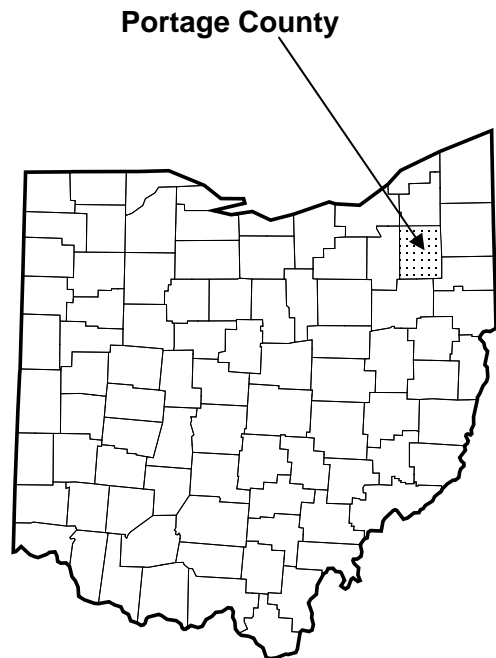


FLOOD INSURANCE STUDY



PORTAGE COUNTY, OHIO AND INCORPORATED AREAS

Community Name	Community Number
AURORA, CITY OF	390454
(1) BRADY LAKE, VILLAGE OF	390713
GARRETTSVILLE, VILLAGE OF	390455
(1) HIRAM, VILLAGE OF	390717
KENT, CITY OF	390456
MANTUA, VILLAGE OF	390457
PORTAGE COUNTY (UNINCORPORATED AREAS)	390453
RAVENNA, CITY OF	390458
STREETSBORO, CITY OF	390797
(1) SUGAR BUSH KNOLLS, VILLAGE OF	390768
WINDHAM, VILLAGE OF	390459



(1) No Special Flood Hazard Areas Identified

**Effective
August 18, 2009**



Federal Emergency Management Agency

FLOOD INSURANCE STUDY NUMBER
39133CV000A

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

<u>Old Zone(s)</u>	<u>New Zone</u>
A1 through A30	AE
V1 through V30	VE
B	X (shaded)
C	X

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Breakneck Creek Overflow	Panel 6P
Camp Creek	Panels 7P – 8P
Cuyahoga River	Panels 9P – 14P
Cuyahoga River Overflow	Panel 15P
Eagle Creek	Panel 16P
Fish Creek	Panels 17P – 18P
Hudson Ditch	Panels 19P – 21P
Plum Creek	Panels 22P – 31P
Small Brook	Panel 32P

PUBLISHED SEPARATELY:

Flood Insurance Rate Map Index
Flood Insurance Rate Map

FLOOD INSURANCE STUDY

PORTAGE COUNTY, OHIO AND INCORPORATED AREAS

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study (FIS) revises and supersedes the FIS reports, Flood Insurance Rate Maps (FIRMs), Flood Boundary and Floodway Maps in the geographic area of Portage County, Ohio, including: Cities Of Aurora, Kent, Ravenna and Streetsboro, Villages Of Brady Lake, Garrettsville, Hiram, Mantua, and Windham and the Portage County unincorporated areas, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood risk data for various areas of the community that will be used to establish actuarial flood insurance rates. This information will also be used by Portage County to update existing floodplain regulations as part of the Regular Phase of the National Flood Insurance Program (NFIP), and by local and regional planners to further promote sound land use and floodplain development. Minimum floodplain management requirements for participation in the NFIP are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

The Villages of Brady Lake, Hiram, and Sugar Brush Knolls are communities with no special flood hazard areas identified. The Village of Mogadore and the City of Tallmadge are both located in Portage and Summit Counties. The entire communities of Mogadore and Tallmadge will be mapped with Summit County and are not included in this FIS report.

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 Maps (DFIRMs) 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 Flood Insurance Study are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

Redelineation of previously effective flood hazard information for this FIS report and accompanying FIRMs as well as conversion of the incorporated areas of Portage County into Countywide Format was performed by Fuller, Mossbarger,

Scott and May Engineers, Inc. (FMSM), for FEMA under Contract No. HSFE05-05-D-0026, Task Order No. HSFE05-06-J-0012. This work was completed in September, 2007.

Information pertaining to the authority and acknowledgements for each of the previously effective FIS reports and new floodplain studies for communities within Portage County was compiled for this FIS report and is shown below.

