27, 1991.

26. Official Ulster County Website, Ulster County, New York, [Online WWW] Available URL: www.co.ulster.ny.us., [Accessed 07/30/07]

27. MuniNetGuide.com, RICIC, L.L.C. MuniNet Guide, P.O. Box 533, Hinsdale, IL 60522, [Online WWW] Available URL: www.muninetguide.com. [Accessed 07/30/07]

28. US Department of Commerce, 2000 Census of Population and Housing, Population and Housing Unit Counts (PHC-3-34), September 2003.