FLOOD INSURANCE STUDY

CRAWFORD COUNTY, OHIO
AND INCORPORATED AREAS

Community Name	Community Number
Bucyrus, City of	390090
Chatfield, Village of	390818
Crawford County (Unincorporated Areas)	390811
Crestline, City of	390091
Galion, City of	390092
*New Washington, Village of	390958
*North Robinson, Village of	390959
*Tiro, Village of	390960

*No Special Flood Hazard Areas Identified

EFFECTIVE
JANUARY 19, 2011

Federal Emergency Management Agency

FLOOD INSURANCE STUDY NUMBER
39033CV000A

Crawford County, Ohio
and Incorporated Areas

NOTICE TO
FLOOD INSURANCE STUDY USERS

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

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 (LOMR) process, which does not involve republication or redistribution of the FIS report. Therefore, users should consult community officials and check the Community Map Repository to obtain the most current FIS 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 and cross sections). In addition, former flood hazard zone designations have been changed as follows.

Old Zone(s)	New Zone
A1 through A30	AE
B	X
C	X

Initial Countywide FIS Effective Date: January 19, 2011

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

FLOOD INSURANCE STUDY
CRAWFORD COUNTY, OHIO AND INCORPORATED AREAS

1.0 INTRODUCTION

1.1 Purpose of Study

This countywide Flood Insurance Study (FIS) revises and updates information on the existence and severity of flood hazards in the geographic area of Crawford County, Ohio; including the Cities of Bucyrus, Crestline and Galion, Villages of Chatfield, New Washington, North Robinson and Tiro, in addition to the unincorporated areas of Crawford County (referred to collectively herein as Crawford County). Note that the only previously printed FIS reports in Crawford County are for the Cities of Bucyrus, Crestline and Galion.

Please note that there are no Special Flood Hazard Areas identified in the Villages of New Washington, North Robinson, and Tiro.

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

Please note that the City of Galion is geographically located in Crawford, Morrow and Richland counties. The City of Crestline is also geographically located in Crawford and Richland counties. This countywide FIS includes the entirety of the Cities of Crestline and Galion due to the majority of land area being located in Crawford County.

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

1.2 Authority and Acknowledgments

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

This FIS was prepared to include the unincorporated areas of, and incorporated communities within, Crawford County in a countywide format. Information on

the authority and acknowledgments for each jurisdiction included in this countywide FIS, as compiled from its previously printed FIS report, is shown below.

Bucyrus, City of:	For the July 3, 1986 FIS, the hydrologic and hydraulic analyses were performed by U.S. Army Corps of Engineers (USACE), Buffalo District, (the Study Contractor) for the Federal Emergency Management Agency (FEMA) under the Inter-Agency Agreement No. EMW-84-E-1506. This study was completed in July 1986 (Reference 1).
Crestline, City of:	For the July 2, 1992 FIS, the hydrologic and hydraulic analyses were performed by USACE, Buffalo District (the Study Contractor), FEMA under the Inter-Agency Agreement No. EMW-89-E-2994, Project Order No. 89-7. This study was completed in July 1992 (Reference 2).
Galion, City of:	For the December 19, 1984 FIS, the hydrologic and hydraulic analyses were performed by Dodson-Lidblom Associates, Inc. (the Study Contractor), FEMA under the Contract No. EMW-83-C-1166. This study was completed in December 1984 (Reference 3).

For this countywide FIS, redelineation of special flood hazard areas as well as approximate hydrologic and hydraulic analyses were performed by CDM Federal Programs Corporation (CDM), under Contract No. HSFE05-2005-D-0027/TO012. This study was completed on June 11, 2009.

The digital base mapping information was provided in digital format by Ohio Statewide Imagery Program (OSIP) and Crawford County. This information was derived from digital orthophotography dated 2006. These data meet or exceed National Mapping Accuracy Standards. Users of this FIS should be aware that minor adjustments may have been made to specific Flood Insurance Rate Map (FIRM) base map features.

The coordinate system used for the production of the FIRM is State Plane, Ohio North, North American Datum of 1983 (NAD 83), GRS 80 spheroid. Differences in the datum and spheroid used in the production of FIRMs for adjacent counties may result in slight positional differences in map features at the county boundaries. These differences do not affect the accuracy of information shown on the FIRM.

1.3 Coordination

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

The dates of the initial and final CCO meetings held for previous FIS for jurisdictions within Crawford County are shown in Table 1, "Initial and Final CCO Meetings".

TABLE 1 - INITIAL AND FINAL CCO MEETINGS

Community	Initial CCO Date	Final CCO Date
Bucyrus, City of	March 7, 1984	August 22, 1985
Crestline, City of	*	July 24, 1991
Galion, City of	April 1983	June 7, 1984

*Information not available

For this countywide FIS, the initial CCO meeting was held on June 4, 2008, and was attended by representatives of FEMA, the Ohio Department of Natural Resources (ODNR), the communities and CDM. The results of the study were reviewed at the final CCO meeting held on October 19, 2009, and attended by representatives of FEMA, ODNR, the communities and CDM. 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 Crawford County, Ohio 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, "Flooding Sources Studied by Detailed Methods," were previously studied by detailed methods. The limits of detailed study are indicated on the Flood Profiles (Exhibit 1) and on the FIRMs (Exhibit 2).

TABLE 2 – FLOODING SOURCES STUDIES BY DETAILED METHODS

Flooding Source	Limits of Detailed Study
East Branch Sandusky River	From approximately 350 feet downstream of East Thrush Ave. in the City of Crestline to North St. in the City of Crestline
Olentangy River	From Hosford Rd. to Cummings St. in the City of Galion
Sandusky River	From approximately ½ mile upstream of Kerstetter Rd. to approximately ½ mile downstream of U.S. Highway 30
West Branch Sandusky River	From approximately 700 feet downstream of Park Rd. to West Bucyrus St., and from approximately 1,050 feet downstream of Patterson St. to approximately 1,900 feet upstream of Patterson St.

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 ODNR.

For this study, entire reaches or following flooding sources were studied with new approximate analyses. These analyses superseded the approximate reaches in the original study or added new approximate study reaches for the following: Allen Run, Brandywine Creek and tributary, Broken Sword Creek, Buckeye Creek, East Branch Sandusky River, Grass Run, Honey Creek, Little Scioto River, Loss Creek and tributary, Marsh Run, Olentangy River and tributaries, Paramour Creek, Rocky Fork, Sandusky River, Shoemaker Ditch, Silver Creek, Sycamore Creek and tributary, West Branch Sandusky River and Zuber Ditch.

2.2 Community Description

Crawford County, with an area of approximately 403 square miles (sq. mi.), is located in the north-central part of Ohio. The county is bordered by Seneca and Huron Counties on the north, Richland County on the east, Morrow and Marion Counties on the south and Wyandot County on the west. The county is served by U.S. Highway 30. The population of Crawford County was 46,966 in 2000, 47,870 in 1990 and 50,075 in 1980 (Reference 4). The county seat is the City of Bucyrus. The Cities of Crestline and Galion are located in the southeastern area of Crawford County.

The single biggest business in Crawford County is agriculture. The topography varies from nearly level plains to gently rolling hills. The total relief within Bucyrus, for example, is approximately 80 feet. Glacial drift covers most of the county (Reference 5).