- | | |
|--------------------------|---|
| City of Aurora | The previously effective FIS for the City of Aurora is dated May 17, 1990. The hydrologic and hydraulic analyses were performed by United State Army Corps of Engineers (USACE) Buffalo District for FEMA under Inter-Agency Agreement No. EMW-87-E-2509, Project Order No. 25. This study was completed in July 1988. Flooding caused by Small Creek, Tributary No. 1 and Channel Brook was studied in detail (Reference 1). |
| Village of Garrettsville | The previously effective FIS for the Village of Garrettsville is dated March 5, 1990. The hydrologic and hydraulic analyses for the study were performed by the USACE Buffalo District for FEMA under Inter-Agency Agreement No. EMW-87-E-2509, Project Order No. 25. This study was completed in May 1988. Flooding caused by Eagle Creek and Camp Creek was studied in detail (Reference 2). |
| City of Kent | The previously effective FIS for the City of Kent is dated September, 1977. The hydrologic and hydraulic analyses of the 1-percent-annual-chance flood event Cuyahoga River were obtained from a Flood Information Report developed by USACE Buffalo District (Reference 3). The hydrologic and hydraulic studies for Fish Creek were performed by Burgess and Niple, Limited for Federal Insurance Administration (FIA) under contract No. H-3911. This study was completed in January 1977 (Reference 4). |
| Village of Mantua | The previously effective FIS for the Village of Mantua is dated July 5, 1984. The hydrologic and hydraulic analyses for the study were obtained from a report prepared by USACE Buffalo District (Reference 5). This study was reviewed and accepted by FEMA in January 19, 1983 (Reference 6). |
| City of Streetsboro | The previously effective FIS for the City of Streetsboro is dated June 18, 1984. The hydrologic and hydraulic analyses of the 1-percent-annual-chance flood event for the study were obtained from a report prepared by USACE Buffalo District (Reference 7). This study was reviewed and |

accepted by FEMA in October 24, 1983 (Reference 8).

New Approximate Studies: New approximate hydrologic and hydraulic analyses for 182 stream reaches in Portage County were performed for this study by FMSM for FEMA under Contract No. HSFE05-05-D-0026, Task Order No. HSFE05-06-J-0012. This study was completed in March 2007 using the methodology reported in "Hydrologic Report: Countywide DFIRM Production and Development for Portage County" by FMSM dated February 1, 2007 (Reference 9) and in "Hydraulic Report: Countywide DFIRM Production and Development for Portage County" by FMSM dated March 29, 2007 (Reference 10). Study reaches included reaches with existing effective approximate flood hazards and additional reaches identified during the scoping meeting for the project.

New Detailed Studies: New detailed hydrologic and hydraulic analyses performed by United States Geologic Survey (USGS) in 2002 were incorporated in this FIS update. The streams included in this study were Breakneck Creek, Cuyahoga River, Hudson Ditch, and Plum Creek. The effective Plum Creek flood profile from the City of Kent was replaced with a new profile from the detailed study. The effective Cuyahoga River flood profile from the Village of Mantua was replaced with a new profile from the detailed study (Reference 4). The new detailed studies were conducted by USGS under a cooperating technical partners (CTP) agreement with a beginning date of October 1, 2000 and a completion date of December 31, 2002. This study was completed using the methodology documented in the Technical Support Data Notebook (TSDN) (Reference 11) completed for the project and obtained from FEMA. A new 0.2-percent annual chance (500-year return period) flood profile was added to the Cuyahoga River flood profile produced by USGS. This work was performed by FMSM for FEMA under Contract No. HSFE05-05-D-0026, Task Order No. HSFE05-06-J-0012.

The coordinate system used for the production of this DFIRM is State Plane Ohio North 3401 Feet, North American Datum 1983, Lambert Conformal Conic Projection. Differences in the datum and projection system used in the production of DFIRMs for adjacent counties may result in slight positional differences in map features at the county boundaries. These differences do not affect the accuracy of information shown on this DFIRM.

Redelineation of the previously effective flood hazard information for this FIS report, correction to the North American Vertical Datum of 1988, and conversion of the unincorporated and incorporated areas of Portage County into the Countywide Format was performed by FMSM, for the FEMA under Contract No. HSFE05-05-D-0026.

1.3 Coordination

The purpose of an initial Consultation Coordination Officer’s (CCO’s) meeting is to discuss the scope of the FIS. A final CCO meeting is held to review the results of the study. The dates of the initial and final CCO meetings held for the previous FIS reports covering the geographic area of Portage County, Ohio are shown in Table 1. The initial and final CCO meetings were attended by the study contractor, FEMA (or FIA), Ohio Department of Natural Resource (ODNR) and the affected community.

