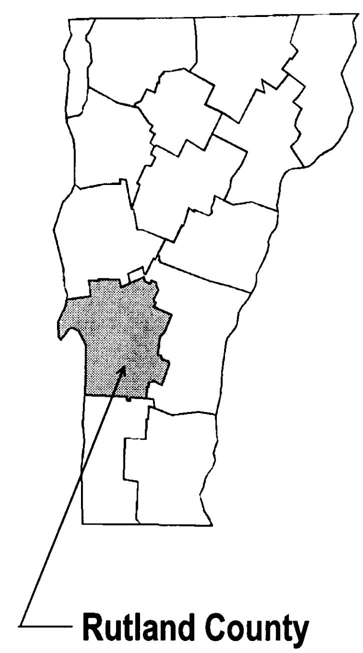
FLOOD INSURANCE STUDY

VOLUME 1 OF 3

RUTLAND COUNTY, VERMONT
(ALL JURISDICTIONS)



COMMUNITY NAME	COMMUNITY NUMBER
BENSON, TOWN OF	500259
BRANDON, TOWN OF	500090
CASTLETON, TOWN OF	500091
CHITTENDEN, TOWN OF	500092
CLARENDON, TOWN OF	500093
DANBY, TOWN OF	500312
FAIR HAVEN, TOWN OF	500094
HUBBARDTON, TOWN OF	500313
IRA, TOWN OF	500260
KILLINGTON, TOWN OF[1]	500268
MENDON, TOWN OF	500095
MIDDLETOWN SPRINGS, TOWN OF	500261
MT. HOLLY, TOWN OF	500096
MT. TABOR, TOWN OF	500262
PAWLET, TOWN OF	500097
PITTSFIELD, TOWN OF	500263
PITTSFORD, TOWN OF	500098
POULTNEY, TOWN OF	500099
POULTNEY, VILLAGE OF	500266
PROCTOR, TOWN OF	500265
RUTLAND, CITY OF	500101
RUTLAND, TOWN OF	500267
SHREWSBURY, TOWN OF	500102
SUDBURY, TOWN OF	500269
TINMOUTH, TOWN OF	500270
WALLINGFORD, TOWN OF	500103
WELLS, TOWN OF	500271
WEST HAVEN, TOWN OF	500272
WEST RUTLAND, TOWN OF	500104

[1]Non-floodprone community

EFFECTIVE:
AUGUST 28, 2008

Federal Emergency Management Agency

FLOOD INSURANCE STUDY NUMBER
50021CV001A

NOTICE TO
FLOOD INSURANCE STUDY USERS

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

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

Initial Countywide FIS Effective Date: August 28, 2008

Revised Countywide FIS Date:

TABLE OF CONTENTS

Table of Contents – Volume 1 – August 28, 2008

		Page
1.0	INTRODUCTION	1
	1.1 Purpose of Study	1
	1.2 Authority and Acknowledgments	1
	1.3 Coordination	5
2.0	AREA STUDIED	6
	2.1 Scope of Study	6
	2.2 Community Description	7
	2.3 Principal Flood Problems	11
	2.4 Flood Protection Measures	18
3.0	ENGINEERING METHODS	19
	3.1 Hydrologic Analyses	20
	3.2 Hydraulic Analyses	32
	3.3 Vertical Datum	40
4.0	FLOODPLAIN MANAGEMENT APPLICATIONS	41
	4.1 Floodplain Boundaries	41
	4.2 Floodways	43
5.0	INSURANCE APPLICATIONS	68
6.0	FLOOD INSURANCE RATE MAP	70
7.0	OTHER STUDIES	70
8.0	LOCATION OF DATA	73
9.0	BIBLIOGRAPHY AND REFERENCES	73

Table of Contents – Volume 1 – continued

	Page
FIGURES	
Figure 1 - Floodway Schematic	68
TABLES	
Table 1 - Initial and Final CCO Meetings	5-6
Table 2 - Flooding Sources Studied by Detailed Methods	6-7
Table 3 - Summary of Discharges	25-32
Table 4 - Summary of Stillwater Elevations	32
Table 5 - Manning's "n" Values	38-39
Table 6 - Floodway Data	45-67
Table 7 - Community Map History	71-72

Table of Contents – Volume 2 – August 28, 2008

EXHIBITS

Exhibit 1 - Flood Profiles

Arnold Brook	Panels 01P–02P
Castleton River	Panels 03P–11P
Clarendon River	Panels 12P–15P
Clark Hill Brook	Panels 16P–20P
Cold River	Panels 21P–25P
Creed Brook	Panels 26P–27P
Curtis Brook	Panels 28P–31P
East Creek	Panels 32P–38P
Flower Brook	Panels 39P–42P
Freeman Brook	Panel 43P
Guernsey Brook	Panel 44P
Homer Stone Brook	Panels 45P–46P
Indian River	Panel 47P
Mettawee River	Panels 48P-50P
Mill Brook No. 1	Panels 51P–52P
Mill Brook No. 2	Panels 53P–54P
Mill River	Panels 55P–67P
Moon Brook	Panels 68P–74P

Table of Contents – Volume 3 – August 28, 2008

EXHIBITS - continued

Exhibit 1 - Flood Profiles - continued

Mussey Brook	Panels 75P–79P
Neshobe River	Panels 80P–87P
North Branch Tenny Brook	Panels 88P–89P
North Breton Brook	Panels 90P–91P
Otter Creek	Panels 92P–112P
Pinnacle Ridge Brook	Panels 113P–114P
Poultney River	Panels 115P–117P
Roaring Brook	Panels 118P–120P
Shrewsbury Brook	Panels 121P–123P
Tenny Brook and South Branch Tenny Brook	Panels 124P–126P
Tweed River and South Branch Tweed River	Panels 127P–130P
Urban Lateral	Panels 131P–132P
Wells Brook	Panels 133P–138P
West Branch Tweed River	Panels 139P–141P

Exhibit 2 - Flood Insurance Rate Map Index
Flood Insurance Rate Map

FLOOD INSURANCE STUDY
RUTLAND COUNTY, VERMONT (ALL JURISDICTIONS)

1.0 INTRODUCTION

1.1 Purpose of Study

This countywide Flood Insurance Study (FIS) investigates the existence and severity of flood hazards in, or revises and updates previous FISs/Flood Insurance Rate Maps (FIRMs) for the geographic area of Rutland County, Vermont, including: the Towns of Benson, Brandon, Castleton, Chittenden, Clarendon, Danby, Fair Haven, Hubbardton, Ira, Killington, Mendon, Middletown Springs, Mount Holly, Mount Tabor, Pawlet, Pittsfield, Pittsford, Poultney, Proctor, Rutland, Shrewsbury, Sudbury, Tinmouth, Wallingford, Wells, West Haven, and West Rutland; the Village of Poultney; and the City of Rutland (hereinafter referred to collectively as Rutland County).

The Town of Killington was previously known as the Town of Sherburne. The Town of Killington is non-floodprone.

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

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

1.2 Authority and Acknowledgments

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

This FIS was prepared to include the unincorporated areas of, and incorporated communities within, Rutland County in a countywide format. Information on the authority and acknowledgments for each jurisdiction included in this countywide FIS, as compiled from their previously printed FIS reports, is shown below.

Brandon, Town of:	the hydrologic and hydraulic analyses from the FIS report dated November 1977 were performed by Dufresne-Henry Engineering Corporation for

the Federal Insurance Administration (FIA), under Contract No. H-4020. That work, which was completed in November 1976, covered all significant flooding sources affecting the Town of Brandon.

Castleton, Town of: the hydrologic and hydraulic analyses from the FIS report dated January 16, 1984, were prepared by the New York District of the U.S. Army Corps of Engineers (USACE). The hydraulic analyses were conducted by FitzPatrick-Llewellyn Associates under subcontract to the USACE. That work was completed in December 1982.

Clarendon, Town of: the hydrologic and hydraulic analyses from the FIS report dated May 1980 were performed by Dufresne-Henry Engineering Corporation for the FIA, under Contract No. H-4576. That work, which was completed in August 1978, covered all significant flooding sources in the Town of Clarendon.

Danby, Town of: the hydrologic and hydraulic analyses from the FIS report dated February 1980 were performed by Dufresne-Henry Engineering Corporation for the FIA, under Contract No. H-4576. That work, which was completed in January 1979, covered all significant flooding sources in the Town of Danby.

Fair Haven, Town of: the hydrologic and hydraulic analyses from the original FIS report for the Castleton River were prepared by the New York District of the USACE for the Federal Emergency Management Agency (FEMA). The hydraulic analysis was conducted by FitzPatrick-Llewellyn Associates under subcontract to the USACE. That work was completed in December 1982.

In the FIS dated April 2, 1993, the hydraulic analysis for the Castleton River was prepared by Roald Haestad, Inc., for FEMA, under Contract No. EMW-90-C-3126. That work was completed in November 1990.

Mt. Tabor, Town of: the hydrologic and hydraulic analyses from the FIS report dated August 4, 1980, were performed by Dufresne-Henry Engineering Corporation for

	the FIA, under Contract No. H-4576. That study was completed in December 1978.
Pawlet, Town of:	the hydrologic and hydraulic analyses from the FIS report dated March 1978 were performed by Dufresne-Henry Engineering Corporation for the FIA, under Contract No. H-4020. That work, which was completed in February 1977, covered all significant flooding sources affecting the Town of Pawlet.
Pittsfield, Town of:	the hydrologic and hydraulic analyses from the FIS report dated September 4, 1991, were prepared by the Soil Conservation Service (SCS) during the preparation of the Flood Plain Management Study for the Town of Pittsfield.
Pittsford, Town of:	the hydrologic and hydraulic analyses from the FIS report dated July 4, 1988, were prepared by the U.S. Geological Survey (USGS) for FEMA, under Inter-Agency Agreement No. EMW-85-E-1823, Project Order No. 20. That work was completed in December 1986.
Poultney, Town and Village of:	the hydrologic and hydraulic analyses from the FIS report dated January 1980 were performed by Dufresne-Henry Engineering Corporation for the FIA, under Contract No. H-4576. That work, which was completed in September 1978, covered all significant flooding sources affecting the Town of Poultney and the Village of Poultney.
Proctor, Town of:	the hydrologic and hydraulic analyses from the FIS report dated June 1978 were performed by Dufresne-Henry Engineering Corporation for the FIA, under Contract No. H-4020. That work, which was completed in November 1977, covered all significant flooding sources affecting the Town of Proctor.
Rutland, City of:	the hydrologic and hydraulic analyses from the FIS report dated October 1977 were performed by Anderson-Nichols and Company, Inc., for the FIA, under Contract No. H-3862. That work, which was completed in January 1977, covered all significant flooding sources affecting the City of Rutland.

Rutland, Town of:	the hydrologic and hydraulic analyses from the FIS report dated March 1978 were performed by Dufresne-Henry Engineering Corporation for the FIA, under Contract No. H-4020. That work, which was completed in April 1977, covered all significant flooding sources affecting the Town of Rutland.
Shrewsbury, Town of:	the hydrologic and hydraulic analyses from the FIS report dated March 1978 were performed by Dufresne-Henry Engineering Corporation for the FIA under Contract No. H-4020. That work, which was completed in June 1977, covered all significant flooding sources in the Town of Shrewsbury.
Wallingford, Town of:	the hydrologic and hydraulic analyses from the FIS report dated July 16, 1980 were performed by Dufresne-Henry Engineering Corporation for the FIA, under Contract No. H-4576. That study was completed in January 1979.
Wells, Town of:	the hydrologic analyses from the FIS report dated June 15, 1988, were performed by the USACE, New York District, during the preparation of a Flood Plain Technical Services report for the Town of Wells. The work for that study was completed in April 1986. The hydraulic analyses were performed by DuBois & King, Inc., for the USACE during preparation of the Floodplain Technical Services for the Town of Wells.
West Rutland, Town of	the hydrologic and hydraulic analyses from the FIS report dated August 4, 2005, were performed by the USGS for FEMA, under Inter-Agency Agreement No. EMW-2002-IA-0115. That work was completed in June 2003.

The authority and acknowledgments for the Towns of Benson, Chittenden, Hubbardton, Ira, Mendon, Middletown Springs, Mount Holly, Sudbury, Tinmouth, and West Haven are not available because no FIS reports were ever published for those communities.

For this countywide FIS, revised hydrologic and hydraulic analyses for East Creek, Moon Brook, and Otter Creek, were prepared by CDM for FEMA, under Contract No. EME-2003-CO-0340. This work was completed in March 2007.

Base map information shown on this FIRM was derived from Vermont digital orthophotography, provided by the Vermont Mapping Program, Department of

Taxes. These data were produced at a scale of 1:5,000 from photography dated May 1994.

The coordinate system used for the production of this FIRM is Vermont State Plane, FIPSZONE 4400. The horizontal datum is North American Datum of 1983 (NAD 83), GRS80 spheroid. Differences in the datum, spheroid, projection, or State Plane zones used in the production of FIRMs for adjacent counties may result in slight positional differences in map features at the county boundaries. These differences do not affect the accuracy of information shown on the FIRM

1.3 Coordination

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

The dates of the initial and final CCO meetings held for Rutland County and the incorporated communities within its boundaries are shown in Table 1, "Initial and Final CCO Meetings."

TABLE 1 – INITIAL AND FINAL CCO MEETINGS

Community	Initial CCO Date	Final CCO Date
Town of Brandon	April 15, 1976	*
Town of Castleton	*	September 7, 1983
Town of Clarendon	June 28, 1977	*
Town of Danby	June 28, 1977	*
Town of Fair Haven	*	October 25, 1983
Town of Mt. Tabor	June 28, 1977	*
Town of Pawlet	April 1976	*
Town of Pittsfield	March 1987[1]	September 12, 1990

[1]Community notified by FEMA
*Date not available

TABLE 1 - INITIAL AND FINAL CCO MEETINGS - continued

Community	Initial CCO Date	Final CCO Date
Town of Pittsford	February 27, 1985	April 15, 1987
Town and Village of Poultney	June 28, 1977	*
Town of Proctor	May 1976	*
City of Rutland	September 1975	April 13, 1977
Town of Rutland	April 14, 1976	*
Town of Shrewsbury	April 15, 1976	*
Town of Wallingford	June 28, 1977	*
Town of Wells	December 15, 1986[1]	June 10, 1987
Town of West Rutland	May 9, 2002	September 15, 2004

[1]Notified by FEMA
*Data not available

2.0 AREA STUDIED

2.1 Scope of Study

This FIS covers the geographic area of Rutland County, Vermont.

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

Arnold Brook	Flower Brook
Castleton River	Freeman Brook
Clarendon River	Guernsey Brook
Clark Hill Brook	Homer Stone Brook
Cold River	Indian River
Creek Brook	Lake Lucidian
Curtis Brook	Lake St. Catherine
East Creek	Little Lake

TABLE 2 - FLOODING SOURCES STUDIED BY DETAILED METHODS - continued

Mettawee River	Poultney River
Mill Brook No. 1	Roaring Brook
Mill Brook No. 2	Shrewsbury Brook
Mill River	South Branch Tenny Brook
Moon Brook	South Branch Tweed River
Mussey Brook	Tenny Brook
Neshobe River	Tweed River
North Branch Tenny Brook	Urban Lateral
North Breton Brook	Wells Brook
Otter Creek	West Branch Tweed River
Pinnacle Ridge Brook	

In this revision, the following flooding sources were restudied by detailed methods: East Creek, from its confluence with Otter Creek to Glen Dam in the Town of Rutland; Moon Brook, from its confluence with Otter Creek to the City of Rutland upstream corporate boundary; and Otter Creek, from the Center Rutland Dam in the Town of Rutland to the Wallingford upstream corporate limits.

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 numerous flooding sources in the county were studied by approximate methods. Approximate analyses were used to study those areas having a low development potential or minimal flood hazards. The scope and methods of study were proposed to, and agreed upon by, FEMA and Rutland County.

2.2 Community Description

Rutland County is located in the west-central portion of the State of Vermont.

According to the U.S. Census Bureau, the 2000 population of Rutland County was 63,400, and the land area was 932 square miles (U.S. Census Bureau, 2000).

Rutland's northerly latitude assures the variety and vigor of a New England climate. A moderate summer, with temperatures reaching 90 degrees Fahrenheit (°F) or higher only several times a year, gives way to a cooler fall period extending well into October. High pressure systems moving rapidly down from central Canada or the Hudson Bay produce the coldest temperatures during the winter months; however, extended periods of extremely cold weather are rare. The normal July temperature generally ranges between 56 and 82°F, while the normal January temperature usually varies between 7 and 25°F. Precipitation is generally plentiful and well distributed throughout the year. The heaviest rainfall usually occurs during summer thunderstorms but excessively heavy rainfall is not common. Mean annual precipitation for the area is about 40 inches, including 80 inches average seasonal snowfall (U.S. Department of Commerce, 1975; U.S. Department of Commerce, 1976).

As common throughout much of Vermont, development has taken place and continues on the flat land adjacent to rivers and streams. For agricultural purposes, these areas are most suitable for cultivation; for commercial purposes, they are easily accessible to highways and railroads which have been constructed along the rivers to take advantage of the flat grades. Floodplains within the Town of Brandon contain relatively light to moderate residential and agricultural development, with concentrations of commercial development in the Villages of Brandon and Forest Dale.

The topography of the town varies from level and gently sloping land in the valleys to very steep and rugged land on the slopes of the foothills and mountains. The Green Mountains, with summits reaching 2,635 feet, lie along the east town line; to the west is the smaller Taconic Range. The central portion of the town contains relatively level terrain.

Underlying the region are deformed and metamorphosed sedimentary, extrusive, and plutonic rocks ranging in age from pre-Cambrian to Ordovician. An anticline is the major structural unit. The shape of the land conforms in a broad way to the structure and composition of the bedrock, thus large areas of lowlands are underlain by easily erodible carbonate rocks; the more resistant quartzites and schists are exposed in ridges (Vermont Development Commission, 1953).

Principal streams in the town are Otter Creek, the Neshobe River, Arnold Brook, and Jones Brook. Otter Creek flows through the town in a northwesterly direction, forming a wide, swampy floodplain. The Neshobe River, which rises among the Green Mountains in Goshen, enters the northeast corner of the town and flows about ten miles before joining with Otter Creek a mile south of Brandon Village. There are several falls on the Neshobe which, in the past, afforded excellent sites for the construction of dams used to supply water power for mills and other industries. In Brandon Village, the Neshobe encounters one of these dams before flowing under several commercial buildings and through a dual culvert at Center Street. Arnold Brook drains a flat, marshy area in the northwestern part of Brandon and then flows in a westerly direction into Otter Creek. Jones Brook drains Smalley Swamp in the center of town before flowing into Otter Creek.

Soils within Brandon are comprised of many different parent materials. The main parent materials are alluvial, or of recent origin, that occur along rivers and streams; marine silts and clays that appear in the southwestern corner of the town; sandy and gravelly outwash on terraces, mainly adjacent to streams; limestone till soils on nearly level or concave sloping stream valleys; organic muck and peat soils on Otter Creek and Neshobe River bottomlands subject to frequent flooding; and acid till soils of the Green Mountains in the northern and eastern portions of the town (U.S. Department of Agriculture, September 1972).

