GEI Consultants

Consulting
Engineers and
Scientists

Regulatory Compliance Report

Weston Units 3 & 4 CCR Surface Impoundments Location Restrictions

Weston Generating Station
Rothschild, Wisconsin

Submitted to:
Wisconsin Public Service Corporation
700 North Adams Street
Green Bay, Wisconsin 54301

Submitted by:
GEI Consultants, Inc.
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Green Bay, Wisconsin 54313
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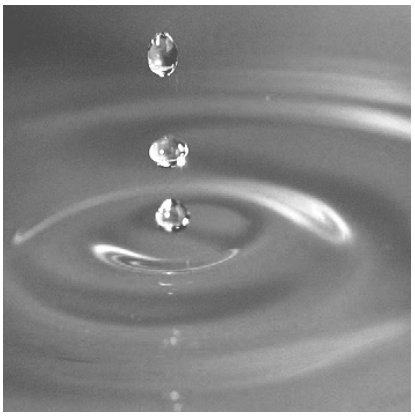
September 2016
Project 1609370



John M. Trast, P.E.
Senior Consultant

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Project Professional

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1. Introduction

The Wisconsin Public Service Corporation (WPSC) owns and operates the Weston Generating Station located at 2501 Morrison Avenue in Rothschild, Wisconsin. The facility is a base load, electrical power station having two coal-fired boilers, a natural gas fired generating unit, and two peaking units used for the production of electricity. The two coal fired units, Units 3 & 4, have nameplate rated capacities of 325 and 595 MW and were commissioned in 1981 and 2008, respectively. WPSC burns sub-bituminous coal from the Powder River Basin as the primary fuel source in the boilers. As a result, coal combustion residuals (CCR), such as fly ash, bottom ash, and flue gas desulfurization (FGD) gypsum, are generated.

Fly ash is removed from the flue gas of Unit 3 using a baghouse, collected in hoppers, and transferred to dry storage silos. The fly ash is beneficially used as a cement replacement in concrete or moisture conditioned using a rotary mixer, transported to a temporary ash storage pad, and temporarily stockpiled for beneficial reuse projects as structural fill.

CCR material from Unit 4 is handled dry. Unit 4 has a dry FGD air emission control system to remove sulfur dioxide. The system generates FGD gypsum that is removed with fly ash by a bag house, collected in hoppers, and is eventually transferred to a dry storage building. FGD and ash from Unit 4 is moisture conditioned using a rotary mixer and transported to a temporary ash storage pad where it is stockpiled for beneficial reuse projects as structural fill. Bottom ash from Weston Unit 4, along with pulverizer rejects and economizer ash, is conveyed via the submerged flight conveyor and mostly dewatered prior to being hauled by a dump truck and to a temporary ash storage pad.

Bottom ash from Unit 3 is collected from the boiler and sluiced to a series of redundant treatment basins (i.e., CCR management units). The CCRs are sluiced to one of two primary settling basins where the CCR quickly settles out and the sluice water flows to the secondary basin. In general, the primary basins are dry and the dewatered bottom ash is removed from the primary basins on a weekly basis using a front-end loader and transported via dump truck to the ash storage pad for future beneficial use.

The secondary bottom ash basins are designed to provide residence time for the CCR fines to settle out from the sluice water. To improve residence time and assist in settling the fines, silt curtains are used in the secondary bottom ash basins. The secondary bottom ash basins also receive low volume wastewater sources from Units 3 & 4. In 2005, to increase the rail car capacity of the plant, the secondary bottom ash basins were bisected to facilitate the construction of a rail line. So rather than having north and south secondary bottom ash basins, Weston has northeast, northwest, southeast, and southwest secondary bottom ash basins. Equalizing underground conduits were installed beneath the rail lines to maintain the water levels between the northeast and northwest bottom ash basins and the southeast and southwest bottom ash basins. Based on the modifications to the secondary ash basins, Hard Hat Services (Hard Hat Services, 2015) completed an evaluation of the Northeast and Southeast secondary basins and

determined that all bottom ash should settle out before ever reaching the west end of the Northeast and Southeast basins. Any CCR that could potentially accumulate in the Northwest or Southwest basins is considered de minimis.

Water from the secondary bottom ash basins is treated for pH and suspended solids, as needed, and pumped to a tertiary basin for storage and reuse as carriage water for sluicing bottom ash in a close-loop system, as non-potable water for the power plant, or discharged to the Wisconsin River under WPDES Permit No. WI-0042756-07-0 though Outfall 002. Figure 1: Site Location Diagram, shows the site and the location of the basins.

On April 17, 2015, the U.S. Environmental Protection Agency published the Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities; Final Rule to regulate the disposal of coal combustion residuals (CCR) as solid waste under Subtitle D of the Resource Conservation and Recovery Act in the Federal Register. The rule creates a minimum standard for solid waste disposal facilities and solid waste management practices to limit adverse effects on health and/or the environment.

Based on the Rule, the Weston Units 3 & 4 bottom ash basins are regulated under 40 CFR Part 257 Subpart D as an existing CCR surface impoundment. The Rule specifies that existing CCR units must meet location restrictions designated in the Rule by October 17, 2018 or cease sending CCR to the facility and begin closure. These location restrictions address placement of CCR: above the uppermost aquifer, in wetlands, within fault areas, in seismic impact zones, and in unstable areas. The five location restrictions apply to all new CCR landfills, all new and existing CCR surface impoundments, and all lateral expansions of CCR units. This report documents that the Weston Units 3 & 4 ash impoundments meet the locational criteria as defined in 40 CFR 257 Subpart D and includes the following sections:

2. § 257.60 Placement above the Uppermost Aquifer

Location restrictions related to the placement above the uppermost aquifer are outlined in § 257.60 Placement above the Uppermost Aquifer:

> *§ 257.60 Placement above the uppermost aquifer.*
>
> *(a) New CCR landfills, existing and new CCR surface impoundments, and all lateral expansions of CCR units must be constructed with a base that is located no less than 1.52 meters (five feet) above the upper limit of the uppermost aquifer, or must demonstrate that there will not be an intermittent, recurring, or sustained hydraulic connection between any portion of the base of the CCR unit and the uppermost aquifer due to normal fluctuations in groundwater elevations (including the seasonal high water table). The owner or operator must demonstrate by the dates specified in paragraph (c) of this section.*

The Rule defines the uppermost aquifer as *"the geologic formation nearest the natural ground surface that is an aquifer, as well as lower aquifers that are hydraulically interconnected with this aquifer within the facility's property boundary. Upper limit is measured at a point nearest to the natural ground surface to which the aquifer rises during the wet season."*

The Wisconsin River is located west of the CCR units and flows north-south. Based on Federal Emergency Management Agency (FEMA) Flood Insurance Study – Marathon County Wisconsin and Incorporated Areas, effective July 22, 2010, and Map Numbers 55073C0631F and 55073C0632, the 100-year flood elevation of the Wisconsin River near the CCR units is elevation +1,153.5 feet North American Vertical Datum 1988 (NAVD88). The normal pool elevation is estimated to be +1,140.0 feet.

GEI obtained groundwater monitoring well data from the Wisconsin Department of Natural Resources' (WDNR) Groundwater and Environmental Monitoring System (GEMS) Database for the WPSC Weston #3 Landfill, WDNR License No 2879. Groundwater monitoring wells closest to the secondary bottom ash basins are OW-38, OW-43A, and OW-43B. Monitoring wells located north of the basins include OW-28AR, OW-28BR, OW-30A, OW-30B, OW-40A, and OW-40B. Figure 2: Secondary Ash Basin Ground and Surface Water Conditions, shows the Normal Pool and 100 year Flood Elevation of the Wisconsin River, the normal operating level, and maximum pool elevation of the secondary bottom ash basins, and the recorded groundwater elevations for the adjacent groundwater monitoring wells. The maximum groundwater table elevation recorded, based on the quarterly groundwater monitoring data since 2002, is +1,147 feet in the natural sand soils underlying the impoundments. This results in a minimum groundwater separation from the bottom of the liner (minimum elevation +1,169 feet) to groundwater-surface of 22 feet. Based on the above information the base of the CCR units are a minimum of 22 feet above the upper the upper limit of the uppermost aquifer, exceed the minimum groundwater separation, and comply with § 257.60.

Reference:

Federal Emergency Management Agency. (2010). Flood Insurance Study – Marathon County Wisconsin and Incorporated Areas, Effective July 22, 2010. Federal Emergency Management Agency *https://msc.fema.gov/portal/advanceSearch#searchresultsanchor*,

Federal Emergency Management Agency. (2010). Flood Insurance Rate Map, Map Numbers 55073C0631F and 55073C0632F, Marathon County Wisconsin and Incorporated Areas, Effective July 22, 2010.