TABLE 1 CCO MEETING DATES FOR PRE-COUNTYWIDE FIS

COMMUNITY NAME	INITIAL CCO DATE	FINAL CCO DATE
City Of Aurora	May 7, 1987	June 7, 1989
Village Brady Lake	N/A	N/A
Village Of Garrettsville	May 7, 1987	April 26, 1989
City Of Kent	February 28, 1975	November 18, 1976
Village of Hiram	N/A	N/A
Village Of Mantua	N/A	January 19, 1983
Portage County Unincorporated Areas	N/A	N/A
City Of Streetsboro	N/A	October 24, 1983
Village of Sugar Knolls	N/A	N/A
Village of Windham	N/A	N/A

Source: References 1-8

The initial CCO meeting for this countywide FIS was held on September 6, 2006 and was attended by FEMA, the Ohio Department of Natural Resource (ODNR), and representatives from Portage County. The results of the study were reviewed at the final CCO meeting held on January 30, 2008, and attended by representatives of FEMA, FMSM and Portage County. Problems raised at that meeting have been addressed.

2.0 AREA STUDIED

2.1 Scope of Study

This FIS covers the geographic area of Portage County, Ohio. The Village of Mogadore and City of Tallmadge were excluded from this study since the majority of their landmass is located outside of Portage County; these communities will be included in a FIS for Summit County.

All previously effective FIRM panels for Portage County have been revised, updated and republished in countywide format as a part of this FIS. Analyses described herein refer collectively to previous study efforts detailed in References

1 to 8 and detailed studies performed by USGS in 2002 (Reference 11). The FIRM panel index, provided as Exhibit 2, illustrates the revised FIRM panel layout.

Approximate methods of analysis were used to study those areas having low development potential and/or minimal flood hazards as identified at the initial CCO meetings identified in Table 1. The scope and methods of approximate study were proposed to and agreed upon by FEMA and Portage County. For this study, 182 new stream reaches were studied by approximate methods. Flood hazards areas for reaches with effective approximate floodplains that were not included in the new approximate studies were digitized and corrected to match the best available topographic information.

The areas studied by detailed methods were selected with priority given to all known flood hazard areas, areas of projected development and proposed construction. Flooding sources studied by detailed methods include: Breakneck Creek, Breakneck Creek Overflow, Camp Creek, Channel Brook, Cuyahoga River, Eagle Creek, Fish Creek, Hudson Ditch, Plum Creek, Small Brook, Tributary No. 1 and Aurora Lake. The detailed reaches are summarized in Table 2

This countywide FIS also incorporated the determination of letters issued by FEMA resulting in map changes (Letters of Map Change, or LOMCs). All LOMCs in Portage County for which information could be found are summarized in the Summary of Map Amendment (SOMA) included in the Technical Support Data Notebook (TSDN) associated with this FIS update. No LOMCs have been incorporated into the revised FIRM panels during the production period as shown in Table 3. Copies of the SOMA may be obtained from the Community Map Repository. Copies of the TSDN may be obtained from FEMA

2.2 Community Description

Portage County, Ohio encompasses approximately 408 square miles and is located in the northeastern part of Ohio. It is bounded on the north by Geauga County; the east by Trumbull and Mahoning Counties; the south by Stark County, the west by Summit County. The county seat is Ravenna. The 2005 estimated population of the county based on the U.S. Census Bureau's estimate on July 1, 2006 is approximately 155,012 persons (Reference 12). The county is served by several highways including Interstate 76 and 80 and U.S. Route 82, 43 and 306.

The county is also served by two railroads: Conrail and the Norfolk Southern Railway (Reference 2).

The climate in Portage County is continental and characterized by marked fluctuations in temperature and precipitation. Temperatures in Portage County range from an extremely high of 100 °F to an extremely low of -21 °F. Average annual precipitation is 35.6 inches. The maximum recorded 24-hour precipitation was 4.18 inches (Reference 1).