The climate of Crawford County is humid continental, consists of cold winters and warm summers. The average high in summer is 81 degrees Fahrenheit (°F) and in winter, 34°F. The average low temperature in summer is 61°F and in winter, 20°F. The lowest temperature on record (-19°F) occurred at Bucyrus in January 1963. The average daily maximum temperature in Bucyrus is 60°F and the average daily minimum is 38.7°F. The precipitation is almost uniformly distributed throughout the year. Annual average precipitation is 34.95 inches (Reference 5).

2.3 Principal Flood Problems

Although flooding can occur at any time during the year, floods are most frequent during the late winter and spring months when heavy rains combine with melting snow.

Flooding occurred throughout much of Ohio in March 1913 as a result of one of the most intense rainstorms ever recorded in northwestern Ohio. Serious floods occurred in the City of Galion in March 1913, January 1959, and June 1981. Based on flood data collected by the USGS at various gaging stations at other locations on the Olentangy and Scioto Rivers, it is estimated that the 1913 flood would have had approximately a 0.2-percent-annual-chance, the 1959 flood a return period of approximately 1- to 0.2-percent-annual-chance, and the 1981 flood a return period of about 2-percent-annual-chance.

The March 1913 flood was the greatest flood of record for the watershed as a whole. However, it was exceeded at City of Bucyrus by the January 1959 flood (Reference 6). The actual flood damage and flooded are estimates are not available for the 1913 flood. Investigations indicated that the damages were not extensive because the floodplain was relatively undeveloped at the time. The peak discharge and average recurrence interval for the 1913 flood are estimated to be 9,800 cubic feet per second (cfs) and 200-year return period, respectively. The January 1959 flood is estimated to have the greatest stage and discharge of record. The peak discharge and average recurrence interval are estimated at 13,500 cfs and approximately 1,000-year return period, respectively. The total area flooded of the City of Bucyrus in 1959 was 170 acres (Reference 1).

In 2004 Crawford County was affected by flood in the Cities of Bucyrus and Crestline. Countywide floods also occurred in 2005 and 2006, and in 2007 rains exceeded 3.3 inches of rain per hour (Reference 7).

2.4 Flood Protection Measures

Nonstructural measures of flood protection are used to aid in the prevention of future flood damage. These include land use regulations adopted from the Code of Federal Regulations to control development within areas that have a high risk

of flooding. No structural flood protection measures are known to exist within the study area.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude that is expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for floodplain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10-, 2-, 1-, and 0.2-percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long-term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood that equals or exceeds the 100-year flood (l-percent chance of annual exceedance) in any 50-year period is approximately 40 percent (4 in 10), 100, 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 the flooding sources studied in detail affecting the county.

The Cities of Bucyrus, Crestline and Galion are the only communities in Crawford County which have previously printed FIS reports. The hydrologic analyses described in that report have been compiled and summarized below.

Pre-Countywide Analysis:

For the original FIS for the City of Bucyrus USGS gage was developed by a log-Pearson Type III analysis following Bulletin No. 17B procedures (Reference 8).

For the City of Crestline the graphical peak discharge method outlined in U.S. Soil Conservation Service Technical Release No. 55 was used to calculate the 1-percent-annual-chance peak discharges. This method was selected because it was designed for use on small watersheds. Basin characteristics used in the analyses were determined from U.S. Geological Survey topographic maps of the study area (Reference 2). Water-Surface-Elevations (WSEs) of the 1-percent-annual-chance recurrence interval flood were computed using the USACE HEC-2 step-backwater computer program (Reference 9). Starting WSEs for the three reaches were determined using normal depth analysis.

Flood discharges for the detailed and approximate study reaches were determined using the equations presented in ODNR Bulletin No. 45 for the original FIS for City of Galion (Reference 3). These equations are regionalized regression equations, and for the Galion area, relate the drainage area, channel slope, average basin elevation, and the average annual precipitation to the peak discharge.

The hydraulic analyses for these studies were based on the effects of 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.

This Countywide analysis:

For this study, new approximate hydrologic analyses were performed. Discharges approximated showing reaches in Crawford County were determined using the regression equations available in StreamStats for Ohio. The GIS applies StreamStats to facilitate the estimations of streamflow statistics at ungaged streams (Reference 10). Flood-frequency estimates determined by means of log-Pearson Type III analyses are reported along with weighted floodfrequency estimates, computed as a function of the log-Pearson Type III estimates and the regression estimates (Reference 11). A discharge-drainage area relationship was developed for each river to determine discharge at various locations in the study reaches.

Peak discharge-drainage area relationships for streams studied by detailed methods are shown in Table 3, Summary of Discharges.

TABLE 3 – 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
SANDUSKY RIVER at City of Bucyrus	88.8	4,830	7,320	8,540	11,800
EAST BRANCH SANDUSKY RIVER at North Street, City of Crestline	3.00	*	*	1,600	*
WEST BRANCH SANDUSKY RIVER about 720 feet downstream of Park Road, City of Crestline	5.31	*	*	2,400	*

TABLE 3 – 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
at Conrail, City of Crestline	4.95	*	*	2,400	*
OLENTANGY RIVER					
at Hosford Road, City of Galion	13.9	1,216	1,905	2,223	2,950
at Cummings Avenue, City of Galion	9.4	1,031	1,643	1,928	2,608

*Data not available

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals. Users should be aware that 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.

The Cities of Bucyrus, Crestline and Galion are the only communities in Crawford County which have a previously printed FIS report. The hydraulic analyses described in that report have been compiled and summarized below.

Pre-Countywide Analysis:

The original FIS for the City of Bucyrus the analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals.

Cross-section data for the Sandusky River were obtained by field survey. Bridges were surveyed to obtain elevation data and structural geometry or to supplement bridge construction plans provided by the Cities of Bucyrus, Crestline and Crawford County. The cross sections for the backwater analyses of the Olentangy River were obtained from field surveys as well as from topographic mapping. Representative channel sections were field surveyed, and the overbank portions of

the cross sections were obtained from topographic mapping based on 1961 aerial photographs (Reference 3).

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles and on the FIRM.

Water-surface profiles were developed through use of the USACE HEC-2 stepbackwater computer program (Reference 12). Starting elevations for the water-surface profiles were calculated using a discharge rating curve at the discontinued stream gage just downstream of the City of Bucyrus and Crestline corporate limits. Field observations indicated that the stream banks along the Sandusky River are heavily wooded in places and the stream carries debris. Some debris accumulations were noted on the piers of several bridges in the reach of the stream studied.

This Countywide Analysis:

For the flooding sources which are studied approximate analyses and listed in Section 2.1, "Scope of Study", HEC-GeoRAS was used to convert centerline and cross section data created in ArcGIS (Reference 13) for use in HEC-RAS 4.0 (Reference 14). HEC-GeoRAS utilized a 2.5 feet resolution Digital Elevation Model (DEM) generated under the Ohio Statewide Imagery Program (OSIP) to develop the model cross sections. The same DEM was used for floodplain mapping. Road crossing locations were selected by looking at the aerial photos and modeled as inline structures. Normal depth was used as the downstream boundary condition for reaches in this study.

Roughness coefficients (Manning's "n") listed below at Table 4 and contraction and expansion loss coefficients used in the hydraulic computations were chosen by engineering judgment and based on field observation of the streams and floodplain areas.