Hard Hat Services (2015), Northwest and Southwest Pond Classification, Weston Generating Station, Weston, WI. October 7, 2015

Wisconsin Department of Natural Resources 2016, Groundwater and Environmental Monitoring System (GEMS) Database (2016), *http://dnr.wi.gov/wastemgmt/gotw/webpages/default.aspx/* Wisconsin Public Service Corporation Weston #3 Landfill, WDNR License No. 2879, Marathon County, Wisconsin.

3. § 257.61 – Wetlands

Location restrictions related to wetlands are outlined in § 257.61 Wetlands:

> *§ 257.61 Wetlands.*
>
> *(a) New CCR landfills, existing and new CCR surface impoundments, and all lateral expansions of CCR units must not be located in wetlands, as defined in § 232.2 of this chapter, unless the owner or operator demonstrates by the dates specified in paragraph (c) of this section that the CCR unit meets the requirements of paragraphs (a)(1) through (5) of this section.*

To demonstrate the CCR units are not located in wetlands, we obtained wetland inventory data obtained from WDNR Surface Water Data Viewer, the Digital Wisconsin Wetland Inventory (WWI), and field assessed wetlands documented in the WPSC Weston Unit 4 Power Plant Final Environmental Impact Statement. Figure 3: Wetlands and Wetland Indicators near the Weston Unit 3 & 4 Ash Impoundments, shows type, size, and location of wetlands near the impoundments. The nearest wetland to the bottom ash basins is a field assessed wetland identified during the permitting of the Weston 4 Power Plant. It is located approximately 800 feet to the west of the secondary basins very near the Wisconsin River. Based on the information reviewed the Weston Units 3 & 4 bottom ash basins are not located in wetlands and comply with § 257.61.

Reference:

Public Service Commission of Wisconsin and Wisconsin Department of Natural Resources (2004), *WPSC Weston Unit 4 Power Plant Final Environmental Impact Statement*, Docket 6690-CE-187, July 2004.

U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS), 2014, Web Soil Survey, *http://websoilsurvey.nrcs.usda.gov/app/*, Soil Survey of Marathon County, Wisconsin,

Wisconsin Department of Natural Resources 2016, Surface Water Data Viewer, Digital Wisconsin Wetland Inventory (WWI) Maps, *http://dnr.wi.gov/topic/surfacewater/swdv/*, Marathon County, Wisconsin

4. § 257.62 – Fault Areas

Location restrictions related to faults are outlined in § 257.62 Fault Areas:

> *§ 257.62 Fault areas.*
>
> *(a) New CCR landfills, existing and new CCR surface impoundments, and all lateral expansions of CCR units must not be located within 60 meters (200 feet) of the outermost damage zone of a fault that has had displacement in Holocene time unless the owner or operator demonstrates by the dates specified in paragraph (c) of this section that an alternative setback distance of less than 60 meters (200 feet) will prevent damage to the structural integrity of the CCR unit.*

The Rule defines a "fault" as *"a fracture or a zone of fractures in any material along which strata on one side have been displaced with respect to that on the other side."* To determine if the CCR units are greater than 200 feet from the outermost damage zone of a fault we analyzed the quaternary fault and fold database for the United States from U.S. Geological Survey (USGS). The Quaternary Faults and Fold database contains information compiled by the Earthquake Hazards Program of the U.S. Geological Survey. The database describes faults and associated folds in the United States that are believed to be sources of earthquakes, greater than magnitude 6, in the past 1,600,000 years, and is intended to be an archive of historical (less than 150 years) and ancient earthquake sources (Peterson and others 2008; Peterson and others 2014). Figure 4: Fault Areas near Ash Impoundments, shows faults and associated folds with respect to the CCR unit. The nearest area fault to the Site is the Wabash Valley area in central and southern Illinois and Indiana, which is over 400 miles south of the site. Based on the information reviewed the Weston Units 3 & 4 ash basins are not located within 200 feet of the outermost damage zone of a fault and comply with § 257.62.

Reference:

Petersen, M.D., Moschetti, M.P., Powers, P.M., Mueller, C.S., Haller, K.M., Frankel, A.D., Zeng, Yuehua, Rezaeian, Sanaz, Harmsen, S.C., Boyd, O.S., Field, Ned, Chen, Rui, Rukstales, K.S., Luco, Nico, Wheeler, R.L., Williams, R.A., and Olsen, A.H., 2014, Documentation for the 2014 update of the United States national seismic hazard maps: U.S. Geological Survey Open-File Report 2014–1091, 243 p. *http://dx.doi.org/10.3133/ofr20141091*.

5. § 257.63 – Seismic Impact Zones

Location restrictions related to seismic impact zones are outlined in § 257.63 Seismic Impact Zones:

> *§ 257.63 Seismic impact zones.*
>
> *(a) New CCR landfills, existing and new CCR surface impoundments, and all lateral expansions of CCR units must not be located in seismic impact zones unless the owner or operator demonstrates by the dates specified in paragraph (c) of this section that all structural components including liners, leachate collection and removal systems, and surface water control systems, are designed to resist the maximum horizontal acceleration in lithified earth material for the site.*

The Rule defines a "Seismic Impact Zone" as "an area having a 2% or greater probability that the maximum expected horizontal acceleration, expressed as a percentage of the earth's gravitational pull (g), will exceed 0.10 g in 50 years." To determine if the CCR units are within a seismic impact zone we analyzed the 2014 USGS National Seismic Hazard Maps. The 2014 probabilistic hazard maps represent an update of the seismic hazard maps; previous versions were developed by Petersen and others (2008) and Frankel and others (2002), using the methodology developed by Frankel and others (1996). Algermissen and Perkins (1976) published the first probabilistic seismic hazard map of the United States which was updated in Algermissen and others (1990). Figure 5: Peak Ground Acceleration (PGA) 2% in 50 Years, shows the 2014 USGS National Seismic Hazard Map (PGA 2% in 50 years). The associated PGA 2% in 50 years for the Site is 0.02g or 2% g; thus, the site is not considered to be in a Seismic Impact Zone. In 2014, GEI was retained by WPSC to perform a geotechnical stability analysis of the Weston Units 3 & 4 bottom ash basins (GEI, 2014). Analysis shows that the secondary ash basins have an adequate factor of safety under the normal pool, maximum pool, rapid draw down, and seismic conditions modeled. Based on the information reviewed the Weston Units 3 & 4 CCR units are not located in a seismic impact zone, all structural components are designed to resist the maximum horizontal acceleration in lithified earth materials, and comply with § 257.63.

Reference:

GEI Consultants, Inc. (2014). Geotechnical Stability Analysis Secondary Ash Basins, Weston Generating Station, Wisconsin Public Service Corporation, Rothschild. WI, May 2014.

Petersen, M.D., Moschetti, M.P., Powers, P.M., Mueller, C.S., Haller, K.M., Frankel, A.D., Zeng, Yuehua, Rezaeian, Sanaz, Harmsen, S.C., Boyd, O.S., Field, Ned, Chen, Rui, Rukstales, K.S., Luco, Nico, Wheeler, R.L., Williams, R.A., and Olsen, A.H., 2014, Documentation for the 2014 update of the United States national seismic hazard maps: U.S. Geological Survey Open-File Report 2014–1091, 243 p., *http://dx.doi.org/10.3133/ofr20141091*.

6. § 257.64 – Unstable Areas

Location restrictions related to unstable areas are outlined in § 257.64 Unstable Areas:

> *§ 257.64 Unstable areas.*
>
> *(a) An existing or new CCR landfill, existing or new CCR surface impoundment, or any lateral expansion of a CCR unit must not be located in an unstable area unless the owner or operator demonstrates by the dates specified in paragraph (d) of this section that recognized and generally accepted good engineering practices have been incorporated into the design of the CCR unit to ensure that the integrity of the structural components of the CCR unit will not be disrupted. (b) The owner or operator must consider all of the following factors, at a minimum, when determining whether an area is unstable: (1) On-site or local soil conditions that may result in significant differential settling; (2) On-site or local geologic or geomorphologic features; and (3) On-site or local human-made features or events (both surface and subsurface).*

The rule defines an *"Unstable Area"* as *"a location that is susceptible to natural or human-induced events or forces capable of impairing the integrity, including structural components of some or all of the CCR unit that are responsible for preventing releases from such unit. Unstable areas can include poor foundation conditions, areas susceptible to mass movements, and karst terrains."* The Rule defines *"poor foundation"* as *"areas where features exist which indicate that a natural or human- induced event may result in inadequate foundation support for the structural components of an existing or new CCR unit. For example, failure to maintain static and seismic factors of safety as required in §§ 257.73(e) and 257.74(e) would cause a poor foundation condition."*

In determining that the CCR units are not located in an unstable area as defined by the Rule, GEI reviewed multiple geotechnical subsurface exploration reports, boring logs that have been completed for the power plant and at or near the CCR units. We have reviewed local and regional geology, ground surface topography, and the location of rivers and streams.