TABLE 2 LIMITS OF DETAILED STUDY

STREAM REACH	STUDY LENGTH (MILES)	LIMIT OF DETAILED STUDY
Aurora Lake	N/A	Aurora Lake with City of Aurora
Breakneck Creek	12.0	Mouth at Cuyahoga River to approximately 0.4 miles upstream of Bower Road
Breakneck Creek Overflow	1.0	Divergence from Breakneck Creek to confluence with Breakneck Creek
Camp Creek	1.6	Mouth at Eagle Creek to Village of Garrettsville upstream corporate boundary
Channel Brook	0.1	Mouth at Aurora Lake to Portage/Summit County boundary
Cuyahoga River	11.3	City of Kent downstream corporate boundary to City of Kent upstream corporate boundary, City of Streetsboro downstream corporate boundary to City of Streetsboro upstream corporate boundary, and approximately 1,700 ft downstream of Infirmiry Road to City of Mantua upstream corporate boundary
Cuyahoga River Overflow	0.4	Divergence from Cuyahoga River to confluence with Cuyahoga River
Eagle Creek	2.0	Village of Garrettsville downstream corporate boundary at Brosius Road to Village of Garrettsville upstream corporate boundary
Fish Creek	2.8	City of Kent downstream corporate boundary to approximately 900 feet upstream of Farm Road
Hudson Ditch	2.5	Mouth at Breakneck Creek to approximately 0.4 miles upstream of Bower Road
Plum Creek	4.9	Mouth at Cuyahoga River to just upstream of Unnamed Road
Small Brook	1.4	Portage/Summit County boundary to approximately 1,425 feet upstream of Garfield West Road
Tributary No. 1	0.6	Mouth at Small Brook to approximately 600 ft upstream of Cochran Road

Source: References 1-8, and 11

TABLE 3 SUMMARY OF LOMCs INCORPORATED

CID	Flooding Source	Case Number	Date Issued	New Panel
N/A	---	---	---	---

management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10-, 2-, 1-, and 0.2-percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long-term, average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood that equals or exceeds the 1-percent-annual-chance flood in any 50-year 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 the original 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 Portage County. A summary of peak discharges for the 10-, 2-, 1-, and 0.2-percent annual chance (10-, 50-, 100-, and 500-year return period) floods of each flooding source studied in detail in Portage County is presented in Table 5. For each stream studied in detail, a hydrologic investigation was performed to generate flow quantities. A description of the derivation of flood discharges for each stream follows.

The peak discharges for Channel Brook, Small Creek and Tributary No. 1 were calculated from TR-20, a runoff hydrograph program (Reference 13). (Reference 1)

The discharges for Eagle Creek and Camp Creek were established using procedures from ODNR Bulletin No. 45 (Reference 14), which provides a regression equation to calculate the peak discharge. Basin characteristics used in the regression equation, such as drainage area, channel slope, and percentage of ponding area, were determined from USGS topographic maps.

Regression equations were also used to compute the peak flood discharges for Breakneck Creek, Hudson Ditch, and Plum Creek. The hydrologic analyses for these reaches were performed using the methods documented in the USGS WRIR Report 89-4126 "Techniques for Estimating Flood-Peak Discharges of Rural, Unregulated Streams in Ohio" (Reference 15).

The discharge for the Breakneck Creek and Cuyahoga River Overflow channels was computed using a split flow analysis in HEC RAS. (Reference 11)

TABLE 5 – SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (SQ. MILES)	PEAK DISCHARGE (CFS)			
		10- PERCENT ANNUAL CHANCE	2- PERCENT ANNUAL CHANCE	1- PERCENT ANNUAL CHANCE	0.2- PERCENT ANNUAL CHANCE
Breakneck Creek					
Upstream of Mouth	78.8	-	-	3,020	-
Downstream of Breakneck Creek Overflow Divergence	N/A			1,375	
Above Wahoo Ditch	63.8	-	-	2,730	-
Breakneck Creek Overflow					
At Confluence with Breakneck Creek	N/A	-	-	1,645	-
Camp Creek					
At mouth	3.44	-	-	660	-
Approximately 0.75 miles upstream from mouth	2.85	-	-	560	-
Channel Brook					
At mouth	2.4	-	-	215	-
Cuyahoga River					
At downstream City of Kent corporate limits	311	3,900	4,850	5,300	6,200
At upstream City of Kent corporate limits	292	3,900	4,850	5,300	6,200
At Lake Rockwell Dam	208	3900	-	5,200	-
Downstream of Cuyahoga River Overflow Convergence	N/A	-	-	5,100	18,300
Downstream of Cuyahoga River Overflow Divergence	N/A	-	-	3,150	5,900
At Main Street	151 ¹	-	-	5,100 ¹	18,300 ¹
Cuyahoga River Overflow					
At Confluence with Cuyahoga River	N/A	-	-	1,950	12,400
Eagle Creek					
At eastern corporate limits of Village of Garrettsville	29.8	-	-	3,550	-
At confluence with Camp Creek	26.2	-	-	3,450	-
Fish Creek					
At downstream corporate limit of City of Kent	6.7	490	690	770	975
At the upstream corporate limits of City of Kent	3.5	290	390	420	520
Hudson Ditch					
Upstream of mouth	9.2	-	-	1,090	-
Plum Creek					
At mouth	13.1	--	-	1,360	-