Land areas in Brandon are used mainly for cropland, pasture, and woodland. Corn and hay, grown for use in dairy farming, are the major crops. A variety of timber, including pine, oak, cherry, sugar maple, red maple, ash, and cedar have been found in abundance in the area. Many gravel and sand pits, both active and abandoned, can be found in the town. The main limiting land use factors are excessive slope in the Green Mountains and foothills and frequent flooding combined with poor drainage along valley bottomlands.

The major watercourse in the Town of Clarendon is Otter Creek, which flows northwesterly from Wallingford. As the valley of Otter Creek widens in a northerly direction, the sinuosity of the stream increases. The increased sinuosity and numerous oxbows scattered throughout the floodplain are characteristic of an actively migrating stream channel. This is further evidenced by the many stream bank failures which can be observed along Otter Creek (Geological Society of America, 1978). The Clarendon River enters Clarendon from the south, and flows through a valley parallel to Otter Creek.

The principal watercourse within the Town of Mount Tabor is Otter Creek; however, most of its floodplain lies within state- and federally-owned land. The principal watercourse with flooding that influences the community is Mill Brook No. 2. This is a relatively small stream with a total length of 7.6 miles and a total drainage area of 13.9 square miles.

Principal streams in the Town of Pawlet are the Mettawee River, Flower Brook, and the Indian River. The Mettawee River flows in a generally northwesterly direction through the central portion of Pawlet and passes southwest of the Village of Pawlet. The floodplain north of Pawlet Village is composed of water-deposited material. South of Pawlet the floodplain is comprised mostly of a loamy soil developed in deep stream deposits of silt or very fine sandy loam, derived mainly from limestone, slate, schist, or gneiss. These soils are deep and free from stones, and experience frequent flooding and excess wetness. The floodplain has a few trees and underbrush, but is mostly open pastureland. Flower Brook flows into the Mettawee River through a narrow, steep valley, with the upper reaches composed of a deep sandy soil. Toward the mouth, and more particularly through the section of the detailed study area, the soil changes to a deep, well-drained silt loam glacial till soil, with bedrock outcrops occurring approximately every hundred feet. The Indian River cuts the southwest corner of Pawlet and flows by West Pawlet Village into New York. The floodplain is wide to narrow at the village and poorly drained.

Fisheries, wetlands, aquifer recharge areas, and agricultural fields are all beneficial components of the floodplains within the town. The streams in the Town of Pittsfield are good cold-water fisheries, and are heavily fished. The floodplains are generally narrow and contain relatively minor wetland areas. Some areas of the floodplain are used for agriculture, as pasture or hay land, which has the potential to minimize flood damage by providing safe areas for floodwaters.

Otter Creek, which flows north through the Town of Proctor, has its source in the Green Mountains about 34 miles south of town. The drainage basin above Proctor has a uniform width of about 10 miles and is hemmed by heavily wooded slopes on both sides. Most of the Otter Creek floodplain is undeveloped or used for agricultural purposes, although some development has taken place near the north end of town. The Vermont Marble Company, Proctor's only large industrial concern, is subject to flooding when the Otter Creek floodwaters pass through the railroad cut south of the plant.

The principal stream in the City of Rutland is Otter Creek, which has its source within the Town of Dorset in the Green Mountains.

East Creek originates at Chittenden Reservoir in the Town of Chittenden, and flows in a southwesterly direction through the Towns of Pittsford and Rutland until it enters Otter Creek in the City of Rutland.

Moon Brook rises in the Town of Mendon, flows in a southwesterly direction through the Town of Rutland and enters Otter Creek in the City of Rutland.

Mussey Brook has its source in the Town of Rutland and flows in a westerly direction until it merges with Moon Brook in the City of Rutland.

The major watercourse in the Town of Rutland is Otter Creek, which flows in a northwesterly direction from Clarendon through low, wide floodplains. In Center Rutland, the valley narrows considerably and a power plant dam has been constructed there to take advantage of a natural waterfall. A unique characteristic of Otter Creek is the vast amount of valley storage below Center Rutland which serves to attenuate flood peaks as they pass downstream. The Clarendon River enters from the west, flowing parallel to U.S. Route 4 through a rapidly developing area, joining Otter Creek in Center Rutland. East Creek has its headwaters in the Green Mountains of Chittenden and flows into the northeast corner of Rutland from Pittsford, joining Otter Creek in Rutland City. Chittenden Reservoir Dam in Chittenden, Glen Dam in Rutland, and Patch Dam at the city-town line are all located on East Creek. The North and South Branches of Tenny Brook, Mussey Brook, Cold Brook, and Moon Brook are relatively short, high gradient streams, flowing down the western slopes of the Green Mountains and entering the Town of Rutland from the east. Tenny Brook flows through a low, wide floodplain before entering the City of Rutland from the north. Creed Brook and Curtis Brook are small tributaries of East Creek draining the northern portion of the town above East Creek. Pinnacle Ridge Brook flows down the eastern side of a ridge dividing the Town of Rutland and Proctor, cutting through the northeast corner of town.

With the exception of the 1947 East Pittsford Dam failure event, the November 4, 1927, flood was the worst flood of historic record in Rutland, having a recurrence interval of 140 years at the Otter Creek gage in Center Rutland and 180 years at the East Creek gage in the City of Rutland. A total of 8.55 inches of rainfall was recorded in Rutland during the storm; of this amount, 6.12 inches fell within a 24-hour period (Roy L. Johnson Company, 1927). Flooding caused extensive bridge and highway damage throughout the town. In Center Rutland, one home was swept downstream by Otter Creek and many others were badly damaged. The Glen Dam on East Creek went out with over 100 feet of penstock; however, Patch Dam held (Luther B. Johnson, 1928; "City Storm Loss Grows," 1927).

The flood of July 24-25, 1830, had a 1-percent annual chance recurrence interval on the Otter Creek in Rutland. A high water mark near Pittsford, 12 miles downstream from Rutland, indicates that the level of this flood was approximately a foot below that of the 1927 flood. The storm was of cloudburst intensity and produced a total rainfall of 7 inches in Burlington, Vermont, 50 miles north of Rutland (U.S. Senate, 1940).

The principal waterways in the Town of Shrewsbury are the Mill River, Cold River, Shrewsbury Brook, Freeman Brook, and Gould Brook. Mill River has its headwaters to the southeast, in Mount Holly, and flows in a northwesterly direction through the Village of Cuttingsville. The Cold River originates on the side slopes of the Green Mountains near the center of town and flows in a northwesterly direction. Shrewsbury Brook, Freeman Brook, and Gould Brook are short, relatively straight high gradient streams which flow down the western slopes of the Green Mountains.

The town has a variety of timber. Northern hardwood associations, dominated by sugar maple and beech, prevail at elevations below 2,400 feet NGVD. Above this level, up to an elevation of 3,000 feet NGVD, forest types change to yellow birch, white birch, and red spruce. Above 3,000 feet NGVD, red spruce and balsam fir dominate. At still higher elevations, ground covers of mosses, ferns, and such low shrubs as blueberry and cranberry are prevalent (Wiitala, S.W., 1965). Agriculturally, corn and hay are the main crops, grown for use in dairy farming.

The major watercourse in the Town of Wallingford is Otter Creek, which flows northerly through the town and roughly parallel to State Route 7. The total length of the river is approximately 100 miles of which 15.2 miles lie within the community. The total drainage area is 936 square miles of which 105 square miles influence the town. Most of the Otter Creek floodplain is low and wide; however, the valley walls narrow considerably in the vicinity of the communities of Wallingford and South Wallingford.

Lake St. Catherine, near the origin of the Mill Brook No. 1 drainage basin, flows into Little Lake, and these two lakes form a large portion of the Mill Brook No. 1 basin.

2.3 Principal Flood Problems

Flood damage in the Town of Brandon has been caused primarily by flooding of the Neshobe River through Brandon Village and Forest Dale. Major floods occurred in November 1927, September 1938, and June 1947. The area was fortunate in that comparatively little damage was incurred in the flood of 1927, which was so disastrous in other parts of Vermont. The town was badly damaged by floodwaters on September 21, 1938, when the Neshobe River undermined ten of the principal commercial buildings upstream of the Center Street bridge crossing in Brandon Village. Extensive damage occurred due to erosion and basement flooding as the floodwaters overflowed the banks, swept rapidly down Center Street, and returned to the main channel through side alleys and driveways. Water was reported to depths of four feet on first floors. The Clay Street area near the crossing of the Neshobe was inundated as well. Trees and electric wires were downed, all telephone service was disrupted, and there was no through train service for six days. Damage was estimated at $100,000. In Forest Dale, the Newton and Thompson factory (presently Vermont Tubbs, Inc.) suffered severe damage, with water six feet deep on the ground floor (Selectmen of Brandon, 1963).

In the Town of Castleton, flood problems along the Castleton River and North Breton Brook are generally associated with spring runoff and summer thunderstorms. Ice jams have not been a problem in the past and were not considered in this study.

On Tuesday, June 16, 1981, a severe thunderstorm hit Castleton, causing serious flooding problems along the Castleton River and North Breton Brook within Castleton. The two articles from the Burlington Free Press indicate the extent and severity of flooding (The Burlington Free Press, June 17, 1981; The Burlington Free Press, June 18, 1981):

> Most residents of the area hit by flash flooding Tuesday night were busy Wednesday pumping out cellars and cleaning up debris.
>
> Castleton Town Manager Herb Hoffman said East Hubbardton Road, Belgo Road, and Eaton Hill Road still were impassable.
>
> Exit 5 on U.S. 4 at the Fort Warren Drive-In was closed, and Vermont 30 near Crystal Beach was opened to one-way traffic as road crews attempted to repair washed out embankments.
>
> Jan Wright, a Central Vermont Public Service Corp. Spokesman, said all but three customers had power by the afternoon. Power to the Vermont Educational Television transmitter atop Grandpa's Knob was not restored until Wednesday evening because of washed out roads.
>
> Hoffman said the town "has hired everybody that's got a truck or a piece of equipment" to work on damaged roads. He said State Transportation Agency officials would meet with town officials Thursday morning to assess the damage and talk about possible state assistance.
>
> The town manager termed the damage "tremendous."
>
> Hoffman said several cows died in the flooding. Two others were killed when they were hit by a tractor trailer Tuesday night, he said.
>
> Much of the storm's fury was felt around the Crystal Beach area of Lake Bomoseen. Water rose up to the doors of several mobile homes.

Julia Olney and her husband Solon, of Springfield, came up to inspect their mobile home at Crystal Beach Wednesday morning. She and her husband said the steps to their mobile home had vanished, along with an aluminum boat which had been resting next to the brook. "It's floating out there somewhere now," remarked Mrs. Olney, pointing at the lake.

A number of homes along Pencil Mill Road and the North Road suffered water damage. Donald Jung sat on the front porch of his home awaiting a call from the insurance company. His wife, Claudia, cleaned the couple's four-wheel-drive vehicle, which Jung had managed to get to higher ground. The couple's other vehicle, a small red compact, had been covered by water.

Water also inundated the couple's small home.

"In 20 minutes it went from a trickling little brook to a raging torrent," Mrs. Jung said of the small brook next to their home.

Mrs. Jung said she and the family dog climbed the hill behind the house to safety.

Jung could not open the doors to his four-wheel-drive, but managed to get in through a rear door and drive the vehicle to a safe place.

Gardens and piles of firewood in the area were washed away. "It was a new experience for everybody," said Mrs. Jung, who moved into the house last summer. "Even the old timers said they had never seen anything like this before."

At the Fort Warren Mobile Home Park in Castleton, Walter Brown and his family and friends took down the skirting around his mobile home and started the process of drying things out.

A couple of inches of water had coated the floor of his home, soaking rugs and insulation in the walls and underneath the floors.

The Browns have lived in their new mobile home for only a few months. They said they have no insurance.

Brown said the water was creeping up his lawn and then "in five minutes it rose a foot and a half."

Brown was able to get his car out, but Donald Celik was not so lucky. When he got home from picking up his wife at Rutland Hospital, where she had been a patient, water was in his mobile home and had ruined his four-wheel-drive vehicle.

> Besides the damage to rugs, insulation, floors, and clothes, Celik said "$2,000 worth of lawn work is just gone." He said a rose garden and landscaping had been destroyed, and a building where he kept his tools had been moved 100 yards.

The second article is as follows:

> Heavy rains flooded the Castleton area Tuesday, washing out roads and bridges, downing power lines and forcing the evacuation of homes.
>
> About 20 families were assisted from their flooded homes in the Fort Warren Trailer Park in Castleton by state police and civil defense workers as the water level rose as much as 4 feet.
>
> Police closed U.S. 4, Vermont 30 and North Road in Castleton and the East Hubbardton Road due to flooding. The raging Castleton River, swollen by the rain, washed out two bridges on Vermont 30 and the Delaware and Hudson Railroad tracks in Castleton about 5 p.m.
>
> A Central Vermont Public Service Corp. spokesman said as many as 2,000 customers were without power in Castleton, Orwell, Sudbury, and Hubbardton because of lines downed by tree branches or utility poles washed away in the flood.
>
> The U.S. Weather Service at 2:45 p.m. issued a tornado watch for the state until 9:45 p.m. because of the unsettled atmospheric condition.
>
> A spokesman said the storms were caused by a "pre-funnel mass" of rising, warm, moist air. The storm started in Hubbardton and worked its way along the river to Poultney.
>
> As the storm ripped through Rutland County, the rest of the state experienced hot weather with highs in the 90s. The spokesman said an approaching cool air front was likely to cause thunderstorms overnight and bring relief from the heat today.
>
> Several trailers and housing developments along Vermont 30 in Castleton and Hubbardton were evacuated, state police said.
>
> As of midnight police said one lane on Vermont 30 and one lane on U.S. 4 would be open, but exit five of U.S. 4 would be closed. The East Hubbardton Road would be open as far as the washed-out bridges, police said.

In comparison with many other communities in the region, which suffer flood damage as a result of extensive floodplain development, the Town of Clarendon has not sustained unduly large or frequently recurring flood losses. However, at infrequent intervals, the community has experienced unusually high flood stages on its streams, with relatively severe flood damage in some areas.

Floods of large magnitude occurred in Clarendon during the years 1811, 1830, 1869, 1913, 1927, 1938, 1945, 1947, and 1973. Minor flooding occurs nearly every spring, particularly along Otter Creek and Clarendon River bottomlands, when melting snow combined with rainfall flows from the surrounding mountains.

The 1927 flood was the worst flood of historic record in Clarendon, having a recurrence interval of 140 years at the Otter Creek gage in Rutland. A total of 8.55 inches of rainfall was recorded nearby in Rutland during the storm; of this amount 6.12 inches fell within a 24-hour period (Luther B. Johnson, 1928).

The flood of July 24-25, 1830, had a 1-percent annual chance recurrence interval on Otter Creek in Clarendon. A high-water mark near Pittsford, 12 miles downstream from Rutland, indicates that the level of this flood was approximately 1 foot below that of 1927. The storm was of cloudburst intensity and produced a total rainfall of 7 inches in Burlington, Vermont, 60 miles north of Clarendon (U.S. Senate, 1940).

The floods of 1811, 1869, 1913, and 1938, respectively, had 1.5-, 2-, 5.6-, and 4-percent annual chance recurrence intervals on Otter Creek. The most recent notable flood occurred on June 30, 1973, and had a 10-percent annual chance recurrence interval.

The Town of Danby has not sustained large or frequent flood losses. However, at infrequent intervals the community has experienced unusually high flood stages on its streams, with relatively severe flood damage in some areas. Floods of large magnitude have occurred in Danby during the years 1927, 1938, 1973, and 1976. Minor flooding occurs nearly every spring, particularly along Otter Creek when melting snow combines with spring rainfall flows from the surrounding mountains.

The worst flood of record in Danby occurred November 3 and 4, 1927, when more than 8 inches of rain fell within 36 hours. In late September of 1938, hurricane-generated rains falling on already saturated soils resulted in major flooding.

Two floods occurred in Danby in the summer of 1976. The first occurred on July 11. This was the lesser of the two floods. A month later, the rivers overtopped their banks again. The source of this flood was the remnant of the fading Hurricane Belle.

In the Town of Fair Haven, flood problems along the Castleton River are generally associated with spring runoff and summer thunderstorms. Ice jams have not been a problem in the past and were not considered in this study.

The Town of Mount Tabor has not sustained unduly large or frequently recurring flood losses.

Based on historical data, the Mettawee River, Flower Brook, and Indian River are the principal sources of flooding within the Town of Pawlet. Ice jams in the spring cause a bottleneck effect at the bridges and the Red Mill Dam on Flower Brook; this condition, along with the spring rains and snow melt, results in overflow of the brook, frequent water in the basements of those residences along Route 133, and runoff across the bridge in the middle of the Village of Pawlet.

The Town of Pittsfield has experienced severe flooding in November 1927, March 1936, September 1938, June 1973, and August 1976. The town experienced major streambank and property damage during these floods. No industrial or major commercial areas are threatened with damage at the 1-percent annual chance storm level. In general, the residences that would be exposed to flooding during the 1-percent annual chance frequency flood would experience relatively minor damage.

Floods of large magnitude have occurred in the Town and the Village of Poultney during 1927 and 1945. The worst flood to occur in the Town and the Village of Poultney was caused by a general New England storm which began on November 3, 1927, and lasted until November 5, 1927. Five inches of rain fell in the river basin during the storm (USACE, 1930). Nine bridges within the Town and the Village of Poultney were washed out during the 1927 flood. The former South Street, State Route 31, bridge was not damaged. However, severe flood damage did occur to the highway on the north of the bridge (Vermont Department of Water Resources, 1976).

The worst flood to hit the Town and the Village of Poultney since the flood of 1927 occurred as a result of a brief but intense summer storm on July 20, 1945. The Poultney River basin was the hardest hit. Extensive damage was done to the roads and bridges in the Town and the Village of Poultney, requiring either repair or replacement of 24 structures (Vermont Department of Water Resources, 1976). Spring floods create no real damage to the community because the flooding is not great.

Flood damage in the Town of Proctor has been caused primarily by flooding along Otter Creek. Major floods have occurred in Proctor in 1811, 1913, 1927, 1936, and 1938 although minor flooding occurs nearly every spring when melting snow from nearby mountains is augmented by rainfall and flows into the valley. The most damaging major flood was the 1927 flood (with an approximate 140-year recurrence interval) which demolished seven homes, washed away the railroad freight station, and caused approximately $750,000 total loss (Roy L. Johnson Company, 1927). Most of the damage was the result of water entering the center of the town through a railroad cut, then cascading down the steep slope of Powers Hill onto a flat portion of the heavily developed floodplain. The 1913 and 1938 floods caused damage in a similar fashion although to a lesser extent.

Major flooding problems in the City of Rutland have been experienced in three locations: (1) the flat area adjacent to Otter Creek, which is due to the spread of floodwaters after overtopping the channel banks; (2) a low-lying area along East Creek, extending from its confluence with Otter Creek to West Street, which is due to the amplification of East Creek flooding at high stages by backwater from Otter Creek; and, (3) the area to the east of East Creek, between West Street and Crescent Streets, which is due to overflow of East Creek itself.

Flood damage to the Town of Shrewsbury has been caused primarily by flooding on the Mill River through the Village of Cuttingsville. Damage has also been caused by floods on Shrewsbury Brook, Freeman Brook, and the Cold River, primarily to roads and bridges. Major floods occurred in November 1927, September 1938, June 1973, and August 1976.