In general, the site soils are alluvial sand and gravels that can be described as medium dense natural sands with some gravel (SP-SW). Bedrock is a weathered granite and encountered approximately 85 feet below the ground surface. Groundwater elevation has historically ranged between +1,142 and +1,146 feet. The Wisconsin River is located approximately 900 feet west of the secondary bottom ash basins, flowing north-south. The normal pool elevation is approximately +1,140.0 feet and the 100-year flood elevation is +1,153.5 feet.

Based on the geology, soil, and bedrock type and conditions the foundation soils are not susceptible to mass movements or excessive settlement. Reviewing maps of karst and shallow carbonate bedrock in Wisconsin prepared by the Wisconsin Geological and Natural History Survey, please see Figure 6: Karst and Shallow Carbonate Bedrock, GEI is confirming the site is not located within a karst landscape. Figure 7: Generalized Cross Section shows that the

secondary ash ponds are in excess of 900 feet from the Wisconsin River. The nearest edge of the 100-year flood plain is approximately 625 feet from the secondary ash ponds. The ground surface slopes at an approximate 20 horizontal to 1 vertical slope to the river and is forested and well vegetated. Based on the information reviewed the Weston Units 3 & 4 CCR units are not located in unstable areas and comply with § 257.64.

Reference:

Black & Veatch Corporation (2004). Wisconsin Public Service Corporation Weston North Unit 4 Rothschild, WI. Geotechnical Report Revision 0. January 14, 2004.

Dewberry Consultants LLC (2014). Coal Combustion Residue Impoundment Round 12 – Dam Assessment Report. Weston Generating Station (Site 26) Northeastern, Northwestern, Southeastern and Southwestern Secondary Bottom Ash Treatment Ponds. Wisconsin Public Service Rothschild, WI. February 2014.

Federal Emergency Management Agency. (2010). Flood Insurance Study – Marathon County Wisconsin and Incorporated Areas, Effective July 22, 2010. Federal Emergency Management Agency *https://msc.fema.gov/portal/advanceSearch#searchresultsanchor*,

Federal Emergency Management Agency. (2010). Flood Insurance Rate Map, Map Numbers 55073C0631F and 55073C0632F, Marathon County Wisconsin and Incorporated Areas, Effective July 22, 2010.

GEI Consultants, Inc. (2014). Geotechnical Stability Analysis Secondary Ash Basins, Weston Generating Station, Wisconsin Public Service Corporation, Rothschild. WI, May 2014.

Petersen, M.D., Moschetti, M.P., Powers, P.M., Mueller, C.S., Haller, K.M., Frankel, A.D., Zeng, Yuehua, Rezaeian, Sanaz, Harmsen, S.C., Boyd, O.S., Field, Ned, Chen, Rui, Rukstales, K.S., Luco, Nico, Wheeler, R.L., Williams, R.A., and Olsen, A.H., 2014, Documentation for the 2014 update of the United States national seismic hazard maps: U.S. Geological Survey Open-File Report 2014–1091, 243 p., *http://dx.doi.org/10.3133/ofr20141091*.

Soil Testing Services of Wisconsin, Inc. (1976). Wisconsin Public Service Corporation, Weston Generating Station, Proposed Unit 3 Soil Boring Logs and Location Diagram. June 25, 1976.

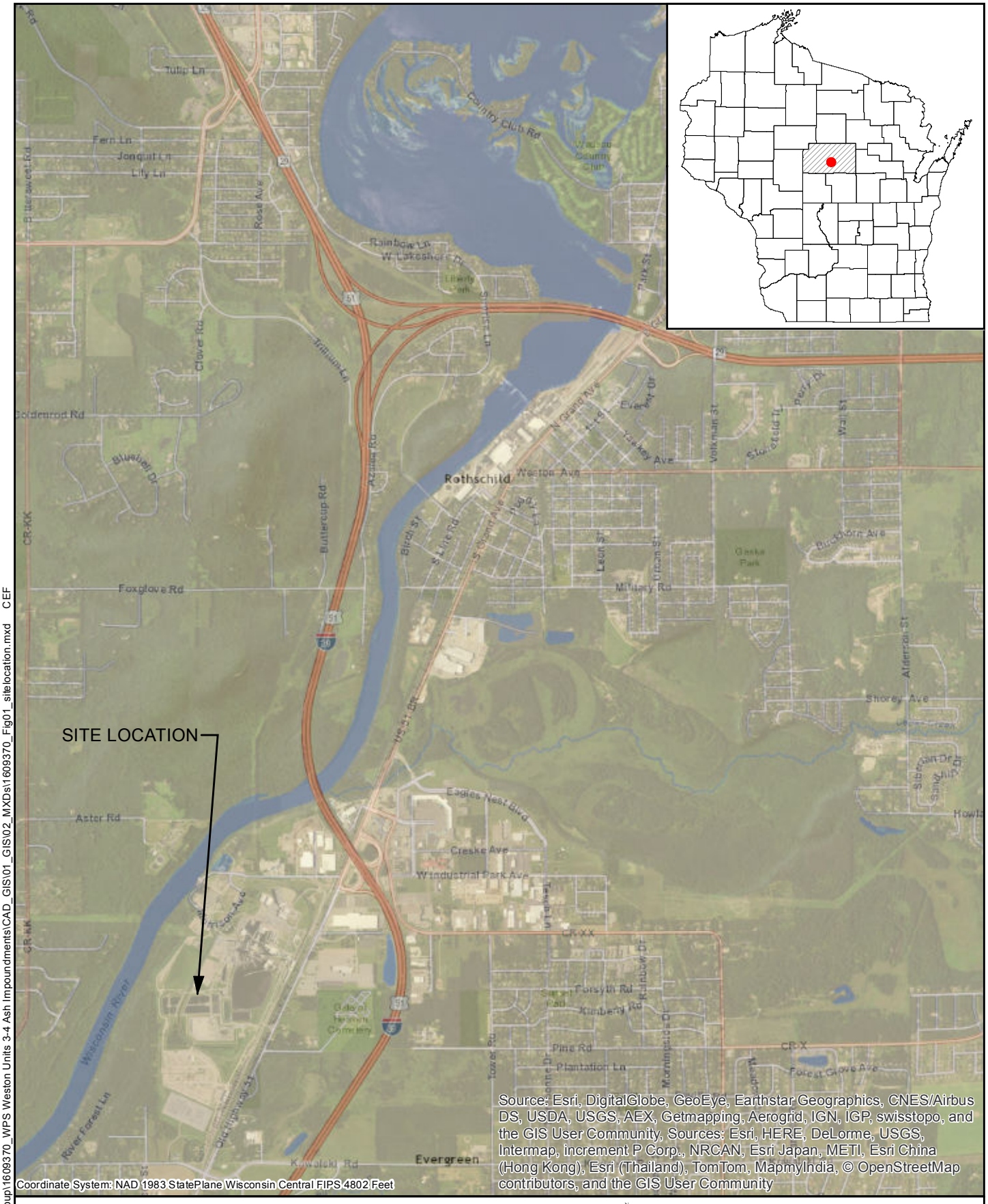
Wisconsin Geological and Natural History Survey (2009). Karst and shallow carbonate bedrock in Wisconsin, Factsheet 02. University of Wisconsin Extension. 2009.

7. Conclusion

The Weston Units 3 & 4 bottom ash basins are regulated under 40 CFR Part 257 Subpart D as an existing CCR surface impoundment. The Rule specifies that all existing CCR units must meet location restrictions designated in the Rule by October 17, 2018 or cease sending CCR to the units and begin closure. The location restrictions address placement of CCR: above the uppermost aquifer, in wetlands, within fault areas, in seismic impact zones, and in unstable areas. This report documents that the Weston Units 3 & 4 bottom ash basins meet all of the locational criteria as defined in § 257.60 – Uppermost Aquifer, § 257.61 – Wetlands, § 257.62 – Fault Areas, § 257.63 – Seismic Impact Zones, and § 257.64 – Unstable Areas.

This report was completed under the direction of John, M. Trast, P.E. I am a licensed professional engineer in the State of Wisconsin in accordance with the requirements of ch. A-E 4, Wisconsin Administrative Code; that this document has been prepared in accordance with the Rules of Professional Conduct in ch. A-E 8, Wisconsin Administrative Code; and that, to the best of my knowledge, all information contained in this document is correct and the document was prepared in compliance with all applicable requirements in 40 CFR Part 257 Subpart D.