TABLE 5 – SUMMARY OF DISCHARGES (Continued)

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (SQ. MILES)	PEAK DISCHARGE (CFS)			
		10-PERCENT ANNUAL CHANCE	2-PERCENT ANNUAL CHANCE	1-PERCENT ANNUAL CHANCE	0.2-PERCENT ANNUAL CHANCE
Small Creek					
At mouth	2.6	-	-	330	-
Just upstream of confluence of Tributary No. 1	2.4	-	-	320	-
Tributary No. 1					
At mouth	0.3	-	-	25	-

¹ Data from USGS Gage at Hiram Rapids, Ohio Source: Reference 1 – 8, and 11

The hydrology analyses for Cuyahoga River were taken from several floodplain study reports developed by USACE. For the portion of Cuyahoga River within the Village of Mantua, the peak discharges were developed using the data obtained in the USGS stream gaging station (No. 04202000) at Hiram Rapids, OH, which had 39 years of record by the time of the previous FIS report. A log-Pearson Type III analysis (Reference 16) was used to determine the discharge-frequency relationship. The 10-percent annual chance (10-year return period) discharge was obtained directly from the USGS in Columbus, Ohio. The Standard Project Flood from USACE’s Floodplain Information Report for Mantua, Hiram, and Portage County (Reference 5) was used as the 0.2-percent annual chance (500-yr return period) flood discharge (Reference 6).

The peak discharge data for the portion of Cuyahoga River within the City of Kent was taken from flood frequency graph in another USACE Floodplain Information Report (Reference 3). For USACE’s analysis, log-Pearson Type III distributions were applied to USGS gage records obtained from three gages: Hiram Rapids gage, Old Portage gage and Little Cuyahoga River gage at Akron. The periods of records for these gages were 30, 41, and 20 years, respectively, at the time of the previous FIS Report. (Reference 4)

For the portion of Cuyahoga River within the City of Streetsboro, the 1-percent annual chance flood discharge was taken directly from the USACE report (Reference 7). The 10-percent annual chance flood discharge was calculated using the Clark Method along with a regression equation. The data was taken from the USGS gage located at Hiram Rapids. The 10-percent annual chance flood discharge was determined by extrapolation using the discharges for Cuyahoga River as reported in the previous FIS for the City of Kent (Reference 4). (Reference 8)

No streamflow records were available for Fish Creek. The 1-percent-annual-chance discharge was obtained from a provisional discharge-frequency relationship developed by USGS. In that calculation, a log-Pearson Type III analysis was performed with adjustments for regional skew factors and outliers. Then a regression analysis taking into account watershed characteristics, such as soil type and stream slope, was carried out to estimate the peak discharges. The 0.2-percent-annual-chance flood discharge was extrapolated from the regression analysis results. The impact of existing urbanization was considered

significant to the Fish Creek Watershed. Therefore, the calculated results were adjusted for the urbanization using a procedure described in several USGS urban hydrology reports (Reference 17-20).

Aurora Lake has three structures that control the water level of the lake, two of which are uncontrolled overflow weirs. The third control structure is a gate controlled structure. A combined rating curve for these structures has been established using the orifice, weir, inlet control and outlet control equations. For this study, it was assumed that the gate was closed and the level of the lake was controlled by the overflow weirs. This is the normal condition in the summer since the gate is only opened to lower the level of Aurora Lake during the fall and winter. Elevation of the lakes in the 1-percent-annual-chance flood event is listed in Table 6 (Reference 1).

One-percent annual chance peak discharges for approximate study reaches were estimated using the regression methods presented in the USGS Water-Resources Investigations Report 03-4164 “*Techniques for Estimating Flood Peak Discharges of Rural, Unregulated Streams in Ohio*” by G.F. Koltun, 2003. The regression equations use drainage area, slope of the main channel, percentage of basin classified as wetlands and water, along with regional regression constants. (Reference 9)

TABLE 6 SUMMARY OF 1-PERCENT-ANNUAL-CHANCE
PEAK ELEVATIONS OF STILLWATER

FLOOD SOURCE AND LOCATION	PEAK ELEVATION (FEET NAVD)
Aurora Lake	
Along shoreline	1,001.53
Channel Brook	
within the City of Aurora	1,001.53

Source: Reference 1

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristic of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals. Users should be aware that 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 report in conjunction with the data shown on the FIRM.

