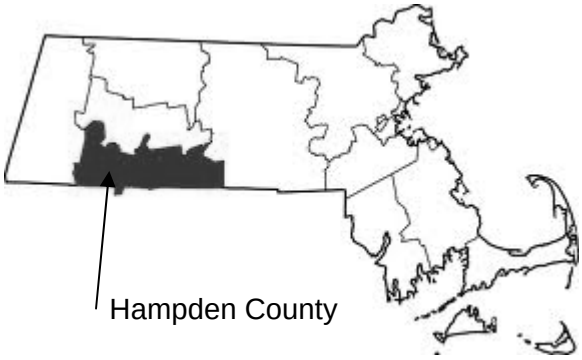
FLOOD INSURANCE STUDY

HAMPDEN COUNTY, MASSACHUSETTS
(ALL JURISDICTIONS)
VOLUME 1 of 3



COMMUNITY NAME	COMMUNITY NUMBER	COMMUNITY NAME	COMMUNITY NUMBER
Agawam, Town of	250133	Monson, Town of	250145
Blandford, Town of	250134	Montgomery, Town of	250146
Brimfield, Town of	250135	Palmer, Town of	250147
Chester, Town of	250136	Russell, Town of	250148
Chicopee, City of	250137	Southwick, Town of	250149
East Longmeadow, Town of	250138	Springfield, City of	250150
Granville, Town of	250139	Tolland, Town of	250151
Hampden, Town of	250140	Wales, Town of	250152
Holland, Town of	250141	West Springfield, Town of	250155
Holyoke, City of	250142	Westfield, City of	250153
Longmeadow, Town of	250143	Wilbraham, Town of	250154
Ludlow, Town of	250144		

PRELIMINARY DATE: APRIL 20, 2012

Federal Emergency Management Agency

FLOOD INSURANCE STUDY NUMBER
25013CV001A

NOTICE TO
FLOOD INSURANCE STUDY USERS

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

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

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

Old Zone(s)	New Zone
Al through A30	AE
B	X
C	X

Initial Countywide FIS Effective Date:

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FLOOD INSURANCE STUDY
HAMPDEN COUNTY, MASSACHUSETTS
(ALL JURISDICTIONS)

1.0 INTRODUCTION

1.1 Purpose of Study

This countywide Flood Insurance Study (FIS) report investigates the existence and severity of flood hazards in the geographic area of Hampden County, including the Cities of Chicopee, Holyoke, Springfield and Westfield; the Towns of Agawam, Blandford, Brimfield, Chester, East Longmeadow, Granville, Hampden, Holland, Longmeadow, Ludlow, Monson, Montgomery, Palmer, Russell, Southwick, Tolland, Wales, West Springfield, and Wilbraham; (referred to collectively herein as Hampden County). This FIS aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood-risk data for various areas of the county that will establish actuarial flood insurance rates and to assist the county in its efforts to promote sound floodplain management. Minimum floodplain management requirements for participation in the National Flood Insurance Program (NFIP) are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

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

The Digital Flood Insurance Rate Map (DFIRM) and FIS report for this countywide study have been produced in digital format. Flood hazard information was converted to meet the Federal Emergency Management Agency (FEMA) DFIRM database specifications and Geographic Information System (GIS) format requirements. The flood hazard information was created and is provided in a digital format so that it can be incorporated into a local GIS and be accessed more easily by the community.

1.2 Authority and Acknowledgments

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

The community based FIS reports prior to 1979 were prepared for the Federal Insurance Administration (FIA). In 1979, an executive order merged the FIA into the newly formed FEMA. Reports from that date forward were prepared for FEMA. All available reports are incorporated into this countywide study.

Agawam, Town of	The hydrologic and hydraulic analyses for the FIS report dated March 1977 were performed by Camp Dresser & McKee, Inc., Environmental Engineers, for the FIA, under Contract No. H-3861. This work, which was completed in November 1976, covered all flooding sources affecting the Town of Agawam. All field survey data for the March 1977 study were collected and compiled by Harry R. Feldman, Inc., Civil Engineers and Land Surveyors, Boston, Massachusetts, under subcontract to Camp Dresser & McKee, Inc.
Brimfield, Town of	The hydrologic and hydraulic analyses for the FIS report dated February 2, 1982 were prepared by Schoenfeld Associates, Inc., for the FEMA, under Contract No. H-4794. This work was completed in October 1979.
Chester, Town of	The hydrologic and hydraulic analyses for the FIS report dated April 6, 1984 were performed by Whitman & Howard, Inc., for the FEMA, under Contract No. EMW-C-0277. This work, which was completed in August 1981, covered all flooding sources affecting the Town of Chester.
Chicopee, City of	The hydrologic and hydraulic analyses for the FIS report dated March 1978 were performed by Camp Dresser & McKee Inc., Environmental Engineers for the FIA, under Contract No. H-3861. This work, which was completed in July 1977, covered all significant flooding sources affecting the City of Chicopee.
East Longmeadow, Town of	The hydrologic and hydraulic analyses for the FIS report dated March 1978 were performed by Anderson-Nichols and Company, Inc. for the FIA under Contract No. H-4019. This work, which was completed in July 1977, covered all significant flooding sources affecting the Town of East Longmeadow.
Hampden, Town of	The hydrologic and hydraulic analyses for the FIS report dated May 1978 were performed by Anderson-Nichols and Co., Inc., for the FIA under Contract Number H-4019. This work, which was completed in August 1977, covered all significant flooding sources in the Town of Hampden.
Holland, Town of	The hydrologic and hydraulic analyses for the FIS report dated January 1, 1984 were performed by Whitman & Howard, Inc., for the FEMA, under Contract No. EMW-C-0277. This work, which was completed in July 1981, covered all flooding sources affecting the Town of Holland.
Holyoke, City of	The hydrologic and hydraulic analyses for the FIS report dated February 1979 were performed by Anderson-Nichols and Company, Inc., for the FIA, under Contract No. H-4019. This work, which was completed in March 1978, covered all significant flooding sources affecting the City of Holyoke.

Longmeadow, Town of	The hydrologic and hydraulic analyses for the original study were performed by Anderson-Nichols and Company, Inc. for the FEMA, under Contract No. H-4019. That work was completed in June 1977. Updated topographic and historical flooding information provided by the community in June 1989 were included in the July 3, 1990 revision.
Ludlow, Town of	The hydrologic and hydraulic analyses in the FIS report dated June 15, 1988 represent a revision of the original analyses prepared by Green International Affiliates, Inc., for the FEMA, under Contract No. H-4793. The work for the original study was completed in September 1979. In the FIS report dated June 15 1988, the hydraulic analysis for the Chicopee River was revised by Anderson-Nichols and Company, Inc. The work for this revision was completed In May 1984.
Monson, Town of	In the original study, the hydrologic and hydraulic analyses were prepared by Green International Affiliates, Inc., for the FIA, under Contract No. H4793. That work was completed in November 1979. In the July 16, 1996 revision, additional hydrologic and hydraulic analyses for Twelvemile Brook and Thayer Brook were prepared by Green International Affiliates, Inc., for the FEMA, under Contract No. EMW-93-C-4144. This work was completed in June 1994.
Palmer, Town of	The hydrologic and hydraulic analyses for the FIS report dated May 4, 1981 were prepared by Green International Affiliates, Inc., for the FIA, under contract No. H-4793. This work was completed in October 1979.
Russell, Town of	The hydrologic and hydraulic analyses in the FIS report dated December 15 1990 were prepared by the New England Division of the U. S. Army Corps of Engineers (USACE) for the FEMA, under Inter-Agency Agreement No. EMW-84-E-1506, Project Order No. 1, Amendment No. 26. The work for this study was completed in October 1987.
Southwick, Town of	The hydrologic and hydraulic analyses for the FIS report dated January 16 1984 were performed by Whitman & Howard, Inc., for the FEMA, under Contract No. EMW-C-0277. This work, which was completed in November 1981, covered all flooding sources affecting the Town of Southwick.

Springfield, City of	The hydrologic and hydraulic analyses in the FIS report dated June 17 1991 represent a revision of the original analyses (effective date February 1, 1980) prepared by Camp, Dresser, & McKee, Inc., for the FEMA, under Contract No. H-3861. The hydrologic and hydraulic analyses in this revision were prepared by the New England Division of the USACE for the FEMA, under Inter-Agency Agreement No. EMW-E-0941. This work was completed in February 1988.
Tolland, Town of	Portions of the hydrologic and hydraulic analyses for the FIS report dated August 2 1990 were prepared by Whitman and Howard, Inc., during the preparation of the FISs for the Towns of Sandisfield and Otis; the remainder of the hydrologic and hydraulic analyses were prepared by the New England Division of the USACE for the FEMA, under Inter-Agency Agreement No. EMW-84-E-1506, Project Order No. 1, Amendment No. 26. The work for this study was completed in March 1988.
Wales, Town of	The hydrologic and hydraulic analyses for the FIS report dated January 2, 1981 were performed by Schoenfeld Associates, Inc., for the FIA, under Contract No. H-4794. This study was completed in July 1979.
Westfield, City of	The hydrologic and hydraulic analyses for the FIS report dated November 1977 were performed by Camp, Dresser & McKee, Inc., for the FIA, under Contract No. H-3861. This work, which was completed in March 1977, covered all significant flooding sources affecting the City of Westfield.
West Springfield, Town of	The hydrologic and hydraulic analyses for the FIS report dated September 1977 were performed by USACE New England Division, for the FIA, under Inter-Agency Agreement Nos.IAA-H-273 and IAA-H-19-74, Project Orders Nos. 14 and 15, respectively. This work, which was completed in May 1976, covered all flooding sources affecting the Town of West Springfield.
Wilbraham, Town of	The hydrologic and hydraulic analyses for the FIS report dated June 15, 1988 represent a revision of the original analyses prepared by Anderson-Nichols and Company Inc., for the FEMA, under Contract No. H-4019. The work for the original analyses was completed in July 1977. The hydrologic and hydraulic analyses in the 1988 revision were prepared by Anderson-Nichols and Company, Inc., for the Swift River Company, under agreement with Massachusetts Emergency Management Agency (MEMA). The work for this revision was completed in May 1984. This revision incorporates a hydraulic model on the Chicopee River.

There are no previous FISs for the Boroughs of Blandford, Granville, and Montgomery; therefore, the previous authority and acknowledgment information for these communities is not included in this FIS. These communities may not appear in the Community Map History table (Section 6.0).

The Connecticut River and its drainage areas were the only portion of Hampden County to have new detailed studies performed. For this revision, the Connecticut River was restudied by detailed methods, and an interior drainage analysis was performed on those areas protected by levees along the main stem of the Connecticut River.

For this countywide study, the hydrologic and hydraulic analyses for the revised portion of the Connecticut River were prepared by ENSR, Spectrum Mapping, CR Environmental, and Green International, under Contract No. EMB-2001-CO067. This work was completed in November 2006.

For this countywide study, the redelineation of the Westfield River (between cross sections BM-BU) and the hydraulic analysis of streams (in the Towns of Blandford, Granville, and Montgomery) studied by approximate methods were prepared for FEMA by STARR, a joint venture between Greenhorne & O'Mara, Inc., CDM, Stantec, and Atkins under the Joint Venture Contract No. HSFEHQ-09-D-0370. This work was completed in March 2012. Streams studied by detailed methods are shown in Table 3.

1.3 Coordination

The purpose of an initial Consultation Coordination Officer's (CCO) meeting is to discuss the scope of the FIS. The initial and final meeting dates for the previous FIS reports for Hampden County and its communities are listed in Table 1, "Initial and Final CCO Meetings."

Table 1 – Initial and Final CCO Meetings

COMMUNITY NAME	INITIAL MEETING	FINAL MEETING
Agawam, Town of	September 2, 1975	October 5, 1976
Brimfield, Town of	May 1978	*
Chester, Town of	June 1979	October 20. 1982
Chicopee, City of	September 3, 1975	August 25, 1977
East Longmeadow, Town of	April 1976	November 7, 1977
Hampden, Town of	September 1976	January 9, 1978
Holland, Town of	June 12, 1979	October 25, 1982
Holyoke, City of	April 1976	*
Longmeadow, Town of	April 1976	September 22, 1977
Ludlow, Town of	May 10, 1978	May 22, 1980
Monson, Town of	May 25, 1978	July 22, 1980
Palmer, Town of	October 23, 1979	September 30, 1980
Russell, Town of	May 16, 1984	January 23, 1990
Southwick, Town of	June 12, 1979	May 25, 1983
Springfield, City of	May 16, 1984	September 18, 1989

* Data Not Available

Table 1 – Initial and Final CCO Meetings (Continued)

COMMUNITY NAME	INITIAL MEETING	FINAL MEETING
Tolland, Town of	May 17, 1984	*
Wales, Town of	May 1978	May 5, 1980
West Springfield, Town of	*	March 18, 1976
Westfield, City of	September 2, 1975	May 31, 1977
Wilbraham, Town of	April 1976	April 5, 1978

* Data Not Available

The results of the countywide study were reviewed at the first final CCO meeting held on June 2, 2009, and attended by representatives of the communities, the study contractor and FEMA. All problems raised at that meeting have been addressed in this study.

The results of the countywide study; concerning the Towns of Blandford, Granville, and Montgomery; were reviewed at the final CCO meeting held on _____, and attended by representatives of the communities, FEMA Study Contractor and FEMA. All problems raised at that meeting have been addressed in this study.

2.0 AREA STUDIED

2.1 Scope of Study

This FIS report covers the geographic area of Hampden County, Massachusetts, including the incorporated communities listed in Section 1.1. The areas studied by detailed methods were selected with priority given to all known flood hazards and areas of projected development or proposed construction. All or portions of the flooding sources listed in Table 2 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

Austin Brook	Scantic River
Bradley Brook	Sherman Brook
Broad Brook	Shurtleff Brook
Chicopee Brook	South Branch Mill River
Chicopee River	Stevens Brook
Connecticut River	Still Brook
Foskett Mill Stream	Swift River
Great Brook	Tannery Brook
Hamilton Reservoir	Thayer Brook
Higher River	Tributary A (E. Longmeadow)
Little River	Tributary A (Hampden)
Longmeadow Brook	Tributary A (Wilbraham)
May Brook	Tributary C (East Longmeadow)
Middle Branch Westfield River	Tributary C (Wilbraham)

Table 2 – Flooding Sources Studied by Detailed Methods (Continued)

Munn Brook	Tributary of Great Brook
Ninemile Pond	Twelvemile Brook
North Branch Mill River	Wales Brook
North Brook	Walker Brook
Otis Wait Brook	Watchaug Brook
Paucatuck Brook	Wales Brook
Pecousic Brook	Ware River
Potash Brook	West Branch Farmington River
Powdermill Brook	West Branch Westfield River
Quaboag River	Westfield River
Sawmill Brook	Willimansett Brook

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 the respective communities. The approximate-studied flooding sources which are identified in each study are listed below in.

Table 3 – Flooding Sources Studied by Approximate Methods

Abbey Brook	Powdermill Brook
Babcock Brook	Quineboag River
Bagg Brook	Raspberry Brook
Bedlam Brook	Ripley Brook
Big Brook	Roaring Brook
Birch Meadow Brook	Rockadundee Brook
Borden Brook	Russell Pond
Bottle Brook	Sawmill Brook
Bradley Brook	Scantic River
Broad Brook	Schneelock Brook
Block Brook	Schoolhouse Brook
Case Brook	Sessions Brook
Caulkin Brook	Seymour Brook
Charles Brook	Shurtleff Brook
Chicopee Brook	Slocum Brook
Cobble Mountain Reservoir	Southeast Bay
Cranberry Pond Brook	Squassick
Dickinson Brook	Stevens Brook
Dismal Bay	Stony Brook
East Branch Salmon Brook	Tar Kiln Dingle Brook
East Brook	Tarkill Brook
Elbow Brook	Taylor Brook

Table 3 – Flooding Sources Studied by Approximate Methods (Continued)

Foskett Mill Stream
Fourmile Brook
Freeland Brook
Freshwater Brook
Fuller Brook
Goldmine Brook
Great Brook
Halfway Brook
Hall Pond Brook
Harris Brook
Higher Brook Canal
Holland Pond
Hollow Brook
Japhet Brook
Jawbuck Brook
Johnson Brook
Kellog Brook
Kings Brook
Little River
Lloyd Brook
Longmeadow Brook
Lost Lake
Maxwell Brook
May Brook
Mill Brook
Mill Stream
Minechoag Brook
Moose Meadow Brook
Mountain Brook
Munn Brook
Noyes Pond
Nye Brook
Pearl Brook
Pebbles Brook
Pecousic Brook
Penny Brook
Piper Brook
Pixley Brook
Pond Brook 1
Pond Brook 2
Potash Brook
Temple Brook
Threemile Brook
Tillotson Brook
Tributaries A-J (East Longmeadow)
Tributaries A-Z (Hampden)
Tributaries to Chicopee Brook (Monson)
Tributaries to Conant Brook Reservoir
Tributary to North Branch Mill River
Tributary to South Branch Mill River
Tuttle Brook
Twining Pond
Unnamed Tributary 1 to Borden Brook
Unnamed Tributary 1 to Hall Pond Brook
Unnamed Tributary 1 to Pixley Brook
Unnamed Tributary 1 to Seymour Brook
Unnamed Tributary 2 to Borden Brook
Unnamed Tributary 2 to Dickinson Brook
Unnamed Tributary 2 to Hall Pond Brook
Unnamed Tributary 2 to Lloyd Brook
Unnamed Tributary 4 to Case Brook
Unnamed Tributary 5 to Ripley Brook
Unnamed Tributary 7 to Peebles Brook
Unnamed Tributary 8 to Peebles Brook
Unnamed Tributary 9 to Peebles Brook
Unnamed Tributary to Potash Brook
Unnamed Tributary to Still Brook
Unnamed Tributaries to Higher Brook
Unnamed Tributaries in Palmer
Unnamed Tributary to Springfield Reservoir
Valley Brook
Vinica Brook
Wales Brook
Wales numerous streams and ponds
Watchaug Brook
Watson Brook
West Brook
Wheeler Brook
White Brook
Wolf Swamp Brook
Worthington Brook

No Letters of Map Revision (LOMRs) were incorporated as part of this study.

2.2 Community Description

Hampden County is located in the southwestern portion of the state of Massachusetts. It is bordered to the north by Hampshire County, to the east by Worcester County, to the west by Berkshire County, and to the south by the State of Connecticut. There are 23 communities in the county and the total area of the county is approximately 634 square miles. More than seven percent of the state's farmland is located in Hampden County, totaling 37,417 acres on 418 farms. The 2010 population of Hampden County was 463,490.

East of the Berkshires, Hampden County lies in the Connecticut River Valley known within Massachusetts as the Pioneer Valley. Hampden County has the most populous collection of cities along the valley: Springfield, Holyoke, West Springfield, and Chicopee. The floor of the valley is level and is formed by fertile alluvial soils. Hills rise steeply east of the valley to divide the Connecticut River basin and the river basins to the east. The nearest large cities are Worcester Massachusetts located to the east, and Hartford, Connecticut, located to the south. Topography in Hampden County is flat along the Connecticut River to rolling hills. The highest elevation in the county is 1,202 feet at Mount Tom in the City of Holyoke.

The county has several rivers; most prevalent is the Connecticut River which flows from north to south and is approximately 407 miles in total length. It runs for about 63miles through Massachusetts (21 most southern miles through Hampden County) and 61 miles in Connecticut before discharging into Long Island Sound. The river basin encompasses an area of approximately 11,250 square miles including portions of Quebec Canada, Vermont, New Hampshire, Massachusetts, and Connecticut. Major tributaries include the Chicopee and White Rivers.

The Quabbin Reservior is located in the Swift River Basin, a tributary of the Chicopee River. The Quabbin Reservoir provides water to metropolitan Boston.

2.3 Principal Flood Problems

Flooding in Hampden County is primarily due to major storms which have occurred in nearly every month of the year. Northeasters are one of the most serious types of storms, generating very strong winds and heavy rain or snow. In winter, northeasters produce the heaviest snowfalls, and during fall and spring they are one of the most frequent causes of flooding. Some of the most severe floods have been those associated with hurricanes or tropical storms in the late summer or early fall. The most significant flood producing storms of this century were the hurricanes of September 1938, August 1955, and September 1960, and the non-hurricane storms of November 1927, March 1936, November 1953, March 1963, March 1968, and May 1984.

A combined, total precipitation of over 18 inches associated with hurricanes Connie and Diane in 1955 created an unprecedented volume of runoff; a peak discharge of 34,300 cfs on the West Branch Farmington River was recorded at the New Boston gaging station (No. 018885500). The flood peak for the watershed has been estimated to have a recurrence interval which falls between 1- and 0.2-percent-annual-chance flood. The

severity of the flood was compounded by the inexplicable release of 3-foot-high splashboards at Otis Reservoir.

The low-lying areas of Longmeadow are subject to periodic flooding; this occurs mainly in the Connecticut River floodplain. Due to the large drainage area, the Connecticut River can have floods that inundate its floodplain for a day or longer. The steeper areas that occur along Longmeadow Brook create a situation of high velocities, which may result in flash flooding. Where Longmeadow Brook flattens, the floodplain becomes wider, and consequently, floods can inundate a large area.

Table 4, "USGS Stream Gages," summarizes the gaging stations in Hampden County and along the Connecticut River with streamflow records and the gage period of operation. The available streamflow data can be downloaded from the U.S. Geological Survey (USGS) website using the following link: http://waterdata.usgs.gov/nwis.

Table 4 – USGS Stream Gages

Gage Location	Gage Number	Period of Record	Gage Still Active
Broad Brook	01171910	1967 –	No
Chicopee River Bircham Bend	01177000	1928 – 1938	Moved
Chicopee River Indian Orchard	01177000	1938 –	Yes
Connecticut River in Montague City, MA	01170500	1904 – 2004	Yes
Connecticut River below power dam at Holyoke	01172003	1983 –	Yes
Connecticut River at I-391	01172010	2002 –	Yes
Connecticut River in Thompsonville, CT	01184000	1929 – 2004	Yes
Connecticut River in Hartford, CT	01190070	1929 – 2004	Yes
Connecticut River in Middletown, CT	01193000	1947 – 2004	Yes
Gibbs Crossing	01173500	1913	No
Goss Heights	01180500	1936 – 1978	No
Huntington	01181000	1936 – 1978	No
Longmeadow Brook	01183810	1964	No
Mill River at Springfield	01178000	1938 – 1999	No
Sykes Brook	unknown	1946 – 1974	No

2.4 Flood Protection Measures

There are numerous flood control projects operated by the USACE throughout the Connecticut River Basin in Vermont, New Hampshire, and Massachusetts in and above Hampden County. There are also a number of local flood protection projects consisting primarily of floodwalls and levees and associated pump stations along the major rivers within the county. These protection projects were typically built by the USACE and are now operated and maintained by the local communities. Most flood control measures were built between 1936 and 1966. In addition, most communities have implemented flood protection regulations.