Figures



3,000 1,500 0 3,000

Feet

WPS Weston Units 3 & 4 Ash Impoundments
Weston Generating Station, Rothschild, Wisconsin

Wisconsin Public Service Corporation
Green Bay, Wisconsin 54301

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1609370

Site Location Diagram

August 2016

Fig. 1

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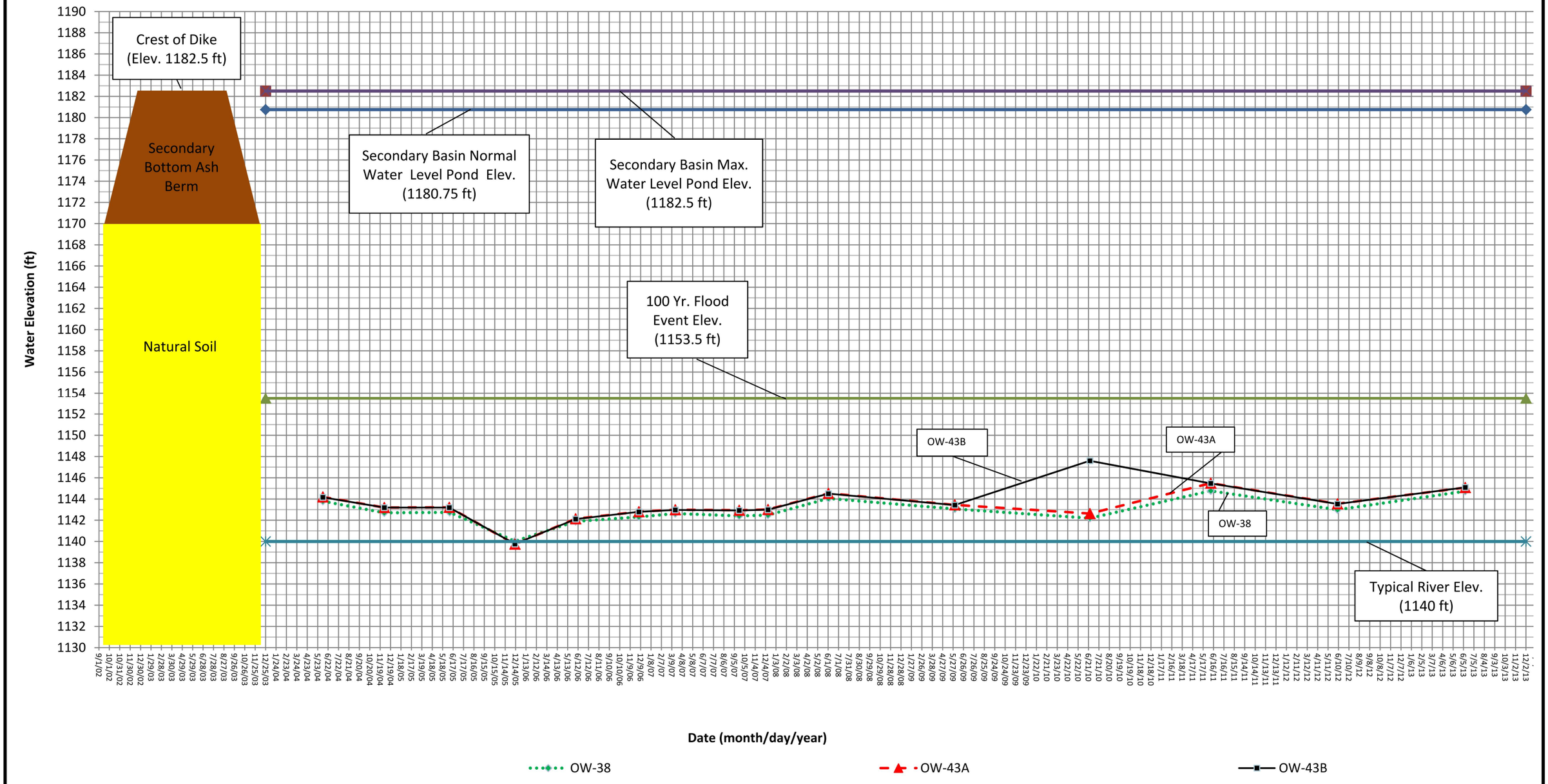

SOURCE:

Adopted from Figure 3 from Geotechnical Stability Analysis Secondary Ash Basins, Weston Generating Station, GEI Consultants Inc., May 2014.

WPS Weston Units 3-4 Ash Impoundments Weston Generating Station, Rothschild, Wisconsin	GEI Consultants	SECONDARY ASH BASIN GROUND AND SURFACE WATER CONDITIONS
Wisconsin Public Service Corporation Green Bay, Wisconsin 54301	Project 1609370	August 2016 Fig. 2

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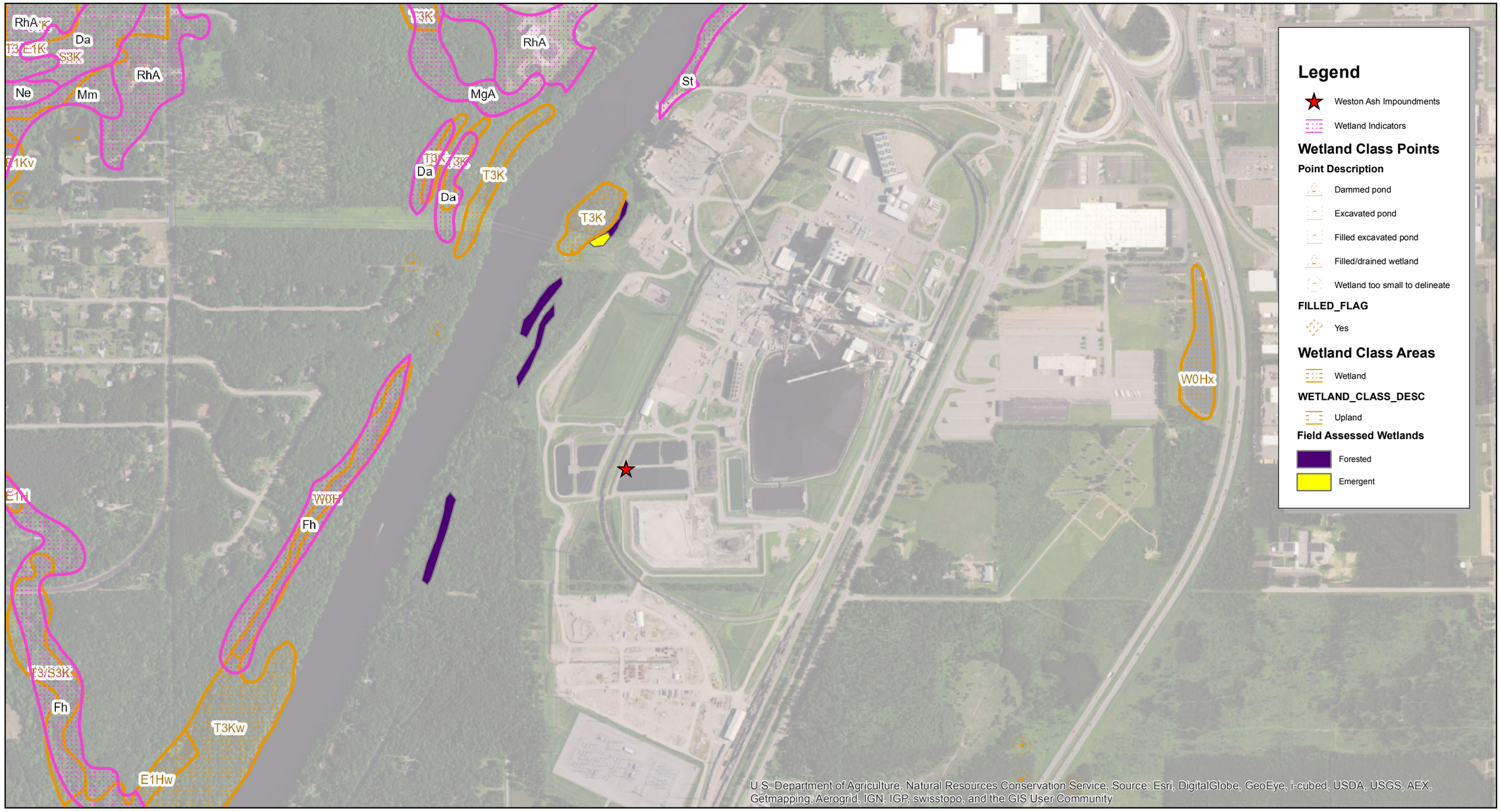

NOTES:
1. Wetland Data obtained from arcgis on dnrmaps.wi.gov (user), Data provided in this service includes existing wetland delineations, soil types, potential restoration areas, and habitat designations.