TABLE 4 – MANNING'S "N" VALUES

STREAM	CHANNEL	OVERBANKS
Sandusky River	0.035 - 0.045	0.05 - 0.15
Olentangy River	0.040 - 0.065	0.040 - 0.100

Flood profiles were drawn showing the computed Water-Surface Elevations (WSEs) for floods of the selected recurrence intervals. In cases where the 2- and 1-percent-annual-chance flood elevations are close together, due to limitations of the profile scale, only the 1-percent-annual-chance profile has been drawn. For the Olentangy River the WSEs were calculated using the slope-area method.

For flooding sources which are studies by detailed analyses, locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles

(Exhibit 1). For stream segments for which a floodway was computed (Section 4.2), selected cross section locations are also shown on the FIRM (Exhibit 2).

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

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 National Geodetic Vertical Datum of 1929 (NGVD). With the completion of the North American Vertical Datum of 1988 (NAVD), many FIS reports and FIRMs are now prepared using NAVD as the referenced vertical datum.

Flood elevations shown in this FIS report and on the FIRM are referenced to the NAVD. These flood elevations must be compared to structure and ground elevations referenced to the same vertical datum. Some of the data used in this revision were taken from the prior effective FIS reports and FIRMs and adjusted to NAVD88. The datum conversion factor from NGVD29 to NAVD88 in Crawford County is -0.4 feet (NGVD - 0.4 = NAVD).

For additional information regarding conversion between the NGVD and NAVD, visit the National Geodetic Survey website at www.ngs.noaa.gov, or contact the National Geodetic Survey at the following address:

Vertical Network Branch, N/CG13
National Geodetic Survey, NOAA
Silver Spring Metro Center 3
1315 East-West Highway
Silver Spring, Maryland 20910
(301) 713-3191

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.

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

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1-percent-annual-chance flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2-percent-annual-chance flood is employed to indicate additional areas of flood risk in the community. For each stream studied by detailed methods, the 1- and 0.2-percent-annual-chance floodplain boundaries have been delineated using the flood elevations determined at each cross section.

Between cross sections, the boundaries for East and West Branch Sandusky River were interpolated using topographic maps at a scale of 1:1200 and a contour interval of 2 feet (Reference 15). For the Sandusky River, boundaries were interpolated using topographic maps at a scale of 1:2400 with a contour interval of 2 feet (Reference 16). For the Olentangy River, boundaries were redelineated using topographic information with a contour interval of 2 feet derived from the mass points break lines provided by the City of Galion. Approximate floodplain boundaries were delineated using topographic information with a contour interval of 4 feet developed by the Ohio Statewide Imagery Program (OSIP).

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

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

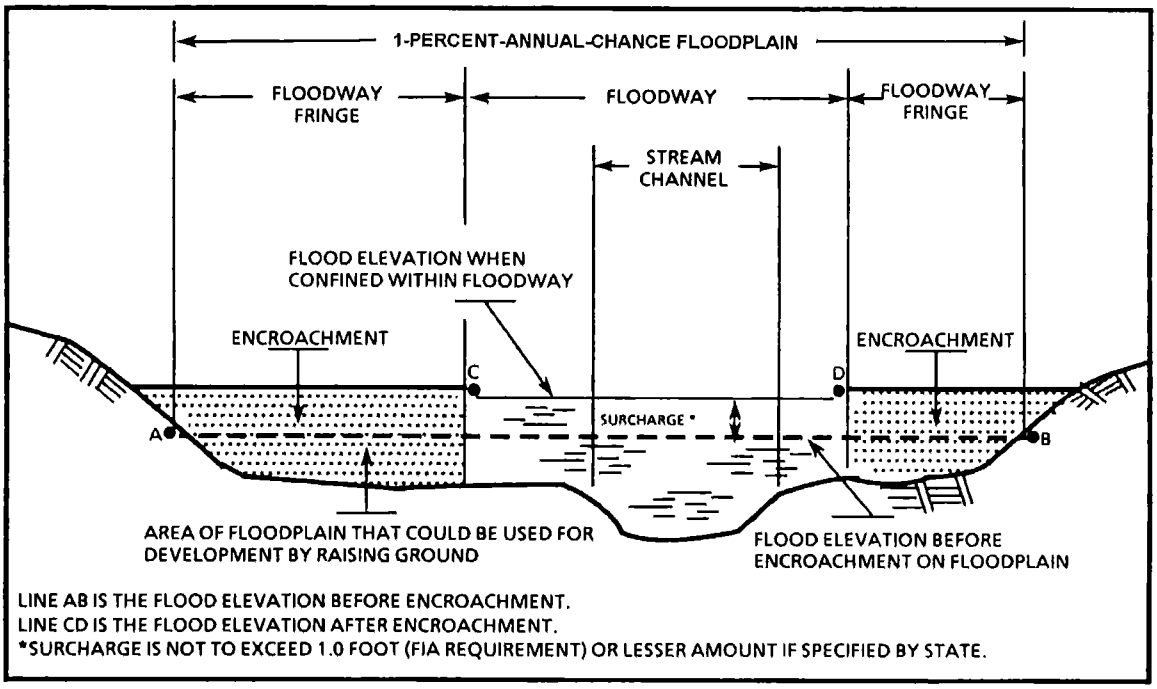
4.2 Floodways

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 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 5, Floodway Data). In cases where the floodway and 1-percent-annual-chance floodplain boundaries are either closer together or collinear, 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 base 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.

FIGURE 1 – FLOODWAY SCHEMATIC



FLOODING SOURCE		FLOODWAY			1%-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	7,300	37	257	6.2	1,132.0	1,132.0	1,132.6	0.6
B	7,740	37	291	5.5	1,133.6	1,133.6	1,134.6	1.0
C	8,100	37	256	6.2	1,133.9	1,133.9	1,134.7	0.8
D	8,600	40	272	5.9	1,135.2	1,135.2	1,136.1	0.9
E	9,070	44	283	5.6	1,136.8	1,136.8	1,137.2	0.4
F	9,600	40	255	6.3	1,138.3	1,138.3	1,138.6	0.3
G	9,900	42	261	6.1	1,140.5	1,140.5	1,140.7	0.2

[1] FEET ABOVE CONFLUENCE WITH PARAMOUR CREEK

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

CRAWFORD COUNTY, OH
AND INCORPORATED AREAS

FLOODWAY DATA

EAST BRANCH SANDUSKY RIVER

FLOODING SOURCE		FLOODWAY			1%-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	80	61	273	8.1	1,111.0	1,111.0	1,111.2	0.2
B	890	49	314	7.1	1,117.8	1,117.8	1,118.0	0.2
C	2,165	58	402	5.5	1,123.3	1,123.3	1,123.6	0.3
D	3,695	93	598	3.7	1,125.9	1,125.9	1,126.8	0.9
E	5,350	63	550	4.0	1,128.6	1,128.6	1,129.1	0.5
F	5,990	79	669	3.3	1,129.9	1,129.9	1,130.3	0.4
G	7,530	82	549	3.7	1,131.8	1,131.8	1,132.4	0.6
H	8,385	74	602	3.4	1,132.7	1,132.7	1,133.2	0.5
I	9,520	73	522	3.9	1,134.8	1,134.8	1,135.1	0.3
J	10,075	39	306	6.7	1,136.3	1,136.3	1,136.4	0.1
K	10,720	61	476	4.3	1,138.6	1,138.6	1,138.7	0.1
L	11,800	58	383	5.3	1,139.7	1,139.7	1,140.5	0.8
M	12,790	54	346	5.9	1,145.4	1,145.4	1,145.4	0.0
N	13,515	68	511	4.0	1,147.9	1,147.9	1,147.9	0.0
O	14,450	80	633	3.0	1,149.1	1,149.1	1,149.3	0.2
P	15,905	100	882	2.2	1,150.2	1,150.2	1,150.8	0.6
Q	16,625	52	494	3.9	1,150.7	1,150.7	1,151.3	0.6
R	17,610	128	763	2.5	1,151.5	1,151.5	1,152.4	0.9