Flood profiles were prepared for all streams studied by detailed methods and show computed water-surface elevations to an accuracy of 0.5 foot for floods of selected recurrence intervals. In cases where the 1-percent-annual-chance and 0.2-percent annual chance flood elevations are close together, only the 1-percent-annual-chance profile has been shown due to limitations of the map scale. For this countywide FIS, flood profiles and approved LOMRs have been consolidated in continuous stream reaches and adjusted to reflect the new

vertical datum as described in Section 3.3. The water surface elevations of Tributary No. 1 are controlled by Small Brook. The water surface elevations for Channel Brook within the study limits are controlled by Aurora Lake. Therefore, water surface profiles were not prepared for these two reaches (Reference 1).

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

The portion of stream cross sections below water was obtained by field survey while the portion above water was obtained from topographic maps with varied scale and contour intervals. On Camp Creek, Eagle Creek, Small Brook, and Tributary 1 cross sections were generated using topographic maps with a scale of 1:24000 and a contour interval of 10 feet along with field survey data. Topographic maps used to generate the cross sections for Breakneck Creek, Breakneck Creek Overflow, Cuyahoga River (from downstream of Village of Mantua to Village of Mantua upstream corporate limit and within the City of Streetsboro), Fish Creek, Hudson Ditch, and Plum Creek have a scale of 1:2400 and a contour interval of 2 feet. Structural geometry and elevations for hydraulic structures (Bridges, Culverts, Dams, Control weirs, etc) were obtained from field survey. Cross sections for Cuyahoga River (within the City of Kent) were taken from a previous USACE floodplain study report. (Reference 1 to 8, and 11)

Channel roughness factors (Manning's "n") were obtained from on-site inspections. For Cuyahoga River, this factor was taken from the previous USACE floodplain study report (References 1-8, and 11). These values are tabulated in Table 7 for the detailed study reaches.

Water surface elevations of floods with the selected recurrence intervals for the detailed study streams excluding Breakneck Creek, Breakneck Creek Overflow, Cuyahoga River, Cuyahoga River Overflow, Hudson Ditch and Plum Creek were computed using the HEC-2 step-backwater computer program developed by the USACE (Reference 21).

For Cuyahoga River (within the Cities of Kent and Streetsboro), the 1-percent annual chance water surface profiles were taken from the floodplain study reports prepared by USACE. For the reach in the City of Streetsboro, the 1-percent annual chance flood profile was computed using HEC-2 (Reference 21). The 10-percent annual chance flood profile was computed using normal depth analysis at selected cross sections (Reference 8).

The 10-, 2, and 0.2- percent-annual-chance flood profiles for Cuyahoga River in the City of Kent were interpolated from a rating curve developed by USACE for the 1-percent annual chance standard project in several floodplain study reports (Reference 3 and 4).

The hydraulic analyses for Breakneck Creek, Breakneck Creek Overflow, Cuyahoga River (within Portage County Unincorporated Areas and the Village of Mantua), Cuyahoga River Overflow, Hudson Ditch, and Plum Creek were originally computed using HEC-RAS Version 3.0.1 with the HEC-2 computation