The Chicopee Flood Control Works (CFCW) was constructed in four separated systems; namely the Chicopee Falls System, the Plainfield Street System, the South Bank Chicopee River System, and the Willimansett System.; to protect portions of the City of Chicopee from flooding of the Chicopee and Connecticut Rivers.

The Chicopee Falls Flood Control System protects the Chicopee Falls section of the City of Chicopee from flooding along the Chicopee River. This system includes a levee and two pumping stations. The accredited levee is shown on the effective FIRM as providing protection from the 1-percent-annual-chance flood.

The Plainfield Street Flood Control System protects the Plainfield Street section of the City of Chicopee from flooding along the Connecticut River, and is a continuation of the flood control system in Springfield. This system includes a levee and one pumping station. The accredited levee is shown on the effective FIRM as providing protection from the 1-percent-annual-chance flood.

The South Bank Chicopee River Flood Control System protects the Ames Privilege/Eastern Etching, Cabotville, and Delta Park sections of the City of Chicopee from flooding alongs the Chicopee River, including backwater from the Connecticut River. This system includes a levee and one active pumping station. The accredited levee is shown on the effective FIRM as providing protection from the 1-percent-annual-chance flood.

The Willimansett Flood Control System protects the Willamansett section of the City of Chicopee from flooding along the Connecticut River. This system includes a levee and four pumping stations. The accredited levee is shown on the effective FIRM as providing protection from the 1-percent-annual-chance flood.

Other levees exist in the study area that provides the County with some degree of protection against flooding. However, it has been ascertained that some of these levees may not protect the communities from rare events such as the 1-percent-annual-chance flood. The criteria used to evaluate protection against the 1-percent-annual-chance flood are 1) adequate design, including freeboard, 2) structural stability, and 3) proper operation and maintenance. Levees that do not protect against the 1-pecent-annual-chance flood are not considered in the hydraulic analysis of the 1-percent-annual-chance floodplain.

3.0 ENGINEERING METHODS

For the flooding sources studied by detailed methods in the county, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude that are expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for floodplain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10-, 2-, 1-, and 0.2-percent-annual-chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long-term, average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For

example, the risk of having a flood that equals or exceeds the 1-percent-annual-chance (100-year) flood in any 50-year period is approximately 40 percent (4 in 10); for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish peak discharge-frequency relationships for each flooding source studied by detailed methods affecting the County. For each community within Hampden County that has a previously printed FIS report, the hydrologic analyses described in those reports have been compiled and are summarized below.

Pre-countywide Analyses

The following summarizes the hydrologic analyses done previous to this most current revision where all community studies in Hampden County were incorporated into this countywide revision.

Log-Pearson Type III statistical analysis of recorded annual peak discharges was the method used for hydrologic analyses for Agawam, Chester, Ludlow, Monson, Russell, and Tolland.

Discharge frequency records for Brimfield, Chicopee, Hampden, Holland, Holyoke, Ludlow, Southwick, Springfield, Wales, and Westfield were determined using a method developed by the USGS specifically for Massachusetts. The methodology takes into consideration both the slope of the main channel and drainage area in its evaluation.

In Chicopee, the Barre Falls Dam, which is located on the Ware River in the upper portion of the Chicopee River basin, was completed in 1958 and the Conant Brook Dam and Reservoir in 1966. Consequently, discharge records must be adjusted to account for effects on floodflows by these flood control structures. The source of data for defining discharge-frequency relationships for all streams in East Longmeadow was regional equations prepared by the USGS. These regional equations relate stream flow to the parameters of drainage area, main-channel slope, and mean annual precipitation. Values of discharges downstream of Lake George for the study in Wales were reduced because of the storage potential created by the outlet structure of the lake.

Peak discharges, which have been recorded since 1914, have been modified to account for the effect of the system of upstream reservoirs. The modified peak discharges for the Connecticut River at its confluence with the Westfield River are also listed in Tables presented below. These modified discharges were used to establish the severity of flooding on the Connecticut River. Annual peak discharges for the 65 years of record (1914 – 1978) maintained at the New Boston gaging station were analyzed, though new Connecticut River studies are being performed as of the date of this report.

For the study in Holland, discharge - frequency relationships for Stevens Brook and May Brook were determined using synthetic hydrograph techniques developed by the Soil Conservation Service. Hydrologic parameters such as channel length, slope, drainage area, and runoff potential were used to compute peak discharges for selected return

periods. Precipitation estimates were taken from the National Weather Bureau Atlas. Peak discharges into Hamilton Reservoir were calculated by the Snyder synthetic unit hydrograph method and routed through the reservoir by storage indication.

With the Holyoke study the peak discharges calculated in that report were modified to account for nine flood control structures in the Connecticut River watershed. Peak discharges for the ungaged streams were obtained using the regional frequency-discharge formulas for Massachusetts. The formulas utilized drainage area, slope of the drainage basin, and total precipitation to develop the calculated discharges.

In Ludlow, Type III Peak discharges were used for the ungaged streams of Broad Brook and Higher Brook. Otherwise discharges for all the streams in Ludlow were computed using regional frequency-discharge formulas developed for Massachusetts. The discharges were transposed to various locations, accounting for changes in watershed area, by means of the following equation:

$$Q_1/Q_2 = (A_1/A_2)^{0.75}$$

where Q_1 and Q_2 are discharges at specific locations, and A_l and A_2 are drainage areas at the locations.

In Monson the natural discharges were modified to account for the degree of flood control afforded by the Conant Brook Dam and Reservoir. The modified discharges are the peak flood flows now expected to occur. Flood flows for Twelvemile Brook and Thayer Brook were calculated using USGS regional flood flow formulas.

Alternatively in Southwick, discharge frequency estimates at the Congamond Lakes outlet were determined by routing synthetic flood hydrographs of the specific recurrence interval through reservoir storage by means of the modified Puls method. Elevation-storage data was obtained from the Environmental Impact Report for the Congamond Lakes, dated 1980.

Because of the availability of soil survey data and because of their comparatively small drainage areas, hydrologic analyses for Shurtleff Brook and Tributary to Great Brook were carried out through the use of the Modified Soil Cover Complex Method. This method, developed by the National Resource Conservation Service (NRCS), is a reliable way to estimate peak rates of discharge for a range of rainfall amounts, soil types, land usage, cover conditions, and average watershed slope. This technique also has adjustments for discharge due to drainage area shape and storage in swamps and ponds.

Discharge-frequency relationships in Springfield for the Mill River, including North and South Branches and their tributaries, were developed using regional frequency analyses and routed through Mill and Watershops Ponds using standard methods. The adopted flows compare favorably with the recorded peak discharge at the dam on the Mill River for the August 1955 flood.

The section of the City of Westfield located near the confluence of the Westfield and Little Rivers is a natural flood plain which becomes inundated during major floods and acts as a storage reservoir. It has been estimated that the flood plain provided about 18,000 acre-feet of storage during the August 1955 flood. The effect of this natural

storage area is to cause the peak outflow recorded at the USGS gage to be less than the peak inflow into the flood plain storage area. The effect of the natural storage area and local ponding is also reflected in the computed discharges upstream of Little River. Peak inflow consists of five components: Westfield and Little Rivers, Powdermill and Great Brooks, and miscellaneous local runoff, including municipal drainage from sections of the city. These inflows were routed through the flood plain. Discharge-frequency relationships for the remaining watercourses studied in the City of Westfield were developed by regional-frequency analysis and routed by standard methods to the study areas.

Countywide Analyses

New hydrologic analyses were conducted on the Connecticut River to establish the peak discharge frequency relationships for floods of the selected recurrence intervals for the Connecticut River within the study area. The peak flood discharges for this restudy of the Connecticut River were developed by the USGS under a separate contract with FEMA and were published in a report entitled *"Estimates of the Magnitude and Frequency of Flood Flows in the Connecticut River in Connecticut,"* Open-file Report 2005-1369, dated 2005.

A Log-Pearson Type III flood frequency analysis was performed for each of the USGS gage stations on the Connecticut River within the study area in accordance with the procedures outlined in Bulletin 17B (USGS, 1976). Three additional reference stations were also used in the analysis. Station skew was only used in evaluating the frequency curves for the stations, because the periods of records both exceeded 1-percent-annual-chance flood, and to be consistent with the hydrologic analysis already performed by the USGS.

Results of the flood frequency analysis predict that peak flows for the 1-percent-annual-chance return frequency are approximately 4 percent higher than those predicted by previous studies, due to the longer period of record of gage data we have accumulated since the effective studies were completed.

In the unrevised reports, the peak discharges for the Connecticut River at the confluences of major tributaries were interpolated from the values published in the USGS report on watershed areas.

In the Towns of Blandford, Granville, and Montgomery, new hydrologic analyses were performed for flooding sources studied by base level analysis. Peak flows to Black Brook, Borden Brook Reservoir, Cooley Lake and Granville Reservoir were determined using the NRCS WINTR-20 program dated March, 2009. The runoff curve numbers and times of concentration for the subareas were derived from the method specified in the NRCS Technical Release No. 55, dated June 1986. The Hydrologic Soil Groups were obtained from the NRCS SSURGO-Certified Soils data for Hampden County.

Peak flows along the lower reaches of Valley Brook were determined using gage date from USGS gage no. 01187400, Valley Brook near West Hartland, Connecticut and methods described in USGS *"Bulletin 17B Guidelines for Determining Flood-flow Frequency"*, dated 1976. The gage analysis was computed using HEC-SSP v2.0. Peak flows for all other flooding sources in this PMR were determined using the three parameter rural regression equations for Connecticut.

Peak discharge-drainage area relationships for the 10-, 2-, 1-, and 0.2-percent-annual-chance floods for each stream studied by detailed methods are presented in Table 5, "Summary of Discharges".

Table 5 – Summary of Discharges

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (SQ. MILES)	PEAK DISCHARGES (cfs) 10%-ANNUAL-CHANCE	2%-ANNUAL-CHANCE	1%-ANNUAL-CHANCE	0.2%-ANNUAL-CHANCE
AUSTIN BROOK					
At confluence with Walker Brook	1.4	180	350	470	860
BRADLEY BROOK					
At mouth	10.8	2,800	5,100	6,400	10,200
BROAD BROOK					
Upstream of Keys Road	2.3	130	190	220	300
BROAD BROOK (LOWER)					
At Holyoke-Southampton corporate limits	3.3	170	250	300	400
BROAD BROOK (UPPER)					
Upstream of Cherry Street Extension	1.0	70	100	115	150
BROAD BROOK					
At confluence with Chicopee River	14.3	410	700	860	1,370
CHICOPEE BROOK					
At confluence with Quaboag River	23.7	1,370	3,000	4,120	8,420
At Ellis Mill No.1	15.1	450	980	1,430	3,200
CHICOPEE RIVER					
At mouth	721	11,000	23,800	32,500	63,000

Table 5 – Summary of Discharges (Continued)

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (SQ. MILES)	PEAK DISCHARGES (cfs) 10%-ANNUAL-CHANCE	2%-ANNUAL-CHANCE	1%-ANNUAL-CHANCE	0.2%-ANNUAL-CHANCE
CHICOPEE RIVER (Continued)					
At USGS gage no. 01177000	688.0	10,800	23,400	32,000	62,100
At USGS gage at Indian Orchard	688.0	10,795	23,400	32,000	62,000
At Springfield-Wilbraham corporate limits	684.9	10,760	23,320	31,890	61,890
At Collins Company Dam	678.0	10,680	23,140	31,650	61,420
At Red Bridge Dam	659.2	10,460	22,260	30,990	60,140
CONNECTICUT RIVER					
At confluence of Westfield River	9,575	137,000	179,000	197,000	241,000
At confluence of Chicopee River	9,046	135,000	175,000	193,000	235,000
At Holyoke's upstream corporate limits	8,275	132,000	170,000	187,000	226,000
FOSKETT MILL STREAM					
At confluence with the Quaboag River	10.1	614	1,030	1,255	1,944
Above State Route 20	8.0	481	804	977	1,508
GREAT BROOK					
At mouth	24.7	600	900	1,000	1,300
At State Route 57	23.1	780	1,300	1,600	2,500
At outlet of Congammond Lakes	11.0	50	110	135	230
HAMILTON RESERVOIR					
At spillway	14.8	1,400	2,200	3,000	4,200

Table 5 – Summary of Discharges (Continued)

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (SQ. MILES)	PEAK DISCHARGES (cfs) 10%-ANNUAL-CHANCE	2%-ANNUAL-CHANCE	1%-ANNUAL-CHANCE	0.2%-ANNUAL-CHANCE
HIGHER BROOK					
At Chicopee-Ludlow corporate limits	10.3	375	650	800	1260
At Fish and Game Club Road	5.0	150	260	320	505
LITTLE RIVER					
Above mouth	84.0	6,800	14,600	19,300	35,900
At Lower Dam	81.0	6,600	14,200	18,900	35,000
At Upper Dam	77.7	6,400	13,800	18,300	34,000
At confluence of Munn Brook	56.5	5,100	11,100	14,700	27,200
LONGMEADOW BROOK					
At confluence with Connecticut River	5.28	189	320	403	660
At confluence of Mill Brook	4.11	160	272	342	554
MAY BROOK					
At outlet of Hamilton Reservoir	5.9	1,050	1,750	2,000	2,900
MIDDLE BRANCH WESTFIELD RIVER					
At Goss Heights gaging station No. 01180500	53.0	7,000	14,700	19,800	3,8000
At Kinne brook Road	49.0	6,700	14,000	18,900	3,6000
At Town of Chester corporate limits	34.0	5,300	11,200	15,000	29,000
MUNN BROOK					
At mouth	21.7	1,300	2,200	2,600	3,700
At Westfield-Southwick corporate limits	19.2	1,300	2,200	2,600	3,700
Upstream of confluence with Shurtleff Brook	14.3	800	1,340	1,630	2,500

Table 5 – Summary of Discharges (Continued)

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (SQ. MILES)	PEAK DISCHARGES (cfs) 10%-ANNUAL-CHANCE	2%-ANNUAL-CHANCE	1%-ANNUAL-CHANCE	0.2%-ANNUAL-CHANCE
NINEMILE POND					
At downstream limit of study	1.4	6	6	6	6
At upstream limit of study	1.3	70	110	120	170
NORTH BRANCH MILL RIVER					
At Wilbraham Road	13.9	430	690	820	1,130
Above Fox Road	11.5	380	610	720	1,000
Above Loon Pond Brook	10.2	350	560	670	920
Above Park Street	9.8	320	515	610	840
At Springfield-Wilbraham corporate limits	8.3	260	390	460	620
Downstream of confluence with Tributary C	5.9	240	350	400	515
At upstream limit of study	2.4	140	220	250	330
NORTH BROOK					
Downstream of North Branch Parkway culvert	1.1	55	70	75	80
Upstream of North Branch Parkway culvert	1.1	70	100	110	140
Above Lumae Street	0.5	46	62	72	87
Above Parker St	0.2	25	35	40	50
OTIS WAIT BROOK					
At confluence with West Branch of the Westfield River	1.6	200	400	530	980
POTASH BROOK					
At mouth	6.6	2,000	3,600	4,500	7,200
At Dickinson Hill Road	2.4	970	1,770	2,200	3,540

Table 5 – Summary of Discharges (Continued)

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (SQ. MILES)	PEAK DISCHARGES (cfs) 10%-ANNUAL-CHANCE	2%-ANNUAL-CHANCE	1%-ANNUAL-CHANCE	0.2%-ANNUAL-CHANCE
POWDERMILL BROOK					
At mouth	19.10	75	750	1,000	1,400
QUABOAG RIVER					
At confluence with the Chicopee River	210	4,205	9,120	12,470	24,205
Upstream of confluence with Chicopee Brook	179	3,265	7,060	9,645	18,465
At West Brimfield USGS gage	151	2,475	5,080	6,850	13,510
SAWMILL BROOK					
Upstream of confluence with South Branch Mill River	2.80	190	300	350	480
At upstream limit of study	2.50	180	290	340	470
SCANTIC RIVER					
At State Line Sommers, CT	26.74	1,130	1,978	2,442	3,700
Above Tributary A	25.10	1,072	1,879	2,320	3,500
At Somers Road	23.17	1,031	1,806	2,229	3,326
Above West Brook	21.71	1,007	1,776	2,198	3,300
Above Big Brook	17.53	858	1,502	1,851	2,810
SHERMAN BROOK					
1,200 feet below State Route 2	6.00	336	574	703	1,094
SHURTLEFF BROOK					
At mouth	2.90	500	900	1,200	1,900
SOUTH BRANCH MILL RIVER					
At Plum Tree Road	12.90	445	720	820	1,180
Above Park Street	9.70	450	740	870	1,250
Above White Oak Road	8.30	415	680	810	1,170

Table 5 – Summary of Discharges (Continued)

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (SQ. MILES)	PEAK DISCHARGES (cfs) 10%-ANNUAL-CHANCE	2%-ANNUAL-CHANCE	1%-ANNUAL-CHANCE	0.2%-ANNUAL-CHANCE
SOUTH BRANCH MILL RIVER (Continued)					
At Springfield-East Longmeadow corporate limits	7.10	360	590	700	1,010
Upstream from Tributary C	5.50	305	490	580	815
At East Longmeadow-Hampden corporate limits	5.32	310	500	600	860
At Hampden-Wilbraham corporate limits	5.20	310	500	600	850
Downstream of confluence with Sawmill Brook	4.40	270	410	475	630
Upstream of confluence with Sawmill Brook	1.60	80	110	120	160
At Wilbraham-Hampden corporate limits	1.68	80	110	120	160
STEVENS BROOK					
At outlet to Hamilton Reservoir	4.30	440	750	870	1,250
STILL BROOK					
Regional Frequency Analysis	5.86	340	540	630	880
SWIFT RIVER					
At confluence with Ware River	216	1,420	3,090	4,210	8,180
Upstream of confluence with Jabish Brook	196	620	1,360	1,850	3,590
TANNERY BROOK					
900 feet North of Lower Westfield Road	0.80	97	139	156	200

Table 5 – Summary of Discharges (Continued)

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (SQ. MILES)	PEAK DISCHARGES (cfs) 10%-ANNUAL-CHANCE	2%-ANNUAL-CHANCE	1%-ANNUAL-CHANCE	0.2%-ANNUAL-CHANCE
TANNERY BROOK (Continued)					
700 feet South of Westfield Road	0.40	45	63	69	87
THAYER BROOK					
At inlet to Pulpit Rock Lake upstream of confluence with Twelvemile Brook	1.32	105	160	195	285
TRIBUTARY A (EAST LONGMEADOW)					
At confluence with Watchaug Brook	3.69	180	270	310	410
At upstream State Route 20	1.70	90	120	140	180
TRIBUTARY C					
At upstream confluence with North Branch Mill River	1.90	130	200	230	310
At upstream limit of study	1.10	90	140	160	220
TRIBUTARY TO GREAT BROOK					
At mouth	0.90	350	610	730	1,100
TWELVEMILE BROOK					
At Dam (outlet) from Pulpit Rock Lake	6.75	300	500	605	850
At inlet to Pulpit Rock Lake upstream of confluence with Thayer Brook	5.25	255	420	510	720
WALES BROOK					
At Brimfield State Forest	4.74	272	472	581	901
At Holland Road	3.61	206	360	443	688

Table 5 – Summary of Discharges (Continued)

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (SQ. MILES)	PEAK DISCHARGES (cfs) 10%-ANNUAL-CHANCE	2%-ANNUAL-CHANCE	1%-ANNUAL-CHANCE	0.2%-ANNUAL-CHANCE
WALES BROOK (Continued)					
At Sizer Drive	2.96	164	289	356	553
At Laurel Hill Road	2.16	92	165	203	311
At State Route 19 near school	2.02	81	145	180	274
At Lake George Outfall	1.23	20	40	50	70
At Lake George Road	0.44	53	94	116	185
WALKER BROOK					
At confluence with West Branch Westfield River	19.00	1,400	2,700	3,400	5,800
At gaging station No. 01180800	3.00	380	740	940	1,600
WARE RIVER					
At Three Rivers	337	5,890	12,780	17,470	33,910
Upstream of confluence with Swift River	219	5,000	10,850	14,840	28,800
WATCHUAG BROOK					
At Somer, CT Town line	7.39	345	545	645	900
Upstream from Tributary A	3.60	190	285	330	450
Upstream from Tributary F	2.78	155	230	265	350
At cross section H	2.28	140	210	240	330
At East Longmeadow-Hampden corporate limits	1.85	120	185	215	280
Above Tributary B	1.13	85	125	145	190
WEST BRANCH FARMINGTON RIVER					
At downstream Tolland corporate limits	103	7,300	18,000	26,200	60,200

Table 5 – Summary of Discharges (Continued)

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (SQ. MILES)	PEAK DISCHARGES (cfs) 10%-ANNUAL-CHANCE	2%-ANNUAL-CHANCE	1%-ANNUAL-CHANCE	0.2%-ANNUAL-CHANCE
WEST BRANCH FARMINGTON RIVER (Continued)					
At New Boston gaging station	92	6,600	16,400	23,800	55,000
At upstream Tolland corporate limits	49	4,000	9,900	14,400	33,200
WEST BRANCH WESTFIELD RIVER					
At Huntington gaging station No. 01181000	94	11,900	23,000	29,500	50,000
At downstream corporate limits	88	11,400	22,100	28,300	48,000
At upstream corporate limits	48	4,000	9,900	14,400	33,200
WESTFIELD RIVER					
At confluence of Connecticut River (Modified Conditions)	517	19,800	38,500	50,200	92,500
At Westfield gaging station (Natural Conditions)	497	32,500	60,500	80,000	145,000
At USGS Gage No. 01183500 (Natural Conditions)	497	31,700	61,400	80,000	148,000
At USGS Gage No. 01183500 (Modified Conditions)	497	19,300	37500	48,800	90,000
Below Little River	452	16,000	38,500	68,000	150,000
At Westfield River, Fowler St. Extension	360	14,900	38,500	58000	135,000
Below Route 90	354	13,600	38,500	60,000	141,000
At upstream corporate limits	140	14,800	34,800	50,000	109,000
At upstream of confluence with Potash Brook	128	14,700	31700	43,700	88,000
At downstream corporate limits	108	14,600	26,600	33,000	53,000

Table 5 – Summary of Discharges (Continued)

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (SQ. MILES)	PEAK DISCHARGES (cfs) 10%-ANNUAL-CHANCE	2%-ANNUAL-CHANCE	1%-ANNUAL-CHANCE	0.2%-ANNUAL-CHANCE
WILLIMANSETT BROOK					
At mouth	4.5	260	410	470	650

3.2 Hydraulic Analyses

Hydraulic analyses, considering storm characteristics and the shoreline and bathymetric characteristics of the flooding source studied, were carried out to provide estimates of the elevations of floods of the selected recurrence intervals along the shoreline. 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. Flood elevations shown on the FIRM are primarily intended for flood insurance rating purposes. For construction and/or floodplain management purposes, users are cautioned to use the flood elevation data presented in this FIS in conjunction with the data shown on the FIRM.