As in much of Vermont, the 1927 flood is the worst of record, having a recurrence interval of approximately 180 years on the Mill River. Damages in Shrewsbury were heaviest within the residential sections of Cuttingsville. Bridge and highway losses were also severe; two concrete bridges on the Mill River were swept from their abutments.

Along the Cold River, the 1973 flood destroyed the Wilmouth Hill Road Bridge and washed out a large section of the Cold River Road.

In August 1976, the Mill River again overflowed its banks, inundating three homes and washing out several low lying portions of Route 103 in Shrewsbury. This flood had an approximate 10-percent annual chance recurrence interval and stayed within banks through the center of Cuttingsville, causing considerably less damage than the 1973 flood.

The worst natural flood of historic record in the Town of Wallingford occurred November 4, 1927, when more than 8 inches of rain fell within 36 hours. Route 7 was flooded both north and south of Wallingford Village and part of Gulf Road was washed out. Roaring Brook did more damage in the Town of Wallingford as it cut new channels during the flood ("1927 and 1973 Floods," 1973).

In late September 1938, hurricane-generated rains, falling on already saturated soils, resulted in major flooding. The Mill River, in particular, caused considerable damage when an oxbow was cut off resulting in the loss of a home and property.

On June 30, 1973, a flood damaged the Dugway and other roads near South Wallingford, and part of Sugar Hill Road. In East Wallingford, the bridge over Freeman Brook went out ("1927 and 1973 Floods," 1973).

In the Town of Wells, flood problems along Wells Brook and Mill Brook No. 1 are generally associated with spring runoff and summer thunderstorms. Some ice jamming has been known to occur in the past, although it was not considered within the confines of this study. Flood problems for Little Lake, Lake St.

Catherine, and Lake Lucidian are generally associated with snowmelt and spring rains and severe summer storms.

2.4 Flood Protection Measures

In the Town of Castleton, there are no flood protection measures in the Castleton River watershed. The SCS has prepared a work plan for the upper reaches of the Castleton River, but no structures have been built (U.S. Department of Agriculture, April 1972).

The National Oceanic and Atmospheric Administration (NOAA) of the U.S. Department of Commerce maintains year-round surveillance of weather conditions in the Poultney area west of Danby. Flood warnings and statements of anticipated weather conditions are issued by the National Weather Service in Burlington, Vermont, and the River Forecast Center in Bloomfield, Connecticut, to radio and television stations and the local press for broadcast to the public. During floods or potential flood periods the National Weather Service releases, at 24-hour intervals, or as may be necessary, forecasts of the high-water elevations that may be expected at the stream gaging stations operated by the USGS along Otter Creek near Rutland, Vermont.

In the Town of Fair Haven, there are no flood protection measures in the Castleton River watershed. Three dams are located within the town; Adams Street Dam, State Route 22A Dam, and Depot Street Dam have no effect on flooding in Fair Haven.

In the Town of Mount Tabor, a portion of Big Branch had caused some flooding in 1938 and again in 1973. After the 1938 flooding, the U.S. Forest Service removed debris from the channel and built a levee. Over the years, the improvements were neglected, and in 1973, the structure was overtopped. Again, the Forest Service took steps to correct the problem. There were no other flood control structures either existing or authorized in the Town of Mount Tabor at the time of this study.

In the Town of Pawlet, on Mill Brook No. 1, a tributary of the Mettawee River, a dam regulates the amount of discharge flowing from Lake St. Catherine and Little Lake to the north of Pawlet. This dam affects the area of the community which is downstream of Blossom Corners and the confluence of Wells Brook with the Mettawee River. Stonework and timber dams provide no flood protection for the downstream reaches in the Town of Pawlet.

The Town of Pawlet maintains a restrictive zoning limit; the current floodplain ordinance prevents the building of new structures other than accessory buildings in flood areas delineated as rough estimates on a map prepared by the Soil Conservation Service (SCS) at the town's request.

The Federal Power Commission required the Vermont Marble Company to install a stop-log structure in the railroad cut near the Marble Bridge in the Town of Proctor to prevent the recurrence of floodwater passing through the railroad cut and damaging property and endangering life as occurred during the 1927 flood. There are no other flood control structures either existing or authorized in the Town of Proctor at the time of this study.

Future development is expected to occur along upstream segments of streams shown in this study, particularly on Moon Brook. At the time of this report, definitive construction dates could not be ascertained. Preliminary concepts for development along Moon Brook indicate a number of stream crossings that might alter the hydraulic characteristics presented in this study.

The City of Rutland has adopted floodplain zoning based on the limits of the 1927 flood and has a policy of restricting building in this area.

In the Town of Rutland, flows on East Creek and Otter Creek are regulated in part by power plant dams and the Chittenden Reservoir on East Creek. Prior to June 3, 1947, flow was also regulated by the East Pittsford Reservoir on East Creek. There are no other flood control structures either existing or proposed for implementation within the foreseeable future in the Town of Rutland.

In the Town of Wells, flood control structures in the area include Little Lake Dam and an old stone dam near the Goodrich Road bridge over Mill Brook 1, neither of which provides protection from flooding.

There are no flood control structures either existing or authorized in the Towns of Brandon, Clarendon, Danby, Pittsfield, Pittsford, Poultney, Shrewsbury, Wallingford, and West Rutland, and the City of Rutland.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the county, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this FIS. Flood events of a magnitude which are expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for floodplain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10-, 2-, 1-, and 0.2-percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (1-percent chance of annual exceedence) in any 50-year period is approximately 40 percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the county at the time of completion of this FIS. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

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

Each incorporated community within, Rutland County, with the exceptions of the Towns of Benson, Chittenden, Hubbardton, Ira, Mendon, Middletown Springs, Mount Holly, Sudbury, Tinmouth, and West Haven, has a previously printed FIS report. The hydrologic analyses described in those reports have been compiled and are summarized below.

Precountywide Analyses

In the Town of Brandon, a USGS partial-record gaging station is located 1.0 mile northeast of Brandon on the Neshobe River. This gage has been in operation since 1968, but does not provide a long enough record to be suitable for analysis. Peak discharges for the 10-, 2-, and 1-percent annual chance floods on the Neshobe River and Arnold Brook were computed by a regional flood-frequency method developed for the New England area (USGS, 1962) by the USGS. This method relates flood peaks to topographic and climatic factors through statistical multiple regression techniques. The 2-percent annual chance peak discharge was determined by a straight-line extrapolation on a log-probability plot of peak flows computed for frequencies up to 100 years.

In the Town of Castleton, discharges for the Castleton River and North Breton Brook were obtained from the USACE report entitled Technical Services for Castleton River and North Breton Brook in Towns of Castleton and Fair Haven, Rutland County, Vermont (USACE, 1982). The Castleton River is ungaged but enters the Poultney River above the USGS gage (No. 04280000) located below Fair Haven. The peak discharge-frequency curve for this gaged portion of the Poultney River basin was updated to the period of record from 1929 to 1980 using the USACE publication Flood Flow Frequency Analysis (USACE, 1980).

A hydrologic model of the gaged Poultney River basin that would compute flood hydrographs for selected points on the Castleton River was developed using the HEC-1 computer program (USACE, 1980). The model was calibrated using the observed floods of November 1972 and August 1976. Hypothetical storms with recurrence intervals of 10-, 2-, 1-, and 0.2-percent annual chance were developed in accordance with information presented in Technical Paper No. 40 and Memorandum Hydro-35 (U.S. Department of Commerce, 1961; U.S. Department of Commerce, 1977). These storms were incorporated into the HEC-1 model, which was then calibrated to the expected probability peak discharge-frequency curve obtained for the Poultney River gage.

The hypothetical peak discharges computed by the model for the Castleton River at its confluence were checked by computing a separate peak discharge-frequency relationship for the Castleton River basin using the method in document Regional Frequency Study, Upper Delaware and Hudson River Basins (USACE, 1974). Agreement between the two peak discharge-frequency relationships obtained was good. Therefore, peak discharges computed by the HEC-1 model for the Castleton River at its confluence and other points upstream were considered to be accurate.

From below Bomoseen Outlet to the confluence with the Poultney River, the discharge of the Castleton River decreases due to the increased storage capacity of the floodplain in this area.

In the Town of Clarendon, discharges for Otter Creek and the Clarendon River were computed by using a regional flood-frequency method developed for the New England area by the USGS (USGS, 1962). This method relates flood peaks to topographic factors through statistical multiple regression techniques.

In the Town of Danby, peak discharge computations for Mill Brook 2 and Otter Creek were based on a regional method developed by the USGS which relates flood flows to drainage areas, hydrologic areas and flood-frequency regions by statistical manipulation of known discharges along selected rivers (USGS, 1962).

In the Town of Fair Haven, discharges for the Castleton River were obtained from the USACE report entitled Technical Services for Castleton River and North Breton Brook in Towns of Castleton and Fair Haven, Rutland County, Vermont (USACE, 1982). The Castleton River is ungaged and enters the Poultney River above the USGS gage (No. 04280000) located below Fair Haven. The peak discharge-frequency curve for this gaged portion of the Poultney River basin was updated to the period of record from 1929 to 1980 using the USACE Flood Flow Frequency Analysis (USACE, 1980).

In the Town of Mount Tabor, peak discharges for Otter Creek were taken from the Danby, Vermont FIS (FEMA, undated). Peak discharge computations for Mill Brook 2 were based on a regional method developed by the USGS which relates flood flows to drainage areas, hydrologic areas, and flood-frequency regions by statistical manipulation of known discharges along selected rivers (USGS, 1965).

In the Town of Pawlet, peak discharges for the 10-, 2-, and 1-percent annual chance floods on the Mettawee River, Flower Brook, Indian River and all approximate studied streams were computed by a regional flood frequency method developed for the New England area by the USGS (USGS, 1962). This method relates flood peaks to topographic and climatic factors through statistical multiple regression techniques. The 0.2-percent annual chance peak discharge was determined by a straight-line extrapolation on a log-probability plot of peak flows computed for frequencies up to 100 years.

In the Town of Pittsfield, hydrologic analyses for the streams studied by detailed methods were taken from the Flood Plain Management Study for the Town of Pittsfield, prepared by the SCS (U.S. Department of Agriculture, undated).

In that study, USGS Bulletin 17B and SCS Technical Release 20 (TR-20) were used to determine flood-frequency discharges values (U.S. Department of the Interior, 1981; U.S. Department of Agriculture, 1965). These values were adjusted as necessary in analyzing them along with values from similar gaged watersheds.

In the Town of Pittsford, the 1-percent annual chance flood discharge for Otter Creek was based on analyses of two long-term USGS gaging stations on Otter Creek: No. 04282000 at Center Rutland, Vermont, upstream of Pittsford; and No. 04282500 at Middlebury, Vermont, downstream of Pittsford. The analyses followed the standard log-Pearson Type III method as outlined in Bulletin 17B and was based on statistical analysis of stream flow records covering 56 years at gage No. 04282000 and 69 years at gage No. 04282500 (U.S. Department of the Interior, 1981; U.S. Department of the Interior, 1984).

In the Town and Village of Poultney, peak discharge computations for the Poultney River were based on a regional method developed by the USGS which relates flood flows to drainage areas, hydrologic areas, and flood-frequency regions by statistical manipulation of known discharges along selected rivers. Parameters used for the regional method are temperature and drainage area (USGS, 1965).

In the Town of Proctor, the USGS gaging stations on Otter Creek at Center Rutland and Middlebury, Vermont, were the primary sources of data for determining discharge-frequency relationships on the creek. The Center Rutland gage, located 7.2 miles upstream of Proctor, has been in operation since 1928. The Middlebury gage, located 37.3 miles downstream from Proctor, has been in operation for the years 1903 to 1907, 1910 to 1920, and 1928 to present. Discharge-frequency curves were developed at each gage by use of the log-Pearson Type III analyses as suggested in the Water Resources Council Bulletin No. 17 (U.S. Water Resources Council, 1976), using a weighted skew of 0.5 at Center Rutland and 0.4 at Middlebury. From the Center Rutland gage to the mouth of the Clarendon River in Rutland, discharges were increased by a ratio of the drainage areas to the 0.75 power. Between the Clarendon River and the Middlebury gage, floodplain storage accounts for a decrease in flood discharges. For this reach, a straight line discharge-drainage area curve was developed on a log-log plot and appropriate discharges were used for drainage areas within the Town of Proctor.

In the City of Rutland, a gaging station on Otter Creek at Center Rutland in the Town of Rutland was the principal source of data for defining discharge-frequency relationships for the river. The gage has been operating since 1928. Values of the 10-, 2-, 1-, and 0.2-percent annual chance peak discharges were obtained from a log-Pearson Type III distribution of annual peak flow data. An alternate method used to verify results was the Mean Annual Flood Method (U.S. Department of the Interior, 1965).

Frequency-discharge data for East Creek were developed by averaging a log-Pearson Type III distribution of records from a gaging station on East Creek in Rutland, which has been operating since 1940, with values from a regional relationship (U.S. Department of the Interior, 1962). Regional equations (U.S. Department of the Interior, 1974) and Senate Document No. 171 (U.S. Congress, 1940) were used to verify results.

Average values were used because of the short length of streamflow records in the statistical analysis and the regional formula's ability to relate downstream storage below the gage.

Two regional frequency relationships (U.S. Department of the Interior, 1962; U.S. Department of the Interior, 1974) were used to develop and verify frequency-discharge data for Moon and Mussey Brooks.

In the Town of Rutland, peak discharge computations for Otter Creek were based on a statistical analysis of discharge records of the USGS gaging stations at Middlebury and Center Rutland, Vermont, and historic flood information dating from 1811. The Middlebury gage has been in operation from April 1903 to April 1907, October 1910 to January 1920, and continuously since May 1928. The Center Rutland gage has recorded flows continuously since May 1928. Additional peak discharge estimates were available at both Middlebury and Center Rutland for the floods of October 1811, July 1830, October 1869, April 1905, March 1913, April 1914, and November 1927 (U.S. Senate, 1940). The analysis followed the standard log-Pearson Type III method as outlined by the Water Resources Council (U.S. Water Resources Council, 1976).

For the downstream reach of Otter Creek between Clarendon River confluence and the Town of Middlebury, the peak discharges were obtained from a straight line log-log plot of discharges versus drainage area curve developed from the gaging station records. A discharge-drainage area ratio was developed from the gaging station analysis to define the peak discharges for the upstream reach of Otter Creek between Clarendon River confluence and the southern corporate limits. The peak discharges for the downstream reach of Otter Creek were found to be lower than the peak discharges for the upstream reach. This anomaly is due to the floodplain storage available within the downstream reach of Otter Creek.

The hydrologic analysis for the Clarendon River was based on a transposition with the Center Rutland gage on Otter Creek. Peak flood discharges were assumed to be directly proportional to the three-fourths power of the drainage areas.

Peak flood discharges on East Creek were computed using an historically adjusted log-Pearson Type III distribution of annual peaks recorded at the USGS gaging station located in Rutland City, 0.2 mile downstream from Patch Dam. This gage has been in continuous operation since August 1940. Included in the analysis are estimates of the November 1927 and September 1938 peak flood discharges. The 1947 peak discharge was caused by failure of the East Pittsford Dam, located 5.8 miles upstream of the gage, and was not included in the analysis.

Discharges on Tenny Brook, North and South Branches Tenny Brook, Creed Brook, Curtis Brook, Mussey Brook, and Pinnacle Ridge Brook were computed using a regional flood-frequency analysis developed for the Hudson and Upper Delaware River drainage basins (USACE, 1974). Gaging stations outside the two basins were used in the study to obtain a better definition of regional parameters. Since Rutland lies on the outer edge of the Hudson River basin, the method was judged applicable to the study area.

In the Town of Shrewsbury, a regional flood-frequency method developed for the New England area (USGS, 1962) by the USGS was used to compute peak discharges on the Mill and Cold Rivers. This method relates flood peaks to topographic and climatic factors through statistical multiple regression techniques. Shrewsbury Brook discharges were computed using the SCS method of estimating peak rates of runoff from small watersheds (U.S. Department of Agriculture, Engineering Field Manual). Peak discharges on Freeman Brook were computed using the Bureau of Public Roads method of estimating peak rates of runoff from small watersheds in portions of Vermont (U.S. Department of Commerce, August 1961). For all methods, the 0.2-percent annual chance peak discharge was determined by a straight line extrapolation on a log-probability plot of peak discharges computed for 10-, 2-, and 1-percent annual chance floods.

In the Town of Wallingford, peak discharge computations for Otter Creek, Homer Stone Brook, Mill River, and Roaring Brook were based on a regional method developed by the USGS which relates flood flows to drainage areas, hydrologic areas, and flood-frequency regions by statistical manipulation of known discharges along selected rivers (USGS, 1965).

The low discharges for the locations on Otter Creek which have the largest contributing drainage areas are the result of large storage areas in the floodplains of the lower reaches of the stream.

In the Town of Wells, for Wells Brook, Mill Brook 1, Little Lake, and Lake St. Catherine, a HEC-1 model was developed for the watershed above the community (USACE, 1980). The HEC-1 model was composed of 4 sub-areas with a total drainage area of 25.25 square miles. Within the HEC-1 model, a reservoir flood routing was performed at Little Lake Dam utilizing a known storage versus discharge relation. A unit hydrograph was developed for the watershed of Lake Lucidian through computer modeling. It has a drainage area of 0.73 square mile (USACE, 1986).

The Technical Paper No. 40 storm precipitation data was applied to the HEC-1 model for the 10-, 2-, 1-, and 0.2-percent annual chance floods (U.S. Department of Commerce, 1961). For these runs, an initial rate of 1 inch per hour and constant rate of 0.1 inch per hour were used.

For the Town of West Rutland, both Clark Hill Brook and the Urban Lateral have complex hydrological settings that make estimating peak discharges difficult. Clark Hill Brook has locations where flow can leave the channel and not return. The Urban Lateral can act as a diversion and will accept overflows from both Clark Hill Brook and the Clarendon River. Flow permanently leaving the channel and flow entering the channel from an alternate source were not assessed in this hydrologic analysis. The discharges for Clark Hill Brook and the Urban Lateral were determined using regional regression equations for estimating peak-flow frequency on an unregulated rural stream in Vermont (USGS, 2002). The discharges for the Urban Lateral were adjusted for urbanization using regression equations developed by the USGS for use in urbanized areas throughout the United States (USGS, 1983).

Countywide Analyses

Discharges were calculated using regional regression equations published by the U.S. Geological Survey (USGS) in cooperation with the Vermont Agency of Transportation (Olsen, 2002). Geographic data for the analysis was developed by CDM or obtained from the Vermont Center for Geographical Information (VCGI, 2006). Regional regression was chosen instead of frequency analysis of peak discharge data because there is no suitable stream gage in the project area. There is a gage on Otter Creek at Center Rutland (USGS Gage # 04282000). This gage is affected by regulation after 1947, and thus violates the assumptions of statistical frequency analysis. Further, a gage on East Creek (USGS 04281500) does not have any data after 1977 and is significantly affected by upstream regulation.

Drainage basins for select discharge locations were delineated by hand using USGS 1:24,000-scale topographic maps. Drainage basin boundaries were then digitized to create a geographic data coverage area. Inputs to the peak discharge regression equations included the basin drainage area, a geographic factor, percent surface water coverage, and an elevation statistic. Inputs were calculated using Geographic Information System (GIS) software, following the methods described by Olsen. Calculation of the peak discharges were performed in a spreadsheet and verified using the National Flood Frequency (NFF) program published by the USGS.