[1] FEET ABOVE HOSFORD ROAD

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

CRAWFORD COUNTY, OH
AND INCORPORATED AREAS

FLOODWAY DATA

OLENTANGY RIVER

FLOODING SOURCE		FLOODWAY			1%-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	3,810	295	2,949	2.9	970.8	970.8	971.2	0.4
B	5,330	390	3,397	2.5	971.8	971.8	972.5	0.7
C	6,800	463	3,683	2.3	972.2	972.2	973.1	0.9
D	8,470	400	3,000	2.8	973.0	973.0	974.0	1.0
E	10,690	173	1,746	4.9	978.1	978.1	978.3	0.2
F	12,240	260	2,197	3.9	980.3	980.3	980.4	0.1
G	12,975	435	4,382	1.9	981.0	981.0	981.4	0.4
H	13,810	580	4,036	2.1	981.2	981.2	981.8	0.6
I	17,020	366	3,632	2.4	983.1	983.1	983.9	0.8
J	19,360	563	4,261	2.0	983.7	983.7	984.5	0.8

[1] FEET ABOVE KERSTETTER ROAD

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

CRAWFORD COUNTY, OH
AND INCORPORATED AREAS

FLOODWAY DATA

SANDUSKY RIVER

FLOODING SOURCE		FLOODWAY			1%-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	7,060	75	464	5.2	1,128.8	1,128.8	1,129.7	0.9
B	7,420	82	379	6.3	1,129.5	1,129.5	1,130.5	1.0
C	7,900	151	709	3.4	1,132.4	1,132.4	1,133.1	0.7
D	8,165	166	740	3.2	1,132.7	1,132.7	1,133.5	0.8
E	8,540	51	345	7.0	1,132.9	1,132.9	1,133.6	0.7
F	12,430	64	562	4.3	1,151.5	1,151.5	1,151.6	0.1
G	13,240	96	606	4.0	1,151.9	1,151.9	1,152.9	1.0
H	13,600	115	901	2.7	1,152.4	1,152.4	1,153.2	0.8
I	14,100	130	817	2.9	1,152.5	1,152.5	1,153.5	1.0
J	14,600	145	735	3.3	1,153.0	1,153.0	1,154.0	1.0

[1] FEET ABOVE CONFLUENCE WITH PARAMOUR CREEK

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

CRAWFORD COUNTY, OH
AND INCORPORATED AREAS

FLOODWAY DATA

WEST BRANCH SANDUSKY RIVER

5.0 INSURANCE APPLICATION

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

Zone AE

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

Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 0.2-percent-annual-chance floodplain, areas within the 0.2-percent-annual-chance floodplain, 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 (sq. mi.), and areas protected from the base flood by levees. No BFEs or depths are shown within this zone.

6.0 FLOOD INSURANCE RATE MAP

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

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 1-percent-annual-chance floodplains that were studied by detailed methods, shows selected whole-foot BFEs or average depths. Insurance agents use 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 Crawford County. 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 (FBFMs), where applicable. Historical data relating to the maps prepared for each community are presented in Table 6, "Community Map History."

COMMUNITY NAME	INITIAL IDENTIFICATION	FLOOD HAZARD BOUNDARY MAP REVISION DATE(S)	FLOOD INSURANCE RATE MAP EFFECTIVE DATE	FLOOD INSURANCE RATE MAP REVISION DATE(S)
Bucyrus, City of	November 16, 1973	May 21, 1976 July 13, 1979	July 3, 1986	None
Chatfield, Village of	October 27, 1978	None	January 19, 2011	None
Crawford County (Unincorporated Areas)	January 20, 1978	August 25, 1978	April 1, 1992	None
Crestline, City of (Dual County Community) (Richland County)	July 11, 1975	February 16, 1979	October 5, 1984	July 2, 1992
Galion, City of (Multi-County Community) (Morrow and Richland Counties)	March 15, 1974	August 27, 1976 July 20, 1979	June 19, 1985	None
*New Washington, Village of	N/A	None	N/A	None
*North Robinson, Village of	N/A	None	N/A	None
*Tiro, Village of	N/A	None	N/A	None

*No Special Flood Hazard Areas Identified

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

CRAWFORD COUNTY, OH AND INCORPORATED AREAS

COMMUNITY MAP HISTORY

7.0 OTHER STUDIES

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 the preparation of this study can be obtained by contacting Federal Insurance and Mitigation Division, FEMA Region V, 536 South Clark Street, Sixth Floor, Chicago, IL 60605.

9.0 BIBLIOGRAPHY AND REFERENCES

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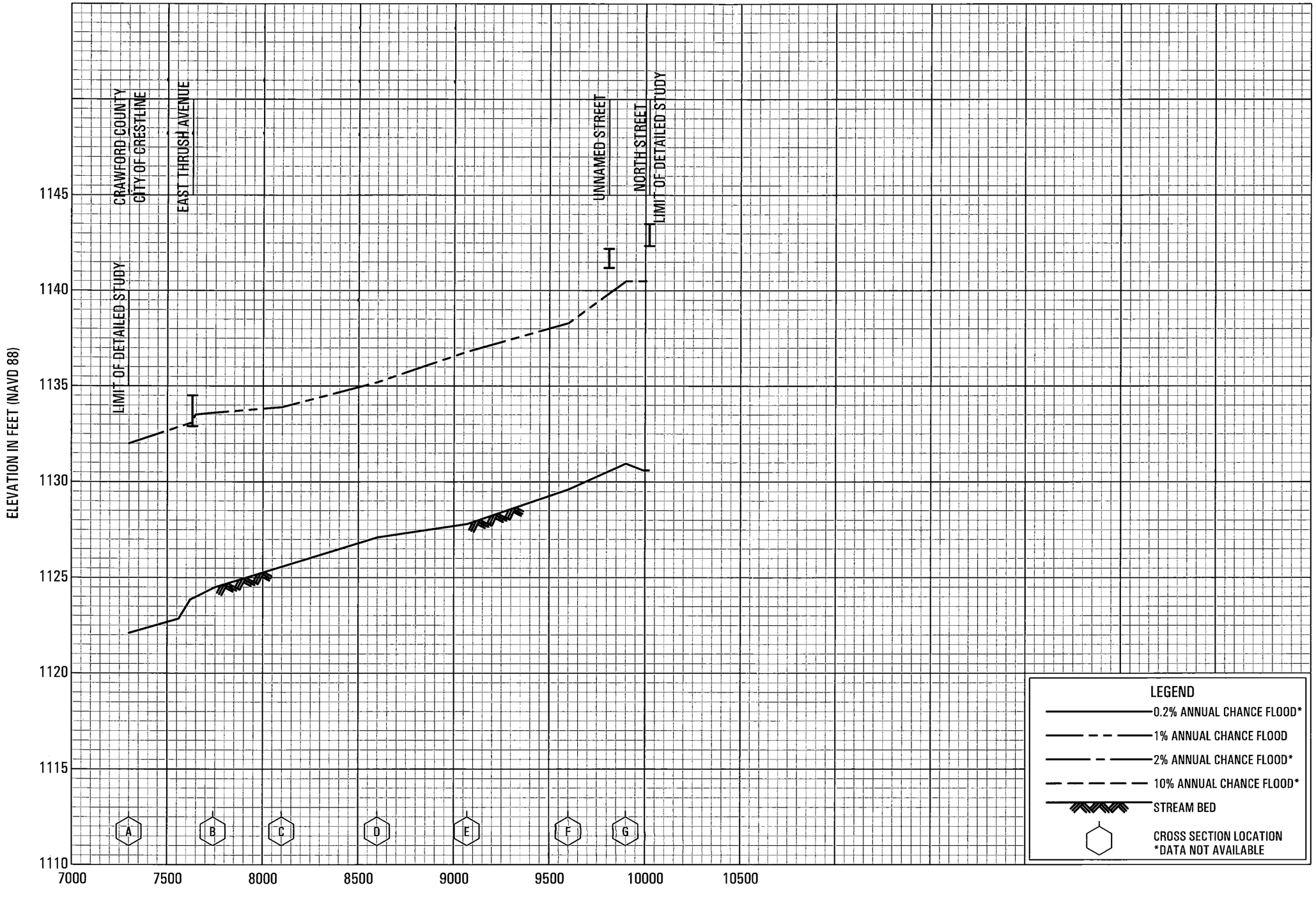