Flood profiles were drawn showing computed water-surface elevations to an accuracy of 0.5 foot for floods of the selected recurrence intervals. 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 is computed (Section 4.2), selected cross-section locations are also shown on the FIRM (Exhibit 2). Unless specified otherwise, the hydraulic analyses for these studies 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 shown on the Flood Profiles and FIRM (Exhibits 1 and 2) are referenced to the North American Vertical Datum of 1988 (NAVD88).

Countywide Analyses

With the exception of the Connecticut River and streams in the Towns of Blandford, Granville and Montgomery; hydraulic analysis and resultant flood profiles are taken from the original flood insurance study reports as described previously in Section 1.2. The only change was to modify the flood elevations to reflect the change from National Geodetic Vertical Datum of 1929 (NGVD29) to NAVD88 as reference in Section 3.3. The following text refers to the analysis performed for this revision on the Connecticut River.

Cross-sections along the Connecticut River were developed for the hydraulic model using GIS-based automated modeling techniques from a digital terrain model of the study area. The floodplain digital terrain model was developed from aerial LiDAR topographic

survey of the above water areas and boat-based bathymetric transect survey of the underwater areas. All other cross-sections were determined from topographic maps and field surveys. For flooding sources studied by detailed methods, 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.

Dimensions of the hydraulic structures along the Connecticut River were determined from available plan information and from previous FIS HEC-2 model inputs (USACE, 1990).

Manning's "n" values along the Connecticut River were assigned using GIS-based automated modeling techniques based on a land cover datalayer available from Mass GIS and refined based on project digital orthophotographs and field notes taken during bathymetric survey. Each land cover type was assigned a representative Manning's "n" value. Manning's "n" values for other rivers were taken from the original FIS reports. Table 6, "Manning's "n" Values," shows the channel and overbank "n" values for the streams studied by detailed methods.

Table 6 – Manning's "n" Values

STREAM	CHANNEL	OVERBANK
Austin Brook	0.035 – 0.045	0.040 – 0.100
Bradley Brook	0.035 – 0.400	0.065 – 0.070
Broad Brook	0.035 – 0.050	0.035 – 0.110
Chicopee Brook	0.020 – 0.050	0.020 – 0.120
Chicopee River	0.019 – 0.050	0.035 – 0.800
Connecticut River	0.028 – 0.029	0.014 – 0.300
Foskett Mill Stream	0.035	0.050 – 0.080
Great Brook	0.015 – 0.045	0.055 – 0.100
Hamilton Reservoir	0.020 – 0.040	0.055 – 0.080
Higher River (Brook)	0.035 – 0.050	0.035 – 0.085
Little River	0.035 – 0.050	0.050 – 0.151
Longmeadow Brook	0.020 – 0.040	0.045 – 0.095
May Brook	0.020 – 0.040	0.055 – 0.080
Middle Branch Westfield River	0.035 – 0.045	0.040 – 0.100
Munn Brook	0.015 – 0.045	0.055 – 0.100
Ninemile Pond	0.019 – 0.060	0.035 – 0.180
North Branch Mill River	0.019 – 0.060	0.035 – 0.50
North Brook	0.025	0.050
Otis Wait Brook	0.035 – 0.045	0.040 – 0.100
Paucatuck*	0.035 – 0.040	0.010
Pecousic Brook	0.040 – 0.050	0.060 – 0.120
Potash Brook	0.035 – 0.400	0.065 – 0.070
Powdermill Brook	0.035	0.070

Table 6 – Manning's "n" Values (Continued)

STREAM	CHANNEL	OVERBANK
Quaboag River	0.035 – 0.100	0.030 – 0.100
Sawmill Brook	0.019 – 0.060	0.035 – 0.180
Scantic River	0.025 – 0.050	0.065 – 0.100
Sherman Brook	0.040	0.065 – 0.080
Shurtleff Brook	0.015 – 0.045	0.055 – 0.080
South Branch Mill River	0.019 – 0.060	0.035 – 0.180
Stevens Brook	0.020 – 0.040	0.055 – 0.080
Still Brook	0.035 – 0.400	0.050 – 0.070
Swift River	0.035 – 0.550	0.020 – 0.090
Tannery Brook	0.040 – 0.070	0.050 – 0.110
Thayer Brook	0.020 – 0.050	0.020 – 0.120
Tributary A (E. Longmeadow)	0.040 – 0.050	0.060 – 0.120
Tributary A (Hampden)	0.025 – 0.050	0.065 – 0.100
Tributary A (Wilbraham)	0.019 – 0.060	0.035 – 0.180
Tributary C (E. Longmeadow)	0.019 – 0.060	0.035 – 0.180
Tributary C (Wilbraham)	0.019 – 0.060	0.035 – 0.180
Tributary E (Hampden)	0.025 – 0.050	0.065 – 0.100
Tributary of Great Brook	0.015 – 0.045	0.055 – 0.080
Twelvemile Brook	0.020 – 0.050	0.020 – 0.120
Wales Brook	0.015 – 0.035	0.050 – 0.080
Walker Brook	0.035 – 0.045	0.040 – 0.100
Watchaug Brook	0.025 – 0.050	0.065 – 0.120
Wales Brook	0.015 – 0.035	0.050 – 0.080
Ware River	0.035 – 0.050	0.020 – 0.075
West Branch Farmington River	0.035 – 0.400	0.055 – 0.081
West Branch Westfield River	0.035 – 0.045	0.040 – 0.100
Westfield River	0.035 – 0.400	0.050 – 0.070
Willimansett Brook	0.019 – 0.050	0.035 – 0.800

Water surface elevations along the Connecticut River were determined for the 10-, 2-, 1-, and 0.2- annual chance flood using a steady flow step backwater hydraulic model, HEC-RAS version 3.1.3, dated 2002. Starting water surface elevations for the Connecticut River at the Massachusetts/Connecticut state border were obtained from Roald Haestad, Inc. who modeled the Connecticut River from the Long Island Sound upstream to the border.

Along the study reach of the Connecticut River there are 17 miles of levees and 24 pump stations that protect shoreline towns and cities in Hampden County. These levees and

pump stations were evaluated for potential flooding in the interior areas protected by the levees as part of this flood study. Holyoke, Chicopee, West Springfield, and Springfield are the communities in Hampden County that have levee systems along the Connecticut River. The low-lying areas they protect are generally highly developed and densely populated.

A hydrologic model was developed using the USACE Hydrologic Engineering Center's Hydrologic Modeling System (HEC-HMS), version 3.0.1 (2006), for the interior drainage areas. The model includes flood elevation calculations via reservoir storage analysis. Geographic information systems (GIS) analysis was used to efficiently characterize the drainage and storage areas. The following flood protection reports from USACE were sources information regarding pump station locations, pump characteristics, levee elevations and watershed boundaries. This information was supplemented by maps and personal knowledge from city/town personnel.

- Operation and Maintenance Manual for Flood Protective Works on Connecticut and Chicopee Rivers and Chicopee-Chicopee Falls, Massachusetts, 1984
- Operation and Maintenance Manual for Flood Protective Works Holyoke, Massachusetts., 1951
- Operation and Maintenance Manual for Flood Protection System at Springfield, Massachusetts, 1945
- Operation and Maintenance Manual for Flood Protective Works at West Springfield, Massachusetts, 1950, revised 1997

Sub-watershed areas were delineated to each pump station. Sub-watershed areas for the Holyoke, Chicopee and West Springfield pump stations were delineated based on the mapping obtained from the USACE. These areas were confirmed or modified based on stormwater and/or combined system mapping and personal knowledge from town/city personnel. Springfield's pumping station Sub-watersheds were delineated based on stormwater and combined system GIS mapping obtained from the city and confirmed with city personnel.

Results showed that if levees are assumed to provide protection from the 1-percent-annual-chance flood, some areas protected by these levees will still be affected by flooding during major rain events. This is due to the pump station not being able to handle the rate of runoff, which results in flooding of the low lying areas. The results show that Holyoke is well protected by the levees/pump stations for the 1-percent-annual-chance event. Springfield is the least protected with a total of 344 acres flooding during this event followed by West Springfield with 202 acres and Chicopee with 134 acres.

For flooding sources studied with approximate methods (in the Towns of Blanford, Granville and Montgomery), the 1-percent-annual-chance flood elevations were determined using USGS Regression Equations and the USACE HEC-RAS computer program. The peak flood discharges from the regression equations were input into a HEC-RAS model that included cross sections extracted from MassGIS, the Connecticut Department of Environmental Protection and University of Connecticut terrain and contour elevation data. Because this cross section information was not supplemented with field survey data and the models did not include bridge and culvert information, resulting floodplain boundaries are mapped as Zone A without base flood elevations

(BFEs) determined. Approximately 60 miles in the Towns of Blandford, Granville, and Montgomery were analyzed using this approach.

New approximate riverine hydraulic analyses were performed along: Bedlam Brook, Birch Meadow Brook, Borden Brook, Case Brook, Dickinson brook, East Branch Salmon Brook, Freeland Brook, Goldmine Brook, Halfway Brook, Hall Pond Brook, Japhet Brook, Little River, Lloyd Brook, Moose Meadow Brook, Nye Brook, Peebles Brook, Pixley Brook, Polash Brook, Pond Brook, Ripley Brook, Roaring Brook, Seymour Brook, Tillotson Brook, Valley Brook, Watson Brook, Wheeler Brook, and various unnamed tributaries.

3.3 Vertical Datum

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

Flood elevations shown in this FIS report and on the FIRM are referenced to the NAVD88. These flood elevations must be compared to structure and ground elevations referenced to the same vertical datum. For information regarding conversion between the NGVD29 and NAVD88, visit the National Geodetic Survey website at www.ngs.noaa.gov, or contact the National Geodetic Survey at the following address:

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

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

Prior versions of the FIS reports and FIRMs were referenced to the NGVD29. When a datum conversion is effected for a FIS report and FIRM, the Flood Profiles, BFEs, and Elevation Reference Marks (ERM) 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.

As noted above, the elevations shown in this FIS report and on the FIRM for Hampden County are referenced to NAVD88. Ground, structure, and flood elevations may be compared and/or referenced to NGVD 29 by applying a standard conversion factor. The conversion factor to NGVD29 is -0.67 feet. 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 NGVD29 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 the minimum to the nearest 0.1 foot.

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

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The NFIP encourages State and local governments to adopt sound floodplain management programs. Therefore, each FIS provides 1-percent-annual-chance (100-year) flood elevations and delineations of the 1- and 0.2-percent-annual-chance (500-year) floodplain boundaries and 1-percent-annual-chance floodway to assist communities in developing floodplain management measures. This information is presented on the FIRM and in many components of the FIS report, including Flood Profiles and Floodway Data Table. Users should reference the data presented in the FIS report as well as additional information that may be available at the local map repository before making flood elevation and/or floodplain boundary determinations.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1-percent-annual-chance flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2-percent-annual-chance flood is employed to indicate additional areas of flood risk in the community.

The Connecticut River boundaries were interpolated between cross-sections using 7.5-min USGS Quads and Digital Ortho Quarter Quads at 1:24,000 scale, 10 foot contour interval, as well as Project LiDAR survey, including topo and digital color orthophotography, RMSE = 0.483 and 2 foot contour intervals.

For the Westfield River (between XS BM-BU), the 1- and 0.2-percent-annual-chance floodplain boundaries have been delineated using the flood elevations determined at each cross section. Floodplain boundaries were interpolated between cross sections using digital terrain models developed from Massachusetts Office of Geographic Information Systems (MassGIS) 2005 digital orthophoto elevation points, 1999 3-foot contour lines, and breaklines provided by the MassGIS and Connecticut 2-foot contour lines provided by the Connecticut Department of Environmental Protection and University of Connecticut, year 2000.

For unrevised streams in Hampden County, the existing data were used from previously mapped Flood Boundary and Floodway Maps and FIRMs for each individual community and delineated on the MassGIS 2005 color digital orthophotography.

Approximate 1-percent-annual-chance floodplain boundaries in some portions of the study area were taken directly from the Flood Hazard Boundary Maps for Agawam, Brimfield, Chester, Chicopee, East Longmeadow, Hampden, Holland, Holyoke, Ludlow, Munson, Palmer, Southwick, Tolland, Wales, Westfield, and Wilbraham.

The 1- and 0.2-percent-annual-chance floodplain boundaries are shown on the FIRM. On this map, the 1-percent-annual-chance floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones A, AE, AH, AO, A99), 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.

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 base flood can be carried without substantial increases in flood heights. Minimum Federal standards limit such increases to 1 foot, provided that hazardous velocities are not produced. The floodways in this study are presented to local agencies as minimum standards that can be adopted directly or that can be used as a basis for additional floodway studies.

The community based FIS reports prior to 1979 were prepared for the FIA. In 1979, an executive order merged the FIA into the newly formed FEMA. Reports from that date were prepared for FEMA. All of the reports are incorporated into this countywide study.

The Connecticut River and its drainage areas were the only portions of Hampden County to have new detailed studies performed. For this revision, the Connecticut River was restudied by detailed methods, and an interior drainage analysis was performed on those areas protected by levees along the main stem of the Connecticut River. No tributaries were restudied. The floodway on the Connecticut River was computed using the project steady flow step-backwater hydraulic model, HEC-RAS. A preliminary floodway encroachment was established using the model's equal conveyance reduction option and a maximum water surface of one foot. Floodway encroachment stations were then manually refined to produce a smoothed and uniform floodway.

The non-revised floodways presented in this study were computed for certain stream segments on the basis of equal-conveyance reduction from each side of the floodplain. Floodway widths were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. The results of the floodway computations are tabulated for selected cross sections (see Table 7, Floodway Data). In cases where the floodway and 1-percent-annual-chance floodplain boundaries are either close together or colinear, only the floodway boundary is shown.

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 WSEL of the 1-percent-annual-chance flood more than 1 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 1, "Floodway Schematic".

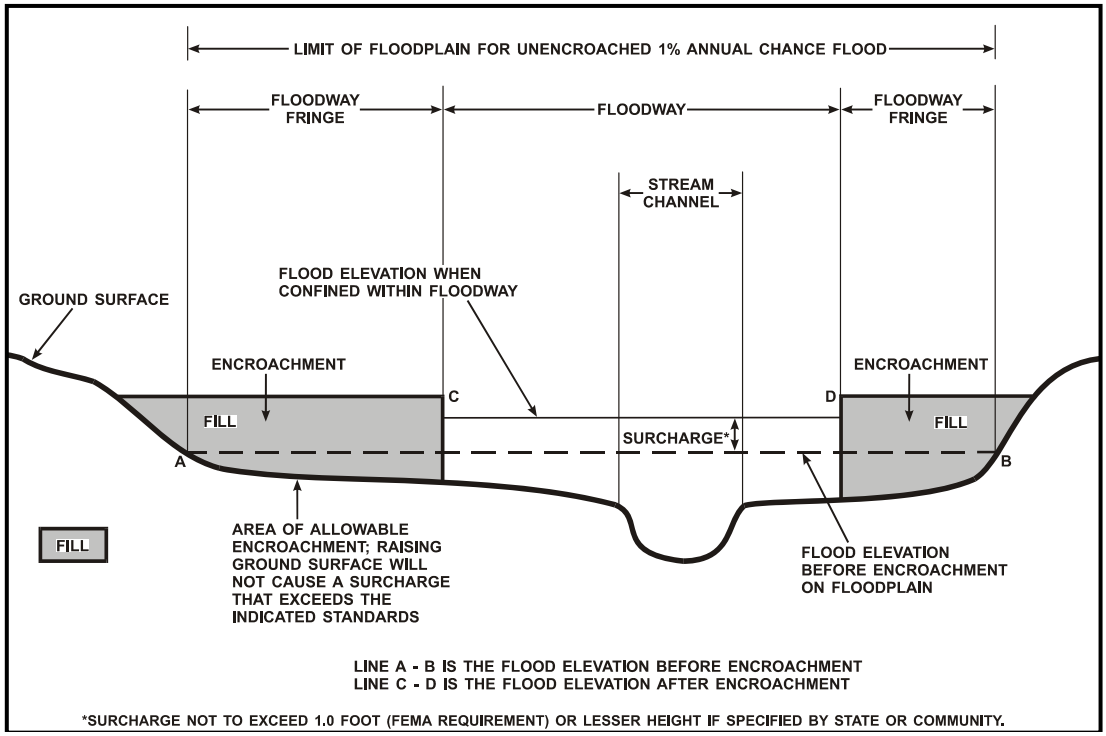

Figure 1 – Floodway Schematic

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
BRADLEY BROOK								
A	1	100	650	9.8	278.0	271.8[2]	278.8	1.0
B	200	82	469	13.6	278.0	276.6[2]	276.8	0.2
C	1,390	154	718	8.9	302.2	302.2[2]	303.0	0.8
D	1,730	41	396	16.1	308.7	308.7	309.6	0.9
E	2,100	104	623	10.3	317.4	317.4	317.5	0.1
F	2,420	221	891	7.2	324.5	324.5	324.5	0.0
G	3,900	78	510	12.6	354.2	354.2	355.2	0.1

[1]Stream distance in feet above confluence with Westfield River
[2]Elevation computed without consideration of backwater effects from Westfield River

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAMPDEN COUNTY, MA

ALL JURISDICTIONS

FLOODWAY DATA

BRADLEY BROOK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
BROAD BROOK								
A	0.075	14	100	8.6	280.7	272.1[2]	273.0	1.0
B	0.087	130	411	2.1	280.7	274.1[2]	274.5	0.5
C	0.191	45	135	6.4	280.7	276.7[2]	276.7	0.1
D	0.258	22	107	8.0	280.7	278.7[2]	279.2	0.6
E	0.324	30	153	5.6	280.7	280.7	281.5	0.8
F	0.357	19	116	7.4	280.7	280.7	281.6	0.9
G	0.361	27	99	8.7	280.9	280.9	281.6	0.7
H	0.484	35	143	6.0	287.3	287.3	288.0	0.7
I	0.512	24	84	10.2	292.5	292.5	292.8	0.3
J	0.664	34	189	4.6	298.9	298.9	299.9	1.0
K	0.778	30	115	7.5	302.2	302.2	302.8	0.6
L	0.863	55	244	3.5	304.6	304.6	305.4	0.8
M	1.109	31	91	9.5	312.2	312.2	312.5	0.3
N	1.143	65	326	2.6	323.7	323.7	323.7	0.0
O	1.342	74	383	2.3	324.3	324.3	324.3	0.0
P	1.370	60	466	1.9	327.9	327.9	327.9	0.0

[1]Stream distance in miles above confluence with Chicopee River
[2]Elevation computed without consideration of backwater effects from Chicopee River

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAMPDEN COUNTY, MA

ALL JURISDICTIONS

FLOODWAY DATA

BROAD BROOK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
BROAD BROOK (LOWER)								
A	0.000	44	120	2.5	223.2	223.2	224.2	1.0
B	0.173	90	300	1.0	226.5	226.5	226.6	0.1
C	0.581	50	230	1.3	235.6	235.6	235.6	0.0
D	0.892	90	550	0.5	237.2	237.2	237.3	0.1
E	1.210	50	60	4.8	238.8	238.8	239.1	0.3

[1]Stream distance in miles above Holyoke corporate limits

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAMPDEN COUNTY, MA

ALL JURISDICTIONS

FLOODWAY DATA

BROAD BROOK (LOWER)

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
BROAD BROOK (UPPER)								
A	4,175	650	1,810	0.1	472.9	472.9	472.9	0.0
B	4,290	310	660	0.2	472.9	472.9	472.9	0.0
C	4,310	230	290	1.3	472.9	472.9	472.9	0.0
D	4,342	310	450	0.7	472.9	472.9	472.9	0.0

[1]Stream distance in miles above Holyoke corporate limits

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAMPDEN COUNTY, MA

ALL JURISDICTIONS

FLOODWAY DATA

BROAD BROOK (UPPER)

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
CHICOPEE BROOK								
A	0.225	195	1,924	2.1	323.0	323.0	323.3	0.3
B	0.580	240	2,285	1.8	323.1	323.1	323.7	0.6
C	0.767	532	3,498	1.2	323.2	323.2	323.9	0.7
D	0.784	350	2,382	1.7	323.7	323.7	324.4	0.7
E	0.994	870	6,225	0.7	323.8	323.8	324.6	0.8
F	1.418	1,438	2,814	1.5	324.0	324.0	324.6	0.6
G	1.469	560	4,495	0.9	324.2	324.2	324.9	0.7
H	1.795	401	2,221	1.9	324.3	324.3	325.1	0.8
I	2.229	333	2,004	1.9	325.9	325.9	326.5	0.6
J	2.521	125	616	6.2	328.5	328.5	329.1	0.6
K	2.579	76	594	6.4	332.4	332.4	332.9	0.5
L	2.636	54	515	7.4	333.0	333.0	333.5	0.5
M	2.646	88	535	7.1	333.0	333.0	333.6	0.6
N	3.366	185	1,024	3.7	343.2	343.2	343.9	0.7
O	3.387	272	1,753	2.2	343.3	343.3	344.2	0.9
P	3.581	54	397	8.6	347.0	347.0	348.0	1.0
Q	3.759	342	1,098	3.1	351.5	351.5	351.8	0.3
R	4.019	176	520	3.6	352.6	352.6	352.6	0.0

[1]Stream distance in miles above confluence with Quaboag River

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAMPDEN COUNTY, MA

ALL JURISDICTIONS

FLOODWAY DATA

CHICOPEE BROOK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
CHICOPEE BROOK								
S	4.493	60	468	4.0	359.4	359.4	359.7	0.3
T	4.644	40	251	7.4	362.0	362.0	362.2	0.2
U	4.713	30	215	8.6	364.0	364.0	364.5	0.5
V	4.859	50	274	6.8	369.0	369.0	369.5	0.5
W	5.001	35	232	8.0	373.0	373.0	373.8	0.8
X	5.017	38	259	7.1	373.6	373.6	374.5	0.9
Y	5.167	52	300	4.8	381.3	381.3	381.4	0.1
Z	5.241	63	190	7.5	385.7	385.7	386.2	0.5
AA	5.370	30	161	8.9	391.6	391.6	392.4	0.8
AB	5.483	37	214	6.7	409.5	409.5	409.9	0.4
AC	5.498	27	200	7.2	413.2	413.2	413.2	0.0
AD	5.524	90	417	3.4	416.1	416.1	416.1	0.0