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

TABLE 3 – SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs)			
		10-PERCENT	2-PERCENT	1-PERCENT	0.2-PERCENT
ARNOLD BROOK					
Arnold District Road	2.1	130	245	340	475
CASTLETON RIVER					
At its confluence with the Poultney River	93.6	4,619	6,914	7,907	11,220
Below Lake Bomoseen outlet	90.2	5,423	8,098	9,256	12,845
Above Lake Bomoseen outlet	54.5	2,774	4,278	4,896	6,967
At the confluence of North Breton Brook	43.8	2,503	3,839	4,385	6,113
At the Town of Castleton/Town of West Rutland corporate limits	30.7	1,386	2,115	2,417	3,363

TABLE 3 - SUMMARY OF DISCHARGES - continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-PERCENT	2-PERCENT	1-PERCENT	0.2-PERCENT
CLARENDON RIVER					
At the Town of Clarendon/Town of West Rutland corporate limits	235	2,480	*	6,320	*
Above Cold River	192	1,320	*	3,675	*
At mouth	46.7	2,550	4,080	4,870	7,120
CLARK HILL BROOK					
At confluence with Clarendon River	1.42	125	207	249	365
COLD RIVER	21.3	4,245	8,530	10,650	18,000
CREED BROOK					
At mouth	1.5	150	300	390	680
Abandoned Road	0.9	100	200	260	450
CURTIS BROOK					
At mouth	2.0	190	380	490	840
Blueberry Lane	1.7	170	340	440	750
Prospect Hill Tributary	1.2	130	250	330	560
EAST CREEK					
At mouth above Otter Creek	61.32	2,500	3,710	4,250	5,640
Downstream of confluence with Tenny Brook	60.04	2,450	3,640	4,170	5,540
Upstream of confluence with Tenny Brook	55.3	2,250	3,350	3,840	5,100
At City of Rutland/Town of Rutland corporate limit	53.56	2,200	3,280	3,770	5,010
Downstream of confluence with Unnamed Tributary	51.74	2,140	3,190	3,660	4,870
Downstream of confluence with Curtis Brook	49.86	2,060	3,070	3,530	4,700
Upstream of confluence with Curtis Brook	47.6	1,960	2,930	3,370	4,490
Downstream of Glen Dam	46.56	1,920	2,880	3,310	4,420

*Data not available

TABLE 3 - SUMMARY OF DISCHARGES - continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-PERCENT	2-PERCENT	1-PERCENT	0.2-PERCENT
FLOWER BROOK					
At mouth of Flower Brook	18.4	2,100	3,050	3,500	4,780
At Cross Section L	17.1	1,995	2,885	3,310	4,540
FREEMAN BROOK					
Russelville Road	5.5	1,120	1,600	1,850	2,400
Confluence with East Fork	2.6	560	830	960	1,280
GUERNSEY BROOK					
At county boundary	4.2	1,153	1,876	2,247	3,302
HOMER STONE BROOK					
At mouth	5.07	1,100	2,300	3,000	5,000
INDIAN RIVER					
Vermont-New York State line	15.7	1,785	3,950	5,300	9,300
METTAWEE RIVER					
Vermont-New York State line	113.6	5,700	10,200	12,700	19,500
Upstream of Bullfrog Hollow Brook	110.5	5,585	9,995	12,445	19,110
At Butternut Bend	68.2	3,615	7,230	9,725	18,350
At Cross Section F	66.2	3,540	7,085	9,530	17,980
At Cross Section G	65.0	3,470	6,940	9,335	17,615
Approximately 0.3 mile downstream of Flower Brook	62.5	3,380	6,760	9,110	17,160
Upstream of Flower Brook	44.0	2,600	5,200	7,000	13,200
MILL BROOK NO. 1					
At mouth	13.9	2,000	3,700	4,500	7,000
MILL BROOK NO. 2					
At confluence with Wells Brook	9.2	460	760	900	1,310
At Little Lake Dam	7.8	390	640	760	1,130

TABLE 3 - SUMMARY OF DISCHARGES – continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-PERCENT	2-PERCENT	1-PERCENT	0.2-PERCENT
MILL RIVER					
At the Town of Shrewsbury/Town of Clarendon corporate limits	67.0	9,600	16,100	19,800	30,000
Shrewsbury Brook	55.3	8,500	14,800	18,080	28,000
Above Freeman Brook	42.8	6,200	10,700	13,100	20,000
Above Bowlsville Brook	24.4	3,500	6,400	8,100	13,000
MOON BROOK					
Confluence with Otter Creek in the City of Rutland	8.7	535	828	964	1,320
Downstream of Mussey Brook in the City of Rutland	8.5	528	817	951	1,300
Upstream of Mussey Brook in the City of Rutland	5.4	356	557	651	897
Downstream of confluence with Unnamed Tributary; approximately 1,200 feet upstream of South Main Street	4.9	327	513	601	832
Upstream of confluence with Unnamed Tributary; approximately 1,400 feet upstream of South Main Street	3.3	227	359	421	586
Downstream of Piedmont Pond	2.5	175	280	330	464
At City of Rutland/Town of Rutland Corporate Limit	1.6	128	210	250	359
MUSSEY BROOK					
Confluence with Moon Brook	3.07	312	495	620	1,115
Bridge at South Main Street	2.81	300	480	600	1,050
Eddy Pond Dam	2.5	230	450	570	980
Cold Brook	1.6	160	320	400	690
River Road	1.0	120	230	290	490

TABLE 3 - SUMMARY OF DISCHARGES – continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-PERCENT	2-PERCENT	1-PERCENT	0.2-PERCENT
NESHOBE RIVER					
Clay Street Bridge	21.8	2,770	4,815	5,840	9,010
Welton Road Bridge	20.1	2,600	4,530	5,500	8,500
Burnell Pond Tributary	18.4	2,450	4,250	5,160	8,000
NORTH BRANCH TENNY BROOK					
At mouth	1.4	150	200	360	600
NORTH BRETON BROOK					
At its confluence with the Castleton River	13.1	1,122	1,724	1,968	2,754
OTTER CREEK					
At the Town of Proctor/Town of Rutland corporate limits	425.0	*	*	12,000	*
Gorham Street Bridge	363.0	11,370	18,040	21,530	31,320
Main Street Bridge	360.4	11,430	18,180	21,700	31,610
At the Town of Pittsford/Town of Proctor corporate limits	357.0	11,520	18,360	21,930	32,000
Cross Section Q	354.1	11,600	18,510	22,130	32,340
Above Clarendon River	307.4	10,430	16,650	19,900	29,100
At Center Rutland Dam	308	12,700	18,500	21,100	27,500
Downstream of confluence with East Creek	306.3	12,600	18,500	21,000	27,400
Upstream of confluence with East Creek	245	11,000	16,200	18,500	24,500
Downstream of confluence with Moon Brook	244.4	11,000	16,200	18,500	24,400
Upstream of confluence with Moon Brook	235.7	10,600	15,700	18,000	23,700
Downstream of confluence with Cold River	233.4	10,600	15,600	17,900	23,600

*Data not available

TABLE 3 - SUMMARY OF DISCHARGES – continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-PERCENT	2-PERCENT	1-PERCENT	0.2-PERCENT
OTTER CREEK (continued)					
At Town of Clarendon-Town of Rutland corporate limits	196.3	8,930	13,300	15,200	20,100
At Alfrecha Road Bridge	195.4	8,900	13,200	15,100	20,100
Downstream of confluence with Mill River	182.5	8,460	12,600	14,500	19,200
Upstream of confluence with Mill River	110.5	5,600	8,460	9,750	13,100
At Wallingford-Clarendon corporate limits	108.7	5,530	8,360	9,640	13,000
Downstream of Unnamed Tributary in Wallingford	108.6	5,520	8,350	9,640	13,000
Downstream of Roaring Brook in Wallingford	102.5	5,260	7,980	9,210	12,400
Downstream of Unnamed Tributary approximately 500 feet below Hartsboro Road.	90.6	4,740	7,210	8,340	11,300
Downstream of South Wallingford Brook in Wallingford	82.2	4,380	6,690	7,750	10,500
Downstream of Homer Stone Brook in Wallingford	80.1	4,280	6,550	7,590	10,300
At Danby-Wallingford Town Line	74.2	4,030	6,180	7,180	9,780
PINNACLE RIDGE BROOK					
Cross Section A	1.4	240	480	620	1,080
Grove Street	1.0	170	350	460	820
POULTNEY RIVER					
Approximately 2,048 feet downstream of Granville Street	48.9	3,250	6,670	8,720	14,800
ROARING BROOK					
At mouth	7.64	1,400	2,700	3,500	6,000
SHREWSBURY BROOK					
At mouth	2.4	640	1,050	1,250	1,750

TABLE 3 - SUMMARY OF DISCHARGES – continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-PERCENT	2-PERCENT	1-PERCENT	0.2-PERCENT
SOUTH BRANCH TENNY BROOK					
At mouth	2.6	240	320	590	980
Woodstock Avenue	1.8	190	250	450	750
SOUTH BRANCH TWEED RIVER					
At confluence with the West Branch Tweed River	21.8	3,724	6,060	7,259	10,668
At upstream side of State Route 100 bridge	20.2	3,537	5,756	6,895	10,132
At upstream corporate limits	5.4	1,390	2,261	2,709	3,981
TENNY BROOK					
Cross Section A	4.6	370	490	890	1,490
TWEED RIVER					
At downstream corporate limits	40.88	5,548	9,027	10,813	15,891
At confluence of the South Branch Tweed River and the West Branch Tweed River	39.5	5,428	8,832	10,580	15,548
URBAN LATERAL					
At confluence with Castleton River	1.79	173	267	310	397
At Thrall Street	0.37	69	98	111	141
WELLS BROOK					
Below confluence of Mill Brook	25.3	2,863	4,195	4,733	6,111
Above confluence of Mill Brook	16.1	2,470	3,630	4,090	5,280
Below confluence of Snow Brook	14.3	1,980	2,900	3,280	4,210
Above confluence of Snow Brook	12.9	1,830	2,690	3,040	3,900
Below Moosehorn Mountain	11.7	1,700	2,500	2,820	3,630
Above Moosehorn Mountain	9.6	1,470	2,150	2,430	3,130

TABLE 3 - SUMMARY OF DISCHARGES – continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-PERCENT	2-PERCENT	1-PERCENT	0.2-PERCENT
WEST BRANCH TWEED RIVER					
At confluence with the South Branch Tweed River	17.6	3,229	5,254	6,294	9,250
At Lower Michigan Road bridge	16.3	3,061	4,981	5,967	8,769
At upstream corporate limits	13.5	2,691	4,378	5,245	7,707

The stillwater elevations have been determined for the 10-, 2-, 1-, and 0.2-percent annual chance floods for the flooding sources studied by detailed methods and are summarized in Table 4, "Summary of Stillwater Elevations."

TABLE 4 – SUMMARY OF STILLWATER ELEVATIONS

FLOODING SOURCE AND LOCATION	ELEVATION (feet NAVD*) 10-PERCENT	2-PERCENT	1-PERCENT	0.2-PERCENT
LAKE LUCIDIAN				
Entire shoreline	498.0	498.2	498.6	499.1
LAKE ST. CATHERINE				
Entire shoreline	485.3	485.8	486.0	486.5
LITTLE LAKE				
Entire shoreline	485.3	485.8	486.0	486.5

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the source 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 FIRM represent rounded whole-foot elevations and may not exactly reflect the elevations shown on the Flood Profiles or in the Floodway Data tables in the FIS report. For construction and/or floodplain management purposes, users are encouraged to use the flood elevation data presented in this FIS in conjunction with the data shown on the FIRM.

Each incorporated community within Rutland County, with the exceptions of the Towns of Benson, Chittenden, Hubbardton, Ira, Mendon, Middletown Springs, Mount Holly, Sudbury, Tinmouth, and West Haven, has a previously printed FIS report. The hydraulic analyses described in those reports have been compiled and are summarized below.

Precountywide Analyses

In the Town of Brandon, stream cross sections were field surveyed and roughness coefficients (Manning's "n") were estimated by field inspection (USGS, 1967; U.S. Department of Commerce, May 1965).

In the Town of Castleton, cross-section data were acquired from the Vermont Department of Water Resources.

In the original study for the Town of Fair Haven, cross-sectional data were acquired from the Vermont Department of Water Resources. Additional cross-sectional information was obtained by field measurements. All bridges, culverts, and dams were field surveyed to obtain elevation data and structural geometry. In this revision, cross-sectional data for the backwater analysis were obtained from the original HEC-2 data file and by field survey. All bridges, culverts, and dams from Adams Street to the upstream corporate limits were resurveyed to obtain elevation data and structural geometry.

In the Town of Pawlet, cross sections for the backwater analyses were located at regular intervals along the streams and at significant changes in ground relief and land use or land cover. Ground elevations for the cross sections were obtained through land survey with control established by USGS benchmarks. Dufresne-Henry personnel tested the hydraulic model and adjusted the "n" values within an acceptable range to best fit high-water marks obtained for the June 1973 and the summer of 1976 floods.

Hydraulic analyses for the streams studied by detailed methods were taken from the Flood Plain Management Study for the Town of Pittsfield, prepared by the SCS (U.S. Department of Agriculture, undated).

In the Town of Pittsfield, cross-section data for the streams and structural geometry of bridges and culverts were obtained by transit surveys. Straight-line interpolations of the elevations were used for flood profiles between cross sections.

In the Town of Pittsford, streambed elevations for Otter Creek were determined by field surveys at structures such as culverts and bridges, and from other points along the stream necessary to define the streambed adequately.

In the City of Rutland, the valley portions of the cross-section data for streams in the area were obtained from contour maps provided by the Vermont Department of Highways (Vermont Highway Department, 1958). The below-water portions were obtained by field measurement. Bridge plans were utilized to obtain elevation data and structural geometry. All bridges for which plans were unavailable or out-of-date were surveyed.

Cross sections for the backwater analyses of the detailed study streams were located at close intervals above and below bridges in order to compute the significant backwater effects of these structures in the developed areas. In long segments between structures, appropriate valley cross sections were also surveyed.

Water-surface elevations were computed through use of the USACE HEC-2 step-backwater computer program (USACE, October 1973). In the Town of Brandon, the starting water-surface elevation for the Neshobe River was determined using the slope/area method and rating curves developed by the study contractor.

In the Town of Brandon, on Arnold Brook, where the analysis indicated supercritical flow conditions, critical depth was assumed for the flood elevations because of the inherent instability of supercritical flow. The starting water-surface elevation for Arnold Brook was determined by allowing the HEC-2 program to determine a critical depth at the transition point between subcritical and supercritical flow.

The approximate elevations of the 1-percent annual chance flood on Otter Creek, Jones Brook, and the portions of the Neshobe River and Arnold Brook beyond the limits of detailed study were determined by a regional stage-frequency method developed for streams in Vermont (Vermont Department of Water Resources, 1974).

During floods, debris and/or ice collecting at bridges and culverts, and other construction could decrease the flood flow-carrying capacity of these structures and cause higher water-surface elevations upstream. However, it is impossible to predict the location or degree of an accumulation of debris and/or ice. Therefore, it was necessary to assume unobstructed bridge and culvert openings in the development of the Flood Profiles.

In the Town of Castleton, starting water-surface elevations for the Castleton River were determined by the slope/area method. Starting water-surface elevations for North Breton Brook were determined from a known elevation.

In the Town of Clarendon, starting water-surface elevations for the Clarendon River were determined by the slope/area method. For Otter Creek, starting water-surface elevations were taken from the FIS for the contiguous community of Rutland, Vermont (U.S. Department of Housing and Urban Development, 1978).

In the Town of Danby, starting water-surface elevations on Otter Creek were determined by a step-backwater analysis presented in the FIS for Wallingford, Vermont (U.S. Department of Housing and Urban Development, unpublished). Starting water-surface elevations on Mill Brook 2 were determined by the step-backwater analysis of Mill Brook 2 performed for the Mount Tabor, Vermont, FIS (U.S. Department of Housing and Urban Development, unpublished).

The extent of 1-percent annual chance flooding on the streams studied by approximate methods was determined through the use of a regional stage-frequency relationship developed for streams in Vermont and the use of the FIA Flood Hazard Boundary Map (FHBM) for the Town of Danby (State of Vermont, 1974; U.S. Department of Housing and Urban Development, 1974).

In the Town of Fair Haven, the September 1990 version of HEC-2 was used for the computations. Starting water-surface elevations for the Castleton River were determined by the slope/area method.

In the Town of Mt. Tabor, starting water-surface elevations on Mill Brook 2 were determined by a culvert analysis for the flow of Mill Brook 2 through the Vermont Railway bridge (U.S. Department of Commerce, December 1965).

The information from which the detailed flooding for Otter Creek was analyzed came from the Town of Danby, Vermont, FIS (FEMA, 1980).

The extent of 1-percent annual chance flooding on the streams studied by approximate methods were determined through the use of a regional stage-frequency relationship developed for streams in Vermont and the use of the FHBM for Mount Tabor (Vermont Department of Water Resources, 1974; U.S. Department of Housing and Urban Development, 1976).

In the Town of Pittsfield, in the SCS study, the WSP-2 computer program and TR-64 were used to determine water-surface elevations of floods of the selected recurrence intervals (U.S. Department of Agriculture, 1976; U.S. Department of Agriculture, 1978). Starting water-surface elevations were taken from the Town of Stockbridge.

In the Town of Pittsford, the 1-percent annual chance flood elevations for Otter Creek were based on high-water marks of notable past floods located along Otter Creek that were field surveyed to the National Geodetic Vertical Datum of 1929 (NGVD 29) during the summer of 1986. Elevations for floods during 1811, 1913, 1927, and 1938 were measured at 368.21, 365.03, 370.42, and 366.62 feet, respectively; these high-water marks are chiseled marks in bedrock outcrop on the west side of Proctor-Florence Road approximately 1,800 feet south of the intersection of covered bridge road. Also used in the analyses were streambed elevations surveyed to NGVD during the same period as well as flood-crest data given in USGS Water-Supply Paper 798 (U.S. Department of the Interior, 1937).

At the upstream end of the study, 1-percent annual chance flood elevations and streambed elevations for the FIS for the Town of Proctor were used where Otter Creek is the common boundary between Pittsford and Proctor (FEMA, 1978).

In the Town and Village of Poultney, starting water-surface elevations on the Poultney River were determined by the slope/area method.

The extent of 1-percent annual chance flooding on streams studied by approximate methods was determined through the use of a regional stage-frequency relationship developed for streams in Vermont and the use of a report including the FIA FHBMs for the Town and the Village of Poultney (Vermont Department of Water Resources, 1974; U.S. Department of Housing and Urban Development, July 1975; U.S. Department of Housing and Urban Development, August 1975).

In the City of Rutland, starting water-surface elevations for Otter Creek were established from a discharge-elevation rating curve for a dam located 500 feet downstream from the corporate limit. Starting elevations for East Creek and Moon Brook were obtained from the multiple profile determinations for Otter Creek, with each flood computed from the same recurrence interval flood on Otter Creek. Mussey Brook starting elevations were established from the Moon Brook multiple profiles. Coincident flooding of these tributaries with the parent stream is assumed in the computation of flood elevations. Coincidence is assumed based on historical information.