0 800 1,600 3,200 Feet

1 inch = 800 feet

N W E S

Coordinate System: NAD 1983 StatePlane Wisconsin Central FIPS 4802 Feet

WPS Weston Units 3-4 Ash Impoundments
Weston Generating Station, Rothschild, Wisconsin

Wisconsin Public Service Corporation
700 North Adams Street
Green Bay, Wisconsin 54301

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WETLANDS AND WETLAND INDICATORS NEAR ASH IMPOUNDMENTS

Date: August 2016

Figure 3

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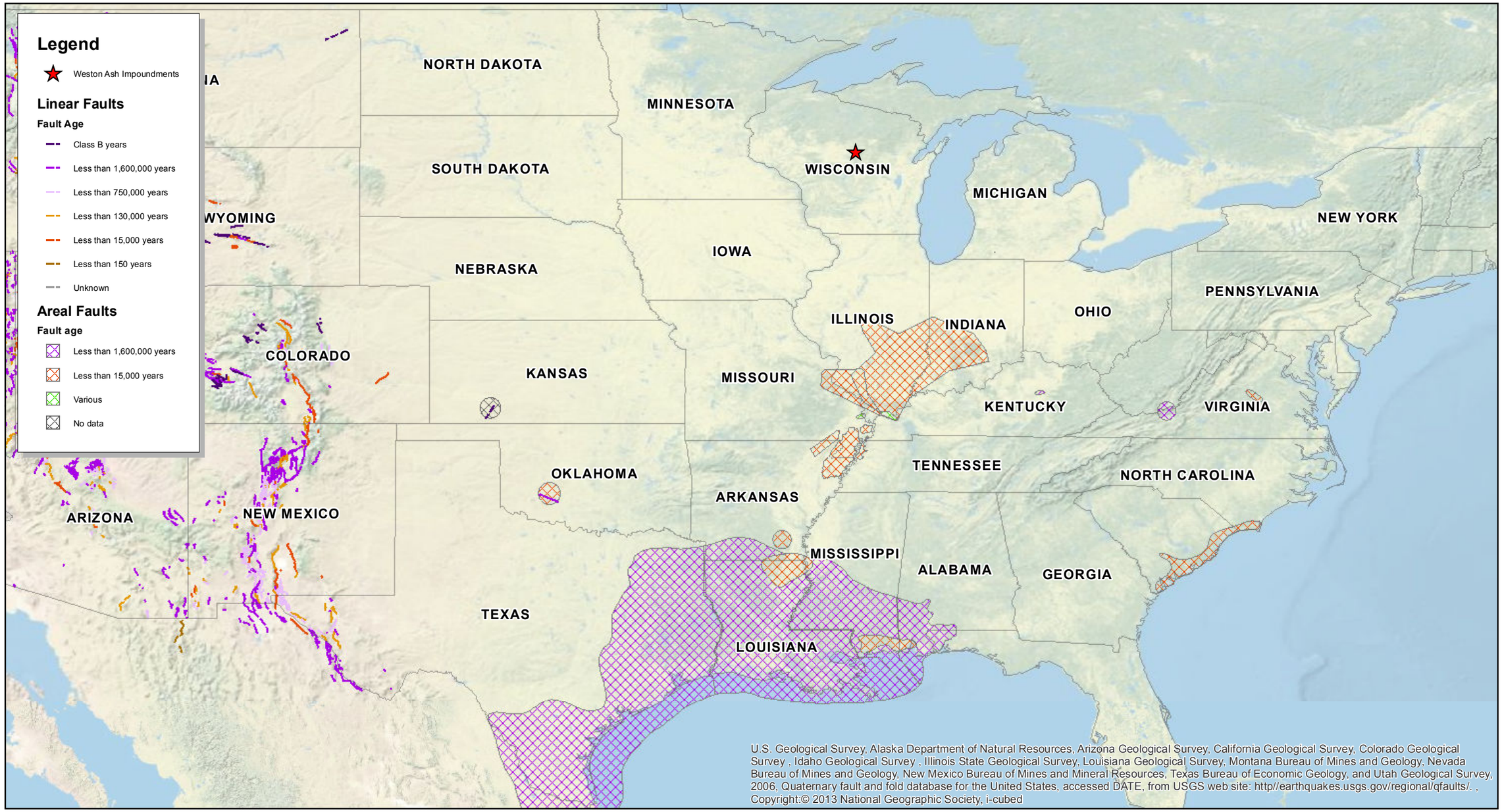

0 200 400 800 Miles

1 in = 200 miles

Coordinate System: GCS North American 1983

N W E S

WPS Weston Units 3-4 Ash Impoundments
Weston Generating Station, Rothschild, Wisconsin

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FAULT AREAS NEAR ASH IMPOUNDMENTS

Date: August 2016

Figure 4

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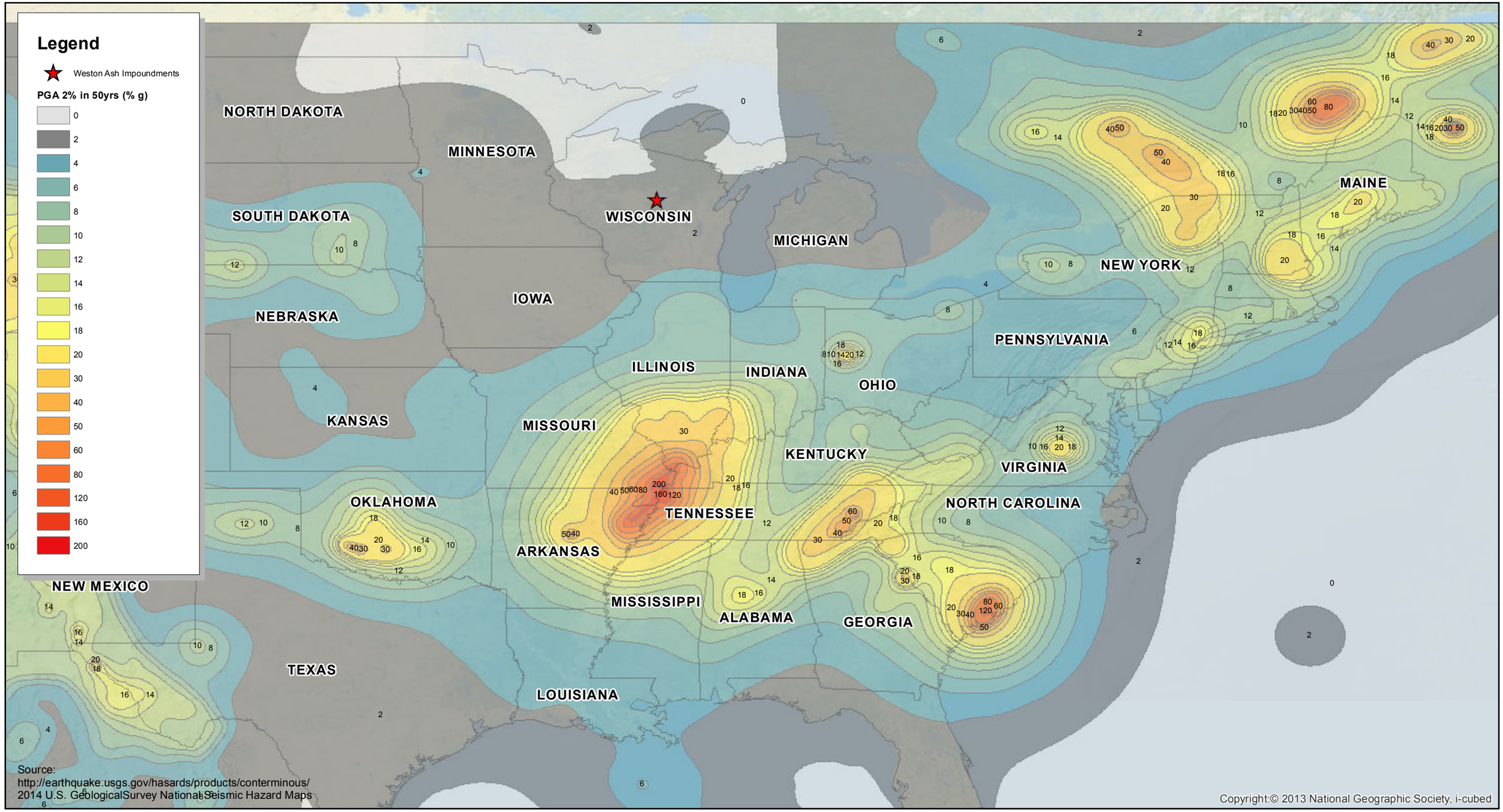