[1]Stream distance in miles above confluence with Quaboag River

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAMPDEN COUNTY, MA

ALL JURISDICTIONS

FLOODWAY DATA

CHICOPEE BROOK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
CHICOPEE RIVER								
A	1,190	820	4,580	7.1	65.1	49.3[2]	49.3	0.0
B	2,590	1,913	13,980	2.3	65.1	51.6[2]	51.6	0.0
C	3,140	1,290	5,420	6.0	65.1	51.8[2]	51.8	0.0
D	3,175	1,290	4,670	7.0	65.1	51.8[2]	51.8	0.0
E	3,685	1,102	6,920	4.7	65.1	53.2[2]	53.2	0.0
F	4,785	343	3,140	10.4	65.1	57.7[2]	57.7	0.0
G	5,045	297	3,970	8.2	65.1	59.7[2]	59.7	0.0
H	5,100	297	2,880	11.3	65.1	59.7[2]	59.7	0.0
I	5,210	299	3,220	10.1	65.1	60.5[2]	60.5	0.0
J	6,125	290	2,750	11.8	65.4	65.4	65.4	0.0
K	6,645	426	4,270	7.6	70.3	70.0	70.3	0.3
L	7,155	295	4,440	7.3	71.3	71.3	71.8	0.5
M	7,210	320	4,580	7.1	85.6	85.6	85.6	0.0
N	7,400	271	4,200	7.7	85.9	85.9	85.9	0.0
O	9,340	254	4,610	7.1	88.7	88.7	89.2	0.5
P	10,760	221	4,400	7.4	90.2	90.2	91.0	0.8
Q	12,100	339	5,380	6.1	91.9	91.9	92.9	1.0
R	13,470	283	4,980	6.5	93.5	93.5	94.4	0.9

[1]Stream distance in feet above confluence with Connecticut River

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAMPDEN COUNTY, MA

ALL JURISDICTIONS

FLOODWAY DATA

CHICOPEE RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
CHICOPEE RIVER								
S	15,040	201	3,100	10.5	95.4	95.4	96.3	0.9
T	16,090	282	4,800	6.8	99.3	99.3	99.7	0.4
U	16,360	351	4,400	7.4	99.6	99.6	100.0	0.4
V	16,420	351	4,490	7.2	99.8	99.8	100.2	0.4
W	16,530	411	4,490	7.2	99.9	99.9	100.3	0.4
X	16,645	351	2,260	14.4	104.6	104.6	104.6	0.0
Y	16,700	351	4,180	7.8	114.8	114.8	115.1	0.3
Z	16,960	250	3,910	8.3	115.4	115.4	115.7	0.3
AA	17,920	270	5,000	6.5	116.9	116.9	117.4	0.5
AB	19,420	812	12,140	2.7	118.0	118.0	118.7	0.7
AC	20,780	1,783	28,260	1.2	118.2	118.2	118.9	0.7
AD	21,470	1,505	21,110	1.5	118.2	118.2	118.9	0.7
AE	22,970	926	10,960	3.0	118.4	118.4	119.0	0.6
AF	25,830	228	3,740	8.7	120.2	120.2	121.2	1.0
AG	27,110	350	5,440	6.0	123.3	123.3	124.3	1.0
AH	27,210	353	5,530	5.9	123.4	123.4	124.4	1.0
AI	27,510	370	5,550	5.8	123.8	123.8	124.7	0.9
AJ	28,830	300	5,340	6.1	125.6	125.6	126.5	0.9

[1]Stream distance in feet above confluence with Connecticut River

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAMPDEN COUNTY, MA

ALL JURISDICTIONS

FLOODWAY DATA

CHICOPEE RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
CHICOPEE RIVER								
AK	30,959	620	9,470	3.4	127.9	127.9	128.6	0.7
AL	32,289	330	4,950	6.6	128.7	128.7	129.3	0.6
AM	32,989	510	5,710	5.6	129.7	129.7	130.4	0.7
AN	34,149	480	4,380	7.3	131.2	131.2	132.0	0.8
AO	35,599	230	3,270	7.8	135.9	135.9	136.0	0.1
AP	36,449	300	5,450	5.9	138.5	138.5	138.6	0.1
AQ	37,639	330	5,450	5.9	139.7	139.7	139.8	0.1
AR	38,159	410	7,410	4.3	140.4	140.4	140.6	0.2
AS	38,999	420	6,090	5.3	140.8	140.8	141.1	0.3
AT	39,189	180	3,750	8.5	140.8	140.8	141.1	0.3
AU	39,374	300	4,770	6.7	141.2	141.2	141.4	0.2
AV	40,054	200	3,450	9.3	142.8	142.8	143.1	0.3
AW	41,344	260	4,090	7.8	148.5	148.5	149.1	0.6
AX	41,509	410	7,620	4.2	149.3	149.3	149.3	0.0
AY	41,609	430	11,950	2.7	167.2	167.2	167.2	0.0
AZ	42,799	570	12,480	2.6	167.4	167.4	167.4	0.0
BA	43,149	590	15,100	2.1	167.4	167.4	167.4	0.0
BB	43,519	540	14,010	2.3	167.5	167.5	167.5	0.0

[1]Stream distance in feet above confluence with Connecticut River

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAMPDEN COUNTY, MA

ALL JURISDICTIONS

FLOODWAY DATA

CHICOPEE RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
CHICOPEE RIVER								
BC	44,389[1]	900	17,850	1.8	167.5	167.5	167.5	0.0
BD	45,399[1]	140	1,620	19.8	167.6	167.6	167.6	0.0
BE	45,549[1]	190	3,380	9.5	174.0	174.0	174.1	0.1
BF	45,729[1]	190	3,300	9.7	174.6	174.6	175.0	0.4
BG	46,929[1]	660	3,560	8.2	177.8	177.8	178.3	0.5
BH	48,099[1]	370	8,070	4.0	179.2	179.2	179.9	0.7
BI	48,579[1]	230	3,690	8.7	179.2	179.2	179.9	0.7
BJ	48,929[1]	140	1,620	19.8	191.9	191.9	191.9	0.0
BK	49,078[1]	150	2,190	14.6	193.5	193.5	194.5	1.0
BL	10.431[2]	300	5,740	5.6	215.1	215.1	215.2	0.1
BM	10.809[2]	840	8,170	3.9	216.2	216.2	216.4	0.2
BN	11.542[2]	1,500	13,280	2.4	218.0	218.0	218.2	0.2
BO	12.166[2]	600	5,717	5.6	219.6	219.6	219.9	0.3
BP	12.572[2]	265	4,094	7.8	222.6	222.6	223.0	0.4
BQ	12.629[2]	285	4,229	7.5	223.1	223.1	223.7	0.6
BR	12.690[2]	350	4,875	6.5	224.2	224.2	224.8	0.6
BS	13.352[2]	220	*	*	230.7	230.7	*	*
BT	13.780[2]	480	9.699	3.3	233.9	233.9	234.8	0.9
BU	14.072[2]	255	4,844	6.5	234.8	234.8	235.5	0.7

[1]Stream distance in feet above confluence with Connecticut River
[2]Stream distance in miles above confluence with Connecticut River
*Data not available

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY
HAMPDEN COUNTY, MA
ALL JURISDICTIONS

FLOODWAY DATA

CHICOPEE RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
CHICOPEE RIVER								
BV	14.454	430	7,462	4.2	238.9	238.9	239.7	0.8
BW	14.920	600	9,141	3.5	241.8	241.8	242.7	0.9
BX	15.116	350	7,058	4.5	242.5	242.5	243.4	0.9
BY	15.252	300	5,529	6.7	244.1	244.1	244.9	0.8
BZ	15.351	700	32,726	0.9	280.7	280.7	280.7	0.0
CA	15.782	920	49,862	0.6	280.7	280.7	280.7	0.0
CB	16.362	440	18,951	1.6	280.7	280.7	280.7	0.0
CC	16.394	405	8,891	3.4	280.7	280.7	281.7	1.0
CD	16.868	445	8,163	3.7	281.1	281.1	282.1	1.0
CE	17.265	335	3,506	8.5	281.2	281.2	282.1	0.9
CF	17.449	194	3,123	9.6	282.9	282.9	283.4	0.5
CG	17.659	388	6,002	5.0	284.5	284.5	285.4	0.9
CH	18.065	91	2,143	14.0	292.8	292.8	293.6	0.8
CI	18.135	165	3,209	9.3	295.4	295.4	296.3	0.9
CJ	18.190	213	3,408	8.8	296.2	296.2	297.0	0.8
CK	18.235	200	2,528	11.8	296.9	296.9	297.6	0.7

[1]Stream distance in miles above confluence with Connecticut River

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAMPDEN COUNTY, MA

ALL JURISDICTIONS

FLOODWAY DATA

CHICOPEE RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
CONNECTICUT RIVER								
A	550	1,614	40,827	5.0	57.1	57.1	57.3	0.2
B	2,550	1,702	41,881	5.0	57.2	57.2	57.6	0.4
C	4,550	1,794	43,468	5.0	57.4	57.4	57.8	0.4
D	6,550	1,832	43,208	5.0	57.6	57.6	58.0	0.4
E	8,550	1,949	46,993	4.0	57.8	57.8	58.3	0.5
F	10,550	1,879	45,719	4.0	57.9	57.9	58.5	0.6
G	12,550	1,723	43,823	5.0	58.1	58.1	58.7	0.6
H	14,550	1,281	36,701	5.0	58.2	58.2	58.8	0.6
I	16,550	1,007	31,767	6.0	58.4	58.4	59.0	0.6
J	18,550	1,300	37,090	5.0	59.0	59.0	59.6	0.6
K	20,280	1,477	38,465	5.0	59.3	59.3	59.8	0.5
L	22,050	1,197	33,618	6.0	60.0	60.0	60.5	0.5
M	24,050	1,189	34,086	6.0	60.3	60.3	60.8	0.5
N	26,050	1,349	37,540	5.0	60.6	60.6	61.2	0.6
O	27,610	1,236	36,750	5.0	60.8	60.8	61.3	0.5
P	29,090	1,312	41,057	5.0	61.8	61.8	62.3	0.5
Q	31,050	1,236	36,869	5.0	62.0	62.0	62.5	0.5
R	33,050	1,189	35,898	5.0	62.2	62.2	62.7	0.5

[1]Stream distance in feet above Agawam/Enfield corporate boundary

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAMPDEN COUNTY, MA

ALL JURISDICTIONS

FLOODWAY DATA

CONNECTICUT RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
CONNECTICUT RIVER								
S	35,050	984	32,186	6.0	62.8	62.8	63.2	0.4
T	37,050	925	31,328	6.0	63.1	63.1	63.5	0.4
U	39,030	1,343	40,676	5.0	63.6	63.6	64.0	0.4
V	41,050	1,213	36,791	5.0	63.7	63.7	64.2	0.5
W	43,050	987	31,822	6.0	63.9	63.9	64.3	0.4
X	45,000	894	30,918	6.0	64.3	64.3	64.7	0.4
Y	47,050	1,087	36,051	5.0	64.7	64.7	65.1	0.4
Z	49,050	1,019	32,162	6.0	64.9	64.9	65.3	0.4
AA	51,050	1,392	41,530	5.0	65.2	65.2	65.8	0.6
AB	52,640	1,100	36,163	5.0	65.9	65.9	66.4	0.5
AC	55,050	846	30,438	6.0	66.1	66.1	66.6	0.5
AD	57,050	1,275	40,013	5.0	66.5	66.5	67.0	0.5
AE	59,050	975	32,165	6.0	66.6	66.6	67.1	0.5
AF	61,050	961	31,820	6.0	66.8	66.8	67.4	0.6
AG	63,050	922	32,271	6.0	67.2	67.2	67.7	0.5
AH	65,550	1,101	35,999	5.0	67.6	67.6	68.1	0.5
AI	67,550	906	29,563	6.0	67.7	67.7	68.2	0.5
AJ	68,550	910	27,853	7.0	68.2	68.2	68.7	0.5

[1]Stream distance in feet above Agawam/Enfield corporate boundary

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAMPDEN COUNTY, MA

ALL JURISDICTIONS

FLOODWAY DATA

CONNECTICUT RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
CONNECTICUT RIVER								
AK	70,680	801	21,982	9.0	68.4	68.4	68.9	0.5
AL	71,240	737	21,927	9.0	69.7	69.7	70.2	0.5
AM	73,050	782	20,786	9.0	70.8	70.8	70.9	0.1
AN	75,050	995	27,073	7.0	72.0	72.0	72.1	0.1
AO	77,060	716	22,220	8.0	72.3	72.3	72.4	0.1
AP	79,050	1,454[2]	40,011	5.0	73.6	73.6	73.7	0.1
AQ	81,050	1,048[2]	17,516	11.0	73.8	73.8	73.9	0.7
AR	83,110	1,427[2]	36,584	5.0	113.2	113.2	113.2	0.0
AS	85,050	1,376[2]	33,418	6.0	113.6	113.6	113.6	0.0
AT	87,050	1,329[2]	32,588	6.0	114.0	114.0	114.0	0.0
AU	89,050	1,120[2]	30,133	6.0	114.2	114.2	114.2	0.0
AV	91,050	1,017[2]	34,174	5.0	114.6	114.6	114.7	0.1
AW	93,310	691[2]	15,481	12.0	114.7	114.7	114.8	0.1
AX	95,050	559[2]	15,693	12.0	116.2	116.2	116.3	0.1
AY	97,050	899[2]	28,546	7.0	118.8	118.8	118.8	0.0
AZ	99,050	1,138[2]	32,875	6.0	119.2	119.2	119.3	0.1
BA	100,940	1,259[2]	35,810	5.0	119.6	119.6	119.6	0.0
BB	103,050	905[2]	27,831	7.0	119.7	119.7	119.8	0.1

[1]Stream distance in feet above Agawam/Enfield corporate boundary
[2]Width extends beyond county boundary

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY
HAMPDEN COUNTY, MA
ALL JURISDICTIONS

FLOODWAY DATA

CONNECTICUT RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH[2] (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
CONNECTICUT RIVER								
BC	107,050	1,104	33,033	6.0	120.5	120.5	120.6	0.1
BD	109,100	776	28,207	7.0	120.8	120.8	120.8	0.0
BE	110,360	940	31,606	6.0	121.1	121.1	121.2	0.1
BF	113,010	807	24,858	8.0	121.8	121.8	121.8	0.0

[1]Stream distance in feet above Agawam/Enfield corporate boundary
[2]Width extends beyond county boundary

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY
HAMPDEN COUNTY, MA
ALL JURISDICTIONS

FLOODWAY DATA

CONNECTICUT RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
FOSKETT MILL STREAM								
A	0.0272	215	714	1.8	356.1	352.2[2]	353.1	1.0
B	0.1372	50	240	5.2	358.3	358.3	358.3	0.0
C	0.3112	100	294	4.3	359.1	359.1	359.7	0.6
D	0.4582	70	284	3.4	364.8	364.8	365.6	0.8
E	0.6282	85	173	5.7	370.9	370.9	371.3	0.4

[1]Stream distance in miles above confluence with Quaboag River
[2]Elevation computed without consideration of backwater effects of Quaboag River

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY
HAMPDEN COUNTY, MA
ALL JURISDICTIONS

FLOODWAY DATA

FOSKETT MILL STREAM

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
GREAT BROOK								
A	450	30	140	7.1	128.7	106.8[2]	106.8	0.0
B	1,170	50	170	5.9	128.7	109.9[2]	109.9	0.0
C	1,370	50	120	8.3	128.7	112.9[2]	112.9	0.0
D	1,670	60	300	3.3	128.7	114.8[2]	114.8	0.0
E	2,340	40	170	5.9	128.7	115.6[2]	115.6	0.0
F	3,570	40	220	4.5	128.7	118.4[2]	118.4	0.0
G	4,610	20	100	10.0	128.7	122.6[2]	122.6	0.0
H	5,415	40	190	5.3	128.7	126.1[2]	126.1	0.0
I	6,135	60	340	2.9	128.7	127.1[2]	127.1	0.0
J	6,915	40	180	5.6	128.7	127.7[2]	127.7	0.0
K	7,575	40	170	5.9	129.3	129.3	129.3	0.0
L	8,480	30	140	7.1	132.0	132.0	132.2	0.2
M	8,620	40	180	5.6	132.6	132.6	133.1	0.5
N	9,420	100	330	3.0	135.1	135.1	135.5	0.4
O	10,730	30	190	5.3	136.7	136.7	137.7	1.0
P	11,575	40	200	5.0	139.4	139.4	140.4	1.0
Q	12,125	40	170	5.9	140.5	140.5	141.1	0.6

[1]Stream distance in feet above confluence with Westfield River
[2]Elevation computed without consideration of backwater effects of Westfield River

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAMPDEN COUNTY, MA

ALL JURISDICTIONS

FLOODWAY DATA

GREAT BROOK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
GREAT BROOK								
R	17,826	26	159	10.1	159.9	159.9	160.0	0.1
S	20,696	120	718	2.2	167.6	167.6	168.6	1.0
T	23,936	182	760	1.8	169.5	169.5	170.4	0.9
U	28,856	254	870	1.6	171.7	171.7	172.7	1.0
V	33,096	32	125	11.2	180.0	180.0	180.2	0.2
W	34,816	39	153	8.1	201.3	201.3	201.7	0.4
X	34,992	11	86	14.5	204.8	204.8	204.8	0.0
Y	35,322	39	318	3.9	209.4	209.4	209.5	0.1
Z	35,882	15	147	8.4	210.8	210.8	211.2	0.4
AA	37,502	40	187	6.6	214.1	214.1	214.3	0.2
AB	37,631	12	124	10.0	219.2	219.2	219.2	0.0
AC	38,961	299	1,753	0.7	221.7	221.7	222.3	0.6
AD	40,841	243	1,483	0.8	221.9	221.9	222.4	0.5
AE	40,971	71	243	4.6	223.2	223.2	223.2	0.0
AF	41,081	40	375	3.0	223.5	223.5	223.5	0.0
AG	42,681	200	1,463	0.8	223.6	223.6	223.9	0.3
AH	44,181	230	1,106	1.0	223.7	223.7	224.0	0.3
AI	44,236	201	785	1.4	223.7	223.7	224.0	0.3
AJ	44,356	146	773	1.4	223.8	223.8	224.1	0.3

[1]Stream distance in feet above confluence with Westfield River

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAMPDEN COUNTY, MA

ALL JURISDICTIONS

FLOODWAY DATA

GREAT BROOK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
GREAT BROOK								
AK	44,951	45	182	6.2	227.0	227.0	227.8	0.8
AL	50,431	160	1,197	0.6	228.5	228.5	229.3	0.8
AM	53,031	133	818	0.2	228.5	228.5	229.3	0.8
AN	53,183	12	68	2.0	228.8	228.8	229.5	0.7
AO	54,571	76	416	0.3	228.9	228.9	229.7	0.8
AP	54,641	11	79	1.7	228.9	228.9	229.7	0.8
AQ	54,674	24	133	1.0	229.0	229.0	229.8	0.8
AR	54,744	20	130	1.0	229.0	229.0	229.8	0.8
AS	55,124	18	111	1.2	229.0	229.0	229.8	0.8

[1]Stream distance in feet above confluence with Westfield River

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAMPDEN COUNTY, MA

ALL JURISDICTIONS

FLOODWAY DATA

GREAT BROOK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
HIGHER BROOK								
A	0.000	80	256	3.1	173.5	173.5	174.5	1.0
B	0.606	28	143	5.6	192.1	192.1	192.7	0.6
C	0.611	28	134	6.0	192.2	192.2	192.8	0.6
D	1.039	118	477	1.7	195.9	195.9	196.7	0.8
E	2.119	45	199	4.0	209.3	209.3	209.7	0.4
F	2.125	24	129	6.2	209.3	209.3	209.7	0.4
G	2.137	30	253	3.2	217.2	217.2	217.2	0.0
H	2.984	97	407	2.0	217.6	217.6	218.0	0.4
I	3.442	150	622	1.3	219.9	219.9	220.4	0.5
J	4.062	70	156	3.5	226.8	226.8	226.9	0.1
K	4.079	13	49	11.0	226.8	226.8	226.9	0.1
L	4.209	100	323	1.7	229.8	229.8	230.3	0.5
M	4.572	22	63	8.6	231.7	231.7	231.7	0.0
N	5.067	85	597	1.4	236.8	236.8	236.8	0.0
O	5.586	160	447	0.7	236.9	236.9	237.0	0.1
P	5.932	60	72	4.4	237.6	237.6	237.8	0.2
Q	6.521	110	331	1.0	241.4	241.4	242.3	0.9
R	6.747	38	62	5.2	243.3	243.3	243.7	0.4

[1]Stream distance in miles above Limit of Study

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAMPDEN COUNTY, MA

ALL JURISDICTIONS

FLOODWAY

HIGHER BROOK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
HIGHER BROOK								
S	6.851	70	81	4.0	253.9	253.9	254.6	0.7
T	6.910	10	63	5.1	264.3	264.3	264.3	0.0

1Stream distance in miles above Limit of Study

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAMPDEN COUNTY, MA

ALL JURISDICTIONS

FLOODWAY

HIGHER BROOK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
LITTLE RIVER								
A	370	320	4,890	4.0	134.5	134.5	134.9	0.4
B	905	760	5,470	3.5	134.6	134.6	135.1	0.5
C	1,675	600	4,880	4.0	135.3	135.3	135.7	0.4
D	5,335	880	7,070	2.7	136.9	136.9	137.9	1.0
E	7,305	260	2,330	8.3	138.0	138.0	139.0	1.0
F	9,705	170	2,520	7.7	143.3	143.3	143.4	0.1
G	9,785	300	2,800	6.9	143.3	143.3	143.4	0.1
H	10,940	1,200	10,380	1.9	146.2	146.2	146.3	0.1
I	13,420	310	2,340	8.2	146.5	146.5	147.1	0.6
J	15,720	370	2,280	8.5	154.4	154.4	154.6	0.2
K	17,050	190	2,300	8.4	156.9	156.9	157.8	0.9
L	17,400	150	2,110	9.1	157.4	157.4	158.3	0.9
M	17,880	200	2,070	9.3	159.0	159.0	159.5	0.5
N	18,420	420	5,290	3.6	167.6	167.6	167.6	0.0
O	19,470	580	6,680	2.8	167.9	167.9	167.9	0.0
P	20,100	420	3,250	5.8	167.9	167.9	167.9	0.0
Q	22,900	190	1,790	10.6	172.8	172.8	172.8	0.0
R	24,570	140	1,450	13.0	177.9	177.9	177.9	0.0