For the streams studied by approximate methods, the 1-percent annual chance flood was established using a stage-drainage area curve (Agency of Environmental Conservation, 1974), special FHBMs (U.S. Department of Housing and Urban Development, 1974), and historical flood information from town officials and local residents.

In the Town of Rutland, starting elevations on Otter Creek were rating curves developed for dams located in Proctor and Center Rutland. The starting elevations for the portion of Otter Creek upstream of the City of Rutland were obtained from preliminary computations for the City of Rutland FIS (Correspondence, April 1977). The starting elevations on East Creek were obtained from a rating curve for Patch Dam supplied by the Central Vermont Public Service Corporation (Correspondence, February 1977). Starting elevations on the remaining streams studied in detail were determined by the slope/area method at the first cross section.

In the Town of Shrewsbury, the starting water-surface elevations for Mill River and Freeman Brook were obtained by the slope/area method. On Shrewsbury Brook, the starting water-surface elevations upstream of Town Hill Road were obtained from a method developed by the Bureau of Public Roads (Bureau of Public Roads, 1965), and a subcritical flow profile was computed for the upstream section. Downstream of Town Hill Road, the starting water-surface elevations were set at critical depth, and a supercritical flow profile was computed for the downstream portion of the brook. A similar analysis was conducted for Cold River upstream and downstream of Wilmouth Hill Road.

The approximate elevations of the 1-percent annual chance flood on Gould Brook and the portions of the Mill River, Shrewsbury Brook, Freeman Brook, and Cold River beyond the limits of detailed study were determined by a regional stage-frequency method developed for streams in Vermont (Vermont Historical Records Survey, 1940).

In the Town of Wallingford, starting water-surface elevations on Otter Creek were determined through the use of the USACE HEC-2 step-backwater computations for the FIS of the Otter Creek in Clarendon, Vermont (USACE, 1968; FEMA, undated). Starting water-surface elevations for Homer Stone Brook and Mill River were calculated as critical depth. Starting water-surface elevations for Roaring Brook were determined by means of the slope/area method.

The extent of 1-percent annual chance flooding on streams studied by approximate methods was determined through the use of the FIA FHBM for Wallingford (U.S. Department of Housing and Urban Development, 1976).

In the Town of Wells, starting water-surface elevations for Wells Brook were determined using the slope/area method. In t hose areas where analysis indicated supercritical flow conditions, critical depth was assumed for the flood elevation because of the inherent instability of supercritical flow. Starting water-surface elevations for Mill Brook 1 were taken from elevations on Wells Brook at the confluence of Mill Brook 1.

For the Town of West Rutland, water-surface elevations for floods of the selected recurrence intervals were computed through the use of USACE HEC-RAS program (USACE, 2003). Normal depth was used as the starting water-surface elevation for Clark Hill Brook (French, 1985). The normal pool elevation of the ponded area of the Castleton River at the mouth of the Urban Lateral was used as the starting water-surface elevation for the Urban Lateral.

Water-surface elevation determined at each cross section were then used along with the USGS 1:24,000 Digital Raster Graphs to determine the extent of flooding (USGS, 1964, 1998).

Countywide Analyses

Starting downstream boundary conditions in the hydraulic models for East Creek and Moon Brook were set to normal depth. However, flood water surface elevations for these streams near the confluence of Otter Creek are determined by the back water effect from Otter Creek. The hydraulic model for Otter Creek was started just downstream of the Center Rutland Dam assuming normal depth. The dam is a hydraulic control and as a result, water surface elevations upstream of the Center Rutland Dam are dictated by the hydraulic characteristics of the dam itself, and not the starting water surface downstream of the dam.

Information on hydraulic structures such as bridges, culverts, and dams were obtained from field survey or "as-built" record drawings obtained from the Vermont Department of Transportation (VDOT) or communities in the study area.

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

Cross sections were determined from topographic maps and field surveys. All bridges, dams, and culverts were field surveyed to obtain elevation data and structural geometry. All topographic mapping used to determine cross sections is referenced in Section 4.1.

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

Roughness factors (Manning's "n") used in the hydraulic computations were chosen by engineering judgment and were based on field observations of the streams and floodplain areas. Roughness factors for all streams studied by detailed methods are shown in Table 5, "Manning's "n" Values."

TABLE 5 – MANNING'S "n" VALUES

Stream	Channel "n"	Overbank "n"
Arnold Brook	0.045	0.035 – 0.100
Castleton River	0.030 – 0.055	0.045 – 0.150
Clarendon River	0.035 – 0.065	0.035 – 0.120
Clark Hill Brook	0.035 – 0.060	0.035 – 0.100
Creed Brook	0.045 – 0.070	0.030 – 0.150
Curtis Brook	0.045 – 0.065	0.035 – 0.100
East Creek	0.035 – 0.095	0.030 – 0.100
Flower Brook	0.025 – 0.050	0.025 – 0.100
Freeman Brook	0.045 – 0.080	0.030 – 0.120
Guernsey Brook	0.053 – 0.058	0.070 – 0.095
Homer Stone Brook	0.045 – 0.060	0.045 – 0.120
Indian River	0.025 – 0.050	0.025 – 0.100
Mettawee River	0.025 – 0.050	0.025 – 0.100
Mill Brook No. 1	*	*
Mill Brook No. 2	0.030 – 0.050	0.015 – 0.075
Mill River	0.040 – 0.060	0.027 – 0.120
Moon Brook	0.035	0.050 – 0.100
Mussey Brook	0.030 – 0.080	0.030 – 0.120
Neshobe River	0.040 – 0.069	0.050 – 0.150
North Branch Tenny Brook	0.050 – 0.060	0.070 – 0.100

*Data not available

TABLE 5 – MANNING'S "n" VALUES - continued

Stream	Channel "n"	Overbank "n"
North Breton Brook	0.030 – 0.055	0.045 – 0.150
Otter Creek	0.035 – 0.120	0.015 – 0.150
Pinnacle Ridge Brook	0.045	0.035 – 0.050
Poultney River	0.035 – 0.080	0.025 – 0.084
Roaring Brook	0.030 – 0.060	0.015 – 0.120
Shrewsbury Brook	0.045 – 0.080	0.030 – 0.120
South Branch Tenny Brook	0.050 – 0.055	0.035 – 0.080
South Branch Tweed River	0.053 – 0.063	0.013 – 0.095
Tenny Brook	0.05	0.060 – 0.073
Tweed River	0.053	0.060 – 0.100
Urban Lateral	0.035 – 0.055	0.035 – 0.100
Wells Brook	*	*
West Branch Tweed River	0.06	0.024 – 0.105

*Data not available

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

All elevations are referenced to the North American Vertical Datum of 1988 (NAVD88). Qualifying bench marks within a given jurisdiction that are cataloged by the National Geodetic Survey (NGS) and entered into the National Spatial Reference System (NSRS) as First or Second Order Vertical and have a vertical stability classification of A, B, or C are shown and labeled on the FIRM with their 6-character NSRS Permanent Identifier.

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

- Stability A: Monuments of the most reliable nature, expected to hold position/elevation well (e.g., mounted in bedrock)
- Stability B: Monuments which generally hold their position/elevation well (e.g., concrete bridge abutment)
- Stability C: Monuments which may be affected by surface ground movements (e.g., concrete monument below frost line)
- Stability D: Mark of questionable or unknown vertical stability (e.g., concrete monument above frost line, or steel witness post)

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

To obtain current elevation, description, and/or location information for bench marks shown on the FIRM for this jurisdiction, please contact the Information Services Branch of the NGS at (301) 713-3191, or visit their Web site at www.ngs.noaa.gov.

It is important to note that temporary vertical monuments are often established during the preparation of a flood hazard analysis for the purpose of establishing local vertical control. Although these monuments are not shown on the FIRM, they may be found in the Technical Support Data Notebook associated with this FIS and FIRM. Interested individuals may contact FEMA to access this data.

3.3 Vertical Datum

All FISs and FIRMs are referenced to a specific vertical datum. The vertical datum provides a starting point against which flood, ground, and structure elevations can be referenced and compared. Until recently, the standard vertical datum in use for newly created or revised FISs and FIRMs was the National Geodetic Vertical Datum of 1929 (NGVD 29). With the finalization of the North American Vertical Datum of 1988 (NAVD 88), many FIS reports and FIRMs are being prepared using NAVD 88 as the referenced vertical datum.

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

Prior versions of the FIS report and FIRM were referenced to NGVD 29. When a datum conversion is effected for an FIS report and FIRM, the Flood Profiles, base flood elevations (BFEs) and ERMs reflect the new datum values. To compare structure and ground elevations to 1-percent annual chance flood elevations shown in the FIS and on the FIRM, the subject structure and ground elevations must be referenced to the new datum values.

As noted above, the elevations shown in the FIS report and on the FIRM for Rutland County are referenced to NAVD 88. Ground, structure, and flood elevations may be compared and/or referenced to NGVD 29 by applying a standard conversion factor. The conversion factor to NGVD 29 is +0.4 foot. The BFEs shown on the FIRM represent whole-foot rounded values. For example, a BFE of 102.4 will appear as 102 on the FIRM and 102.6 will appear as 103. Therefore, users that wish to convert the elevations in this FIS to NGVD 29 should apply the stated conversion factor(s) to elevations shown on the Flood

Profiles and supporting data tables in the FIS report, which are shown at a minimum to the nearest 0.1 foot.

For more information on NAVD 88, see Converting the National Flood Insurance Program to the North American Vertical Datum of 1988, FEMA Publication FIA-20/June 1992, or contact the Spatial Reference System Division, National Geodetic Survey, NOAA, Silver Spring Metro Center, 1315 East-West Highway, Silver Spring, Maryland 20910 (Internet address http://www.ngs.noaa.gov).

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

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

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1-percent annual chance flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2-percent annual chance flood is employed to indicate additional areas of flood risk in the county. For the streams studied in detail, the 1- and 0.2-percent annual chance floodplain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using topographic maps at a scale of 1:24,000, with a contour interval of 5 feet (Vermont Department of Highways, 1959); topographic maps at a scale of 1:24,000, enlarged to a scale of 1:4,800 with a contour interval of 20 feet (U.S. Department of the Interior, 1944, et cetera); topographic maps at a scale of 1:2,400 with a contour interval of 5 feet (State of Vermont, 1967); topographic maps at a scale of 1:24,000, enlarged to a scale of 1:6,000 with a contour interval of 20 feet (U.S. Department of the Interior, 1944, et cetera); Vermont Highway Department photogrammetric maps at a scale of 1:2,400, with a contour interval of 5 feet (Vermont Department of Highways, 1967), photographically enlarged quadrangle maps at a scale of 1:9,600, with a contour interval of 20 feet (USGS, 1967, et cetera), topographic maps at a scale of 1:24,000, with a contour interval of 10 feet (U.S. Department of the Interior, 1970, et cetera); and contour lines on 1:24,000 Digital Raster Graph with a contour interval of 20 feet (USGS, 1998).

For the streams studied by approximate methods, the boundary of the 1-percent annual chance flood has been delineated using elevations determined by a regional stage frequency method (Vermont Department of Water Resources, 1974). In addition, in the Town of Brandon, approximate boundaries on Breese Mill Brook, Sugar Hollow Brook, and several small unnamed tributaries and swamps were taken from the Flood Hazard Boundary Map (FHBM) (U.S. Department of Housing and Urban Development, September 1974). The boundary of the 1-percent annual chance flood was delineated using the FHBM for the Town of Castleton (U.S. Department of Housing and Urban Development, 1977), the FHBM for the Town of Clarendon (U.S. Department of Housing and Urban Development, 1974), the FHBM for the Town of Danby (State of Vermont, 1974; U.S. Department of Housing and Urban Development, June 1974), the FHBM for the Town of Fair Haven (USHUD, February 1977), the FHBM for Mount Tabor (U.S. Department of Housing and Urban Development, 1976), the FHBM for the Town of Pittsfield (U.S. Department of the Interior, 1970, et cetera), the FHBM for the Town of Pittsford (U.S. Department of Housing and Urban Development, June 3, 1977), FHBMs for the Town and Village of Poultney (U.S. Department of Housing and Urban Development, July 1975; U.S. Department of Housing and Urban Development, August 1975), the FHBM for the City of Rutland (U.S. Department of Housing and Urban Development, March 1974), the FHBM for the Town of Wallingford (Vermont Department of Water Resources, August 1974), the FHBM for the Town of Wells (U.S. Department of Housing and Urban Development, September 1976); and the previously printed FIRM for the Town of West Rutland (FEMA, 2005).

The boundary of the 1-percent annual chance flood was delineated using the elevations determined by a regional stage-frequency method (Vermont Department of Water Resources, 1974) and by a Flood Prone Area Map developed by the SCS for the Town of Pawlet to determine ordinance limits. This map is unpublished and was composed at the town's request. Several tributaries to Mettawee Brook, Dry Brook, Rush Hollow, and several small swamps were added from the FHBM (U.S. Department of Housing and Urban Development, 1974; U.S. Department of Housing and Urban Development, 1976).

In the Town of Proctor, a small swampy area with a drainage area less than one square mile, located along the southwest corporate limit, was added from the FHBM (U.S. Department of Housing and Urban Development, May 1974). The area of Beaver Pond with a drainage area less than one square mile, located west of the Southerland Falls Dam, has also been added from the FHBM.

In the Town of Rutland, certain SFHAs were added to the Flood Boundary and Floodway Map (FBFM) and the FIRM based upon the FHBM (U.S. Department of Housing and Urban Development, 1975). These areas include: Rutland City Reservoir, an area north of Perkins Road in the southeastern part of the community, and small tributaries of Otter Creek upstream of the Vermont Railroad in the south-central part of the community.

Certain areas shown on the FHBM (U.S. Department of Housing and Urban Development, 1975) were determined to be areas of minimal flooding and, as such, have not been included on the FBFM and the FIRM.

Flood-Prone Area Maps prepared by the USGS (USGS, 1969, et cetera) indicate areas that may be occasionally flooded by Otter Creek, the Clarendon River, and

East Creek within the Town of Rutland. A map of Flood Hazard Areas in the Town of Rutland was prepared as part of land use guidance study (Durkee, S., 1974). Both of these sources were used as aids in developing approximate 1-percent annual chance flood boundaries.

For the revised streams, the boundaries between cross sections were determined using GIS. Automated modeling techniques were done by the GIS to best determine the extent of flooding. LIDAR derived data sets, a gridded Digital Elevation Model (DEM), and Triangulated Irregular Network files were imported to the GIS and using a 2 foot contour interval. A mass point and breaklines were used for hydrology and hydraulic modeling and delineation of the floodplain.

The 1- and 0.2-percent annual chance floodplain boundaries are shown on the FIRM (Exhibit 2). On this map, the 1-percent annual chance floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones A and AE), and the 0.2-percent annual chance floodplain boundary corresponds to the boundary of areas of moderate flood hazards. In cases where the 1- and 0.2-percent annual chance floodplain boundaries are close together, only the 1-percent annual chance floodplain boundary has been shown. Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

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

4.2 Floodways

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

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

No floodways were computed for the flooding sources in the Towns of Clarendon and West Rutland.

A floodway has been added to the upper reach of Otter Creek from data taken from the FIS for the Town of Proctor (FEMA, 1978).

In the City of Rutland, the floodways along East Creek, Moon Brook, and Mussey Brook were computed on the basis of equal conveyance reduction without consideration of backwater flooding from their respective confluent streams.

In the Town of Fair Haven, from the downstream corporate limits to Depot Street Dam, the floodways were computed on the basis of equal conveyance reduction from each side of the floodplains. From Depot Street Dam to the upstream corporate limits, the floodway represents the limits of the existing 1-percent annual chance floodplain. From the Depot Street Dam to River Street, the floodwaters overtop the right bank of the Castleton River and rejoin the river downstream of the Depot Street Dam. If the overtopping of the right overbank is eliminated, the computed water-surface elevations would increase by more than 1.0 foot above the existing levels. Peak flows decrease from the upstream corporate limits to River Street. This indicates that the storage provided by the large wetlands area within this reach was utilized in the hydrologic computations. A reduction of storage within this reach would result in increased flows for the Castleton River reaches downstream of River Street. The Town of Fair Haven was consulted on this matter and with the town's concurrence, the decision was made to show the floodway equal to the existing 1-percent annual chance floodplain.

A portion of the floodway width for the Tweed River extends beyond the county boundary.

Floodway widths were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. The results of the floodway computations are tabulated for selected cross sections (Table 6). The computed floodways are shown on the FIRM (Exhibit 2). In cases where the floodway and 1-percent annual chance floodplain boundaries are either close together or collinear, only the floodway boundary is shown.

Near the mouths of streams studied in detail, floodway computations are made without regard to flood elevations on the receiving water body. Therefore, "Without Floodway" elevations presented in Table 6 for certain downstream cross sections of the Clarendon River, East Creek, Moon Brook, Mussey Brook, and North Breton Brook, are lower than the regulatory flood elevations in that area, which must take into account the 1-percent annual chance flooding due to backwater from other sources.

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." In order to reduce the risk of property damage in areas where the stream velocities are high, the community may wish to restrict development in areas outside the floodway.