FLOOD PROFILES

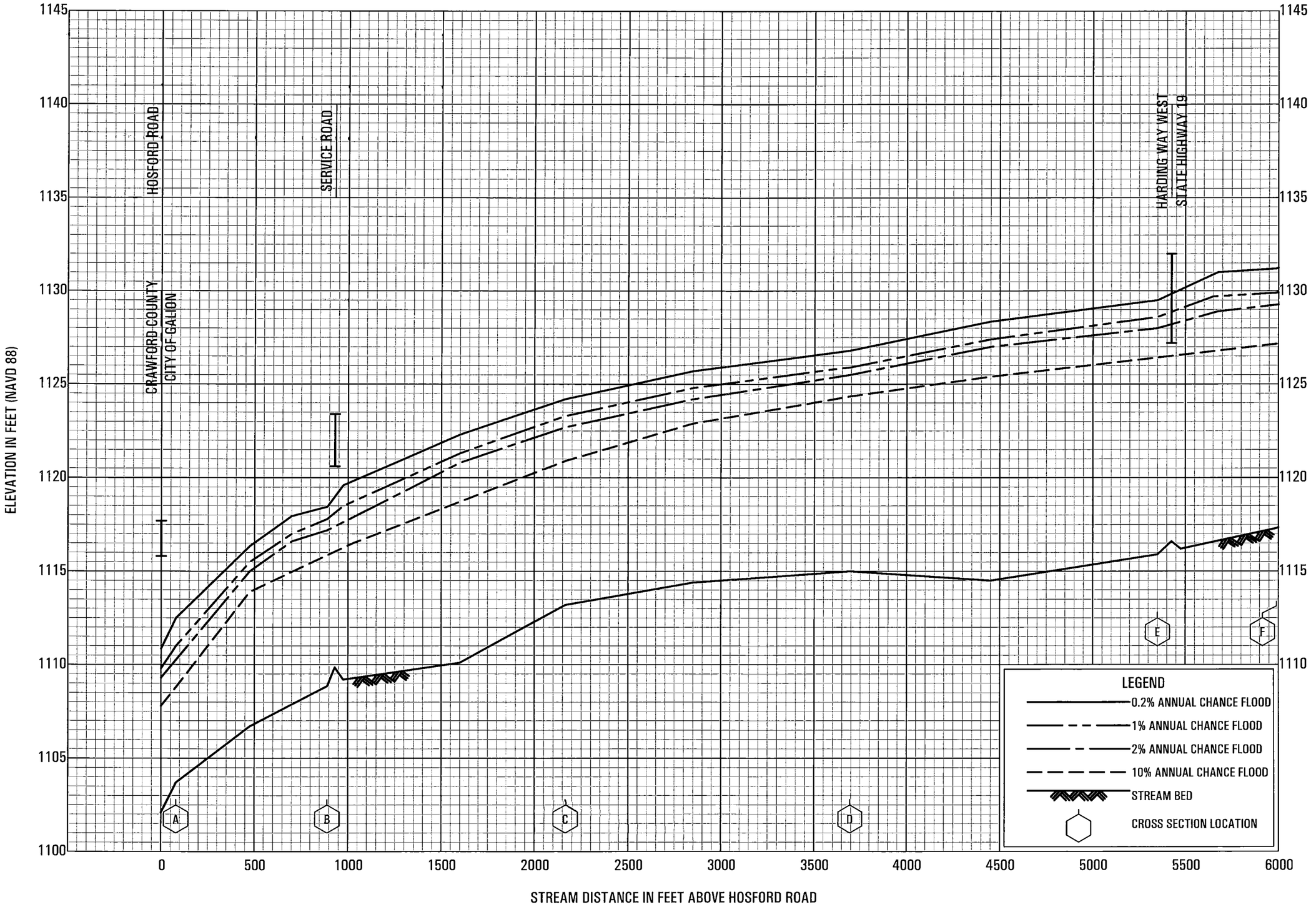
EAST BRANCH SANDUSKY RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CRAWFORD COUNTY, OH