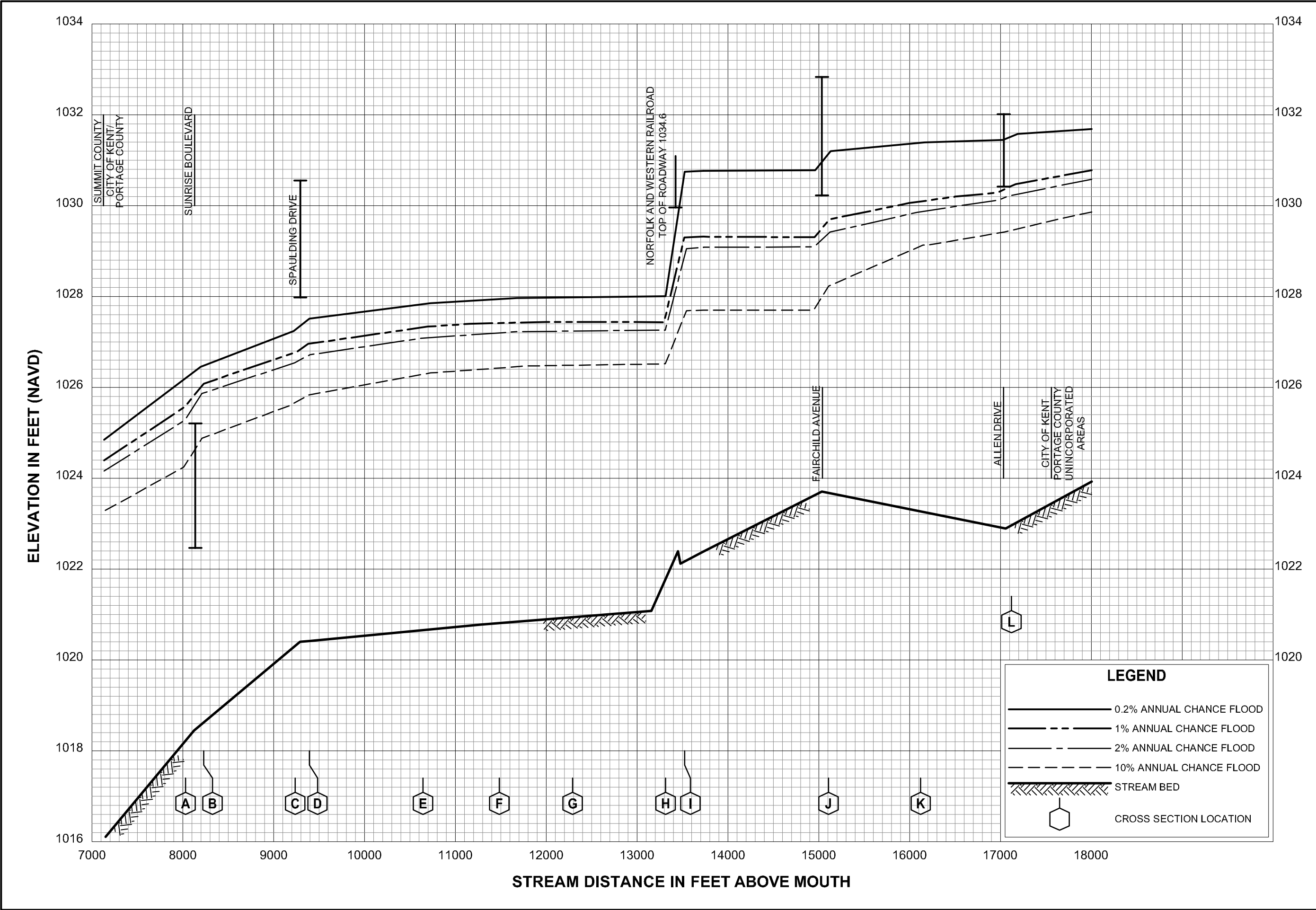
FLOODING SOURCE		FLOODWAY				1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION (FEET)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	WIDTH REDUCE FROM PRIOR STUDY ³ (FEET)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE (FEET)
Eagle Creek									
A	1,790 ¹	87	454	7.6		949.8	949.8	950.2	0.4
B	3,420 ¹	79	671	5.1		957.1	957.1	957.1	0.0
C	5,020 ¹	91	322	10.7		958.0	958.0	958.0	0.0
D	6,153 ¹	53	332	10.4		963.2	963.2	963.2	0.0
E	6,931 ¹	100	925	3.7		984.7	984.7	984.7	0.0
F	8,680 ¹	155	1008	3.4		985.4	985.4	985.4	0.0
Fish Creek									
A	8,020 ²	40	222	3.5		1,025.6	1,025.6	1,025.6	0.0
B	8,205 ²	40	242	3.2		1,026.1	1,026.1	1,026.6	0.5
C	9,235 ²	59	529	1.3	68	1,026.8	1,026.8	1,027.3	0.5
D	9,367 ²	68	569	1.2	68	1,026.9	1,026.9	1,027.4	0.5
E	10,629 ²	191	747	0.9		1,027.3	1,027.3	1,027.8	0.5
F	11,489 ²	306	1,179	0.5		1,027.4	1,027.4	1,027.9	0.5
G	12,297 ²	346	1,360	0.4		1,027.4	1,027.4	1,027.9	0.5
H	13,311 ²	284	1,083	0.6		1,027.4	1,027.4	1,027.9	0.5
I	13,543 ²	764	3,566	0.2		1,029.3	1,029.3	1,029.8	0.5
J	15,106 ²	49	195	2.9		1,029.7	1,029.7	1,030.2	0.5
K	16,146 ²	103	436	1.3		1,030.1	1,030.1	1,030.6	0.5
L	17,128 ²	69	307	1.7		1,030.4	1,030.4	1,030.9	0.5
M	20,735 ²	266	743	0.6		1,032.3	1,032.3	1,032.8	0.5