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Arnold Brook								
A	5,400[1]	181	74	4.6	403.4	403.4	403.4	0.0
B	6,100[1]	71	28	12.1	435.0	435.0	435.0	0.0
C	6,285[1]	330	1,088	0.3	442.8	442.8	443.8	1.0
D	6,485[1]	115	541	0.6	442.8	442.8	443.8	1.0
Castleton River								
A	164[2]	138	1,740	4.5	303.7	303.7	304.7	1.0
B	1,636[2]	190	2,058	3.8	305.2	305.2	306.2	1.0
C	2,340[2]	116	1,467	5.4	306.0	306.0	306.8	0.8
D	5,040[2]	274	2,911	2.7	308.5	308.5	309.5	1.0
E	8,608[2]	121	1,863	4.2	310.0	310.0	311.0	1.0
F	11,360[2]	210	1,574	5.0	312.4	312.4	313.3	0.9
G	14,080[2]	238	2,745	2.9	315.6	315.6	316.6	1.0
H	15,916[2]	260	2,028	3.9	316.5	316.5	317.4	0.9
I	16,230[2]	80	723	10.9	316.8	316.8	317.5	0.7
J	16,320[2]	115	1,596	5.0	325.8	325.8	326.5	0.7
K	16,490[2]	140	1,574	5.0	326.0	326.0	326.7	0.7
L	16,675[2]	170	2,313	3.4	326.3	326.3	327.0	0.7
M	16,760[2]	120	1,372	5.8	338.7	338.7	339.2	0.5
N	16,900[2]	49	723	10.9	340.9	340.9	341.6	0.7
O	17,300[2]	90	1,394	5.7	343.0	343.0	343.5	0.5
P	18,150[2]	586	2,959	2.7	368.9	368.9	368.9	0.0
Q	19,070[2]	907	6,720	1.2	369.4	369.4	369.4	0.0
R	20,000[2]	1,824	16,582	0.5	369.6	369.6	369.6	0.0
S	20,650[2]	2,928	26,050	0.3	369.6	369.6	369.6	0.0
T	20,690[2]	2,928	26,105	0.3	369.7	369.7	369.7	0.0
U	24,820[2]	1,235	9,859	0.9	369.8	369.8	369.8	0.0

[1] Feet above Vermont Railway
[2] Feet above confluence with Poultney River

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

RUTLAND COUNTY, VT (ALL JURISDICTIONS)

FLOODWAY DATA

ARNOLD BROOK - CASTLETON RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Castleton River (continued)								
V	26,050	550	5,289	1.8	369.9	369.9	369.9	0.0
W	29,205	1,005	8,682	1.1	371.3	371.3	371.3	0.0
X	31,637	470	3,874	1.3	371.6	371.6	371.6	0.0
Y	32,249	292	1,034	4.7	372.7	372.7	372.7	0.0
Z	33,405	750	5,675	0.9	372.7	372.7	372.9	0.2
AA	35,797	1,709	6,861	0.7	372.9	372.9	373.2	0.3
AB	38,657	1,500	2,514	1.9	374.0	374.0	374.1	0.1
AC	40,909	1,035	1,999	2.4	380.4	380.4	380.5	0.1
AD	41,321	200	1,046	4.7	382.8	382.8	382.8	0.0
AE	43,453	1,100	1,965	2.5	384.8	384.8	385.2	0.4
AF	46,661	800	2,706	1.8	389.3	389.3	390.3	1.0
AG	48,637	440	1,641	2.7	394.4	394.4	394.7	0.3
AH	51,205	300	1,050	4.2	398.5	398.5	398.9	0.4
AI	52,541	330	998	4.4	403.0	403.0	403.5	0.5
AJ	53,137	64	454	9.6	406.4	406.4	406.4	0.0
AK	53,341	150	1,061	4.1	409.0	409.0	410.0	1.0
AL	54,861	600	2,405	1.8	411.3	411.3	412.1	0.8
AM	55,057	600	4,161	1.1	414.7	414.7	415.1	0.4
AN	56,753	550	580	7.6	418.4	418.4	418.8	0.4
AO	58,253	601	2,025	2.2	423.9	423.9	424.7	0.8
AP	59,605	205	643	3.8	427.2	427.2	427.6	0.4
AQ	60,709	80	436	5.5	430.5	430.5	430.5	0.0
AR	60,933	97	442	5.5	431.6	431.6	431.6	0.0
AS	62,693	235	1,109	2.2	435.8	435.8	436.8	1.0
AT	62,869	200	1,085	2.2	439.9	439.9	439.9	0.0
AU	64,609	129	892	2.7	440.8	440.8	441.0	0.2

[1] Feet above confluence with Poultney River

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

RUTLAND COUNTY, VT (ALL JURISDICTIONS)

FLOODWAY DATA

CASTLETON RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Castleton River (continued)								
AV	65,705[1]	339	1,367	1.8	441.4	441.4	441.9	0.5
AW	66,461[1]	185	388	6.2	443.0	443.0	443.0	0.0
AX	69,093[1]	275	822	2.9	452.8	452.8	453.3	0.5
AY	70,817[1]	439	1,849	1.3	456.4	456.4	456.7	0.3
AZ	71,329[1]	300	562	4.3	461.5	461.5	461.5	0.0
BA	72,109[1]	273	663	3.6	465.7	465.7	465.9	0.2
BB	72,289[1]	600	4,010	0.6	468.9	468.9	469.6	0.7
BC	77,121[1]	380[4]	3,482	0.7	469.2	469.2	470.0	0.8
Clarendon River								
A	1,500[2]	61	486	10.0	486.8	484.9[6]	485.6	0.7
B	1,790[2]	128	1,079	4.5	487.8	487.8	488.0	0.2
C	2,320[2]	134	1,312	3.7	488.9	488.9	489.0	0.1
D-R**								
Clark Hill Brook								
A	32[3]	25[5]	55	4.5	497.2	*	*	*
B	95[3]	117[5]	180	1.4	498.9	*	*	*
C	500[3]	293[5]	204	1.2	499.3	*	*	*
D	700[3]	282[5]	456	0.5	500.6	*	*	*
E	920[3]	209[5]	185	1.3	501.4	*	*	*
F	1,560[3]	300[5]	38	6.6	504.9	*	*	*
G	2,204[3]	15[5]	46	5.4	517.7	*	*	*
H	2,307[3]	15[5]	62	4.0	520.7	*	*	*
I	2,484[3]	15[5]	31	8.1	525.3	*	*	*

[1] Feet above confluence with Poultney River
[2] Feet above confluence with Otter Creek
[3] Feet above confluence with Clarendon River
[4] Width within the Town of Castleton
[5] Floodway not mapped
[6] Elevation computed without consideration of backwater effects from Otter Creek
*Data not available
**Floodway not computed; floodplain not developed

FEDERAL EMERGENCY MANAGEMENT AGENCY

RUTLAND COUNTY, VT (ALL JURISDICTIONS)

FLOODWAY DATA

CASTLETON RIVER – CLARENDON RIVER – CLARK HILL BROOK

TABLE 6

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Clark Hill Brook (continued)								
J	2,805[1]	50	154	1.6	538.0	*	*	*
K	2,908[1]	35	147	1.7	540.8	*	*	*
L	3,915[1]	27	36	7.0	580.8	*	*	*
M	5,691[1]	19	33	7.6	691.1	*	*	*
Cold River								
A	11,600[2]	85	544	19.6	1,158.7	1,158.7	1,158.7	0.0
B	13,560[2]	118	829	12.9	1,198.9	1,198.9	1,199.9	1.0
C	14,900[2]	91	534	20.0	1,222.3	1,222.3	1,222.4	0.1
D	16,600[2]	89	681	15.6	1,256.8	1,256.8	1,257.8	1.0
E	18,100[2]	75	503	21.2	1,281.1	1,281.1	1,282.0	0.9
F	19,500[2]	102	871	12.2	1,313.7	1,313.7	1,314.7	1.0
G	20,800[2]	196	967	11.0	1,335.9	1,335.9	1,336.9	1.0
H	21,250[2]	209	982	10.8	1,344.2	1,344.2	1,345.2	1.0
I	22,000[2]	73	440	24.2	1,355.9	1,355.9	1,356.9	1.0
J	22,340[2]	115	944	11.3	1,366.7	1,366.7	1,367.3	0.6
K	22,540[2]	122	751	14.2	1,370.9	1,370.9	1,371.0	0.1
Creed Brook								
A	570[3]	106	68	5.7	633.5	633.5	633.5	0.0
B	1,850[3]	93	263	1.5	640.8	640.8	641.6	0.8
C	3,920[3]	46	63	6.2	652.6	652.6	652.8	0.2
D	4,050[3]	37	163	1.6	660.8	660.8	660.8	0.0
E	4,260[3]	57	161	1.6	662.8	662.8	663.6	0.8
F	4,400[3]	19	34	7.7	663.6	663.6	664.3	0.7

[1] Feet above confluence with Clarendon River
[2] Feet above the Town of Clarendon/Town of Shrewsbury corporate limits (corporate limits are approximately 0.97 miles downstream of confluence of North Branch Cold River)
[3] Feet above confluence with East Creek

Floodway not mapped

FEDERAL EMERGENCY MANAGEMENT AGENCY

RUTLAND COUNTY, VT (ALL JURISDICTIONS)

FLOODWAY DATA

CLARK HILL BROOK - COLD RIVER – CREED BROOK

TABLE 6

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Curtis Brook								
A	1,950[1]	164	193	2.5	674.3	674.3	675.3	1.0
B	2,300[1]	50	106	4.6	677.3	677.3	678.0	0.7
C	2,450[1]	50	113	4.3	679.5	679.5	679.7	0.2
D	2,550[1]	100	341	1.3	681.8	681.8	681.8	0.0
E	3,500[1]	107	77	4.3	686.8	686.8	687.5	0.7
F	4,250[1]	107	99	3.3	696.8	696.8	697.8	1.0
East Creek								
A	1,438[2]	62	392	10.9	531.9	527.0[3]	527.2	0.2
B	2,602[2]	52	429	9.9	532.6	532.6	532.9	0.3
C	3,318[2]	59	540	7.9	535.2	535.2	535.9	0.7
D	3,886[2]	48	399	10.7	536.3	536.3	537.2	0.9
E	4,673[2]	63	531	8.0	539.8	539.8	540.6	0.8
F	5,848[2]	125	855	4.5	544.7	544.7	545.5	0.8
G	6,630[2]	99	809	4.8	545.9	545.9	546.8	0.9
H	8,908[2]	64	432	8.9	555.9	555..9	556.2	0.3
I	10,933[2]	96	354	10.9	567.6	567.6	567.6	0.0
J	11,430[2]	86	620	6.2	573.6	573.6	573.6	0.0
K	12,320[2]	226	3,143	1.2	602.6	602.6	602.6	0.0
L	13,848[2]	100	1,008	3.7	602.7	602.7	602.7	0.0
M	14,668[2]	80	608	6.2	602.9	602.9	602.9	0.0
N	15,104[2]	93	460	8.2	603.4	603.4	603.6	0.1
O	15,442[2]	182	1,164	3.2	605.2	605.2	605.3	0.1
P	16,306[2]	96	401	9.4	605.7	605.7	605.7	0.0
Q	16,991[2]	69	519	7.3	609.8	609.8	609.8	0.0
R	18,789[2]	85	432	8.7	615.9	615.9	616.7	0.8
S	20,046[2]	167	659	5.7	623.7	623.7	624.6	0.9

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

FEDERAL EMERGENCY MANAGEMENT AGENCY

RUTLAND COUNTY, VT (ALL JURISDICTIONS)

FLOODWAY DATA

CURTIS BROOK - EAST CREEK

TABLE 6

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
East Creek (continued)								
T	20,608[1]	107	603	6.3	628.4	628.4	629.2	0.8
U	22,243[1]	47	341	10.7	638.2	638.2	638.7	0.5
V	22,587[1]	146	834	4.4	642.7	642.7	642.8	0.1
W	23,260[1]	58	330	11.1	643.5	643.5	643.9	0.4
X	24,121[1]	71	362	10.1	650.4	650.4	650.7	0.3
Y	25,185[1]	73	386	9.5	660.0	660.0	660.6	0.6
Z	26,548[1]	370	771	4.4	674.7	674.7	674.7	0.0
AA	26,938[1]	419	1,216	2.8	678.0	678.0	678.0	0.0
AB	27,974[1]	393	1,427	3.6	694.0	694.0	694.5	0.5
AC	31,512[1]	110	428	7.9	743.4	743.4	743.4	0.0
AD	32,114[1]	131	360	9.4	752.2	752.2	752.2	0.0
Flower Brook								
A	290[2]	72	387	9.0	634.2	634.2	635.2	1.0
B	475[2]	50	326	10.7	635.2	635.2	636.2	1.0
C	1,300[2]	57	333	10.5	646.7	646.7	646.7	0.0
D	1,406[2]	33	395	8.8	658.2	658.2	658.3	0.1
E	1,466[2]	30	359	9.7	658.5	658.5	658.6	0.1
F	1,567[2]	26	269	13.0	661.7	661.7	661.7	0.0
G	1,635[2]	93	1,153	3.0	683.7	683.7	684.7	1.0
H	1,805[2]	160	1,598	2.2	683.8	683.8	684.8	1.0
I	2,625[2]	99	359	9.7	686.8	686.8	687.2	0.4
J	3,525[2]	104	498	7.0	695.5	695.5	696.3	0.8
K	3,689[2]	73	667	5.3	701.7	701.7	701.7	0.0
L	4,599[2]	57	329	10.7	704.8	704.8	705.8	1.0

[1] Feet above confluence with Otter Creek
[2] Feet above confluence with Mettawee River

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

RUTLAND COUNTY, VT (ALL JURISDICTIONS)

FLOODWAY DATA

EAST CREEK - FLOWER BROOK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Flower Brook (continued)								
M	5,159[1]	68	341	9.7	712.8	712.8	712.8	0.0
N	5,233[1]	70	547	6.0	716.9	716.9	717.1	0.2
O	5,283[1]	283	1,955	1.7	717.6	717.6	717.8	0.2
Freeman Brook								
A	5,700[2]	69	350	5.3	1,488.0	1,488.0	1,489.0	1.0
B	5,925[2]	53	273	3.5	1,490.1	1,490.1	1,491.0	0.9
C	6,300[2]	116	1,332	0.7	1,498.8	1,498.8	1,499.5	0.7
Guernsey Brook								
A	125[3]	250[5]	1,541	1.46	843.3	843.3	844.3	1.0
B	955[3]	46	238	9.34	862.8	862.8	863.8	1.0
C	1,915[3]	71	279	7.87	902.7	902.7	903.7	1.0
Homer Stone Brook								
A	200[4]	64	260	11.5	633.5	633.5	633.5	0.0
B	350[4]	70	384	7.8	638.9	638.9	638.9	0.0
C	600[4]	80	280	10.7	642.7	642.7	642.7	0.0
D	850[4]	80	280	10.7	650.8	650.8	650.8	0.0
E	1,050[4]	250	503	6.0	665.6	665.6	665.6	0.0
F	1,145[4]	46	271	11.1	671.0	671.0	671.6	0.6
G	1,250[4]	46	232	12.9	675.8	675.8	675.8	0.0
H	1,450[4]	46	231	13.0	684.7	684.7	684.7	0.0

[1] Feet above confluence with Mettawee River
[2] Feet above the Town of Shrewsbury/Town of Mt. Holly corporate limits (corporate limits are approximately 1,820 feet upstream of confluence of Russell Brook)
[3] Feet above State Route 100 (County Boundary)
[4] Feet above confluence with Otter Creek
[5] Width within county

FEDERAL EMERGENCY MANAGEMENT AGENCY

RUTLAND COUNTY, VT (ALL JURISDICTIONS)

TABLE 6

FLOODWAY DATA

FLOWER BROOK - FREEMAN BROOK – GUERNSEY BROOK – HOMER STONE BROOK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Indian River								
A	37,820[1]	129	594	8.9	510.4	510.4	511.4	1.0
B	38,195[1]	80	438	12.1	521.8	521.8	521.8	0.0
C	38,257[1]	79	871	6.1	523.7	523.7	524.2	0.5
D	38,274[1]	67	587	9.0	526.6	526.6	527.6	1.0
E	38,666[1]	130	960	5.5	529.1	529.1	529.9	0.8
F	39,074[1]	110	829	6.4	530.5	530.5	530.9	0.4
G	39,157[1]	104	1,059	5.0	533.4	533.4	533.7	0.3
H	39,687[1]	247	2,146	2.4	534.2	534.2	534.7	0.5
Mettawee River								
A	109,400[2]	267	1,872	6.8	404.4	404.4	405.4	1.0
B	110,634[2]	326	2,786	4.6	407.4	407.4	408.4	1.0
C	111,865[2]	360	2,509	5.1	409.3	409.3	410.3	1.0
D	140,795[2]	193	1,282	7.6	564.8	564.8	565.8	1.0
E	141,518[2]	118	850	11.4	569.0	569.0	569.9	0.9
F	142,610[2]	73	787	12.4	577.5	577.5	578.5	1.0
G	143,995[2]	219	1,933	4.9	583.2	583.2	584.2	1.0
H	145,315[2]	149	771	12.1	588.8	588.8	589.4	0.6
I	152,682[2]	117	938	9.7	625.4	625.4	626.4	1.0
J	154,032[2]	103	997	9.1	631.7	631.7	632.7	1.0
K	154,332[2]	82	615	11.3	633.2	633.2	634.0	0.8
L	154,492[2]	76	695	10.0	634.8	634.8	635.6	0.8
M	154,688[2]	79	676	10.4	636.3	636.3	637.0	0.7
N	154,818[2]	207	1,212	5.8	638.6	638.6	638.6	0.0
O	155,798[2]	249	1,524	4.6	640.1	640.1	640.8	0.7

[1] Feet above county boundary
[2] Feet above confluence with Champlain Canal

FEDERAL EMERGENCY MANAGEMENT AGENCY

RUTLAND COUNTY, VT (ALL JURISDICTIONS)

FLOODWAY DATA

INDIAN RIVER – METTAWEE RIVER

TABLE 6

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Mill Brook No. 1								
A	1,200[1]	40	147	6.1	442.7	442.7	443.7	1.0
B	1,360[1]	20	109	8.2	445.2	445.2	445.3	0.1
C	1,480[1]	78	349	2.6	447.4	447.4	447.5	0.1
D	2,690[1]	70	174	5.1	456.3	456.3	457.2	0.9
E	3,690[1]	42	170	5.3	464.6	464.6	464.9	0.3
F	7,190[1]	110	311	2.9	482.6	482.6	483.4	0.8
Mill Brook No. 2								
A	1,150[2]	181	857	5.2	673.9	673.9	673.9	0.0
B	1,195[2]	60	336	13.4	674.2	674.2	674.2	0.0
C	1,420[2]	76	527	8.5	679.0	679.0	679.0	0.0
D	1,485[2]	199	1,101	4.1	680.7	680.7	680.7	0.0
E	1,740[2]	200	546	8.2	682.8	682.8	683.5	0.7
F	2,320[2]	51	318	14.1	697.7	697.7	697.7	0.0
G	2,515[2]	51	347	13.0	703.9	703.9	703.9	0.0
H	2,591[2]	25	255	17.7	706.1	706.1	706.1	0.0
I	2,660[2]	31	384	11.7	711.0	711.0	711.0	0.0
J	2,825[2]	47	308	14.6	711.0	711.0	711.0	0.0
K	2,975[2]	25	248	18.1	714.3	714.3	714.3	0.0
Mill River								
A	4,750[3]	201	1,494	13.3	849.2	849.2	850.2	1.0
B	6,720[3]	137	1,181	16.8	887.6	887.6	887.6	0.0
C	8,280[3]	262	1,663	11.9	896.3	896.3	896.3	0.0
D	9,900[3]	328	3,345	5.9	911.6	911.6	912.2	0.6
E	10,750[3]	266	1,881	10.5	914.7	914.7	915.5	0.8

[1] Feet above confluence with Wells Brook
[2] Feet above confluence with Otter Creek
[3] Feet above the Town of Shrewsbury/Town of Clarendon corporate limits (corporate limits are approximately 0.64 miles upstream of East Street)

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

RUTLAND COUNTY, VT (ALL JURISDICTIONS)

FLOODWAY DATA

MILL BROOK NO. 1 – MILL BROOK NO. 2 – MILL RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Mill River (continued)								
F	13,600	1,122	2,996	6.6	934.3	934.3	935.3	1.0
G	14,630	259	1,536	12.9	945.6	945.6	945.6	0.0
H	16,330	283	1,638	12.1	957.9	957.9	958.2	0.3
I	17,200	342	2,343	8.5	966.1	966.1	967.1	1.0
J	18,100	243	1,451	13.7	975.2	975.2	975.9	0.7
K	18,870	589	2,861	6.3	983.2	983.2	984.2	1.0
L	20,070	117	1,183	15.3	996.5	996.5	996.5	0.0
M	20,700	121	1,182	15.3	1,001.5	1,001.5	1,001.7	0.2
N	21,560	252	2,070	8.7	1,011.1	1,011.1	1,012.0	0.9
O	22,750	217	1,391	13.0	1,025.1	1,025.1	1,025.1	0.0
P	23,500	196	1,727	10.5	1,033.5	1,033.5	1,034.2	0.7
Q	23,900	158	1,312	13.8	1,037.2	1,037.2	1,037.8	0.6
R	25,080	300	1,615	11.2	1,051.3	1,051.3	1,052.2	0.9
S	26,620	180	1,243	10.5	1,068.8	1,068.8	1,069.6	0.8
T	28,220	174	1,224	10.7	1,088.2	1,088.2	1,088.2	0.0
U	29,400	130	867	15.1	1,105.8	1,105.8	1,105.9	0.1
V	30,700	160	1,201	10.9	1,124.8	1,124.8	1,124.9	0.1
W	31,620	249	1,226	10.7	1,139.8	1,139.8	1,139.8	0.0
X	32,560	190	1,529	8.6	1,149.2	1,149.2	1,149.9	0.7
Y	33,640	170	963	13.6	1,162.1	1,162.1	1,162.1	0.0
Z	34,320	216	1,113	11.8	1,171.5	1,171.5	1,171.5	0.0
AA	34,620	208	1,907	6.9	1,176.8	1,176.8	1,177.1	0.3
AB	35,160	155	933	14.0	1,179.4	1,179.4	1,179.4	0.0
AC	35,560	200	1,384	9.5	1,185.9	1,185.9	1,185.9	0.0
AD	35,970	138	872	9.3	1,190.6	1,190.6	1,190.6	0.0