AND INCORPORATED AREAS

01P



FLOOD PROFILES

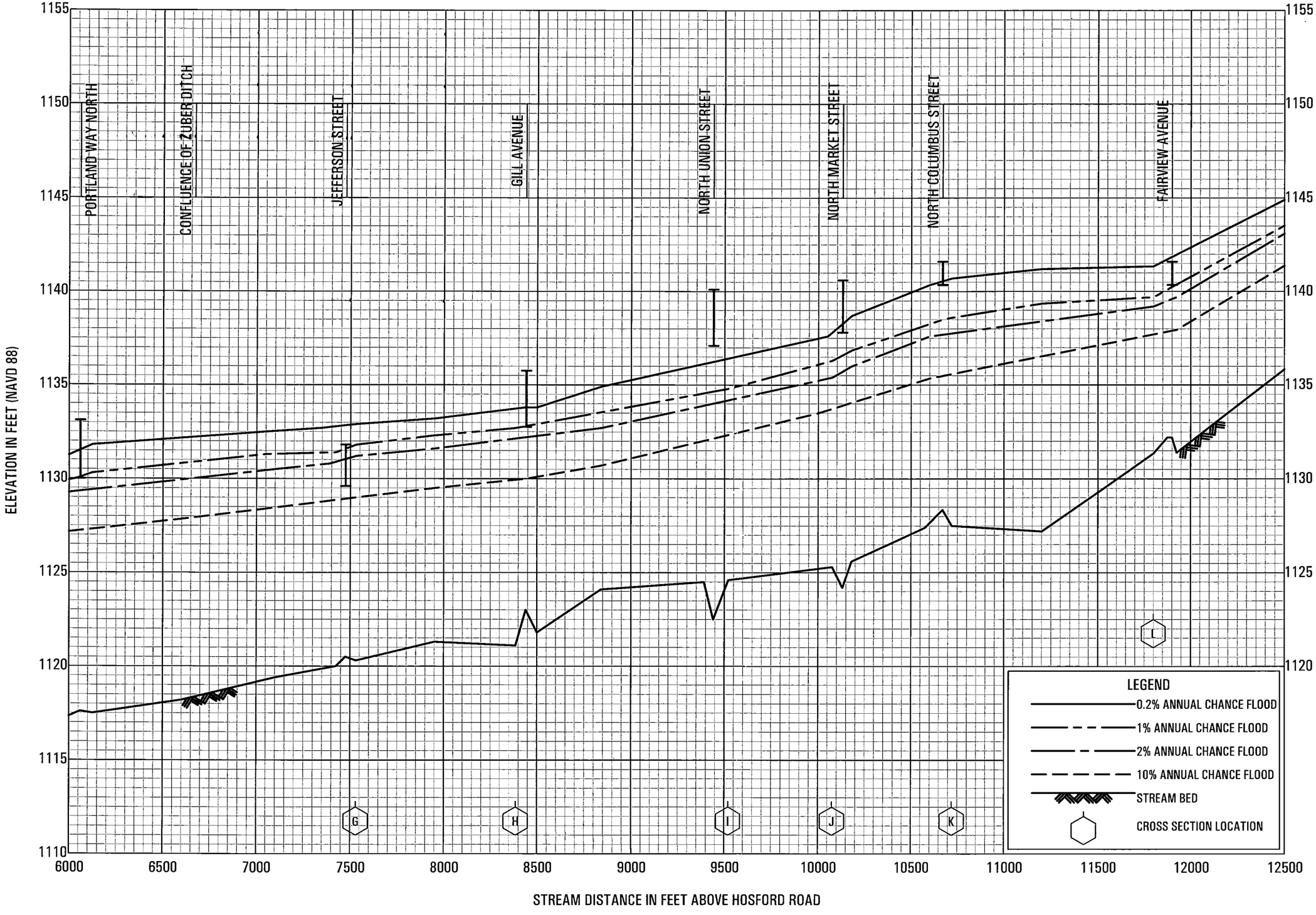
OLENTANGY RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CRAWFORD COUNTY, OH

AND INCORPORATED AREAS

02P



FLOOD PROFILES

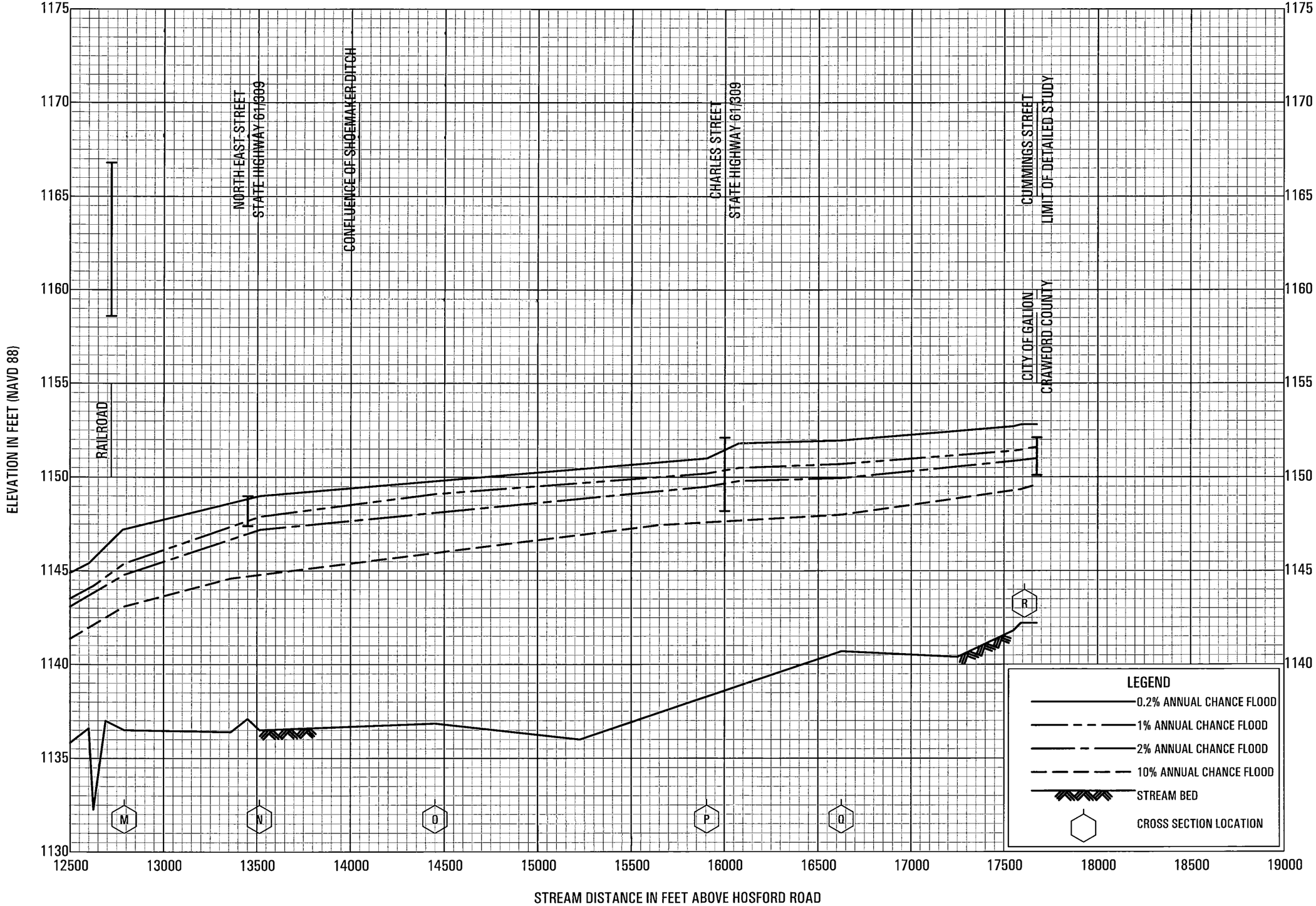
OLENTANGY RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CRAWFORD COUNTY, OH