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0 200 400 800 Miles

1 inch = 200 miles

Coordinate System: GCS North American 1983

WPS Weston Units 3-4 Ash Impoundments
Weston Generating Station, Rothschild, Wisconsin

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Green Bay, Wisconsin 54301

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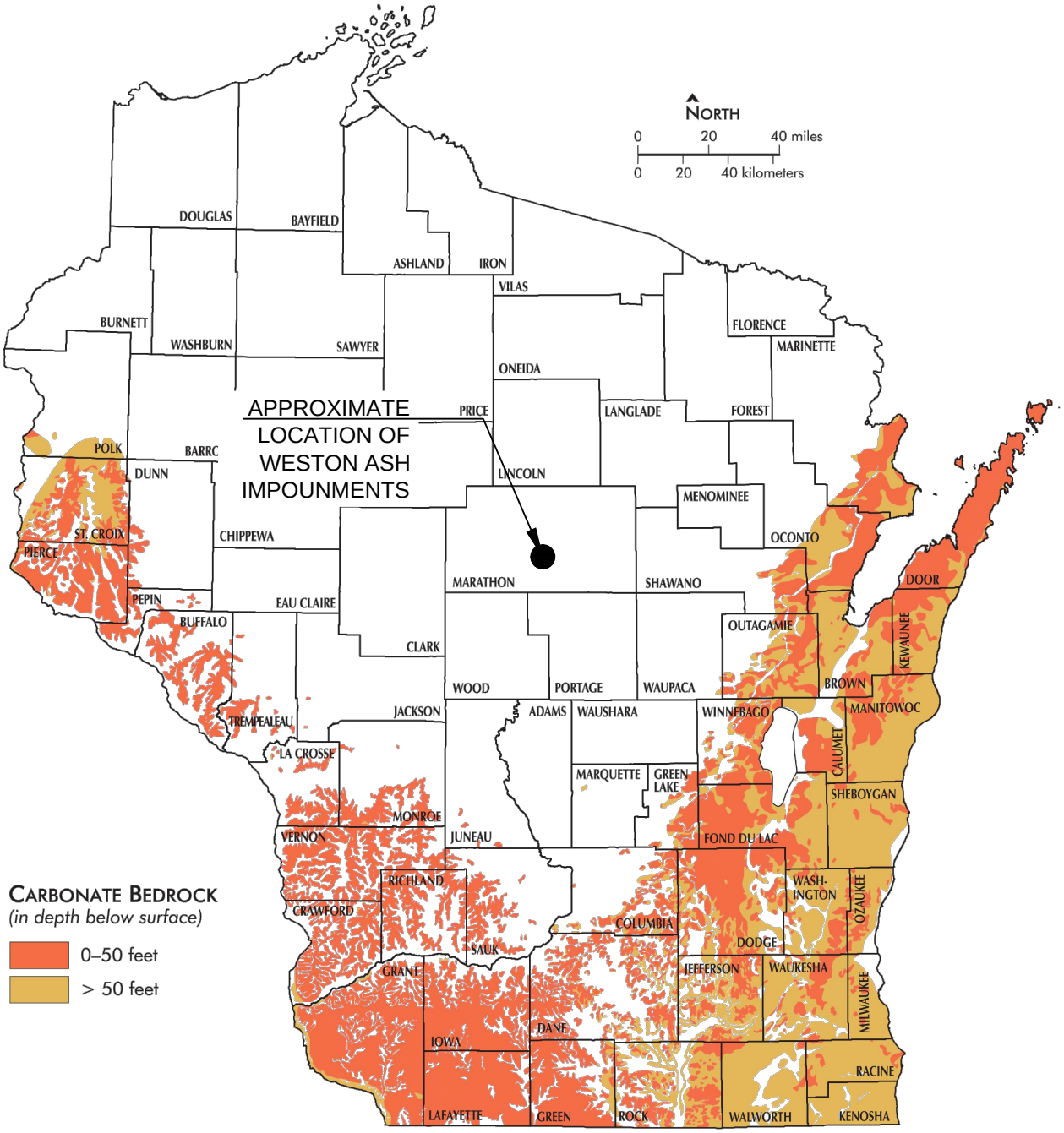
PEAK GROUND ACCELERATION (PGA)
2% IN 50 YEARS

Date: August 2016

Figure 5



UW Extension
University of Wisconsin-Extension

Wisconsin Geological and Natural History Survey 3817 Mineral Point Road • Madison, Wisconsin 53705-5100
Tel 608.263.7389 • Fax 608.262.8086 • WisconsinGeologicalSurvey.org
Director and State Geologist: James M. Robertson

SOURCE:

1. PLAN BASED ON MAP PREPARED BY WISCONSIN GEOLOGICAL AND NATURAL HISTORY SURVEY, FACTSHEET 02, 2009

WPS Weston Units 3-4 Ash Impoundments Weston Generating Station, Rothschild, Wisconsin	GEI Consultants	KARST AND SHALLOW CARBONATE BEDROCK
Wisconsin Public Service Corporation Green Bay, Wisconsin 54301	Project 1609370	August 2016 Fig. 6

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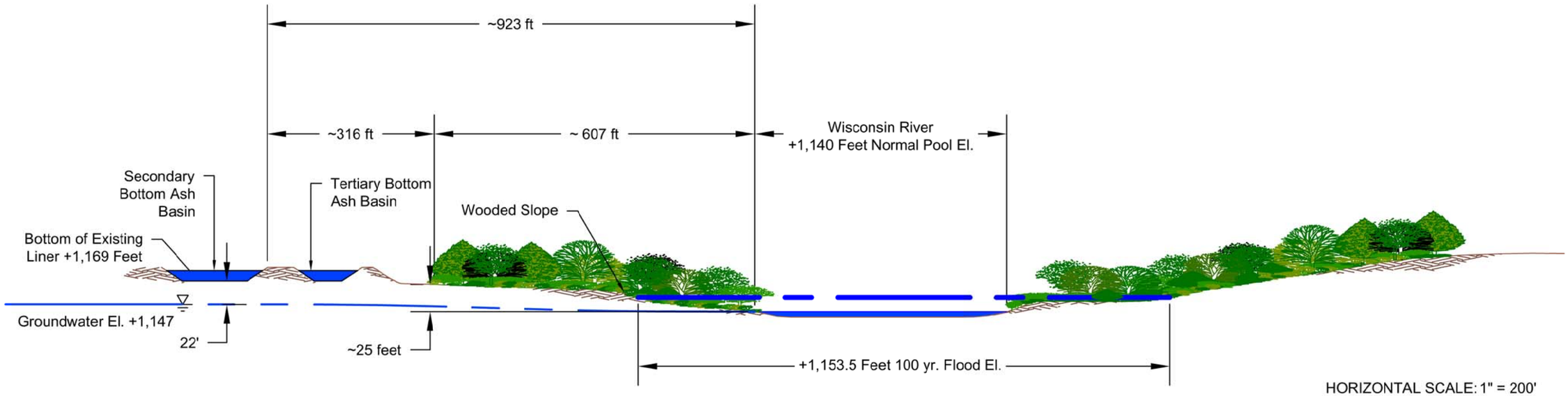
A

Southeast

A'

Northwest



HORIZONTAL SCALE: 1" = 200'

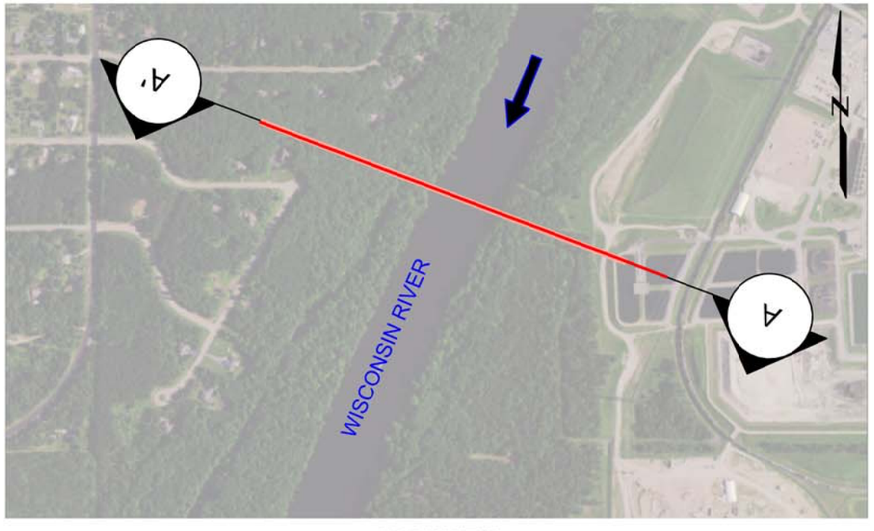
0 200' 400'