[1] Feet above the Town of Shrewsbury/Town of Clarendon corporate limits (corporate limits are approximately 0.64 miles upstream of East Street)

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

RUTLAND COUNTY, VT (ALL JURISDICTIONS)

FLOODWAY DATA

MILL RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Moon Brook								
A	1,198	55	155	6.2	533.3	526.4[2]	526.8	0.4
B	2,362	19	119	5.5	533.3	530.7	531.3	0.6
C	3,205	60	294	2.2	534.0	534.0	534.6	0.6
D	4,124	27	158	4.1	538.1	538.1	538.1	0.0
E	4,314	34	238	2.7	540.8	540.8	540.8	0.0
F	4,758	40	403	1.6	546.7	546.7	546.7	0.0
G	5,385	60	480	1.4	546.7	546.7	546.8	0.1
H	6,966	84	508	0.8	546.8	546.8	547.8	1.0
I	7,774	26	52	8.0	552.5	552.5	552.6	0.1
J	8,624	123	228	1.8	570.7	570.7	570.7	0.0
K	9,077	33	188	2.2	576.2	576.2	577.1	0.9
L	10,318	21	91	4.6	579.5	579.5	580.2	0.7
M	10,963	17	96	4.4	587.2	587.2	588.0	0.8
N	11,617	25	61	6.9	597.2	597.2	597.4	0.2
O	12,051	35	52	6.3	602.4	602.4	602.4	0.0
P	12,215	79	190	1.7	606.1	606.1	606.1	0.0
Q	13,103	10	32	10.4	615.5	615.5	615.5	0.0
R	14,395	18	45	7.4	638.8	638.8	639.1	0.3
S	15,540	17	40	8.2	655.6	655.6	656.5	0.9
T	16,460	23	57	5.8	675.5	675.5	675.6	0.1

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

FEDERAL EMERGENCY MANAGEMENT AGENCY

RUTLAND COUNTY, VT (ALL JURISDICTIONS)

FLOODWAY DATA

MOON BROOK

TABLE 6

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Mussey Brook								
A	120[1]	125	269	2.3	533.3	526.4[3]	527.4	1.0
B	600[1]	30	123	5.0	533.3	530.8[3]	531.0	0.2
C	1,040[1]	30	197	3.1	533.3	533.2[3]	533.7	0.5
D	1,665[1]	55	594	1.0	540.6	540.6[3]	541.5	0.9
E	2,310[1]	50	396	1.5	540.6	540.6[3]	541.6	1.0
F	3,120[1]	50	317	1.9	540.7	540.7[3]	541.7	1.0
G	800[2]	120	447	1.3	586.4	586.4	586.4	0.0
H	900[2]	25	68	8.4	586.4	586.4	586.4	0.0
I	1,320[2]	29	93	6.1	593.6	593.6	594.5	0.9
J	1,530[2]	43	174	3.3	600.1	600.1	600.1	0.0
K	1,870[2]	18	69	8.3	600.7	600.7	600.7	0.0
L	2,050[2]	35	137	4.2	604.6	604.6	604.6	0.0
M	2,365[2]	29	66	8.7	607.7	607.7	607.7	0.0
N	2,460[2]	67	403	1.4	613.0	613.0	613.0	0.0
O	2,700[2]	62	377	1.5	613.0	613.0	613.0	0.0
P	3,000[2]	50	240	2.4	613.1	613.1	613.1	0.0
Q	3,500[2]	43	76	5.3	613.2	613.2	613.6	0.4
R	3,825[2]	50	118	3.4	616.9	616.9	617.7	0.8
S	5,060[2]	50	99	4.0	626.1	626.1	626.8	0.7
T	5,200[2]	84	538	0.7	633.0	633.0	633.0	0.0
U	6,070[2]	30	42	6.8	643.1	643.1	643.1	0.0

[1] Feet above confluence with Moon Brook
[2] Feet above the Town of Rutland/City of Rutland corporate limits (corporate limits are approximately 470 feet upstream of Curtis Avenue)
[3] Elevation computed without consideration of flooding controlled by Moon Brook

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

RUTLAND COUNTY, VT
(ALL JURISDICTIONS)

FLOODWAY DATA

MUSSEY BROOK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Neshobe River								
A	6,000	315	1,211	4.8	361.5	361.5	362.5	1.0
B	6,490	487	2,476	2.4	362.3	362.3	363.3	1.0
C	6,639	276	1,404	4.2	363.9	363.9	363.9	0.0
D	7,575	306	1,722	3.4	364.3	364.3	364.9	0.6
E	8,916	174	725	8.1	367.0	367.0	368.0	1.0
F	9,050	285	2,581	2.3	372.5	372.5	372.5	0.0
G	10,575	278	2,171	2.7	373.9	373.9	374.3	0.4
H	11,100	56	386	15.1	381.3	381.3	381.3	0.0
I	11,250	48	353	9.5	410.3	410.3	410.3	0.0
J	11,650	101	676	8.6	429.2	429.2	430.2	1.0
K	12,130	168	1,214	4.8	430.8	430.8	431.8	1.0
L	13,450	341	2,849	2.1	432.7	432.7	433.7	1.0
M	14,450	383	2,436	2.4	433.3	433.3	434.3	1.0
N	16,100	701	3,782	1.5	433.7	433.7	434.7	1.0
O	16,260	998	4,771	1.2	434.7	434.7	435.2	0.5
P	18,280	417	1,601	3.7	435.5	435.5	436.2	0.7
Q	19,060	333	988	5.6	440.5	440.5	441.0	0.5
R	19,212	64	571	9.6	449.5	449.5	449.5	0.0
S	19,670	193	849	6.5	457.9	457.9	458.9	1.0
T	21,360	348	1,582	3.5	460.9	460.9	461.8	0.9
U	23,170	321	990	5.6	464.9	464.9	465.7	0.8
V	25,170	385	1,662	3.3	472.4	472.4	473.0	0.6
W	27,510	1,053	1,017	5.4	478.8	478.8	479.5	0.7
X	27,660	1,256	7,712	0.7	485.1	485.1	485.1	0.0
Y	28,970	317	694	7.4	486.1	486.1	486.1	0.0
Z	32,190	373	1,548	3.3	507.9	507.9	508.9	1.0

[1] Feet above confluence with Otter Creek

FEDERAL EMERGENCY MANAGEMENT AGENCY

RUTLAND COUNTY, VT (ALL JURISDICTIONS)

FLOODWAY DATA

NESHOBE RIVER

TABLE 6

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Neshobe River (continued)								
AA	33,290[1]	43	230	16.7	528.5	528.5	528.6	0.1
AB	34,230[1]	47	320	16.1	552.3	552.3	553.3	1.0
AC	34,530[1]	59	249	20.7	559.7	559.7	559.7	0.0
AD	34,660[1]	55	371	13.9	568.5	568.5	568.5	0.0
AE	35,690[1]	42	326	15.8	601.1	601.1	601.5	0.4
AF	36,190[1]	64	372	13.9	614.8	614.8	614.8	0.0
North Branch Tenny Brook								
A	1,650[2]	55	67	5.4	639.1	639.1	639.8	0.7
B	3,550[2]	22	52	6.9	688.0	688.0	688.3	0.3
North Breton Brook								
A	120[3]	172	347	5.7	423.9	422.7[4]	423.3	0.6
B	828[3]	227	682	2.9	426.9	426.9	427.9	1.0
C	1,143[3]	53	305	6.5	430.1	430.1	430.1	0.0
D	1,727[3]	120	603	3.3	435.0	435.0	435.3	0.3
E	2,171[3]	128	636	3.1	436.8	436.8	437.2	0.4
F	2,290[3]	62	281	7.0	436.8	436.8	437.3	0.5
G	2,626[3]	45	504	3.9	444.9	444.9	444.9	0.0
H	2,726[3]	55	563	3.5	446.3	446.3	446.3	0.0
I	4,318[3]	136	252	7.8	450.9	450.9	450.9	0.0

[1] Feet above confluence with Otter Creek
[2] Feet above confluence with Tenny Brook
[3] Feet above confluence with Castleton River
[4] Elevation computed without consideration of backwater effects from Castleton River

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

RUTLAND COUNTY, VT (ALL JURISDICTIONS)

FLOODWAY DATA

NESHOBE RIVER – NORTH BRANCH TENNY BROOK – NORTH BRETON BROOK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Otter Creek								
A	46,995	582	6,266	3.4	367.4	367.4	368.3	0.9
B	50,325	2,546	25,589	0.8	367.8	367.8	368.7	0.9
C	54,855	1,785	17,553	1.2	367.9	367.9	368.8	0.9
D	56,855	188	3,436	6.3	367.9	367.9	368.8	0.9
E	58,085	138	1,961	11.1	478.5	478.5	478.5	0.0
F	58,475	180	2,626	8.3	480.5	480.5	480.5	0.0
G	58,665	244	3,339	6.5	484.2	484.2	484.2	0.0
H	59,235	185	3,971	5.5	484.7	484.7	484.7	0.0
I	61,935	300	5,207	4.2	486.0	486.0	486.3	0.3
J	63,345	400	6,881	3.2	486.7	486.7	487.2	0.5
K	70,355	2,000	23,976	0.9	486.9	486.9	487.8	0.9
L	74,995	905	12,973	1.7	487.0	487.0	487.9	0.9
M	79,335	1,341	17,172	1.3	487.1	487.1	488.1	1.0
N	85,235	1,684	18,009	1.2	487.2	487.2	488.2	1.0
O	88,735	1,272	14,596	1.5	487.4	487.4	488.4	1.0
P	91,635	1,383	14,659	1.5	487.5	487.5	488.5	1.0
Q	92,935	1,886	16,385	1.4	487.6	487.6	488.6	1.0
R	94,235	1,809	15,850	1.4	487.7	487.7	488.7	1.0
S	95,285	447	4,493	4.4	487.7	487.7	488.7	1.0
T	95,535	190	2,776	7.2	491.7	491.7	491.7	0.0
U	95,960	177	2,597	7.7	493.0	493.0	493.0	0.0
V	96,235	158	2,985	6.5	493.6	493.6	493.8	0.2
W	96,252	287	4,500	5.2	514.6	514.6	514.6	0.0
X	96,725	181	2,416	8.7	515.6	515.6	515.6	0.0
Y	97,030	109	1,573	13.4	516.1	516.1	516.1	0.0

[1] Feet above Town of Brandon/ Town of Pittsford corporate limits (corporate limits are approximately 2.49 miles upstream of Union Street)

FEDERAL EMERGENCY MANAGEMENT AGENCY

RUTLAND COUNTY, VT (ALL JURISDICTIONS)

FLOODWAY DATA

OTTER CREEK

TABLE 6

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Otter Creek (continued)								
Z	99,137	320	3,450	6.1	520.7	520.7	520.7	0.0
AA	99,366	228	2,082	10.1	520.7	520.7	520.7	0.1
AB	100,623	376	2,609	8.1	525.4	525.4	525.4	0.0
AC	101,514	187	2,606	8.1	530.9	530.9	530.9	0.2
AD	102,534	243	4,805	3.9	532.7	532.7	532.7	0.6
AE	106,928	1,400	16,099	1.1	533.3	533.3	533.3	0.9
AF	110,658	1,511	16,058	1.1	533.5	533.5	533.5	1.0
AG	111,869	1,400	14,533	1.2	534.3	534.3	534.3	0.8
AH	118,199	1,332	10,560	1.7	534.7	534.7	534.7	0.9
AI	121,917	1,294	12,063	1.3	534.9	534.9	534.9	0.9
AJ	122,449	1,125	9,968	1.5	535.1	535.1	535.1	0.9
AK	128,142	2,097	16,823	0.9	535.5	535.5	535.5	0.9
AL	134,095	1,494	8,329	1.8	535.7	535.7	535.7	0.9
AM	141,474	1,002	5,648	2.7	537.5	537.5	537.5	0.9
AN	151,357	1,523	6,714	4.3	541.4	541.4	541.6	0.2
AO	151,475	1,523	9,831	2.3	543.0	543.0	543.0	0.5
AP	156,209	1,076	5,934	2.5	543.5	543.5	543.5	0.7
AQ	158,772	1,127	8,005	1.9	544.7	544.7	544.7	0.9
AR	162,783	920	7,277	2.0	546.2	546.2	546.2	1.0
AS	167,536	467	4,074	2.4	547.9	547.9	547.9	1.0
AT	172,096	1,300	9,742	1.0	549.1	549.1	549.1	1.0
AU	176,846	630	2,651	3.6	551.0	551.0	551.0	0.8
AV	178,435	142	972	10.5	555.4	555.4	555.4	1.0
AW	178,608	473	3,478	2.8	559.4	559.4	559.4	0.5
AX	180,117	115	864	11.2	561.3	561.3	561.3	0.5

[1] Feet above Town of Brandon/ Town of Pittsford corporate limits (corporate limits are approximately 2.49 miles upstream of Union Street)

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

RUTLAND COUNTY, VT (ALL JURISDICTIONS)

FLOODWAY DATA

OTTER CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Otter Creek (continued)								
AY	180,288	216	1,013	10.8	561.4	561.4	562.1	0.7
AZ	181,183	91	968	9.5	567.2	567.2	568.2	1.0
BA	181,430	65	612	15.0	567.5	567.5	568.3	0.8
BB	185,602	356	4,896	3.0	574.3	574.3	575.2	0.9
BC	185,954	526	5,185	1.8	575.3	575.3	576.1	0.8
BD	194,114	840	4,801	2.1	576.4	576.4	577.4	1.0
BE	194,314	493	4,038	2.1	577.2	577.2	577.8	0.6
BF	198,838	638	4,424	2.1	577.9	577.9	578.7	0.8
BG	200,172	1,190	8,417	1.0	578.3	578.3	579.0	0.7
BH	200,517	1,161	5,256	1.6	579.9	579.9	580.1	0.2
BI	203,125	902	5,783	1.4	580.1	580.1	580.5	0.4
BJ	203,198	941	5,698	1.5	580.1	580.1	580.5	0.4
BK	204,864	787	4,312	1.9	580.4	580.4	580.9	0.5
BL	204,977	761	3,952	2.1	580.5	580.5	581.1	0.6
BM	208,626	505	2,589	4.1	582.8	582.8	583.5	0.7
BN	208,837	458	3,039	2.7	585.2	585.2	585.4	0.2
BO	211,548	180	2,807	6.0	593.6	593.6	593.6	0.0
BP	211,820	366	1,319	6.3	595.2	595.2	595.3	0.1
BQ	214,170	85	564	13.7	614.0	614.0	614.0	0.0
BR	214,420	92	672	11.5	617.8	617.8	617.8	0.0
BS	218,637	102	1,074	7.1	636.8	636.8	637.7	0.9
BT	221,349	850	5,469	1.3	638.9	638.9	639.8	0.9
BU	222,369	767	6,810	2.3	643.2	643.2	644.2	1.0
BV	222,469	796	6,460	2.4	643.3	643.3	644.3	1.0
BW	224,089	800	6,906	2.3	643.8	643.8	644.7	0.9

[1] Feet above Town of Brandon / Town of Pittsford corporate limits (corporate limits are approximately 2.49 miles upstream of Union Street)

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

RUTLAND COUNTY, VT (ALL JURISDICTIONS)

FLOODWAY DATA

OTTER CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Otter Creek (continued)								
BX	225,019[1]	500	3,639	4.3	644.1	644.1	644.9	0.8
BY	226,279[1]	140	1,094	14.4	645.6	645.6	645.6	0.0
BZ	227,269[1]	125	1,819	8.6	649.3	649.3	650.1	0.8
CA	228,069[1]	121	1,832	7.9	650.6	650.6	651.4	0.8
CB	228,869[1]	125	1,889	7.7	651.7	651.7	652.3	0.6
CC	229,869[1]	300	3,431	4.2	653.2	653.2	653.8	0.6
CD	230,769[1]	696	5,708	2.5	653.7	653.7	654.3	0.6
CE	231,979[1]	1,602	12,773	1.1	654.0	654.0	654.6	0.6
CF	233,569[1]	1,877	16,494	0.9	654.1	654.1	654.7	0.6
CG	234,289[1]	1,865	21,729	0.7	654.2	654.2	654.8	0.6
CH	235,619[1]	1,882	21,490	0.7	654.2	654.2	654.8	0.6
Pinnacle Ridge Brook								
A	0[2]	128	212	2.9	654.3	654.3	654.3	0.0
B	970[2]	39	118	5.3	658.6	658.6	658.6	0.0
C	1,600[2]	210	144	4.3	665.2	665.2	665.7	0.5
D	1,750[2]	50	186	2.5	671.0	671.0	671.0	0.0
E	2,450[2]	50	79	5.8	673.8	673.8	674.6	0.8
F	2,880[2]	30	62	7.4	681.3	681.3	681.3	0.0
G	3,025[2]	30	101	4.6	685.5	685.5	685.5	0.0
H	3,350[2]	30	58	7.9	688.0	688.0	688.1	0.1

[1] Feet above Town of Brandon / Town of Pittsford corporate limits (corporate limits are approximately 2.49 miles upstream of Union Street)
[2] Feet above Town of Pittsford / Town of Rutland corporate limits (corporate limits are approximately 1,670 feet downstream of North Grove Street)

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

RUTLAND COUNTY, VT (ALL JURISDICTIONS)

FLOODWAY DATA

OTTER CREEK – PINNACLE RIDGE BROOK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Poultney River								
A	11,840[1]	800	3,518	2.5	402.0	402.0	403.0	1.0
B	13,190[1]	800	3,355	2.6	402.9	402.9	403.8	0.9
C	13,580[1]	500	2,132	4.1	408.2	408.2	408.2	0.0
D	14,360[1]	185	1,211	7.2	408.2	408.2	409.2	1.0
E	15,200[1]	700	3,920	2.2	411.0	411.0	411.9	0.9
F	15,470[1]	65	678	12.9	414.5	414.5	414.6	0.1
G	16,050[1]	500	3,694	2.4	417.9	417.9	418.1	0.2
H	16,713[1]	150	1,380	6.3	418.2	418.2	419.2	1.0
I	17,453[1]	150	805	10.8	420.6	420.6	420.6	0.0
J	18,198[1]	150	1,113	7.8	426.0	426.0	426.9	0.9
K	18,538[1]	300	3,178	2.7	436.4	436.4	436.4	0.0
L	19,288[1]	300	3,152	2.8	436.7	436.7	436.7	0.0
M	20,158[1]	300	2,329	3.8	436.8	436.8	437.3	0.5
N	22,298[1]	300	1,031	8.5	441.7	441.7	442.4	0.7
Roaring Brook								
A	330[2]	227	497	7.0	575.8	575.8	575.8	0.0
B	425[2]	350	1,167	3.0	578.8	578.8	579.6	0.8
C	510[2]	219	627	5.6	580.8	580.8	581.1	0.3
D	700[2]	100	347	10.1	584.9	584.9	585.5	0.6
E	900[2]	99	363	9.6	591.6	591.6	591.6	0.0
F	1,085[2]	100	394	8.9	597.1	597.1	597.4	0.3
G	1,250[2]	200	729	4.8	603.0	603.0	604.0	1.0
H	1,400[2]	88	327	10.7	606.4	606.4	606.4	0.0
I	1,610[2]	87	343	10.2	614.1	614.1	614.1	0.0