AND INCORPORATED AREAS

03P



FLOOD PROFILES

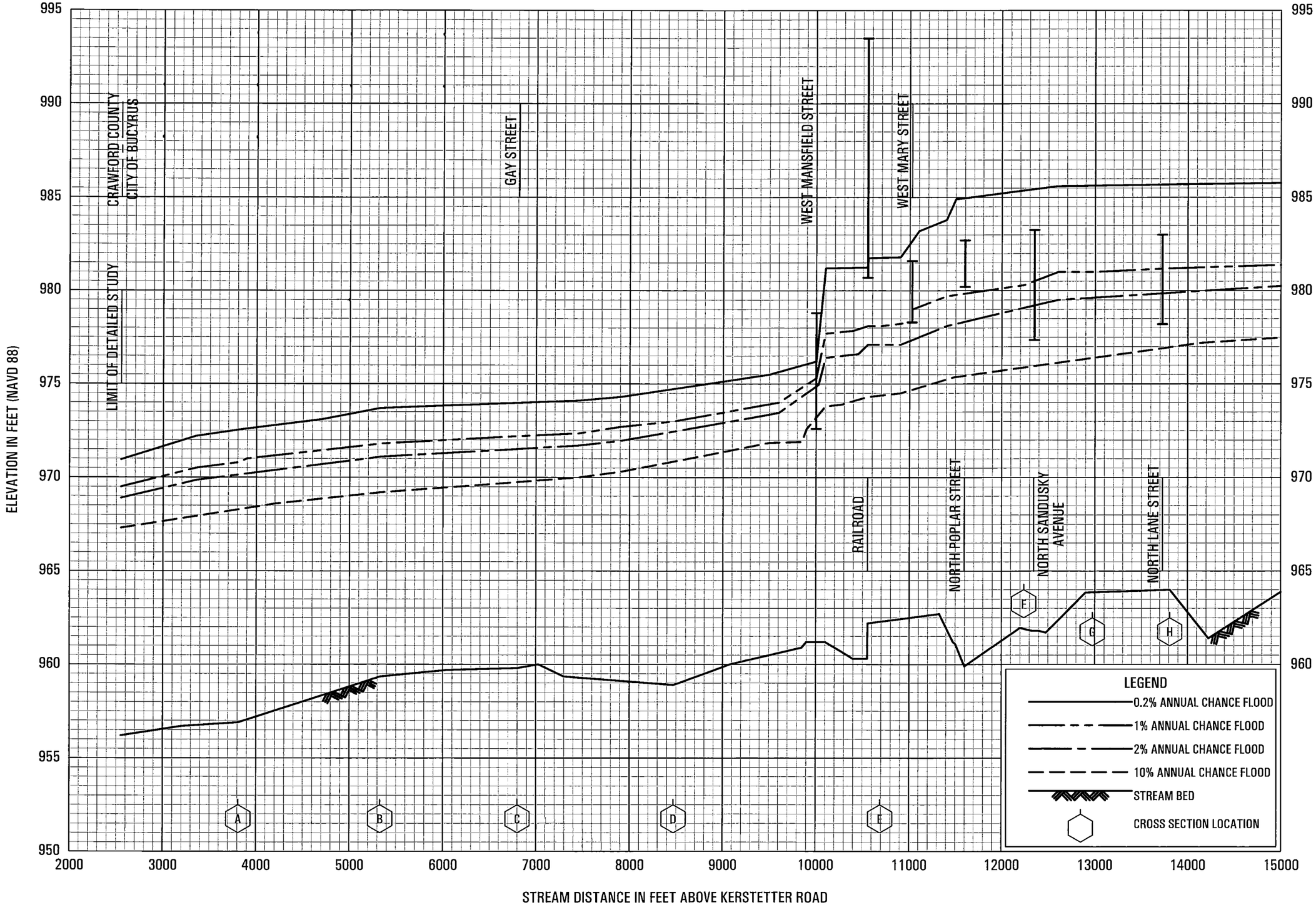
OLENTANGY RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CRAWFORD COUNTY, OH

AND INCORPORATED AREAS

04P



FLOOD PROFILES

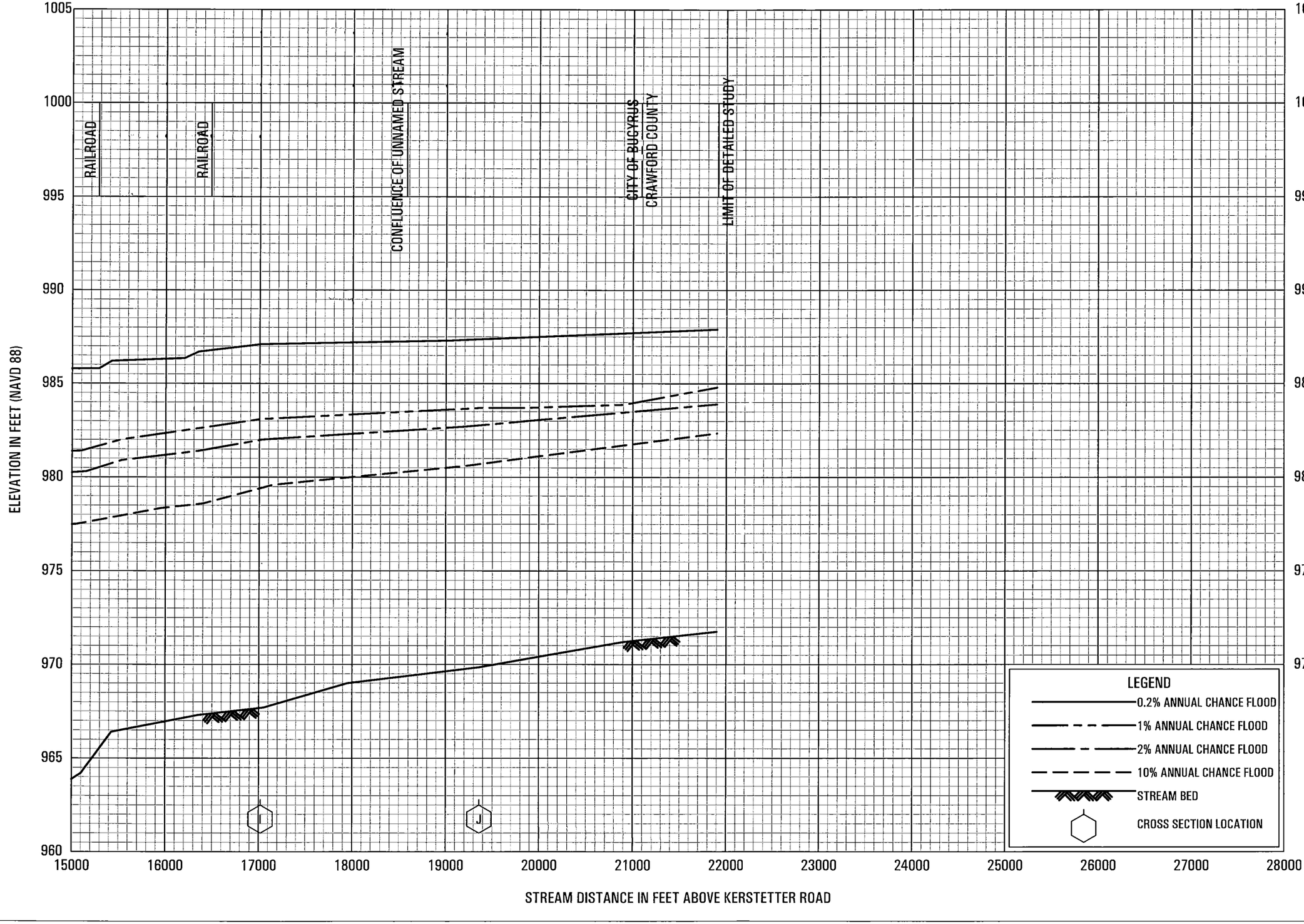
SANDUSKY RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CRAWFORD COUNTY, OH