[1]Stream distance in feet above confluence with Westfield River

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAMPDEN COUNTY, MA

ALL JURISDICTIONS

FLOODWAY DATA

LITTLE RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
LITTLE RIVER								
S	25,150	220	2,730	6.7	190.8	190.8	190.8	0.0
T	25,590	230	2,640	6.9	192.4	192.4	192.4	0.0
U	27,100	130	2,150	8.5	193.7	193.7	193.7	0.0
V	27,710	400	6,350	2.9	194.7	194.7	195.1	0.4
W	28,570	990	11,540	1.3	194.9	194.9	195.3	0.4
X	29,930	1,820	11,380	1.3	195.1	195.1	195.5	0.4
Y	31,520	940	1,600	9.2	201.1	201.1	201.9	0.8
Z	32,610	590	3,360	4.4	204.8	204.8	205.8	1.0
AA	33,850	610	3,680	4.0	210.1	210.1	210.4	0.4
AB	34,850	580	3,500	4.2	210.5	210.5	210.8	0.5
AC	35,730	380	1,350	10.9	212.8	212.8	213.0	0.4
AD	36,640	530	3,270	4.5	219.1	219.1	220.1	1.0
AE	37,410	560	2,520	5.8	221.7	221.7	222.6	1.0
AF	38,220	630	3,120	4.7	226.1	226.1	226.8	0.1
AG	39,010	600	2,610	5.6	231.0	231.0	231.8	0.1
AH	39,330	80	790	18.6	236.7	236.7	236.8	0.1
AI	39,565	470	5,180	2.8	243.8	243.8	243.8	0.6
AJ	40,365	430	2,340	6.3	244.3	244.3	245.1	0.2

[1]Stream distance in feet above confluence with Westfield River

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAMPDEN COUNTY, MA

ALL JURISDICTIONS

FLOODWAY DATA

LITTLE RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
LITTLE RIVER								
AK	41,085	300	2,080	7.1	248.7	248.7	249.1	0.9
AL	41,830	300	1,530	9.6	252.2	252.2	252.9	0.9
AM	42,620	190	1,410	10.4	258.4	258.4	258.4	0.5

[1]Stream distance in feet above confluence with Westfield River

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAMPDEN COUNTY, MA

ALL JURISDICTIONS

FLOODWAY DATA

LITTLE RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
LONGMEADOW BROOK								
A	380	25	95	4.2	57.0	42.5 [2]	43.5	1.0
B	2,150	20	80	5.0	57.0	47.3 [3]	47.3	0.0
C	2,900	50	170	2.4	57.0	50.5 [3]	50.7	0.2
D	3,580	40	195	2.1	57.0	53.4 [3]	50.9	-2.5
E	4,480	40	170	2.4	57.0	54.7 [3]	54.7	0.0
F	5,830	50	60	6.7	57.3	57.3	57.3	0.0
G	6,500	50	190	2.1	62.2	62.2	62.2	0.0
H	7,920	15	50	8.1	63.2	63.2	63.8	0.6
I	8,160	25	160	1.2	77.1	77.1	77.1	0.0
J	9,210	25	280	1.2	77.1	77.1	77.1	0.0
K	11,050	25	205	1.5	77.1	77.1	77.4	0.3
L	11,870	25	185	1.7	77.1	77.1	77.7	0.6
M	12,940	20	45	7.1	85.4	85.4	85.5	0.1
N	13,050	35	180	1.8	89.9	89.9	90.1	0.2
O	13,620	245	715	0.4	100.1	100.1	100.3	0.2

[1]Stream distance in feet above confluence with Connecticut River
[2]Flooding controlled by Connecticut River
[3]Elevation computed without consideration of backwater effects from Connecticut River

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAMPDEN COUNTY, MA

ALL JURISDICTIONS

FLOODWAY DATA

LONGMEADOW BROOK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
MAY BROOK								
A	42	170	452	4.4	690.4	690.4	691.2	0.8
B	92	170	571	3.5	691.8	691.8	692.0	0.2
C	1,072	31	156	12.8	700.8	700.8	700.9	0.1
D	1,322	60	193	10.4	715.0	715.0	715.0	0.0
E	2,042	120	278	7.2	729.9	729.9	730.2	0.3
F	2,542	78	263	7.6	735.4	735.4	735.4	0.0

[1]Stream distance in feet from downstream face of May Brook Road in Holland

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAMPDEN COUNTY, MA

ALL JURISDICTIONS

FLOODWAY DATA

MAY BROOK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
MIDDLE BRANCH OF THE WESTFIELD								
A[2]	0	*	*	*	573.9	573.9	*	*
B[2]	50	*	*	*	576.4	576.4	*	*
C	1,370	120	1,235	15.3	582.9	582.9	583.9	1.0
D	2,650	141	1,055	15.6	594.3	594.3	594.3	0.0
E	4,010	116	990	16.7	608.4	608.4	608.4	0.0
F	6,290	140	1,192	13.8	626.9	626.9	627.2	0.3
G	8,550	101	1,025	16.1	642.2	642.2	642.2	0.0
H	10,090	102	953	17.3	655.0	655.0	655.1	0.1
I	11,370	97	936	17.6	668.6	668.6	668.6	0.0
J	11,454	50	938	17.6	674.5	674.5	674.5	0.0
K	11,495	100	2,035	8.1	679.7	679.7	679.7	0.0
L	12,635	140	1,668	9.9	680.7	680.7	680.8	0.1
M	14,255	170	1,115	14.8	690.9	690.9	690.9	0.0
N	15,575	162	1,223	13.5	702.5	702.5	702.6	0.1
O	16,695	210	1,414	10.6	710.5	710.5	710.5	0.0
P	18,435	170	1,064	14.1	724.5	724.5	724.5	0.0
Q	18,514	240	1,044	14.4	728.7	728.7	728.7	0.0

[1]Stream distance in feet from Kinne Brook Road
[2]No floodway computed because Army Corps of Engineers flowage easement to EL 580.3 NAVD
*No data available

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAMPDEN COUNTY, MA
ALL JURISDICTIONS

FLOODWAY DATA

MIDDLE BRANCH OF THE WESTFIELD RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
MIDDLE BRANCH OF THE WESTFIELD								
R	18,575	292	3,770	4.0	736.5	736.5	736.5	0.0
S	19,375	125	1,534	9.8	736.7	736.7	736.7	0.0
T	20,135	440	2,742	5.5	738.0	738.0	739.0	1.0
U	20,895	290	1,540	9.7	746.3	746.3	747.1	0.8
V	21,965	320	1,480	10.1	755.0	755.0	756.0	1.0
W	23,035	360	1,842	8.1	763.6	763.6	764.2	0.6
X	23,142	385	2,485	6.0	768.1	768.1	768.9	0.8
Y	23,185	440	4,436	3.4	768.8	768.8	769.8	1.0
Z	24,185	150	101	14.8	774.1	774.1	774.6	0.5

[1]Stream distance in feet from Kinne Brook Road

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAMPDEN COUNTY, MA

ALL JURISDICTIONS

FLOODWAY DATA

MIDDLE BRANCH OF THE WESTFIELD RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
MUNN BROOK								
A	1,640	70	400	6.5	194.9	189.2[2]	189.2	0.0
B	2,675	50	410	6.3	194.9	191.1[2]	191.5	0.4
C	3,675	90	650	4.0	194.9	192.2[2]	192.8	0.6
D	4,675	70	410	6.3	194.9	192.5[2]	193.5	1.0
E	5,875	60	530	4.9	194.9	194.9	195.5	0.6
F	7,115	70	290	9.0	196.3	196.3	197.1	0.8
G	9,425	110	400	6.5	202.5	202.5	202.9	0.4
H	10,955	70	560	4.6	205.3	205.3	205.4	0.1
I	11,145	80	850	3.1	205.6	205.6	205.8	0.2
J	12,630	40	250	10.4	206.8	206.8	207.2	0.4
K	12,840	233	1,246	2.1	206.9	206.9	207.9	1.0
L	13,680	139	675	3.9	207.6	207.6	208.6	1.0
M	15,140	119	579	4.5	210.8	210.8	211.7	0.9
N	16,200	86	509	5.1	214.0	214.0	214.8	0.8
O	16,340	63	485	5.4	214.4	214.4	215.3	0.9
P	16,440	125	300	8.7	215.7	215.7	215.7	0.0
Q	16,790	430	1,091	2.4	217.1	217.1	217.8	0.7
R	17,120	161	383	6.8	220.1	220.1	220.1	0.0

[1]Stream distance in feet above confluence with Little River
[2]Elevation computed without consideration of backwater effects from Little River

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAMPDEN COUNTY, MA

ALL JURISDICTIONS

FLOODWAY DATA

MUNN BROOK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
MUNN BROOK								
S	18,750	256	658	2.5	227.0	227.0	227.6	0.6
T	20,186	469	711	2.3	236.7	236.7	237.1	0.4
U	20,286	44	416	3.9	237.0	237.0	237.2	0.2
V	21,180	60	170	9.6	241.5	241.5	241.5	0.0
W	21,500	39	174	9.4	244.3	244.3	253.7	9.4
X	22,200	40	222	7.4	249.9	249.9	250.5	0.6

[1]Stream distance in feet above confluence with Little River

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAMPDEN COUNTY, MA

ALL JURISDICTIONS

FLOODWAY DATA

MUNN BROOK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
NORTH BRANCH MILL RIVER								
A	0	20	140	5.9	158.3	158.3	158.3	0.0
B	110	350	2,000	0.4	160.7	160.7	160.8	0.1
C	2,370	50	280	2.9	160.7	160.7	160.8	0.1
D	5,030	60	120	6.8	162.2	162.2	162.5	0.3
E	5,060	15	70	11.7	163.1	163.1	163.1	0.0
F	5,165	130	740	1.1	173.2	173.2	173.2	0.0
G	6,915	70	300	2.7	173.2	173.2	173.3	0.1
H	7,015	20	110	7.5	173.2	173.2	173.3	0.1
I	7,170	90	650	1.3	176.3	176.3	176.4	0.1
J	10,290	120	330	2.2	182.6	182.6	183.6	1.0
K	10,540	20	70	10.3	184.6	184.6	184.6	0.0
L	10,620	220	540	1.3	187.1	187.1	187.1	0.0
M	12,150	130	190	3.4	190.7	190.7	190.7	0.0
N	13,020	80	110	6.1	193.8	193.8	193.8	0.0
O	15,270	180	210	3.2	202.0	202.0	202.0	0.0
P	15,420	20	70	9.6	203.7	203.7	203.7	0.0

[1]Stream distance in feet above south face of Wilbraham Road Bridge in Springfield

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAMPDEN COUNTY, MA

ALL JURISDICTIONS

FLOODWAY DATA

NORTH BRANCH MILL RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
NORTH BRANCH MILL RIVER								
Q	15,600	140	610	1.1	206.3	206.3	206.3	0.0
R	16,130	170	230	2.9	206.3	206.3	206.3	0.0
S	16,290	15	60	11.2	206.8	206.8	206.8	0.0
T	16,395	80	290	2.3	209.6	209.6	209.6	0.0
U	17,575	40	100	6.1	210.3	210.3	210.3	0.0
V	17,585	30	90	6.8	210.3	210.3	210.3	0.0
W	17,670	30	120	5.1	211.7	211.7	211.7	0.0
X	18,880	30	120	5.1	212.3	212.3	212.9	0.6
Y	20,200	60	120	5.1	214.4	214.4	215.1	0.7
Z	21,450	20	110	5.5	216.3	216.3	217.2	0.9
AA	21,480	30	150	4.1	217.0	217.0	217.6	0.6
AB	21,555	40	180	3.4	218.2	218.2	218.2	0.0
AC	24,135	120	430	1.4	218.5	218.5	219.1	0.6
AD	26,055	30	110	5.5	220.6	220.6	220.6	0.0

[1]Stream distance in feet above south face of Wilbraham Road Bridge in Springfield

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAMPDEN COUNTY, MA

ALL JURISDICTIONS

FLOODWAY DATA

NORTH BRANCH MILL RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
NORTH BRANCH MILL RIVER								
AE	27,298[1]	60	155	3.9	222.6	222.6	223.6	1.0
AF	27,435[1]	60	120	3.8	223.8	223.8	224.0	0.2
AG	29,980[1]	60	285	1.6	227.6	227.6	228.3	0.7
AH	32,673[1]	110	405	1.1	228.1	228.1	229.0	0.9
AI	40,994[1]	170	145	3.0	234.4	234.4	234.7	0.3
AJ	43,127[1]	100	430	1.0	236.3	236.3	237.0	0.7
AK	43,819[1]	210	735	0.6	237.8	237.8	238.0	0.2
AL	45,049[1]	210	245	1.6	237.8	237.8	238.5	0.7
AM	45,873[1]	250	605	0.7	238.4	238.4	238.9	0.5
AN	48,233[1]	350	395	0.7	239.0	239.0	239.7	0.7
AO	51,512[1]	120	95	2.9	245.0	245.0	245.0	0.0
AP	52,053[1]	80	175	1.6	248.4	248.4	248.8	0.4
AQ	10.25[2]	100	190	1.3	249.5	249.5	250.3	0.8
AR	10.64[2]	80	275	0.9	250.2	250.2	251.1	0.9
AS	11.41[2]	100	60	4.2	274.8	274.8	274.8	0.0

[1]Stream distance in feet above south face of Wilbraham Road Bridge in Springfield
[2]Stream distance in miles above south face of Wilbraham Road Bridge in Springfield

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAMPDEN COUNTY, MA

ALL JURISDICTIONS

FLOODWAY DATA

NORTH BRANCH MILL RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
NORTH BROOK								
A	180	11	12	2.8	176.1	173.9[2]	173.8	0.0
B	365	52	285	0.4	179.8	179.8	179.9	0.1
C	865	10	15	7.1	182.1	182.1	182.2	0.1
D	2,780	71	66	1.7	187.0	187.0	187.1	0.1
E	3,620	15	20	6.2	194.5	194.5	195.2	0.7
F	3,635	3	10	10.6	196.9	196.9	196.9	0.0
G	3,880	8	90	1.2	212.7	212.7	212.8	0.1
H	4,010	4	50	2.2	212.7	212.7	212.8	0.1
I	4,670	8	90	0.8	214.9	214.9	215.0	0.1
J	5,140	4	30	2.3	214.9	214.9	215.0	0.1
K	5,480	40	140	0.5	216.1	216.1	216.2	0.1
L	6,150	7	10	4.0	220.1	220.1	220.1	0.0
M	6,465	15	20	2.0	223.6	223.6	223.7	0.1
N	7,765	10	10	4.0	226.9	226.9	226.9	0.0

[1]Stream distance in feet above confluence with North Branch Mill River
[2] Elevation computed without consideration of backwater effects from North Branch Mill River

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAMPDEN COUNTY, MA

ALL JURISDICTIONS

FLOODWAY DATA

NORTH BROOK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
POTASH BROOK								
A	1	119	561	8.0	235.7	235.3[2]	234.8	0.5
B	120	62	338	13.3	237.2	237.2	237.4	0.2
C	760	52	394	11.4	275.4	275.4	275.4	0.0
D	1,050	37	284	15.8	287.5	287.5	288.2	0.7
E	2,505	76	680	6.6	400.3	400.3	401.3	1.0
F	3,570	42	297	15.2	447.6	447.6	448.0	0.4
G	5,300	116	807	5.6	615.6	615.6	616.6	1.0
H	6,360	34	320	14.1	667.3	667.3	667.5	0.2
I	6,650	48	360	12.5	675.4	675.4	675.9	0.5
J	7,530	37	337	13.3	684.0	684.0	684.1	0.1
K	7,840	40	295	15.2	691.5	691.5	691.5	0.0
L	8,100	35	287	15.7	705.7	705.7	705.9	0.2
M	9,720	492	1,350	3.3	719.7	719.7	720.7	1.0
N	9,950	96	495	9.1	723.0	723.0	723.1	0.1
O	11,500	196	717	6.3	741.3	741.3	742.2	0.9
P	13,050	370	769	5.8	756.1	756.1	756.4	0.3
Q	14,150	199	450	10.0	772.8	772.8	773.4	0.6
R	15,700	420	544	4.0	800.0	800.0	801.0	1.0

[1]Stream distance in feet above confluence with Westfield River
[2] Elevation computed without consideration of backwater effects from Westfield River

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAMPDEN COUNTY, MA

ALL JURISDICTIONS

FLOODWAY DATA

POTASH BROOK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
POTASH BROOK								
S	17,100	31	173	12.7	843.7	843.7	844.0	0.3
T	18,000	62	270	8.2	871.6	871.6	871.9	0.3
U	18,450	21	156	14.1	886.2	886.2	886.5	0.3

[1]Stream distance in feet above confluence with Westfield River

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAMPDEN COUNTY, MA

ALL JURISDICTIONS

FLOODWAY DATA

POTASH BROOK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
POWDERMILL BROOK								
A	470	50	450	3.8	131.3	117.7 [2]	118.0	0.3
B	2,625	200	840	2.0	131.3	118.7 [2]	119.5	0.8
C	4,590	100	180	5.6	131.3	120.9 [2]	121.9	1.0
D	4,865	20	110	9.1	131.3	122.3 [2]	123.1	0.8
E	5,180	400	1,350	0.7	131.3	124.7 [2]	124.9	0.2
F	7,480	200	580	1.7	131.3	127.7 [2]	128.0	0.3
G	7,775	30	120	8.3	131.3	127.1 [2]	128.0	0.9
H	8,195	160	380	2.6	131.3	129.2 [2]	129.5	0.3
I	10,010	230	740	1.3	131.3	130.9 [2]	131.9	1.0
J	11,490	30	110	9.1	132.9	132.9	133.4	0.5
K	11,950	45	250	4.0	134.6	134.6	136.1	1.5

[1] Stream distance in feet above Railroad
[2] Elevation computed without consideration of backwater effects from Westfield River

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAMPDEN COUNTY, MA

ALL JURISDICTIONS

FLOODWAY DATA

POWDERMILL BROOK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
QUABOAG RIVER								
A	0.015	165	2,365	5.3	300.2	300.2	301.2	1.0
B	0.042	156	2,087	6.0	300.2	300.2	301.2	1.0
C	0.373	330	3,121	4.0	301.9	301.9	302.8	0.9
D	0.998	930	4,295	2.9	304.9	304.9	305.8	0.9
E	1.449	175	1,944	6.4	308.0	308.0	308.6	0.6
F	1.469	144	1,708	7.3	308.0	308.0	308.7	0.7
G	1.547	190	2,298	5.4	309.2	309.2	309.8	0.6
H	1.561	137	1,781	7.0	309.2	309.2	309.8	0.6
I	1.672	160	2,088	6.0	310.5	310.5	311.0	0.5
J	1.734	182	1,798	6.9	310.9	310.9	311.5	0.6
K	2.077	465	4,007	3.1	312.6	312.6	313.4	0.8
L	2.370	650	4,637	2.7	313.6	313.6	314.2	0.6
M	2.407	795	6,100	2.0	313.8	313.8	314.5	0.7
N	2.943	610	6,015	2.1	314.1	314.1	314.8	0.7
O	3.483	270	2,724	4.5	315.0	315.0	315.7	0.7
P	3.502	125	1,128	10.8	315.0	315.0	315.7	0.7
Q	3.670	390	4,229	2.9	318.9	318.9	319.3	0.4
R	3.739	460	5,584	2.2	319.9	319.9	320.2	0.3
S	4.342	540	5,616	2.2	320.3	320.3	320.7	0.4

[1]Stream distance in miles above confluence with Chicopee River

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAMPDEN COUNTY, MA

ALL JURISDICTIONS

FLOODWAY DATA

QUABOAG RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
QUABOAG RIVER								
T	4.360	129	1,924	6.3	320.3	320.3	320.7	0.4
U	4.434	324	3,926	3.1	321.3	321.3	321.7	0.4
V	4.642	786	6,830	1.8	321.6	321.6	322.0	0.4
W	5.325	780	3,720	2.6	324.8	324.8	324.9	0.1
X	6.465	336	2,077	4.6	339.8	339.8	340.5	0.7
Y	6.685	250	2,083	4.6	341.7	341.7	342.7	1.0
Z	7.013	264	1,989	4.8	345.1	345.1	345.8	0.7
AA	7.216	210	1,244	7.8	347.4	347.4	348.2	0.8
AB	7.246	266	1,597	6.0	348.9	348.9	349.5	0.6
AC	8.358	337	1,542	5.4	360.7	360.7	361.2	0.5
AD	8.902	80	704	11.7	368.7	368.7	368.7	0.0
AE	9.177	200	1,507	5.5	372.7	372.7	373.3	0.6
AF	10.117	170	1,545	4.4	384.6	384.6	385.3	0.7
AG	10.217	190	2,093	3.3	385.3	385.3	385.9	0.6
AH	10.513	150	1,389	4.9	385.9	385.9	386.9	1.0
AI	11.282	97[2]	1,023	6.7	397.0	397.0	397.9	0.9
AJ	11.540	101[2]	850	8.1	400.1	400.1	400.7	0.6
AK	11.737	85[2]	673	10.2	403.9	403.9	404.8	0.9

[1]Stream distance in miles above confluence with Chicopee River
[2]Width extends beyond county boundary

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAMPDEN COUNTY, MA

ALL JURISDICTIONS

FLOODWAY DATA

QUABOAG RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
QUABOAG RIVER								
AL	11.907	85[2]	766	8.9	410.2	410.2	410.9	0.7
AM	12.067	80[2]	559	11.4	418.0	418.0	418.8	0.8
AN	12.267	100[2]	985	6.5	426.2	426.2	426.8	0.6
AO	12.495	109[2]	845	7.6	439.7	439.7	440.4	0.7
AP	12.827	62[2]	566	11.6	458.0	458.0	458.6	0.6
AQ	12.879	70[2]	565	11.2	461.5	461.5	462.0	0.5

[1]Stream distance in miles above confluence with Chicopee River
[2]Width extends beyond county boundary

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAMPDEN COUNTY, MA

ALL JURISDICTIONS

FLOODWAY DATA

QUABOAG RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
SAWMILL BROOK								
A	0.086	110	320	1.1	230.9	230.3[2]	231.1	0.8
B	0.284	80	480	0.7	232.1	232.1	232.1	0.0
C	0.403	60	85	4.1	234.9	234.9	235.1	0.2
D	0.517	40	150	2.3	236.8	236.8	237.5	0.7
E	0.578	50	325	1.1	245.2	242.2	242.3	0.1
F	0.618	40	225	1.6	245.2	242.2	242.3	0.1
G	0.666	120	320	1.1	245.2	245.2	245.2	0.0
H	0.676	30	70	5.0	245.2	245.2	245.2	0.0
I	0.738	140	1,275	0.3	245.3	245.3	245.7	0.4

[1]Stream distance in miles above confluence with South Branch Mill River
[2]Elevation computed without consideration of backwater effects from South Branch Mill River