¹ FEET ABOVE MOUTH

² FEET ABOVE BROSIUS ROAD

³ SEE EXPLANATION IN SECTION 4.2 FLOODWAYS

TABLE 10	FEDERAL EMERGENCY MANAGEMENT AGENCY	FLOODWAY DATA
	PORTAGE COUNTY, OH	
	(AND INCORPORATED AREAS)	EAGLE CREEK - FISH CREEK



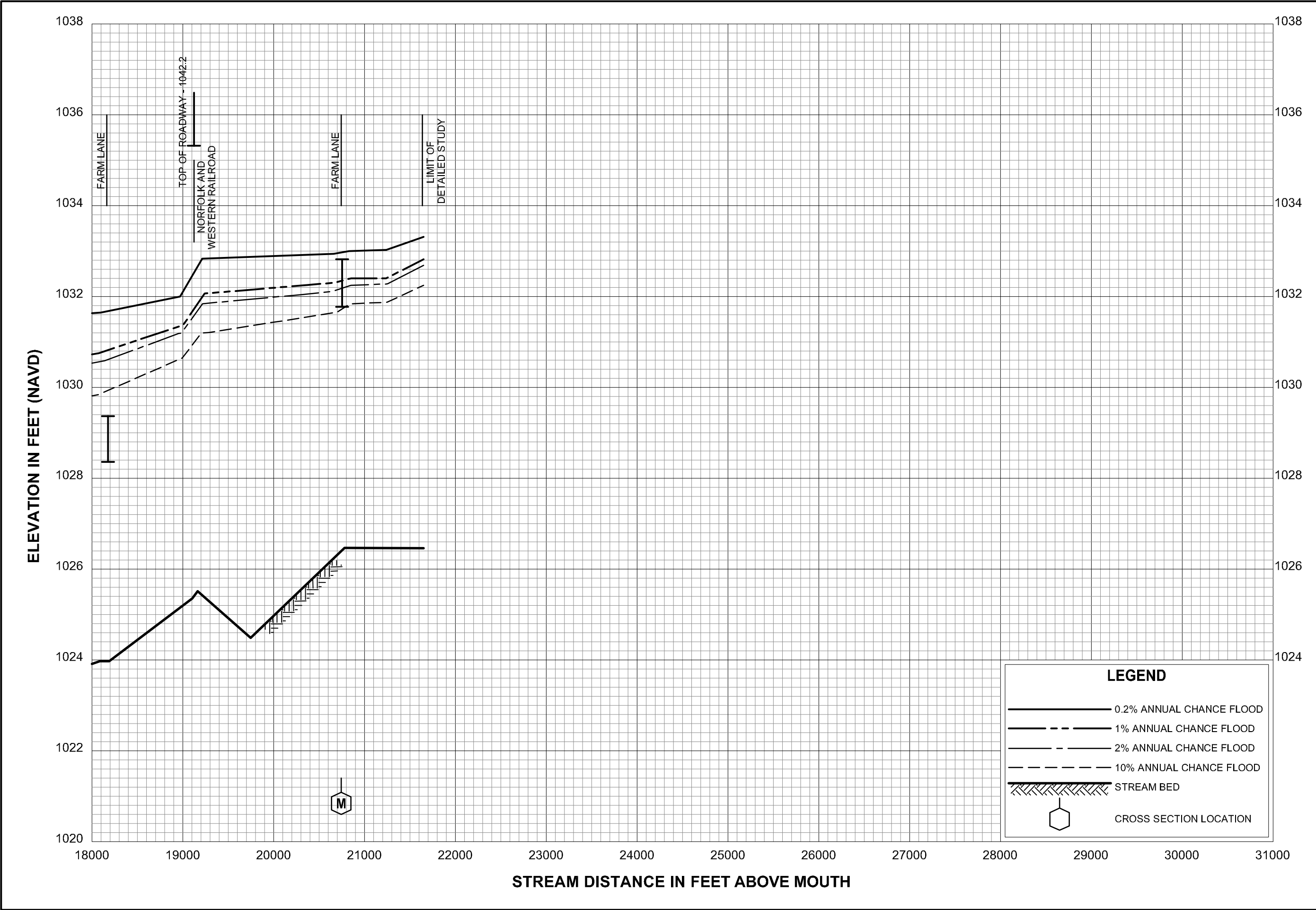
FLOOD PROFILES

FISH CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

PORTAGE COUNTY, OH

AND INCORPORATED AREAS



FLOOD PROFILES

FISH CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

PORTAGE COUNTY, OH

AND INCORPORATED AREAS