0 100' 200'

VERTICAL SCALE: 1" = 100'

NOTE: 2x VERTICAL EXAGGERATION

SECTION VIEW



PLAN VIEW

NOT TO SCALE

WPS Weston Units 3-4 Ash Impoundments Weston Generating Station, Rothschild, Wisconsin	GEI Consultants	GENERALIZED CROSS SECTION
Wisconsin Public Service Corporation Green Bay, Wisconsin 54301	Project 1609370	August 2016 Fig. 7

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Appendix A

Flood Insurance Study and Rate Map

FLOOD INSURANCE STUDY

MARATHON COUNTY, WISCONSIN

AND INCORPORATED AREAS

Community Name	Community Number
Abbotsford, City of	550299
Athens, Village of	550246
*Birnamwood, Village of	550413
Brokaw, Village of	550247
Colby, City of	550049
*Dorchester, Village of	550241
Edgar, Village of	550248
Elderon, Village of	550249
Fenwood, Village of	550250
Hatley, Village of	550251
Kronenwetter, Village of	550193
Marathon City	550252
Marathon County (Unincorporated Areas)	550245
*Marshfield, City of	550515
Mosinee, City of	555567
Rothschild, Village of	555577
Schofield, City of	555579
*Spencer, Village of	550315
Stratford, Village of	550256
*Unity, Village of	550257
Wausau, City of	550258
Weston, Village of	550323

*No Special Flood Hazard Areas Identified

EFFECTIVE:
JULY 22, 2010

Federal Emergency Management Agency

FLOOD INSURANCE STUDY NUMBER
55073CV000A

Marathon County, Wisconsin
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 effective 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: July 22, 2010

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EXHIBITS

FLOOD INSURANCE STUDY
MARATHON COUNTY, WISCONSIN 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 Marathon County, including the cities of Abbotsford, Colby, Marshfield, Mosinee, Schofield, and Wausau; the villages of Athens, Birnamwood, Brokaw, Dorchester, Edgar, Elderon, Fenwood, Hatley, Kronenwetter, Marathon City, Rothschild, Spencer, Stratford, Unity, and Weston; and the unincorporated areas of Marathon County (referred to collectively herein as Marathon County). Note that the cities of Abbotsford, Colby, Marshfield, Mosinee, and Schofield, and the villages of Birnamwood, Brokaw, Dorchester, Edgar, Elderon, Fenwood, Hatley, Kronenwetter, Rothschild, Spencer, Stratford, and Weston did not have previous FIS text. Within the geographic area of Marathon County, no Special Flood Hazard Areas have been identified for the City of Marshfield and the villages of Birnamwood, Dorchester, Spencer, and Unity.

The flood-hazard information for the portions of the cities of Abbotsford, Colby, Marshfield, and Unity, and the villages of Birnamwood and Dorchester that lie in Marathon County are included in this FIS report. For flood-hazard information in Clark, Shawano, and Wood Counties, see separately published FIS reports and Flood Insurance Rate Maps (FIRM).

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 Marathon County to update existing floodplain regulations as part of the Regular Phase of the National Flood Insurance Program (NFIP), and will also be used by local and regional planners to further promote sound land use and floodplain development. Minimum floodplain management requirements for participation in the NFIP are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

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

1.2 Authority and Acknowledgments

The sources of authority for this FIS 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, Marathon County in a countywide format. Information on the authority and acknowledgments for each jurisdiction included in this countywide FIS, as compiled from their previously printed FIS reports, is shown below.

Athens, Village of	The hydrologic and hydraulic analyses for this study was performed by the U.S. Geological Survey (USGS) for the Federal Insurance Administration, under Inter-Agency Agreement No. IAA-H-9-77, Project Order No. 25. This work was completed in August 1978.
Marathon County	The hydrologic and hydraulic analyses for this study was performed by the USGS, for the Federal Insurance Administration, under Inter-Agency Agreement No. IAA-H-17-72. This study was completed in August 1974 and the FIRM from this initial study became effective February 1, 1979. The additional hydrologic and hydraulic analyses for the expanded study were also performed by the USGS, for the Federal Insurance Administration under Inter-Agency Agreement No. IAA-H-9-77. This work, which was completed in April 1979, covered the significant flooding effects of the Big Rib River, Little Rib River, Eau Claire River, Bull Junior Creek, and Johnson Creek, all in the unincorporated areas of Marathon County.
Marathon City, Village of	The hydrologic and hydraulic analyses for this study was performed by the USGS for the Federal Insurance Administration, under Inter-Agency Agreement No. IAA-H-9-77, Project Order No. 25. This work was completed in November 1978.
Wausau, City of	The hydrologic and hydraulic analyses for this study was performed by the USGS for the Federal Insurance Administration, under Inter-Agency Agreement No. IAA-H-3-73, Project Order No. 3. This work was completed in August 1974.

For this countywide FIS, digital conversion and re-delineation of special flood hazard areas was performed by CDM Federal Programs Corporation (CDM), under contract

HSFE05-05-D-0027/006. Work was completed October 19, 2007. The hydrologic and hydraulic analyses for this study were developed by the U.S. Army Corps of Engineers (USACE). The digital base mapping information was provided in digital format by Marathon County. This base mapping information was derived from data compiled in 2005. 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 FIRM base map features.

The coordinate system used for the production of the FIRM is Universal Transverse Mercator (UTM), 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 Marathon 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
Village of Athens	March 15, 1977	July 17, 1979
Marathon Co., Unincorporated Areas	June 10, 1976	August 6, 1980
Village of Marathon City	*	July 17, 1979
City of Wausau	*	December 16, 1975

*Information Not Available

For this countywide FIS, the initial CCO meeting was held September 19, 2006 and was attended by representatives of CDM, the Wisconsin Department of Natural Resources (WDNR), FEMA, and the communities of Marathon County. The results of the study were reviewed at the final CCO meeting held on February 19, 2009 and attended by representatives of CDM, WDNR, FEMA and the communities. 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 Marathon County, Wisconsin, 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 and 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 FIRM (Exhibit 2).

TABLE 2 – FLOODING SOURCES STUDIED BY DETAILED METHODS

Stream	Limits of Detailed Study
Big Rib River	From its confluence at the Wisconsin River to State Highway 29.
Black Creek	From approximately 3,000 feet downstream of Degner Street to approximately 3,500 feet upstream of the City of Athens Dam.
Bull Junior Creek	From its confluence at the Mosinee flowage area of the Wisconsin River to approximately 1.9 miles upstream of County Highway X at Town Road.
Eau Claire River	From the Brooks and Ross Dam to the upstream side of County Highway N.
Jim Moore Creek	From its confluence with the Wisconsin River to approximately 4,300 feet upstream of the Tenth Street bridge.
Johnson Creek	From County Highway C to State Highway 153.
Little Rib River	From its confluence with Big Rib River to Stettin Drive.

TABLE 2 – FLOODING SOURCES STUDIED BY DETAILED METHODS
(continued)

Stream	Limits of Detailed Study
Potato Creek	From its confluence at Black Creek to approximately 1,500 feet upstream of Allen Street.
Wisconsin River	From approximately 1.3 miles downstream of the Main Street Bridge in the City of Mosinee to approximately 5 miles upstream of Adolph Street in the City of Wausau.

As part of this countywide FIS, updated analyses were included for the flooding sources shown in Table 3, "Scope of Revision."

TABLE 3 – SCOPE OF REVISION

Stream	Limits of Revised or New Detailed Study
Wisconsin River	From the Dam at Mosinee to the Dam at Rothschild

This FIS also incorporates the determinations of letters issued by FEMA resulting in map changes (Letter of Map Revision [LOMR], Letter of Map Revision-based on Fill [LOMR-F], and Letter of Map Amendment [LOMA]) as shown in Table 4, "Letters of Map Change."

TABLE 4 – LETTERS OF MAP CHANGE

Community	Flooding Source(s)/Project Identifier	Date Issued	Type
City of Wausau	Wisconsin River	May 5, 1999	LOMR

For this countywide study, all or portions of Big Sandy Creek, Bull Junior Creek and Tributary, Cedar Creek, Comet Creek, Eau Claire River, Little Eau Claire River, Plover River, Prospect Creek, Skulen Creek, Spranger Creek, Spring Brook, Trappe River, and numerous unnamed streams were studied by approximate methods.