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAMPDEN COUNTY, MA

ALL JURISDICTIONS

FLOODWAY DATA

SAWMILL BROOK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
SCANTIC RIVER								
A	0.268	110	738	3.1	214.3	214.3	214.9	0.6
B	0.559	81	535	4.3	215.3	215.3	215.9	0.6
C	0.873	290	1,364	1.7	216.8	216.8	217.6	0.8
D	1.187	36	261	8.9	218.6	218.6	219.5	0.9
E	1.378	100	724	3.2	221.8	221.8	222.1	0.3
F	1.688	300	1,546	1.5	222.7	222.7	223.4	0.7
G	2.098	150	439	5.3	228.6	228.6	228.6	0.0
H	2.381	500	1,142	2.0	233.2	233.2	233.7	0.5
I	2.734	50	262	8.9	239.4	239.4	239.5	0.1
J	3.009	60	334	6.7	244.5	244.5	244.7	0.2
K	3.220	60	518	4.3	252.1	252.1	252.9	0.8
L	3.572	50	271	8.2	263.2	263.2	263.9	0.7
M	3.758	60	631	3.5	285.1	285.1	285.1	0.0
N	4.069	60	548	4.1	286.0	286.0	286.1	0.1
O	4.367	34	171	12.9	296.3	296.3	296.4	0.1
P	4.697	100	462	4.8	309.6	309.6	309.9	0.3
Q	4.889	100	597	3.7	311.2	311.2	311.8	0.6
R	5.180	250	1,567	1.2	312.3	312.3	311.6	0.7

[1]Stream distance in miles above Hampden corporate limits

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAMPDEN COUNTY, MA

ALL JURISDICTIONS

FLOODWAY DATA

SCANTIC RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
SHERMAN BROOK								
A	0.010	40	199	3.5	655.7	655.7	656.3	0.6
B	0.185	210	1,159	0.6	655.9	655.9	656.7	0.8
C	0.288	50	112	6.3	656.2	656.2	656.2	0.0
D	0.316	40	169	4.2	656.9	656.9	657.6	0.7
E	0.356	40	143	4.9	657.4	657.4	658.0	0.6
F	0.374	40	208	3.4	658.8	658.8	659.0	0.2
G	0.451	100	487	1.4	659.0	659.0	659.7	0.7
H	0.467	100	611	1.2	659.0	659.0	659.7	0.7
I	0.718	100	509	1.4	659.2	659.2	660.0	0.8
J	0.849	80	439	1.6	659.4	659.4	660.3	0.9
K	0.920	100	533	1.3	659.6	659.6	660.5	0.9
L	1.069	100	352	2.0	660.0	660.0	660.9	0.9
M	1.091	50	243	2.9	661.5	661.5	661.7	0.2

[1]Stream distance in miles above Cemetery Road in Brimfield

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAMPDEN COUNTY, MA

ALL JURISDICTIONS

FLOODWAY DATA

SHERMAN BROOK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
SHURTLEFF BROOK								
A	1,300	120	212	5.7	225.4	221.3[2]	221.4	0.1
B	1,800	83	291	4.1	225.7	224.9[2]	225.4	0.5
C	1,984	440	1,311	0.9	228.7	228.7	229.1	0.4
D	2,120	190	959	1.3	228.9	228.9	229.3	0.4
E	3,560	35	115	10.4	232.6	232.6	232.7	0.1
F	4,760	60	260	4.6	241.6	241.6	242.5	0.9
G	5,060	20	96	12.5	243.8	243.8	244.3	0.5

[1]Stream distance in feet above confluence with Munn Brook
[2]Flooding controlled by Munn Brook

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAMPDEN COUNTY, MA

ALL JURISDICTIONS

FLOODWAY DATA

SHURTLEFF BROOK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
SOUTH BRANCH MILL RIVER								
A	0	20	70	11.7	160.9	160.9	160.9	0.0
B	220	20	170	4.8	166.8	166.8	166.8	0.0
C	1,590	50	250	3.3	167.2	167.2	167.6	0.4
D	1,640	15	105	7.8	167.2	167.2	167.6	0.4
E	1,765	20	140	5.9	169.1	169.1	169.1	0.0
F	3,065	280	1,020	0.8	169.2	169.2	170.0	0.8
G	4,565	170	560	1.5	169.6	169.6	170.2	0.6
H	7,195	40	160	5.1	170.9	170.9	171.2	0.3
I	9,195	90	460	1.8	172.0	172.0	172.9	0.9
J	9,585	40	100	8.2	180.9	180.9	180.9	0.0
K	9,785	40	110	7.5	191.2	191.2	191.2	0.0
L	9,885	50	100	8.2	194.5	194.5	194.5	0.0
M	9,960	60	190	4.6	208.2	208.2	208.2	0.0
N	11,895	90	640	1.4	211.2	211.2	211.2	0.0
O	14,665	40	140	6.2	212.3	212.3	213.0	0.7
P	16,785	110	520	1.6	214.6	214.6	215.3	0.7
Q	18,815	40	150	5.4	215.4	215.4	215.9	0.5
R	21,115	80	330	2.5	217.8	217.8	218.8	1.0
S	24,275	40	170	4.8	219.8	219.8	220.6	0.8

[1]Stream distance in feet above northern most headwall of Plumtree Road Bridge in Springfield

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAMPDEN COUNTY, MA

ALL JURISDICTIONS

FLOODWAY DATA

SOUTH BRANCH MILL RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
SOUTH BRANCH MILL RIVER								
T	4.725	50	135	5.2	220.3	220.3	221.1	0.8
U	5.003	50	295	2.4	221.8	221.8	222.5	0.7
V	5.181	90	415	1.6	222.4	222.4	222.8	0.4
W	5.583	80	435	1.3	222.8	222.8	223.4	0.6
X	5.987	80	125	4.8	224.8	224.8	224.9	0.1
Y	6.267	65	264	2.3	226.9	226.9	227.8	0.9
Z	6.517	100	332	1.8	227.6	227.6	228.4	0.8
AA	6.929	200	695	0.9	228.2	228.2	228.9	0.7
AB	7.248	220	660	0.7	230.9	230.9	231.0	0.1
AC	7.338	110	255	0.5	230.9	230.9	231.1	0.2
AD	7.480	50	190	0.6	233.0	233.0	233.0	0.0
AE	7.557	50	145	0.8	233.0	233.0	233.0	0.0
AF	7.847	35	121	1.0	233.1	233.1	233.3	0.2
AG	8.125	40	181	0.7	233.3	233.3	233.6	0.3

[1]Stream distance in miles above northern most headwall of Plumtree Road Bridge in Springfield

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAMPDEN COUNTY, MA

ALL JURISDICTIONS

FLOODWAY DATA

SOUTH BRANCH MILL RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
STEVENS BROOK								
A	330	16	97	9.0	690.1	690.1	690.3	0.2
B	970	20	77	11.3	699.7	699.7	699.7	0.0
C	1,370	30	153	5.7	704.9	704.9	705.9	1.0
D	2,650	30	91	9.5	725.8	725.8	725.8	0.0
E	4,690	70	218	4.0	755.8	755.8	756.7	0.9
F	5,210	35	119	6.8	758.5	758.5	759.1	0.6
G	5,910	195	556	1.5	760.1	760.1	761.0	0.9
H	6,127	100	258	3.1	763.0	763.0	763.6	0.6
I	6,807	200	847	1.0	763.1	763.1	764.0	0.9
J	7,177	42	100	8.1	765.8	765.8	766.0	0.2
K	7,727	135	195	4.2	771.2	771.2	772.1	0.9

[1]Stream distance in feet above confluence with Hamilton Reservoir

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAMPDEN COUNTY, MA

ALL JURISDICTIONS

FLOODWAY DATA

STEVENS BROOK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)[2]	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
SWIFT RIVER								
A	0.013	90	817	5.2	309.0	304.7[3]	305.6	0.9
B	0.316	61	540	7.8	309.0	307.3[3]	307.6	0.3
C	0.960	622	1,693	2.5	312.1	312.1	312.5	0.4
D	1.360	120	1,095	3.8	313.6	313.6	314.1	0.5
E	1.379	98	832	5.1	313.6	313.6	314.2	0.6
F	1.694	90	875	4.8	315.6	315.6	316.0	0.4
G	2.542	105	720	2.6	319.2	319.2	319.8	0.6
H	3.241	72	423	4.4	330.6	330.6	330.8	0.2
I	3.271	132	615	3.0	331.7	331.7	331.8	0.1
J	3.425	176	1,131	1.6	342.0	342.0	342.0	0.0
K	3.449	110	828	2.2	342.0	342.0	342.0	0.0
L	3.678	66	190	9.7	346.7	346.7	346.7	0.0
M	3.708	71	352	5.3	348.7	348.7	348.9	0.2
N	3.957	54	462	4.0	350.6	350.6	351.4	0.8
O	3.999	124	2,169	0.9	365.6	365.6	365.6	0.0

[1]Stream distance in miles above confluence with Ware River
[2]Width extends beyond county boundary
[3]Elevation computed without consideration of backwater effects from the Ware River

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAMPDEN COUNTY, MA

ALL JURISDICTIONS

FLOODWAY DATA

SWIFT RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
TANNERY BROOK								
A	2.044	50	140	0.8	285.0	285.0	285.0	0.0
B	2.190	20	80	1.3	291.0	291.0	291.0	0.0
C	2.246	25	150	0.7	293.2	293.2	293.2	0.0
D	2.430	26	25	4.4	296.6	296.6	296.6	0.0
E	2.650	17	15	4.5	314.7	314.7	314.7	0.0

[1]Stream distance in miles above confluence with Connecticut River

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAMPDEN COUNTY, MA

ALL JURISDICTIONS

FLOODWAY DATA

TANNERY BROOK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
TRIBUTARY A TO WATCHAUG BROOK								
A	0.084	30	55	5.6	207.2	207.2	207.3	0.1
B	0.656	20	55	5.3	213.5	213.5	214.5	1.0
C	0.840	20	60	4.4	218.3	218.3	219.0	0.7
D	1.076	80	130	1.2	221.0	221.0	221.0	0.0
E	1.492	20	25	4.8	234.3	234.3	234.1	0.2
F	1.704	130	200	0.6	238.0	238.0	237.8	0.2

[1]Stream distance in miles above confluence with Watchaug Brook

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAMPDEN COUNTY, MA

ALL JURISDICTIONS

FLOODWAY DATA

TRIBUTARY A TO WATCHAUG BROOK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
TRIBUTARY A TO SCANTIC RIVER								
A	0.035	62	423	0.6	215.3	215.3	215.3	0.0
B	0.619	60	143	1.6	227.2	227.2	227.9	0.7
C	0.830	50	98	4.7	234.6	234.6	235.3	0.7

[1]Stream distance in miles above confluence with Scantic River

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAMPDEN COUNTY, MA

ALL JURISDICTIONS

FLOODWAY DATA

TRIBUTARY A TO SCANTIC RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
TRIBUTARY A (WILBRAHAM)								
A	0.143	25	10	3.2	216.3	212.8 [2]	212.8	0.0
B	0.192	30	310	0.1	223.4	223.4	223.4	0.0
C	0.329	25	100	0.3	223.4	223.4	223.4	0.0
D	0.650	10	55	2.5	233.8	233.8	234.3	0.5

[1]Stream distance in miles above confluence with Chicopee River
[2]Elevation computed without consideration of backwater effects from Chicopee River

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAMPDEN COUNTY, MA

ALL JURISDICTIONS

FLOODWAY DATA

TRIBUTARY A (WILBRAHAM)

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
TRIBUTARY C								
A	0.486	150	145	1.6	251.4	251.4	251.9	0.5
B	0.802	20	50	4.6	264.1	264.1	264.2	0.1
C	0.910	20	95	2.4	268.0	268.0	268.0	0.0
D	1.000	100	550	0.4	268.1	268.1	268.4	0.3
E	1.200	40	60	3.8	268.8	268.8	268.8	0.0
F	1.230	60	120	1.9	271.1	271.1	271.1	0.0
G	1.258	70	235	1.0	271.6	271.6	271.6	0.0
H	1.350	80	285	0.8	274.4	274.4	274.4	0.0
I	1.400	70	90	2.6	274.4	274.4	274.4	0.0

[1]Stream distance in miles above confluence with North Branch Mill River

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAMPDEN COUNTY, MA

ALL JURISDICTIONS

FLOODWAY DATA

TRIBUTARY C

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
TRIBUTARY TO GREAT BROOK								
A	600	40	174	4.2	223.3	223.3	224.3	1.0
B	772	10	85	8.6	226.1	226.1	226.1	0.0
C	810	60	394	1.9	228.0	228.0	228.8	0.8
D	1,450	30	78	9.3	229.3	229.3	229.3	0.0
E	1,950	30	108	6.8	236.6	236.6	236.9	0.3
F	2,080	21	92	8.0	242.0	242.0	242.0	0.0
G	2,150	60	382	1.9	242.2	242.2	243.1	0.9

[1]Stream distance in feet above confluence with Great Brook

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAMPDEN COUNTY, MA

ALL JURISDICTIONS

FLOODWAY DATA

TRIBUTARY TO GREAT BROOK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
TWELVEMILE BROOK								
A	3,110	126	1,407	0.4	366.2	366.2	367.1	0.9
B	3,210	1,010	4,358	0.1	366.2	366.2	367.1	0.9
C	4,420	58	278	1.8	366.2	366.2	367.0	0.8
D	4,513	20	54	9.4	372.5	372.5	372.5	0.0
E	4,656	24	58	8.8	383.5	383.5	383.5	0.0
F	5,050	24	57	8.9	398.4	398.4	398.4	0.0
G	5,261	32	124	4.1	400.3	400.3	400.4	0.1
H	5,394	20	99	5.2	403.0	403.0	403.0	0.0
I	5,750	20	54	9.4	405.9	405.9	405.9	0.0
J	5,924	16	50	10.2	413.9	413.9	413.9	0.0
K	6,000	115	811	0.6	425.5	425.5	426.1	0.6
L	6,960	40	211	2.4	425.5	425.5	426.1	0.6

[1]Stream distance in feet above Monson corporate limits

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAMPDEN COUNTY, MA

ALL JURISDICTIONS

FLOODWAY DATA

TWELVEMILE BROOK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
WALES BROOK								
A	-0.122	20	66	8.8	729.3	729.3	729.3	0.0
B	0.163	60	144	2.5	751.4	751.4	751.9	0.5
C	0.177	10	49	7.2	753.9	753.9	753.9	0.0
D	0.267	28	93	3.8	761.3	761.3	762.3	1.0
E	0.585	9	37	9.6	822.1	822.1	822.1	0.0
F	0.598	35	71	5.0	824.9	824.9	824.9	0.0
G	1.264	10	23	7.9	905.3	905.3	905.3	0.0
H	1.604	20	63	2.9	913.3	913.3	914.0	0.7
I	1.630	95	449	0.4	918.1	918.1	918.1	0.0
J	1.977	380	956	0.1	918.1	918.1	918.7	0.6
K	1.987	417	989	0.1	918.1	918.1	918.7	0.6

[1]Stream distance in miles above Holland Road in Wales

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAMPDEN COUNTY, MA

ALL JURISDICTIONS

FLOODWAY DATA

WALES BROOK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
WARE RIVER								
A	0.000	197	2,484	7.0	300.0	300.0	301.0	1.0
B	0.028	202	2,148	8.1	300.0	300.0	301.0	1.0
C	1.302	153	1,763	8.4	310.5	310.5	311.1	0.6
D	1.601	363	2,622	5.7	313.4	313.4	314.2	0.8
E	2.336	139	1,788	8.3	331.8	331.8	332.4	0.6
F	2.374	105	1,158	12.8	332.3	332.3	332.8	0.5
G	2.474	160	2,217	6.7	338.1	338.1	338.9	0.8
H	2.748	130	1,237	12.0	347.8	347.8	348.0	0.2
I	2.919	116	1,719	8.6	355.4	355.4	356.2	0.8
J	2.936	120	1,549	9.6	356.6	356.6	357.6	1.0
K	3.133	299	3,644	4.1	361.0	361.0	361.7	0.7
L	4.447	220	2,676	5.5	372.3	372.3	372.8	0.5
M	4.458	224	1,765	8.4	372.3	372.3	372.8	0.5
N	5.112	493	4,897	2.8	376.7	376.7	377.2	0.5
O	5.856	112	2,378	5.7	377.9	377.9	378.7	0.8
P	5.930	420	6,862	2.0	378.7	378.7	379.3	0.6
Q	9.118	160[2]	1,815	7.0	393.2	393.2	393.8	0.6

[1]Stream distance in miles above confluence with Chicopee River
[2]Width extends beyond county boundary

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAMPDEN COUNTY, MA

ALL JURISDICTIONS

FLOODWAY DATA

WARE RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
WATCHAUG BROOK								
A	0.126	80	225	2.9	205.6	205.6	206.4	0.8
B	0.216	100	590	1.1	206.4	206.4	207.1	0.7
C	0.350	80	120	2.8	206.4	206.4	207.1	0.7
D	0.834	320	575	0.6	209.2	209.2	209.6	0.4
E	1.000	70	90	3.5	210.5	210.5	211.2	0.7
F	1.208	60	165	1.6	213.6	213.6	214.0	0.4
G	1.420	30	135	2.0	218.2	218.2	218.4	0.2
H	1.606	370	1,350	0.2	221.3	221.3	221.5	0.2
I	2.026	280	1,260	0.2	221.3	221.3	221.5	0.2
J	2.239	12	31	6.9	221.7	221.7	221.8	0.1
K	2.413	50	218	1.0	227.7	227.7	227.7	0.0
L	2.787	100	211	0.7	231.3	231.3	232.3	1.0
M	3.232	70	161	0.9	235.0	235.0	235.9	0.9
N	3.442	20	118	1.2	240.6	240.6	240.6	0.0

[1]Stream distance in miles above East Longmeadow corporate limits

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAMPDEN COUNTY, MA

ALL JURISDICTIONS

FLOODWAY DATA

WATCHAUG BROOK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH[2] (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
WEST BRANCH FARMINGTON RIVER								
A[3]	13,200	*	*	*	751.9	751.9	*	*
B	27,210	560	1,419	12.1	882.2	882.2	883.0	0.8
C	31,970	125	1,036	16.5	961.1	961.1	961.2	0.1
D	35,750	94	842	17.1	1,022.0	1,022.0	1,022.0	0.0
E	39,600	276	3,460	4.2	1,094.6	1,094.6	1,094.7	0.1
F	43,660	95	846	17.0	1,105.9	1,105.9	1,105.9	0.0
G	45,220	676	4,701	3.1	1,110.8	1,110.8	1,111.7	0.9
H	47,120	320	1,445	10.0	1,115.2	1,115.2	1,115.2	0.0

[1]Stream distance in feet above Tolland corporate limits
[2] Width extends beyond county boundary
[3] No floodway calculated because of flowage easements held by U.S. Army Corps of Engineers

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAMPDEN COUNTY, MA

ALL JURISDICTIONS

FLOODWAY DATA

WEST BRANCH FARMINGTON RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
WEST BRANCH OF THE WESTFIELD RIVER								
A	800	603	3,478	8.1	428.3	428.3	429.2	0.9
B	5,100	310	2,430	11.0	453.8	453.8	454.7	0.9
C	9,600	213	2,010	13.6	476.3	476.3	477.0	0.7
D	9,715	127	1,586	17.2	478.6	478.6	478.6	0.0
E	12,400	768	4,351	6.3	493.6	493.6	494.6	1.0
F	14,000	287	2,241	12.2	500.2	500.2	500.2	0.0
G	14,682	193	1,698	16.1	502.8	502.8	503.3	0.5
H	15,240	370	3,658	7.1	509.2	509.2	509.2	0.0
I	17,040	252	2,074	12.5	518.8	518.8	518.8	0.0
J	18,340	180	2,077	12.5	526.1	526.1	527.0	0.9
K	18,732	194	1,550	16.1	527.3	527.3	527.3	0.0
L	18,798	194	2,330	10.7	531.1	531.1	531.6	0.5
M	20,756	211	2,638	9.5	539.4	539.4	539.8	0.4
N	21,140	190	1,873	13.3	539.9	539.9	539.9	0.0
O	24,540	390	2,398	10.4	563.9	563.9	564.6	0.7
P	27,260	838	4,277	5.8	582.9	582.9	583.8	0.9
Q	27,767	720	1,860	13.4	586.7	586.7	586.7	0.0
R	28,040	700	3,321	7.5	591.3	591.3	591.3	0.0

[1]Stream distance in feet above Town of Chester corporate limits

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAMPDEN COUNTY, MA

ALL JURISDICTIONS

WEST BRANCH OF THE WESTFIELD RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
WEST BRANCH OF THE WESTFIELD RIVER								
S	28,327	471	2,097	11.9	592.1	592.1	592.2	0.1
T	28,540	463	1,836	13.6	593.9	593.9	594.9	1.0
U	29,363	250	2,387	8.7	602.7	602.7	602.7	0.0
V	31,040	397	2,166	9.6	611.9	611.9	611.9	0.0
W	32,300	460	2,770	7.3	618.7	618.7	619.5	0.8
X	32,410	400	2,415	8.4	619.5	619.5	620.4	0.9
Y	33,710	300	2,120	9.6	627.9	627.9	628.0	0.1
Z	33,830	100	1,194	17.0	632.1	632.1	632.1	0.0
AA	35,845	337	1,833	10.9	646.3	646.3	646.6	0.3
AB	37,535	206	1,547	12.9	657.3	657.3	658.3	1.0
AC	37,644	115	1,391	14.3	665.4	665.4	665.4	0.0
AD	39,435	160	1,290	15.4	675.5	675.5	676.5	1.0
AE	39,548	68	1,178	16.9	683.8	683.8	683.8	0.0
AF	42,875	175	1,392	14.0	709.3	709.3	710.2	0.9
AG	43,779	98	1,071	18.2	718.6	718.6	719.2	0.6
AH	44,495	85	1,121	17.4	725.9	725.8	725.8	0.0
AI	46,083	52	850	23.0	741.8	741.8	741.8	0.0