AND INCORPORATED AREAS

05P



FLOOD PROFILES

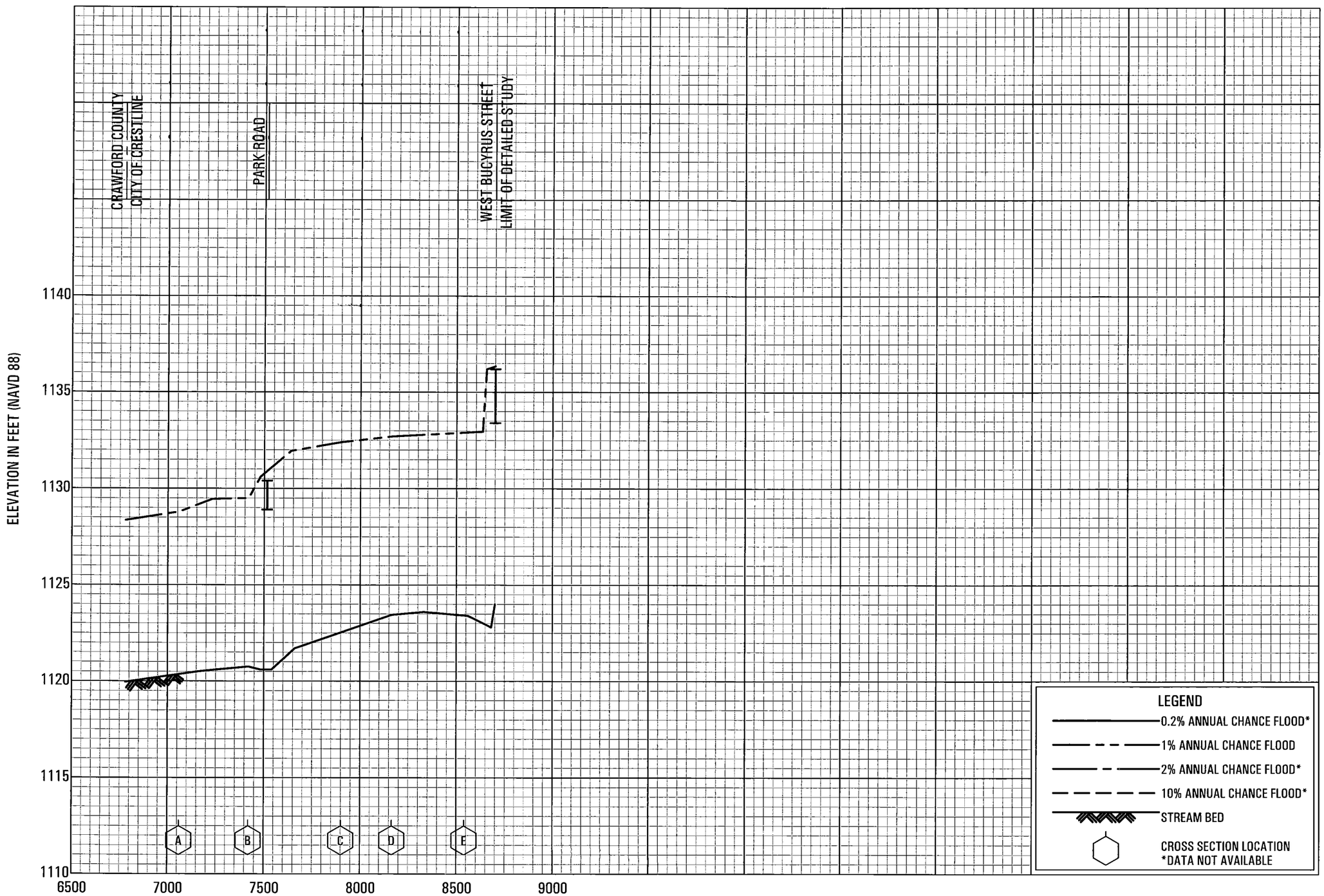
SANDUSKY RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CRAWFORD COUNTY, OH

AND INCORPORATED AREAS

06P

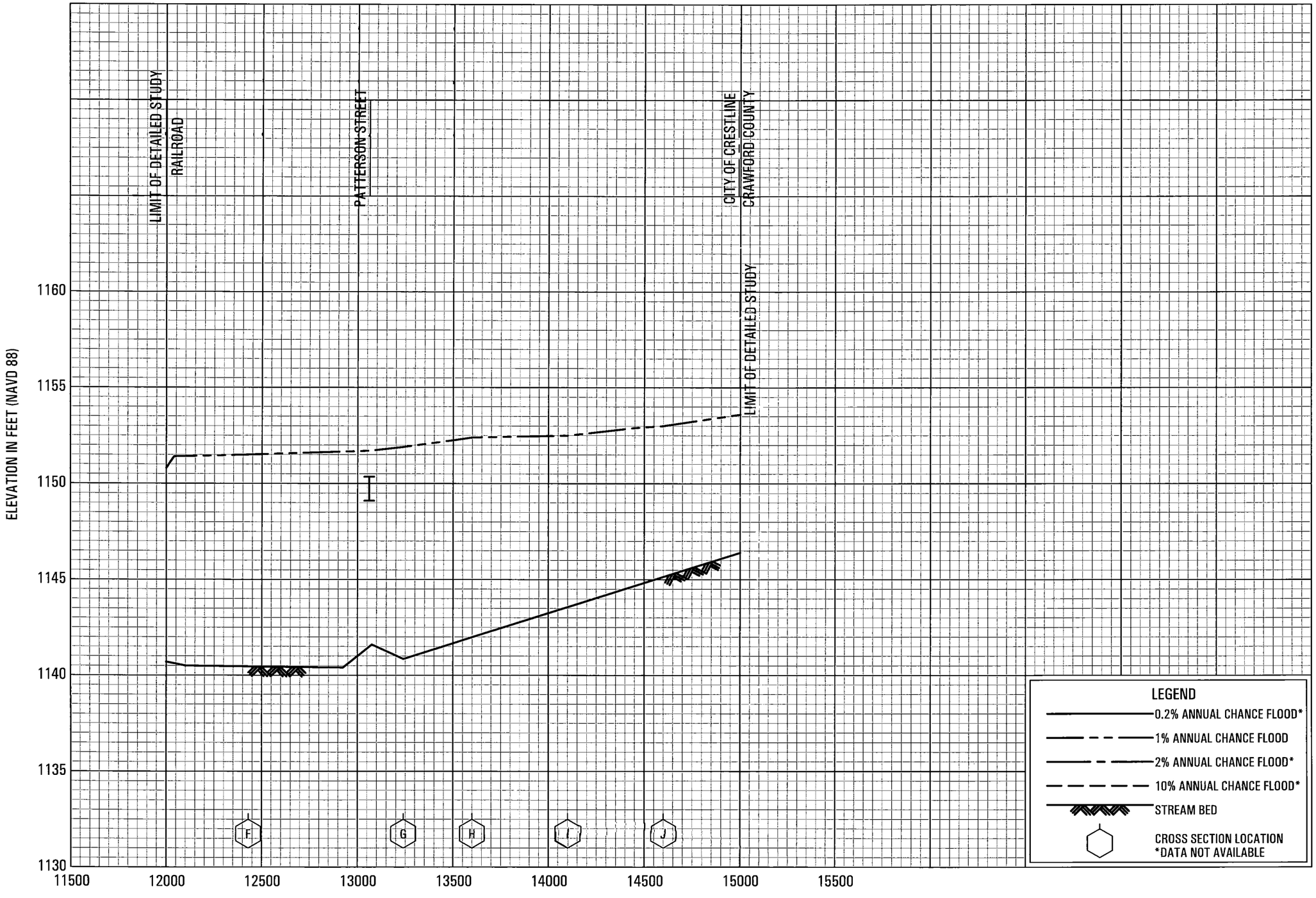


FLOOD PROFILES

WEST BRANCH SANDUSKY RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY
CRAWFORD COUNTY, OH
AND INCORPORATED AREAS

07P



FLOOD PROFILES

WEST BRANCH SANDUSKY RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY
CRAWFORD COUNTY, OH
AND INCORPORATED AREAS

08P