[1] Feet above Town of Fair Haven/ Town of Poultney corporate limits (corporate limits are approximately 1.44 miles upstream of confluence of Lewis Brook)
[2] Feet above confluence with Otter Creek

FEDERAL EMERGENCY MANAGEMENT AGENCY

RUTLAND COUNTY, VT (ALL JURISDICTIONS)

FLOODWAY DATA

POULTNEY RIVER – ROARING BROOK

TABLE 6

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Roaring Brook (continued)								
J	1,780[1]	100	355	9.9	621.3	621.3	621.6	0.3
K	2,100[1]	100	357	9.8	629.6	629.6	630.1	0.5
L	2,300[1]	60	282	12.4	637.1	637.1	637.1	0.0
M	2,530[1]	59	290	12.1	646.5	646.5	646.5	0.0
N	2,760[1]	87	319	11.0	653.1	653.1	653.1	0.0
O	3,070[1]	60	294	11.9	667.1	667.1	667.2	0.1
P	3,230[1]	60	298	11.7	673.7	673.7	673.9	0.2
Q	3,380[1]	60	285	12.3	677.2	677.2	677.6	0.4
Shrewsbury Brook								
A	200[2]	77	154	8.1	984.4	984.4	984.4	0.0
B	825[2]	41	104	12.0	1,017.2	1,017.2	1,017.2	0.0
C	1,200[2]	95	1,171	1.1	1,041.5	1,041.5	1,042.5	1.0
Tenny Brook - South Branch Tenny Brook								
A	0[3]	88	283	3.1	622.3	622.3	622.8	0.5
B	1,600[3]	140	423	2.1	624.8	624.8	625.8	1.0
C	3,350[3]	200	393	2.2	628.3	628.3	629.3	1.0
D	5,750[3]	301	260	2.3	635.0	635.0	635.8	0.8
E	7,300[3]	16	55	10.7	662.4	662.4	662.4	0.0
F	7,415[3]	150	818	0.7	667.0	667.0	667.0	0.0
G	7,800[3]	32	70	8.5	674.2	674.2	674.2	0.0
H	8,250[3]	20	60	9.8	696.7	696.7	696.7	0.0
I	8,450[3]	37	132	3.4	703.8	703.8	703.8	0.0

[1] Feet above confluence with Otter Creek
[2] Feet above confluence with Mill River
[3] Feet above Town of Rutland corporate limits (corporate limits are approximately 0.57 miles upstream of Main Street in City of Rutland)

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

RUTLAND COUNTY, VT (ALL JURISDICTIONS)

FLOODWAY DATA

ROARING BROOK – SHREWSBURY BROOK – TENNY BROOK-SOUTH BRANCH TENNY BROOK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Tweed River - South Branch Tweed River								
A	15,250	384[2]	2,878	3.76	796.7	796.7	797.7	1.0
B	16,900	301	1,661	6.46	807.4	807.4	807.9	0.5
C	19,560	129	1,069	9.93	827.5	827.5	828.0	0.5
D	20,580	162	1,273	8.31	834.9	834.9	835.9	1.0
E	20,990	233	1,348	5.38	837.4	837.4	838.4	1.0
F	21,100	200	1,182	6.14	840.9	840.9	841.4	0.5
G	22,340	214	975	7.43	850.6	850.6	850.6	0.0
H	22,430	248	1,317	5.50	854.4	854.4	854.4	0.0
I	22,660	241	2,545	2.85	855.5	855.5	856.5	1.0
J	24,620	179	1,346	5.36	864.5	864.5	864.9	0.5
K	26,980	156	897	7.68	887.6	887.6	888.1	0.5
L	27,100	116	1,314	5.25	893.1	893.1	893.6	0.5
M	28,800	180	895	7.69	913.2	913.2	914.2	1.0
N	30,050	228	783	7.10	928.8	928.8	928.8	0.0
O	30,120	231	1,550	3.59	932.1	932.1	932.1	0.0
P	32,140	195	804	6.69	949.3	949.3	949.8	0.5
Q	33,710	216	811	6.56	970.0	970.0	970.5	0.5
R	33,810	188	966	5.51	973.1	973.1	974.1	1.0
S	35,510	119	484	8.51	999.8	999.8	1,000.3	0.5
T	35,600	101	662	6.22	1,002.1	1,002.1	1,002.6	0.5
U	37,680	67	411	9.51	1,038.2	1,038.2	1,039.2	1.0
V	37,760	74	683	5.72	1,042.3	1,042.3	1,043.3	1.0
W	38,240	129	315	9.05	1,049.4	1,049.4	1,049.4	0.0
X	38,310	127	647	4.41	1,051.7	1,051.7	1,052.2	0.5
Y	41,440	82	261	10.36	1,107.1	1,107.1	1,107.1	0.0
Z	41,490	89	277	9.77	1,108.8	1,108.8	1,108.8	0.0

[1] Feet above confluence with the White River
[2] This width extends beyond county boundary

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

RUTLAND COUNTY, VT (ALL JURISDICTIONS)

FLOODWAY DATA

TWEED RIVER – SOUTH BRANCH TWEED RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Urban Lateral								
A	1,345[1]	59[3]	167	1.9	484.3	*	*	*
B	1,469[1]	42[3]	157	2.0	484.4	*	*	*
C	4,129[1]	17[3]	82	3.8	488.2	*	*	*
D	4,204[1]	10[3]	69	4.5	488.4	*	*	*
E	4,318[1]	10[3]	73	4.2	488.8	*	*	*
F	4,404[1]	33[3]	168	2.4	489.2	*	*	*
G	5,049[1]	50[3]	130	0.9	489.5	*	*	*
H	5,173[1]	156[3]	343	0.3	490.8	*	*	*
I	5,803[1]	39[3]	131	0.8	490.8	*	*	*
J	5,873[1]	39[3]	133	0.8	490.8	*	*	*
K	6,110[1]	39[3]	134	0.8	490.8	*	*	*
L	6,226[1]	90[3]	197	0.6	492.2	*	*	*
M	6,538[1]	128[3]	336	0.3	492.2	*	*	*
N	6,650[1]	166[3]	293	0.4	492.2	*	*	*
O	7,300[1]	161[3]	324	0.3	492.2	*	*	*
P	7,451[1]	161[3]	324	0.3	492.2	*	*	*
Wells Brook								
A	5,100[2]	241	1,137	4.2	438.9	438.9	439.4	0.5
B	5,600[2]	437	1,889	2.2	439.9	439.9	440.9	1.0
C	6,000[2]	76	828	4.9	448.9	448.9	449.0	0.1
D	8,100[2]	152	501	8.2	457.1	457.1	457.7	0.6
E	9,100[2]	67	505	8.1	466.3	466.3	467.3	1.0
F	10,800[2]	151	555	5.9	478.7	478.7	479.2	0.5
G	11,170[2]	53	259	12.6	482.1	482.1	482.7	0.6
H	12,170[2]	154	453	7.2	499.9	499.9	500.0	0.1

[1] Feet above confluence with the Castleton River
[2] Feet above confluence with the Mettawee River
[3] Floodway not mapped

*Data not available

FEDERAL EMERGENCY MANAGEMENT AGENCY

RUTLAND COUNTY, VT (ALL JURISDICTIONS)

FLOODWAY DATA

URBAN LATERAL – WELLS BROOK

TABLE 6

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Wells Brook (continued)								
I	12,820[1]	690	1,291	2.5	506.8	506.8	506.9	0.1
J	14,620[1]	74	291	11.3	526.4	526.4	526.4	0.0
K	17,120[1]	70	337	9.7	572.3	572.3	572.3	0.0
L	19,620[1]	51	257	11.8	617.4	617.4	617.7	0.3
M	20,420[1]	72	310	9.8	636.7	636.7	636.7	0.0
N	20,770[1]	69	290	10.5	643.3	643.3	643.6	0.3
O	20,970[1]	53	246	12.4	653.8	653.8	654.1	0.3
P	21,460[1]	116	607	5.0	668.6	668.6	668.6	0.0
Q	23,460[1]	87	283	13.6	714.1	714.1	714.1	0.0
R	25,360[1]	82	326	8.6	754.0	754.0	754.0	0.0
S	27,060[1]	91	317	8.9	783.2	783.2	783.3	0.1
T	27,480[1]	47	615	4.6	799.9	799.9	799.9	0.0
U	28,580[1]	188	326	7.5	804.5	804.5	805.0	0.5
West Branch Tweed River								
A	21,090[2]	159	1,040	6.05	843.6	843.6	844.6	1.0
B	23,280[2]	148	872	7.16	878.2	878.2	878.7	0.5
C	24,540[2]	108	719	8.54	898.1	898.1	899.1	1.0
D	26,280[2]	168	599	10.06	935.6	935.6	935.6	0.0
E	27,570[2]	163	663	9.00	961.8	961.8	961.8	0.0
F	27,680[2]	139	959	9.06	966.7	966.7	966.7	0.0
G	29,150[2]	133	716	8.12	995.6	995.6	996.1	0.5
H	31,700[2]	95	482	11.78	1,053.6	1,053.6	1,053.6	0.0
I	33,480[2]	78	426	12.31	1,095.4	1,095.4	1,095.4	0.0

[1] Feet above confluence with the Mettawee River
[2] Feet above confluence with the White River

TABLE 6

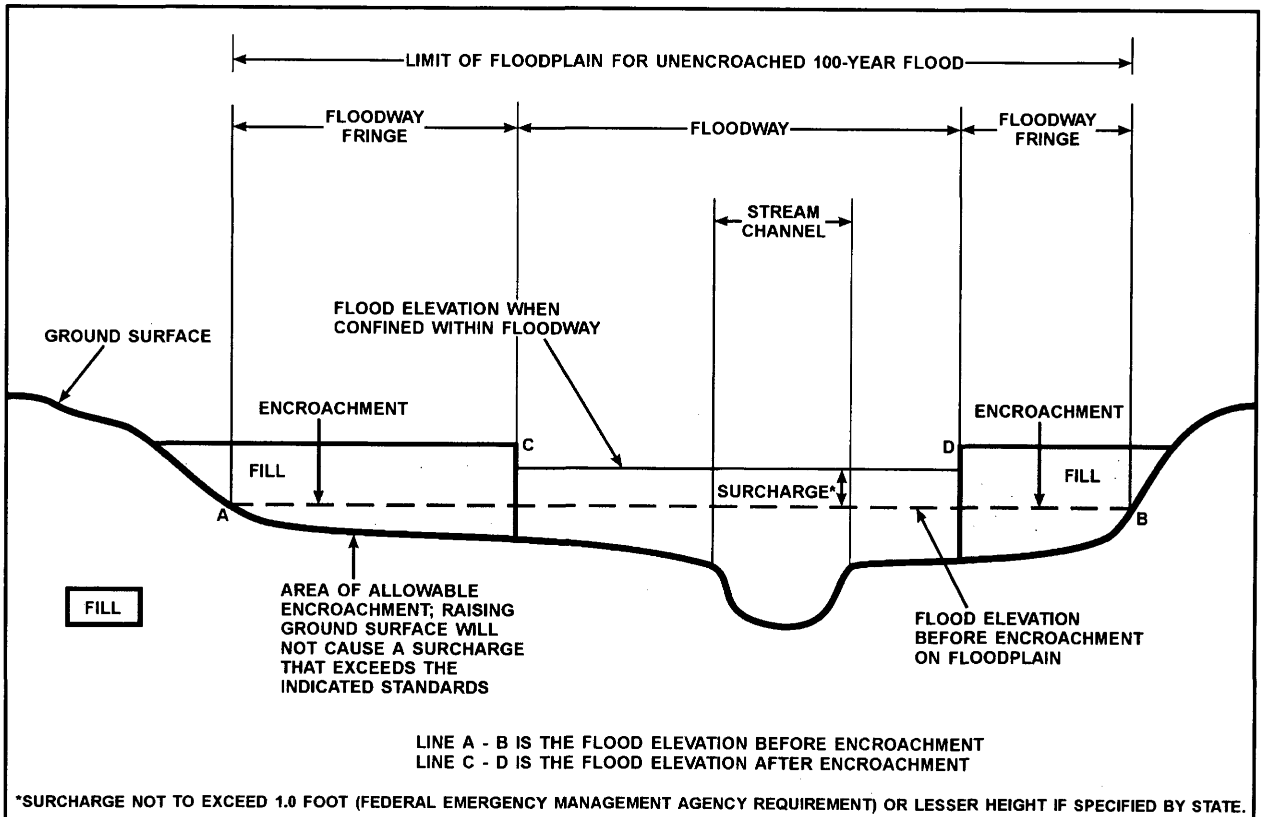
FEDERAL EMERGENCY MANAGEMENT AGENCY

RUTLAND COUNTY, VT
(ALL JURISDICTIONS)

FLOODWAY DATA

WELLS BROOK – WEST BRANCH TWEED RIVER

The area between the floodway and 1-percent annual chance floodplain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the floodplain that could be completely obstructed without increasing the water-surface elevation of the 1-percent annual chance flood by more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in the above Figure 1, "Floodway Schematic."



FLOODWAY SCHEMATIC Figure 1

5.0 INSURANCE APPLICATIONS

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

Zone A

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

Zone AE

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

Zone AH

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

Zone AO

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

Zone AR

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

Zone A99

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

Zone V

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

Zone VE

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

Zone X

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

Zone D

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

6.0 FLOOD INSURANCE RATE MAP

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

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

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

The current FIRM presents flooding information for the entire geographic area of Rutland County. Previously, separate Flood Hazard Boundary Maps and/or FIRMs were prepared for each identified flood-prone incorporated community and the unincorporated areas of the county. This countywide FIRM also includes flood hazard information that was presented separately on Flood Boundary and Floodway Maps (FBFMs), where applicable. Historical data relating to the maps prepared for each community, up to and including this countywide FIS, are presented in Table 7, "Community Map History."

7.0 OTHER STUDIES

FISs have been prepared for the following towns in Washington County, New York: Town of Dresden (FEMA, 1996); Town of Putnam (FEMA, 1996); Town of Whitehall (FEMA, 1986); An FIS is currently being prepared for Windsor County, Vermont (FEMA, unpublished).

COMMUNITY NAME	INITIAL IDENTIFICATION DATE	FLOOD HAZARD BOUNDARY MAP REVISIONS DATE	FIRM EFFECTIVE DATE	FIRM REVISIONS DATE
Benson, Town of	December 13, 1974	October 8, 1976	September 27, 1985	August 28, 2008
Brandon, Town of	September 6, 1974	November 19, 1976	May 15, 1978	February 19, 1982 August 28, 2008
Castleton, Town of	August 30, 1974	None	July 16, 1984	August 28, 2008
Chittenden, Town of	April 1, 1977	None	September 18, 1985	August 28, 2008
Clarendon, Town of	May 31, 1974	July 9, 1976	November 19, 1980	August 28, 2008
Danby, Town of	January 17, 1975	None	August 1, 1980	August 28, 2008
Fair Haven, Town of	July 19, 1974	February 11, 1977	October 16, 1984	August 28, 2008
Hubbardton, Town of	December 13, 1974	None	December 1, 1990	August 28, 2008
Ira, Town of	December 6, 1974	September 17, 1976	September 18, 1985	August 28, 2008
Mendon, Town of	August 16, 1974	November 19, 1975	September 18, 1985	August 28, 2008
Middletown Springs, Town of	December 6, 1974	None	September 18, 1985	August 28, 2008
Mount Holly, Town of	June 28, 1974	August 27, 1976	September 18, 1985	August 28, 2008
Mount Tabor, Town of	January 10, 1975	None	February 4, 1981	August 28, 2008
Pawlet, Town of	June 28, 1974	March 4, 1977	September 1, 1978	August 1, 1980 August 28, 2008

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

RUTLAND COUNTY, VT (ALL JURISDICTIONS)

COMMUNITY MAP HISTORY

COMMUNITY NAME	INITIAL IDENTIFICATION DATE	FLOOD HAZARD BOUNDARY MAP REVISIONS DATE	FIRM EFFECTIVE DATE	FIRM REVISIONS DATE
Pittsfield, Town of	December 13, 1974	October 1, 1976	September 4, 1991	August 28, 2008
Pittsford, Town of	June 14, 1974	None	July 4, 1988	August 28, 2008
Poultney, Town of	June 28, 1974	February 11, 1977	July 2, 1980	August 28, 2008
Poultney, Village of	December 6, 1974	November 29, 1977	July 2, 1980	August 28, 2008
Proctor, Town of	May 31, 1974	None	December 1, 1978	August 28, 2008
Rutland, City of	March 15, 1974	None	April 17, 1978	August 28, 2008
Rutland, Town of	February 7, 1975	September 24, 1976	September 29, 1978	August 28, 2008
Shrewsbury, Town of	June 28, 1974	None	September 1, 1978	August 28, 2008
Sudbury, Town of	January 24, 1975	None	August 28, 2008	
Tinmouth, Town of	December 6, 1974	None	August 28, 2008	
Wallingford , Town of	May 31, 1974	July 16, 1976	January 16, 1981	August 28, 2008
Wells, Town of	January 10, 1975	September 10, 1976	June 15, 1988	August 28, 2008
West Haven , Town of	January 3, 1975	None	August 28, 2008	
West Rutland , Town of	July 26, 1974	July 2, 1976	September 1, 1989	August 4, 2005 August 28, 2008

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

RUTLAND COUNTY, VT
(ALL JURISDICTIONS)

COMMUNITY MAP HISTORY

FIRMS have been prepared for the following towns in Addison County, Vermont: Town of Goshen (FEMA, 1986); Town of Leicester (FEMA, 1985); Town of Orwell (FEMA, 1985); and Town of Whiting (FEMA, 1985); in Bennington County, Vermont: Town of Dorset (FEMA, 1986); and Town of Rupert (FEMA, 1985); in Washington County, New York: Town of Granville (FEMA, 1985); Town of Hampton (FEMA, 1985); and Town of Hebron (FEMA, 1994).

An FHBM has been prepared for Town of Peru, Bennington County, Vermont (U.S. Department of Housing and Urban Development, 1977).

Flood-prone area maps prepared by the USGS (U.S. Department of the Interior, 1969, et cetera) indicate areas studied by approximate methods that may occasionally be flooded by Otter Creek and the Clarendon River within the Town of Clarendon.

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

8.0 LOCATION OF DATA

Information concerning the pertinent data used in preparation of this FIS can be obtained by contacting FEMA, Federal Insurance and Mitigation Division, 99 High Street, 6th Floor, Boston, Massachusetts 02110.

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