[1]Stream distance in feet above Town of Chester corporate limits

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAMPDEN COUNTY, MA

ALL JURISDICTIONS

FLOODWAY DATA

WEST BRANCH OF THE WESTFIELD RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
WESTFIELD RIVER								
A	1,635[1]	540	10,720	4.7	59.9	58.8[4]	58.9	0.1
B	2,095[1]	460	9,230	5.4	59.9	58.9[4]	59.0	0.1
C	3,295[1]	630	13,370	3.8	59.9	59.6[4]	59.6	0.0
D	4,170[1]	320	7,420	6.8	59.9	59.6[4]	59.6	0.0
E	4,670[1]	590	12,050	4.2	59.9	59.7[4]	60.3	0.6
F	5,670[1]	640	13,940	3.6	59.9	59.9	60.6	0.7
G	6,770[1]	560	11,850	4.2	60.0	60.0	60.7	0.7
H	7,710[1]	460	10,170	4.9	60.0	60.0	60.8	0.8
I	9,010[1]	530	11,240	4.5	60.2	60.2	61.2	1.0
J	3.160[2]	400	6,410	7.8	66.0	66.0	66.1	0.1
K	3.200[2]	400	6,450	7.8	66.4	66.4	66.6	0.2
L	3.410[2]	300	4,190	12.0	66.8	66.8	67.1	0.3
M	3.450[2]	290	3,500	14.3	68.5	68.5	69.2	0.7
N	4.010[2]	465[3]	3,410	14.7	81.4	81.4	81.4	0.0
O	4.050[2]	500[3]	8,360	6.0	103.0	103.0	103.4	0.4
P	4.550[2]	350[3]	4,930	10.1	104.9	104.9	105.3	0.4
Q	4.880[2]	300[3]	5,300	9.4	107.6	107.6	108.3	0.7
R	6.150[2]	500[3]	7,160	7.0	117.9	117.9	118.0	0.1
S	6.950[2]	800[3]	12,470	4.0	120.4	120.4	120.6	0.2

[1]Stream distance in feet above confluence with Connecticut River
[2]Stream distance in miles above confluence with Connecticut River
[3]Width extends beyond corporate boundary
[4]Elevation computed without consideration of backwater effects from Connecticut River

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAMPDEN COUNTY, MA

ALL JURISDICTIONS

FLOODWAY DATA

WESTFIELD RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
WESTFIELD RIVER								
T	7.500 [2]	270[3]	5,630	8.9	121.0	121.0	121.3	0.3
U	7.700 [2]	300[3]	6,480	7.8	122.2	122.2	122.3	0.1
V	8.030 [2]	250[3]	5,480	9.1	123.0	123.0	123.3	0.3
W	8.150 [2]	240[3]	4,590	10.6	123.4	123.4	123.6	0.2
X	44,321[1]	170	4,680	10.5	125.7	125.7	125.9	0.2
Y	44,756[1]	360	5,340	9.4	125.7	125.7	126.1	0.4
Z	45,286[1]	720	8,070	6.2	126.9	126.9	127.3	0.4
AA	46,996[1]	1,680	19,600	2.7	128.5	128.5	129.0	0.5
AB	51,826[1]	1,000	12,760	4.2	129.4	129.4	129.9	0.5
AC	52,786[1]	1,010	15,800	3.4	130.1	130.1	130.6	0.5
AD	53,526[1]	2,100	24,600	2.4	131.1	131.1	131.5	0.4
AE	55,696[1]	2,360	28,160	2.4	132.0	132.0	132.5	0.5
AF	59,096[1]	3,480	34,830	1.7	133.0	133.0	133.7	0.7
AG	63,386[1]	300	3,920	15.3	134.0	134.0	134.8	0.8
AH	65,946[1]	330	7,480	8.0	141.8	141.8	141.8	0.0
AI	66,456[1]	350	6,890	8.7	141.8	141.8	141.9	0.1
AJ	66,756[1]	280	5,030	11.9	141.8	141.8	141.9	0.1
AK	67,336[1]	390	6,920	8.7	143.9	143.9	143.9	0.0
AL	67,936[1]	690	8,380	7.2	144.4	144.4	144.4	0.0

[1]Stream distance in feet above confluence with Connecticut River
[2]Stream distance in miles above confluence with Connecticut River
[3]Width extends beyond corporate boundary

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAMPDEN COUNTY, MA

ALL JURISDICTIONS

FLOODWAY DATA

WESTFIELD RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
WESTFIELD RIVER								
AM	69,206	1,010	12,860	4.7	147.1	147.1	147.7	0.6
AN	70,846	1,050	11,340	5.3	149.0	149.0	149.5	0.5
AO	74,566	1,600	10,150	5.9	153.6	153.6	154.0	0.4
AP	78,806	1,770	17,300	3.5	159.1	159.1	159.1	0.0
AQ	81,656	2,400	13,530	4.4	161.5	161.5	161.5	0.0
AR	84,656	1,580	8,030	7.5	166.6	166.6	166.6	0.0
AS	88,056	400	6,890	8.7	172.7	172.7	173.4	0.7
AT	90,516	770	6,970	8.6	176.1	176.1	177.1	1.0
AU	92,436	310	4,850	12.4	181.9	181.9	181.9	0.0
AV	92,800	240	5,150	9.7	182.3	182.3	183.3	1.0
AW	93,339	175	3,451	14.5	182.3	182.3	182.9	0.6
AX	94,949	307	5,309	9.4	188.0	188.0	189.0	1.0
AY	96,749	514	7,927	6.3	192.2	192.2	193.2	1.0
AZ	97,969	210	3,336	16.1	193.0	193.0	193.2	0.2
BA	98,249	335	3,110	16.1	203.7	203.7	203.8	0.1
BB	99,999	652	3,616	13.8	235.6	235.6	236.2	0.6
BC	101,799	507	6,945	6.3	241.5	241.5	242.5	1.0
BD	103,299	272	3,994	10.9	242.3	242.3	243.0	0.7

[1]Stream distance in feet above confluence with Connecticut River

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAMPDEN COUNTY, MA

ALL JURISDICTIONS

FLOODWAY DATA

WESTFIELD RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
WESTFIELD RIVER								
BE	104,599	252	4,398	9.9	244.9	244.9	245.6	0.7
BF	106,399	354	5,017	8.7	247.6	247.6	248.4	0.8
BG	107,799	333	5,303	8.2	250.2	250.2	250.9	0.7
BH	109,829	144	2,184	20.0	251.1	251.1	251.4	0.3
BI	111,299	237	4,455	9.8	260.4	260.4	261.2	0.8
BJ	113,829	288	3,714	11.8	278.0	278.0	278.8	0.8
BK	114,059	319	4,935	8.9	280.9	280.9	281.4	0.5
BL	115,799	250	4,717	9.3	282.9	282.9	283.5	0.6
BM	118,399	187[2]	2,316	18.9	287.3	287.3	287.5	0.2
BN	119,799	206[2]	5,434	8.0	295.4	295.4	296.3	0.9
BO	122,799	256[2]	5,259	8.3	297.7	297.7	298.6	0.9
BP	124,449	155[2]	2,597	16.8	298.0	298.0	298.6	0.6
BQ	125,799	280[2]	4,869	9.0	304.1	304.1	305.1	1.0
BR	127,099	220[2]	2,659	16.4	304.8	304.8	305.8	1.0
BS	128,599	201[2]	2,543	17.2	341.2	341.2	342.2	1.0
BT	129,799	250[2]	4,681	9.3	345.9	345.9	346.5	0.6
BU	130,799	329[2]	3,579	9.2	347.0	347.0	347.6	0.6

[1]Stream distance in feet above confluence with Connecticut River
[2]Width extends beyond corporate boundary

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAMPDEN COUNTY, MA

ALL JURISDICTIONS

FLOODWAY DATA

WESTFIELD RIVER

5.0 INSURANCE APPLICATIONS

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

Zone A

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

Zone AE

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

Zone AH

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

Zone AO

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

Zone X

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

6.0 FLOOD INSURANCE RATE MAP

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

For flood insurance applications, the map designates flood insurance risk zones as described in Section 5.0 and, in the 1-percent-annual-chance floodplains that were studied by detailed methods, shows selected whole-foot BFEs or average depths. Insurance agents use the zones and

BFEs in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

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

The countywide FIRM presents flooding information for the entire geographic area of Hampden County, Massachusetts. Previously, FIRMs were prepared for each incorporated community and the unincorporated areas of the County identified as flood-prone. This countywide FIRM also includes flood-hazard information that was presented separately on Flood Boundary and Floodway Maps, where applicable. Historical data relating to the maps prepared for each community are presented in Table 8, "Community Map History."

COMMUNITY NAME	INITIAL NFIP MAP DATE	FLOOD HAZARD BOUNDARY MAP REVISIONS DATE	INITIAL FIRM DATE	FIRM REVISIONS DATE
Agawam, Town of	February 8, 1974	None	February 1, 1978	None
Brimfield, Town of	July 19, 1974	January 21, 1977	August 2, 1982	None
Chester, Town of	July 19, 1974	November 19, 1976	October 16, 1984	None
Chicopee, City of	April 12, 1974	None	September 29, 1978	None
East Longmeadow, Town of	June 14, 1974	None	September 15, 1978	None
Hampden, Town of	June 21, 1974	None	November 15, 1978	None
Holland, Town of	June 7, 1974	April 8, 1977	July 5, 1984	None
Holyoke, City of	April 12, 1974	July 12, 1977	August 15, 1979	August 8, 1980
Longmeadow, Town of	March 11, 1977	None	September 1, 1978	July 3, 1990
Ludlow, Town of	July 6, 1974	July 26, 1977 March 28, 1978	March 19, 1981	None
Monson, Town of	September 14, 1974	None	June 1, 1981	July 16, 1996
Palmer, Town of	April 5, 1974	October 22, 1976	November 4, 1981	None
Russell, Town of	June 28, 1974	November 19, 1976	December 15, 1990	None
Southwick, Town of	November 8, 1974	December 17, 1976	July 16, 1984	None
Springfield, City of	July 26, 1974	None	February 1, 1980	June 17, 1991
Tolland, Town of	April 4, 1975	None	August 2, 1990	None
Wales, Town of	November 19, 1976	None	July 2, 1981	None

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAMPDEN COUNTY, MA
(ALL JURISDICTIONS)

COMMUNITY MAP HISTORY

COMMUNITY NAME	INITIAL NFIP MAP DATE	FLOOD HAZARD BOUNDARY MAP REVISIONS DATE	INITIAL FIRM DATE	FIRM REVISIONS DATE
West Springfield, Town of	June 28, 1974	None	September 30, 1977	October 11, 1979
Westfield, City of	July 26, 1974	February 18, 1977 July 1, 1978	May 1, 1978	None
Wilbraham, Town of	May 17, 1974	August 2, 1977	March 1, 1979	July 19, 1981 June 15, 1988

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAMPDEN COUNTY, MA
(ALL JURISDICTIONS)

COMMUNITY MAP HISTORY

7.0 OTHER STUDIES

Due to the nature of this 2007 county-wide study, the current analyses which are more up-to-date than the community-based FIS reports supersedes the previous reports for: Agawam 250133V 02/01/1978, Brimfield 250135V 08/02/1982, Chester 250136V 10/16/1984, Chicopee 250137V 03/29/1978, East Longmeadow 250138V 09/15/1978, Hampden 250140V 05/15/1978, Holland 250141V 07/05/1984, Holyoke 250142V 02/15/1979, Longmeadow 250143V 07/03/1990, Ludlow 250144V 06/15/1988, Monson 250145V 07/16/1996, Palmer 250147S 05/04/1981, Russell 250148V 12/15/1990, Southwick 250149V 01/16/1984, Springfield 250150V 06/17/1991, Tolland 250151V 08/02/1990, Wales 250152V 01/02/1981, Westfield 250153V 11/01/1977, Wilbraham 250154V 06/15/1988, and West Springfield 250155S 09/1977.

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

8.0 LOCATION OF DATA

Information concerning the pertinent data used in preparation of this study can be obtained by contacting FEMA Region I, 99 High Street, 6th Floor, Boston, MA 02110.

9.0 BIBLIOGRAPHY AND REFERENCES

Ahearn, Elizabeth A., Regression Equations for Estimating Flood Flows for the 2-, 10-, 25-, 50-, 100-, and 500-Year Recurrence Intervals in Connecticut, Scientific Investigations Report 2004-5160, U.S. Department of the Interior, U.S. Geological Survey, Reston, Virginia, 2004.

Almer Huntley, Jr. and Associates, Inc., Topographic Mapping of Abbey Brook, Scale 1:4,800, Contour Interval 2 Feet, undated.

Anderson-Nichols & Co., Inc., "Revised Flood Hazard Impacts Analysis for Reconstruction of Collins Dam, Wilbraham, Massachusetts, Clinton, Massachusetts," May 18, 1984.

Area Maps, Hampden, Massachusetts - Connecticut, March 1974.

Brater, Ernest F., and Horace Williams King, Handbook of Hydraulics, Sixth Edition, New York, McGraw-Hill, 1976.

C.E. Maguire, Waltham, Massachusetts, Topographic Map of Bondi Island Town of Agawam, Massachusetts, Scale 1:1200, Contour Interval 2 feet, May 1973 New England River Basins Commission, The Rivers Reach--A Plan for Flood Drainage Reduction and Flood Plain Management in the Connecticut River Basin, December 1975.

Camp, Dresser, & McKee Inc., Contract No. 2-City of Springfield, Sewerage Works Improvements (Along South Bank of Chicopee River), December 1970.

Camp, Dresser, & McKee, Inc., Sewerage Works Improvements Along South Bank of Chicopee River, City of Springfield, December 1970.

Chow, Ven Te, Handbook of Applied Hydrology, New York, McGraw-Hill, 1964.

Chow, Ven Te, Open-Channel Hydraulics, McGraw-Hill, New York, 1959.

City of Chicopee, Street Map, Scale 1:12,000: Chicopee, Massachusetts, updated to January 1975.

City of Chicopee, Topographic Map, Scale 1:9600, Contour Interval ten feet: Chicopee, Massachusetts, updated.

City of Holyoke, Revised Ordinances of the City of Holyoke, 1972, Appendix A, 1975.

City of Springfield, Topographic Mapping, Scale 1:1,200, Contour Interval 2 Feet, 1932.

City of Westfield, Massachusetts Planning Board, Street Map, City of Westfield (January 1975).

City of Westfield, Massachusetts Westfield Interceptor Sewer, 1969.

Col - East Photogrammetric Engineering, Project No. 5133, Strip Topographic Mapping, Scale 1:2,400, Contour Interval 2 feet:

Commonwealth of Massachusetts, Department of Commerce and Development, Massachusetts Profile of Brimfield, Boston, Massachusetts, March 1976.

Commonwealth of Massachusetts, Department of Commerce and Development, Massachusetts Profile of Hampden, Holyoke, East Longmeadow, 1975.

Commonwealth of Massachusetts, Department of Commerce and Development, Massachusetts Profile of Wales, Boston, Massachusetts, March 1976.

Commonwealth of Massachusetts, Department of Commerce and Development, Monograph, Town of Ludlow, Boston, Massachusetts, revised 1971.

Commonwealth of Massachusetts, Department of Public Works, Bureau of Transportation Planning and Development, Topographic Maps, Scale 1:2,400, Contour Interval 5 feet: Chicopee, Massachusetts, 1950, 1951, 1957, 1961, and 1963, Boston, Massachusetts.

Commonwealth of Massachusetts, Department of Public Works, Bureau of Transportation Planning and Development, Topographic Maps, Scale 1:2,400, Contour Interval 5 feet: Westfield, Massachusetts (1950); (1968); (1971).

Commonwealth of Massachusetts, Department of Public Works, Bureau of Transportation, Planning, and Development, Topographic Maps, Scale 1:2,400, Contour Interval five feet: Chicopee, Massachusetts, 1950, 1951, 1957, 1961, and 1963., Bridge Plans and Sections.

Commonwealth of Massachusetts, Department of Public Works, Division of Waterways, Contract No. 2582: Channel Improvements to Willimansett Brook, January 1967.

Commonwealth of Massachusetts, Department of Public Works, Draft Environmental Impact

Statement for 1-391, Chicopee-Holyoke, Massachusetts, December 1974.

Commonwealth of Massachusetts, Department of Public Works, General Highways Map, Urban Area Series, Scale 1 inch = 1,000', Ludlow, Massachusetts, Region C, Sheet 9A, 1975.

Commonwealth of Massachusetts, Department of Public Works, General Highways Map, Urban Area Series, Scale 1:12,000, Holyoke (North), Holyoke (South), 1975.

Commonwealth of Massachusetts, Department of Public Works, General Highways Map, Urban Area Series, Scale 1:2,400, Wilbraham, Region C, Sheet 14A, 1975.

Commonwealth of Massachusetts, Department of Public Works, Interstate 1:2,400, Contour Interval 5 feet.

Commonwealth of Massachusetts, Department of Public Works, Relocation of Route 141: Holyoke-Easthampton, Scale 1:2400, Contour Interval 5 feet, 1959.

Commonwealth of Massachusetts, Department of Public Works, Relocation of Route 20, Scale 1:2,400, Contour Interval 5 feet, Sheets 3 and 4, January 1950.

Commonwealth of Massachusetts, Department of Public Works, Relocation of Route 20, Scale 1:2,400, Contour Interval 5 feet, Sheets 5,6,7,and 8, November 1972.

Commonwealth of Massachusetts, Department of Public Works, Relocation of Route 5 From North End Bridge in West Springfield to Smith's Ferry in Holyoke, Scale 1:2,400, Contour Interval 5 feet, April 1954.

Commonwealth of Massachusetts, Division of Fisheries and Game, Inventory of the Ponds, Lakes, and Reservoirs of Massachusetts-Hampden and Hampshire Counties, February 1972.

Commonwealth of Massachusetts, Massachusetts General Laws, Wetlands Protection Act, Chapter 131, Section 40, Last amended in 1978.

Commonwealth of Pennsylvania, Department of Public Works, Bureau of Transportation, Planning and Development, Topographic Maps, Scale 1:2,400, Contour Interval 5 feet: City of Springfield, Boston, Massachusetts, 1951, 1953, 1954, 1961, 1963, and 1972.

Commonwealth of Pennsylvania, Department of Public Works, Bureau of Transportation, Planning, and Development, Bridge Plans and Sections, Boston, Massachusetts, various dates .

Connecticut Department of Environmental Protection and University of Connecticut, Connecticut 2-foot contour lines, 2000. http://cteco.uconn.edu/

Conversation with Selectmen, Town of Hampden, Massachusetts, April 1977.

Federal Emergency Management Agency, Guidelines and Specifications for Flood Hazard Mapping Partners (Guidelines), November 2009.

Federal Emergency Management Agency, Flood Insurance Study, City of Springfield, Hampden County, Massachusetts, Washington, D.C. Flood Insurance Rate Map Dated February 1, 1980.

Federal Emergency Management Agency, Flood Insurance Study, Town of Agawam, Hampden County, Massachusetts, Washington, D.C. February 1, 1978.

Federal Emergency Management Agency, Flood Insurance Study, Town of Brimfield, Hampden County, Massachusetts (Unpublished), Washington, D.C., June 30, 1981.

Federal Emergency Management Agency, Flood Insurance Study, Town of Brookfield, Worcester County, Massachusetts, Washington, D.C. (Unpublished).

Federal Emergency Management Agency, Flood Insurance Study, Town of East Longmeadow, Hampden County, Massachusetts, Washington, D.C. September 15, 1978.

Federal Emergency Management Agency, Flood Insurance Study, Town of Longmeadow, Hampden County, Massachusetts, Washington, D.C. September 1, 1978.

Federal Emergency Management Agency, Flood Insurance Study, Town of Monson, Hampden County, Massachusetts (Unpublished), July 22, 1980.

Federal Emergency Management Agency, Flood Insurance Study, Town of Otis, Hampden County, Massachusetts, Washington, D. C., June 15, 1983.

Federal Emergency Management Agency, Flood Insurance Study, Town of Palmer, Hampden County, Massachusetts (Unpublished); Washington, D.C., May 4, 1981.

Federal Emergency Management Agency, Flood Insurance Study, Town of Sandisfield, Berkshire County, Massachusetts, Washington, D. C., June 4, 1984.

Federal Emergency Management Agency, Flood Insurance Study, Town of Sturbridge, Worcester County, Massachusetts, Washington, D.C. (Unpublished).

Federal Emergency Management Agency, Flood Insurance Study, Town of Suffield, Harford County, Connecticut, Washington, D. C., June 4, 1984.

Federal Emergency Management Agency, Flood Insurance Study, Town of Wales, Hampden County, Massachusetts, Washington, D.C., January 2,1981.

Federal Emergency Management Agency, Flood Insurance Study, Town of West Springfield, Hampden County, Massachusetts, (unpublished); Washington, D.C., October 11, 1979.

Federal Emergency Management Agency, Flood Insurance Study, Town of Westfield, Hampden County, Massachusetts, Washington, D.C., May 1, 1978.

Federal Emergency Management Agency, Flood Insurance Study, Town of Wilbraham, Hampden County, Massachusetts, Washington, D.C., July 10, 1981.

Framatome Anp DE&S Inc., Holyoke Project, Ferc Project No. 2004-MA, Eighth Five-Year Safety Inspection, Portland, ME, September 2002.

Green International Affiliates Inc., Topographic Map, Scale 1:240, Contour Interval one foot: Abbey Brook, Chicopee Massachusetts, 1975.

Hampden County, Natural Resources Technical Team, Natural Resources Program of the Town of Wales, Massachusetts, June 1976.

Hampden Soil Conservation District and City of Westfield, Watershed Work Plan for Watershed Protection and Flood Prevention-Powdermill Brook Watershed, August 1961.

Hampden, Massachusetts Conservation District, et al, Work Plan for Watershed Protection and Flood Prevention - West Branch of the Westfield River Watershed, September 1971.

Holland, Massachusetts Commemorates America's Bicentennial 1776-1976, Monson, MA, Blatchley's Printers, April 1976.

Hydrologic Engineering Center, Statistical Software Package (HEC-SSP), Version 2.0, U.S. Army Corps of Engineers, Davis, CA, October 2010.

Island Town of Agawam, Massachusetts, Scale 1:1,200, Contour Interval 2 feet, May 1973.

James W. Sewall Company of Old Town, Maine, 5 Foot Contour Mapping of Streams in Springfield, Massachusetts, from aerial photography dated April 30, 1985.

Johnson, Carl G. and Tasker, Gary D., Flood Magnitude and Frequency of Massachusetts Streams. Progress Report. USGS open file report no. 74-131, March 1974.

Johnstone, Don and Cross, W. P., Elements of Applied Hydrology, New York, Ronald Press Company, 1949.

King, H. W., and Brater, E. F., Handbook of Hydraulics, 6th Edition, New York, McGraw-Hill, 1976.

Lockwood Mapping, Inc., of Rochester, New York, Topographic Maps compiled from aerial photographs, Scale 1”=800’, Contour Interval 5 Feet: Brimfield, Massachusetts, 1978.

Lockwood Mapping, Inc., of Rochester, New York, Topographic Maps prepared by Photogrammetric Methods, Scale 1:4,800, Contour Interval 5 Feet: Monson, (Ludlow) Massachusetts, 1979.

Lower Pioneer Valley Regional Planning Commission, “Community Profiles – Chester; Southwick; West Springfield,” Massachusetts, 1978.

MacConnell, William P., University of Massachusetts, Massachusetts Map Down-Land Use and Vegetative Cover, 7.5 Series Hampden-Ludlow, 1970.

Massachusetts Office of Geographic Information Systems, digital orthophotos, 2005. http://www.mass.gov/mgis/massgis.htm

Massachusetts Department of Commerce and Development, Massachusetts Profile(s) of Brimfield March 1976; Longmeadow 1975; Hampden 1975; Wilbraham 1975; Boston, Massachusetts.

Massachusetts Department of Commerce and Development, Massachusetts Community Data - Holland, Massachusetts, Boston, 1978 Massachusetts Department of Commerce and Development, Massachusetts Community Data - Southwick, Massachusetts, Boston, 1978.

Massachusetts Department of Commerce and Development, Monograph, City of Chicopee, April 1973.

Massachusetts Department of Commerce and Development, Monograph, City of Westfield, April 1973.

Massachusetts Department of Commerce and Development, Monograph, Town of Agawam, July 1973.

Massachusetts Department of Commerce and Development, Monograph, Town of Russell, Massachusetts, Boston, Massachusetts, Revised December 1973.

Massachusetts Department of Environmental Quality Engineering - Division of Waterways, Draft Environmental Impact Report - Flood Control Works, Congamond Lakes, Southwick, Massachusetts, by Jason M. Cortell and Associates, Inc., March 1980.

Massachusetts Turnpike Authority, Engineering and Maintenance, Western Massachusetts, Bridge Plans and Sections .

Massachusetts Office of Geographic Information Systems, 2005, http://www.mass.gov/mgis/laylist.htm

Massachusetts, April 12, 1974 City of Chicopee, Street Map, Scale of 1:12,000: Chicopee, Massachusetts, Updated to January 1975.

Moore Aerial Survey of Holland, Massachusetts, Aerial Contour Maps, Scale 1 inch = 400', Contour Interval 5 Feet: Shrewsbury, Massachusetts, 1980.

Moore Aerial Survey of Sandisfield, Massachusetts, Aerial Contour Maps, Scale 1:4,800, Contour Interval 5 Feet: Shrewsbury 1980, Massachusetts.

Moore Aerial Survey of Southwick, Massachusetts, Aerial Contour Maps, Scale 1 inch = 400', Contour Interval 5 Feet: Shrewsbury, Massachusetts, April 1977, 1980.

Moore Mapping and Survey Corporation, Topographic, Maps, Scale 1:4,800, Contour Interval 5 feet, Longmeadow, March 1977; Wilbraham 1974, E. Longmeadow (date not disclosed), Massachusetts.

Moore Survey and Mapping Company, Inc., Topographic Maps, Scale 1:48,000, Contour Interval 5 feet: Holyoke 1977, Massachusetts.

Moore Survey and Mapping Corporation, Topographic Maps, Scale 1 inch = 400', Contour Interval Five Feet, Shrewsbury, Massachusetts, April 1977.

National Oceanic and Atmospheric Administration, Climatological Data-1976, Volume 88, No. 13, 1977.

Natural Resource Conservation Service, SSURGO-Certified Soils Data for Hampden County, MA, United Stated Department of Agriculture, provided digitally by MassGIS, November 2010.

Natural Resource Conservation Service, Technical Release 55: Urban Hydrology for Small Watersheds, United Stated Department of Agriculture, June 1986.

Natural Resources Conservation Service, WinTR-20: The Computer Program for Project Formulation Hydrology, Version 1.11, United Stated Department of Agriculture, March 2009.

New England River Basins Commission, The River's Reach - A Plan for Flood Drainage Reduction and Flood Plain Management in the Connecticut River Basin, December 1975.

Northeast Airphoto Associates, Inc., Shrewsbury, Massachusetts, Aerial Photographs, December

Northeast Regional Climate Center, Atlas of Precipitation Extremes for the Northeastern United States and Canada, Cornell University, Ithaca, NH, September 1993.

Quinn and Associates of Horsham, Pennsylvania, Topographic Maps compiled from aerial photographs, Scale 1”=1,200’, Contour Interval 5 Feet: Brimfield, Massachusetts, 1978 Quinn and Associates of Horsham, Pennsylvania, Topographic Maps compiled from aerial photos, Scale 1”=2,400’, Contour Interval 5 Feet: (unpublished).

Route 91: West Springfield-Chicopee-Holyoke, Scale 1:2,400, Contour Interval 5 feet, 1961 Soil Conservation Service, Engineering Handbook, Section 4, Chapter 15, Revised Edition 1972.

Southwick Bicentennial Committee, The Southwick, Massachusetts Bicentennial, 1770-1970.

Springfield Civil Defense, Flood Control Operations Plan for the City of Springfield, Springfield, Massachusetts, 1976.

State of Connecticut, Department of Environmental Protection, Bulletin No. 1, Gazetteer of Natural Drainage Areas of Streams and Water Bodies Within the State of Connecticut, Mentall P. Thomas, U. S. Geological Survey, 1972.

Tighe and Bond, Consulting Engineers, General Development Plan, Chicopee, Massachusetts, Sanitary Sewerage Study, October 1971.

Tighe and Bond, Consulting Engineers, Tannery Brook Improvements-City of Holyoke, Massachusetts, June 1975.

Tighe and Bond, Inc., Consulting Engineers, Report on Surface Drainage for Board of Selectmen, Agawam, Massachusetts, August 1972.

Town of Longmeadow, Zoning 125 January 1973.

Town of Monson, Massachusetts - Town Clerk's Office; June 21, 1H4 .

Town of Southwick, Massachusetts, “Zoning-By-Law”, First Adopted December 20, 1950, As Amended September 26, 1978.

Town of Wilbraham, Massachusetts, Annual Report, 1955.

Town of Wilbraham, Massachusetts, Zoning By-Laws of the Town of Wilbraham, 1973.

U.S. Army Corps of Engineers, Chicopee Falls Local Protection Project - Design Memorandum No. 2, December 1962.

U.S. Army Corps of Engineers, Connecticut and Chicopee Rivers Flood Protection System General-Plan and Profile of Dike, 1939.

U.S. Army Corps of Engineers, Connecticut River Basin - Comprehensive Water and Related Land Resources Investigation, Waltham, Massachusetts, June 1970, Volume 4, Appendix F.

U.S. Army Corps of Engineers, Connecticut River Flood Protection System-Operation Chart, 1945.

U.S. Army Corps of Engineers, Design Memorandum No. 1 - Hydrology and Hydraulic Analysis, Westfield Local Protection Project, Westfield and Little Rivers, Massachusetts, October 1963.

U.S. Army Corps of Engineers, HEC-2 Training Document No. 6, Applications of HEC-2 Bridge Routines, June 1974.

U.S. Army Corps of Engineers, Hydrologic Engineering Center, Floodway Determination Using Computer Program HEC-2 Training Document No. 5 Davis, California, May 1974.

U.S. Army Corps of Engineers, Hydrologic Engineering Center, Floodway Determination Using Computer Program HEC-2 Training Document No. 5 Davis, California, May 1976.

U.S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-2 Water Surface Profiles, Generalized Computer Program, Davis, California, December 1968.

U.S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-2 Water Surface Profiles, Generalized Computer Program, Davis, California, October 1973.

U.S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-2 Water Surface Profiles, Generalized Computer Program, Davis, California, April 1974.

U.S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-2 Water Surface Profiles, User's Manual, Davis, California, November 1976.

U.S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-2 Water Surface Profiles, User's Manual, Davis, California, November 1977.

U.S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-2 Water Surface Profiles, Generalized Computer Program, Davis, California, August 1979, Revised May 1980.

U.S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-2 Water Surface Profiles, Generalized Computer Program, Davis, California, August 1979, Revised May 1984.

U.S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-2 Water Surface Profiles, Generalized Computer Program, Davis, California, September 1982.

U.S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-2 Water Surface Profiles, User's Manual, Davis, California, September 1990.

U.S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-GeoRAS User's Manual, Version 3.1, October 2002.

U.S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-HMS User's Manual, Version 3.0.1, April 2006.

U.S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-RAS User's Manual, Version 3.1, November 2002.

U.S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-RAS Hydraulic Reference Manual, Version 3.1, Davis California, November 2002.

U.S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-RAS Hydraulic Reference Manual, Version 4.1, Davis California, March 2008.

U.S. Army Corps of Engineers, New England District, Hamilton Reservoir Dam, Phase 1 Inspection Report No. MA 00536 - National Dam Inspection Program, November 1978.

U.S. Army Corps of Engineers, New England District, Westfield River Watershed-Littleville Lake-Master Manual of Water Control, Appendix H, January 1978.

U.S. Army Corps of Engineers, New England Division, Congamond Lakes Outlet (Middle Pond), Phase I Inspection Report No. MA 00071-National Dam Inspect Program, Waltham, MA, March 1979.

U.S. Army Corps of Engineers, New England Division, Connecticut River Basin Coordinating Committee, Comprehensive Water and Related Land Resources Investigation: Connecticut River Basin, June 1970.

U.S. Army Corps of Engineers, New England Division, Connecticut River Basin, Comprehensive Water and Related Land Resources Investigation, Waltham, Massachusetts, June 1979.

U.S. Army Corps of Engineers, New England Division, Farmington River Basin -- Master Water Control Manual for the Colebrook Reservoir, 1980.

U.S. Army Corps of Engineers, New England Division, Flood Plain Information Chicopee and Conant Brooks, Monson, Massachusetts, Waltham, Massachusetts, December 1963.

U.S. Army Corps of Engineers, New England Division, Flood Plain Information Report, Westfield, Massachusetts, June 1969.

U.S. Army Corps of Engineers, New England Division, Flood Plain Information Chicopee River, Chicopee, Ludlow, Wilbraham, and Palmer, Massachusetts, Waltham, Massachusetts, September 1973.

U.S. Army Corps of Engineers, New England Division, Hydrologic Engineering Section, Hydrologic Engineering Input to Phase I of the Connecticut River Supplemental Study, Waltham, Massachusetts, December 1973.

U.S. Army Corps of Engineers, New England Division, Real Estate Project Map -- Colebrook River Lank, Scale 1:4,800, Washington, D. C., Approved October 28, 1977.

U.S. Army Corps of Engineers, Office of the Division Engineering, New England Division, Operation and Maintenance Manual for Flood Protective Works on Connecticut and Chicopee Rivers and Chicopee-Chicopee Falls, Massachusetts, 1984.

U.S. Army Corps of Engineers, Office of the Division Engineering, New England Division, Operation and Maintenance Manual for Flood Protective Works Holyoke, Mass., 1951.

U.S. Army Corps of Engineers, Office of the Division Engineering, New England Division, Operation and Maintenance Manual for Flood Protection System at Springfield, Massachusetts, 1945.

U.S. Army Corps of Engineers, Office of the Division Engineering, New England Division, Operation and Maintenance Manual for Flood Protective Works at West Springfield, Massachusetts, 1950, revised 1997.

U.S. Army Corps of Engineers, Preliminary Flood Insurance Study--Town of West Springfield, October 1975.

U.S. Army Corps of Engineers, Water Resources Development in Massachusetts, 1975.

U.S. Census Bureau, 2010 Census: Hampden County, Maine. Retrieved April 4, 2012 from http://www.census.gov/popfinder/.

U.S. Department of Agriculture, Soil Conservation Service, Flood Prone Area Maps, Hampden, Massachusetts - Connecticut, March 1974.

U.S. Department of Agriculture, Soil Conservation Service, Guidelines for Soil and Water Conservation in Urbanizing Areas of Massachusetts, Amherst, MA, October 1977.

U.S. Department of Agriculture, Soil Conservation Service, Inventory of Potential and Existing Upstream Reservoir Sites, Thames Study Area, Washington, D. C., January 1971.

U.S. Department of Agriculture, Soil Conservation Service, Inventory of Potential and Existing Upstream Reservoir Sites, Chicopee Study Area, Washington, D. C., May 1973.

U.S. Department of Agriculture, Soil Conservation Service, National Handbook of Applied Hydrology, Channel Routing Methods, Section 4, Hydrology, 1972.

U.S. Department of Agriculture, Soil Conservation Service, Soils and Their Interpretations for Various Land Uses, Town of Wilbraham, April 1966.

U.S. Department of Agriculture, Soil Conservation Service, Soils and Their Interpretations for Various Land Uses, City of Holyoke, 1970.

U.S. Department of Agriculture, Soil Conservation Service, Water and Related Land Resources of Central Region, Massachusetts, Washington, D. C., June 1976.

U.S. Department of Agriculture, Soil Conservation Service, Water and Related Land Resources of Central Region, Massachusetts, Washington, D. C., August 1978.

U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Climatological Data-1976, Volume 88, No. 13, 1977.

U.S. Department of Commerce, Weather Bureau, Technical Paper No. 40, Rainfall Frequency Atlas of The United States, Washington, D.C., 1961, Revised 1963.

U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, Town of Chester, Hampden County, Massachusetts, Washington, D.C., November 19, 1976 .

U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, City of Chicopee, Hampden County, Massachusetts, Washington, D.C., July 19, 1974.

U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, Town of Brimfield, Hampden County, Massachusetts, Washington, D.C., July 19, 1974.

U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, Town of East Longmeadow, Hampden County, Massachusetts, Washington, D.C., June 1974.

U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, Town of Hampden, Hampden County, Massachusetts, Washington, D.C., July 1976.

U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, Town of Holland, Hampden County, Massachusetts, Washington, D.C., April 8, 1977.

U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, Town of Ludlow, Hampden County, Massachusetts, Washington, D.C., October 17, 1974.

U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, Town of Southwick, Hampden County, Massachusetts, December 16, 1976.

U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, Town of Tolland, Hampden County, Massachusetts, Washington, D.C., April 4, 1975.

U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, Town of Wales, Hampden County, Massachusetts, Washington, D.C., November 19, 1976

U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, Westfield, Massachusetts, Washington, D.C., July 1974; (Revised) February 1977.

U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, Wilbraham, Massachusetts, Washington, D.C., July 10, 1981.

U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Insurance Study Guidelines and Specifications, January 1976.

U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Insurance Study, City of Agawam, Hampden County, Massachusetts, Washington, D.C., February 1, 1978 .

U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, City of Agawam, Hampden County, Massachusetts, Washington, D.C., February 1, 1978 .

U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, Town of Brimfield, Hampden County, Massachusetts, Washington, D.C.

U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, Town of Chester, Hampden County, Massachusetts, Washington, D.C.

U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Insurance Study, City of Chicopee, Hampden County, Massachusetts, Washington, D.C., (Preliminary) 1977.

U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Insurance Study, City of Chicopee, Hampden County, Massachusetts, Washington, D.C., September 29, 1978.

U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, City of Chicopee, Hampden County, Massachusetts, Washington, D.C., September 29, 1978.

U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Insurance Study, City of Springfield, Hampden County, Massachusetts, Washington, D.C., 1977.

U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Insurance Study, City of Springfield, Hampden County, Massachusetts, Washington, D.C., May 28, 1974.

U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Insurance Study, Enfield, Connecticut, Washington, D.C., (in progress).

U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Insurance Study, Massachusetts, Washington, D.C., October 1975.

U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood

Insurance Study, Town of East Longmeadow, Hampden County, Massachusetts, Washington, D.C., 1977.

U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, Town of East Longmeadow, Hampden County, Massachusetts, Washington, D.C., 1977.

U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Insurance Study, Town of Easthampton, Hampshire County, Massachusetts, Washington, D.C., (Preliminary) 1978.

U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Insurance Study, Town of Hadley, Hampden County, Massachusetts, Washington, D.C., (preliminary) 1977.

U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Insurance Study, Town of Hampden, Hampden County, Massachusetts, Washington, D.C., November 15, 1978.

U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, Town of Hampden, Hampden County, Massachusetts, Washington, D.C., November 15, 1978.

U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, Town of Holland, Hampden County, Massachusetts, Washington, D.C.

U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Insurance Study, City of Holyoke, Hampden County, Massachusetts, Washington, D.C., (in preparation).

U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, City of Holyoke, Hampden County, Massachusetts, Washington, D.C.

U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Insurance Study, Town of Longmeadow, Hampden County, Massachusetts, Washington, D.C., September 1, 1978.

U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, Town of Ludlow, Hampden County, Massachusetts, Washington, D.C.

U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, Town of Monson, Hampden County, Massachusetts, Washington, D.C.

U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, Town of Palmer, Hampden County, Massachusetts, Washington, D.C.

U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Insurance Study, Town of Springfield, Hampden County, Massachusetts, Washington, D.C., (in preparation) .

U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood

Insurance Study, Town of South Hadley, Hampshire County, Massachusetts, Washington, D.C., (in preparation).

U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Insurance Study, Town of South Hadley, Hampshire County, Massachusetts, Washington, D.C., (Preliminary) 1977.

U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Insurance Study, Town of Southampton, Hampshire County, Massachusetts, Washington, D.C., (Preliminary) 1977.

U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, Town of Southwick, Hampden County, Massachusetts, Washington, D.C.

U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, Town of Tolland, Hampden County, Massachusetts, Washington, D.C.

U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, Town of Wales, Hampden County, Massachusetts, Washington, D.C.

U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Insurance Study, Town of West Springfield, Hampden County, Massachusetts, Washington, D.C., October 1975.

U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Insurance Study, Town of Westfield, Hampden County, Massachusetts, Washington, D.C., May 1, 1978.

U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, Town of Westfield, Hampden County, Massachusetts, Washington, D.C., May 1, 1978.

U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Insurance Study, Town of Wilbraham, Hampden County, Massachusetts, 1977.

U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, Town of Wilbraham, Hampden County, Massachusetts, 1977.

U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Insurance Study, Town of Wilbraham, Hampden County, Massachusetts, Washington, D.C. March 1, 1979.

U.S. Department of Housing and Urban Development, Federal Insurance Administration, "Flood Insurance Study-Guidelines and Specifications," January 1976.

U.S. Department of Housing and Urban Development, Federal Insurance Administration, Preliminary Flood Insurance Study, Town of West Springfield, Massachusetts, October 1975.

U.S. Department of Housing and Urban Development, Flood Insurance Study: Town of East

Longmeadow, Hampden County, Massachusetts, 1977.

U.S. Department of Housing and Urban Development, Flood Insurance Study: Town of Wilbraham, Hampden County, Massachusetts, 1977.

U.S. Department of the Interior, Geological Survey, 7.5-Minute Series Flood-Prone Areas, Scale 1:24,000, Contour Interval 10 Feet: Palmer1974; Ludlow 1974; Hampden 1974, Massachusetts.

U.S. Department of the Interior, Geological Survey, 7.5-Minute Series Topographic Maps, Scale 1:24,000, Contour Interval 20 Feet: Springfield South 1970; West Springfield 1970, Massachusetts-Connecticut .

U.S. Department of the Interior, Geological Survey, 7.5-Minute Series Topographic Maps, Scale 1:24,000, Contour Interval 5 Feet: Boston, Massachusetts 1951.

U.S. Department of the Interior, Geological Survey, 7.5-Minute Series Topographic Maps, Scale 1;24,000, Contour Interval 10 feet: Becket 1973; Blandford 1972; Chester 1972; Hampden, Massachusetts- Connecticut, 1938; Hampden, Massachusetts - Connecticut, 1958, Photorevised 1970; Ludlow 1938, Photorevised 1969; Monson 1943, Photorevised 1967; Mount Tom 1972; Palmer, 1943, Photorevised 1969; Southwick 1958; Springfield North, Massachusetts, 1958, 1972, Photorevised 1977; Springfield South Massachusetts-Connecticut 1958, Photorevised 1970; Monson, Massachusetts-Connecticut, 1967; Wales, Massachusetts - Connecticut, 1967; Warren 1969; West Springfield 1970; Westford, -Connecticut, 1952, Photo revised 1970; Woronco 1967; Massachusetts Quadrangles .

U.S. Department of the Interior, Geological Survey, Average Annual Runoff and Precipitation in the New England-New York Area, Hydrologic Investigations Atlas HA-7, Washington, D. C., 1955.

U.S. Department of the Interior, Geological Survey, Office of Water Data Collection, Interagency Advisory Committee on Water Data, “Guidelines for Determining Flood Flow Frequency,” Bulletin 17B, Reston, Virginia, March 1976, Revised September 1981.

U.S. Department of the Interior, Geological Survey, Open-File Report No. 74-131, Flood Magnitude and Frequency of Massachusetts Streams, Carl G. Johnson and Gary D. Tasker, March 1974.

U.S. Department of the Interior, Geological Survey, Water Resources Data for Massachusetts – “WATSTORE” Peak Flow File Retrieval Program, 1980.

U.S. Department of the Interior, Geological Survey, Water Resources Data for Massachusetts and Rhode Island, Water Year 1975, 1976, 1977.

U.S. Department of the Interior, Geological Survey, Water Resources Data for Massachusetts, New Hampshire, Rhode Island, and Vermont, Part I, Surface Water Records, 1915 to 1974.

U.S. Department of the Interior, Geological Survey, Water Resources Data for Massachusetts, New Hampshire, Rhode Island, and Vermont, Part I, Surface Water Records, 1938 to 1974.

U.S. Department of the Interior, Geological Survey, Water Resources Investigations 77-39, Estimating the Magnitude and Frequency of Floods on Natural-Flow Streams in Massachusetts by S. W. Wandle, Jr., Washington, D. C., 1977.

U.S. Department of the Interior, Geological Survey, Water Supply Paper 1420, Floods of August-October 1955, New England to North Carolina, by D.B. Bogart, Washington, D.C., 1960.

U.S. Department of the Interior, Geological Survey, Water-Supply Paper 1779-M, Historical Floods in New England, Washington, D.C., 1964.

U.S. Department of the Interior, Geological Survey, Water-Supply Paper 1849, Roughness Characteristics of Natural Channels by Harry H. Barnes, Jr., Washington, D. C., 1967.

U.S. Department of the Interior, Geological Survey, Water-Supply Paper 2214, Estimating Peak Discharges of Small, Rural Streams in Massachusetts, Wandle, 1983.

U.S. Department of Transportation, Federal Highway Administration, General Highway Map, Regional Series, Commonwealth of Massachusetts, Region C and E, Scale 1 inch = 2,000 feet, 1974.

U.S. Geological Survey, Open-File Report, Flood Magnitude and Frequency of Massachusetts Streams, C.G. Johnson and G.D. Tasker, March 1974.

U.S. Geological Survey, Water-Data Report MA-RI-75-1, Water Resources Data for Massachusetts and Rhode Island, 1975.

Viessman, Warren J., Harbaugh, Terence E. and Knapp, John W., Introduction to Hydrology. New York: Intext Educational Publishers, 1972.

Viessman, Warren Jr., Introduction to Hydrology. Harper & Row, Publishers, New York: 1977.

Water Resources Council, “Guidelines for Determining Flood Flow Frequency,” Bulletin 17A, Washington, D.C., June 1977.

Wilander, A., Personal Correspondence, Chester, Massachusetts, September 15, 1980, flood photographs.