Approximate analyses were used to study those areas having a low development potential or minimal flood hazards. The Zone A floodplain boundaries for the streams listed above in Marathon County were developed using limited detail study techniques. The remaining Zone A floodplain boundaries were digitized and adjusted to fit the best available topographic data. The scope and methods of study were proposed to, and agreed upon, by FEMA and the WDNR.

2.2 Community Description

Marathon County, located in the central part of Wisconsin, is the largest in area of all Wisconsin counties and covers approximately one million acres. The county, named for the Greek battlefield, witnessed its first settlement in the 1830s. Clockwise from the northeast, surrounding counties are Taylor, Lincoln, Langlade, Shawano, Waupaca, Portage, Wood, and Clark. In 1990 and 2000, the U.S. Bureau of the Census reported the population of the area to be 115,400 and 125,834, respectively (Reference 1).

The climate of the area is classified as continental, with long, relatively cold winters and warm summers. Periods with consecutive days of minimum temperatures below zero are not unusual during the months of December, January, and February. Summers are mostly pleasant, but usually have one or more periods with consecutive days with temperatures of 90 degrees Fahrenheit (^{o}F) or more. Precipitation is ample for the economy of the region. Thunderstorms are the principal source of moisture during the summer. Snowfall is extremely variable from one year to the next.

The Wisconsin River is the chief topographic feature in this section of northern Wisconsin. The land surface is moderately hilly, with a relief of approximately 200 feet. The hills are so moderate in slope that most roads are laid out on the rectangular system of section lines. Several quartzite hills, of which Rib Mountain is the highest, are located in Marathon County. Rib Mountain's peak, which is 1,940 feet, rises approximately 640 feet above the surrounding upland. Few natural lakes exist in the county, but reservoirs have been created along the Wisconsin River and some of its tributaries.

Land uses in the county include agriculture, silviculture, light industry, transportation, public utilities, and parks. Most of the floodplains are in open space uses, that is, cropland, woodland, and pasture. Residential development is scattered throughout the county, with most residences being single-family homes on farmsteads located adjacent to villages and towns, and in unincorporated areas, mostly around the outskirts of Wausau.

Marathon County is credited with 377,800 acres of forest land, but the tree cover is generally light. In the sawtimber category, oak, elm, and hard maple trees lead the list; but, a substantial volume of softwoods also exist. Continuing economic development within the study area is expected. Extensive development is not recommended for flood-prone areas.

2.3 Principal Flood Problems

Overall flooding in Marathon County is generally due to high stages on the Wisconsin River.

In the Village of Athens, flooding on Black Creek and Potato Creek has been minor. In the 1930's, reportedly, a dam located just upstream from State Highway 97 on Black Creek failed in Athens, causing severe flooding downstream (Reference 2). The 1930 flood was at peak stream discharge. It is believed that a log jam caused the dam to fail. The most severe floods for Black Creek and Potato Creek in Athens are caused by rain on frozen ground or intense thunderstorms. These storms are normally limited to relatively small areas or narrow bands along cold fronts and squall lines. Floods that are generally less severe are caused by a combination of melting snow and rainfall in the spring. Stream gaging records account for the effect of snowmelt on flooding.

The greatest recorded flood on the Eau Claire River at Kelly (2.0 miles east of Schofield) occurred August 1926 according to USGS records. This flood's recurrence interval is estimated to be between 25 and 50 years. The period of record is from 1914 to 1926 and from 1940 to the present.

In the Village of Marathon City, the maximum recorded discharge on the Big Rib River at the gaging station at Rib Falls was 23,800 cubic feet per second (cfs) on August 31, 1938. This was approximately a 30-year recurrence interval flood, but did very little structural damage at Marathon City because most of the land in the floodplain was agriculture. The Rib Falls gage is located six river miles upstream from Marathon City and was operated from 1925-1957.

The principal flood problem in the City of Wausau is on the south side of town, west of the Wisconsin River and south of East Thomas Street. This area is relatively low and mostly occupied by single-family residences. The greatest flood of record occurred on September 1, 1941, which exceeded the July 24, 1912 flood, which was the highest since 1881. The recurrence interval of the 1941 flood is estimated to about one in 170 years, and that of the 1912 flood to about once in 100 years.

The 1912 flood on the Wisconsin River reached a higher stage than the 1941 flood below the Rothschild Dam because a cofferdam was dynamited to save the main structure. The water rushing from Lake Wausau produced a stage at the downstream side of the dam 1.5 feet higher than that of 1941. The flood discharge in the study reach below the dam would also have been higher during the 1912 flood. Effects of cofferdam failures that occurred upstream from Wausau during the 1912 and 1941 floods on the Wisconsin River are unknown.

Other high flood stages have occurred due to backwater from ice jams. Reportedly, thick ice cover on Lake Wausau in the City of Wausau can catch and accumulate ice coming down the river in early spring, sometimes creating considerable backwater. During the spring of 1973, such a jam backed up the river to nearly the 1-percent annual chance flood stage. Another reported outstanding ice jam under the low railroad bridge over the West Channel of the Wisconsin River, just upstream from the Wausau Dam, caused extensive backwater.

In the City of Wausau, a culvert at a foot crossing in the American Legion Golf Course, approximately 1,900 feet upstream on Jim Moore Creek, is inadequate for passage of even low-magnitude flood flows. It can cause approximately 2.5 feet more backwater on floods of the 10-year recurrence interval and greater.

The Wausau Dam on the Wisconsin River can discharge the 0.2-percent annual chance flood at normal pool elevation at the dam. However, there will be a large increase in stage from the dam to Barker's Island, 0.3 mile upstream, during major floods. The principal cause of this increased flood stage is the presence of a former falls in this reach, now submerged from view by the pool created by the dam. Other causes of high flood stages include the horizontal constriction of the flood flows due to control structures under the Memorial Bridge; further constriction is caused by an adjacent island, as well as the width of the West Channel of the Wisconsin River.

Logs reportedly jammed the Rothschild Dam during the 1941 flood, backing up water approximately 1.7 feet higher than for unobstructed conditions.

2.4 Flood Protection Measures

In Marathon County, more than 750 ponds have been constructed by landowners. The Soil Conservation Service (SCS) has assisted in the design and construction of more than half of these small ponds, with more than 250 having some built-in flood control.

For the Village of Athens, there are no flood protection structures on Black Creek or Potato Creek. There are remnants of an old dam on Black Creek which consist of rip-rap and concrete across the stream. This structure does not have sufficient reservoir capacity for significant reduction of flood peaks or volume.

In the City of Wausau, a minimal amount of flood protection exists. A levee just south of the sewage treatment plant offers some protection from flooding, but has gaps in it. Two dams in the area (The American Can Company Dam in Rothschild and the Wausau Dam in Wausau) are used to control discharge as a means of flood protection. As discussed previously, high flood stages do occur upstream from the Wausau Dam.

Both the Domtar Paper Company levee in the Village of Rothschild, and the City of Mosinee Wastewater Treatment Plant levee were shown to provide protection from the Wisconsin River base flood on previous FIRMs. During this study, it was determined that these levees may not meet the operation and maintenance requirements of Title 44 of the Code of Federal Regulations, Section 65.10 for certification under the NFIP. Therefore, for the purpose of this study, these levees were assumed to be ineffective.

3.0 ENGINEERING METHODS

For the flooding sources studied by detailed methods in the community, standard hydrologic and hydraulic study methods were used to determine the flood-hazard data required for this study. Flood events of a magnitude that 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 1-percent-annual-chance flood in any 50-year period is approximately 40 percent (4 in 10); for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the county at the time of completion of this FIS. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish peak discharge-frequency relationships for each flooding source studied by detailed methods affecting the county.

The City of Athens, the villages of Athens and Marathon City, and the unincorporated areas of Marathon County have a previously printed FIS report. The hydrologic analyses described in those reports have been compiled and summarized below.

Pre-Countywide Analysis:

The hydrologic analyses for the unincorporated areas of Marathon County on the Wisconsin River near the City of Mosinee were taken from the Mosinee, Wisconsin Flood Insurance Study (Reference 3). For the Wisconsin River in central Marathon County, peak discharges for floods of 10-, 2-, and 1-percent annual chance recurrence intervals were based on data previously developed for the WDNR by the USGS (Reference 4).

For the Big Rib River and Eau Claire River in unincorporated Marathon County, flood frequency data were based on statistical analysis of stage-discharge records from gaging stations operated by the USGS. The Big Rib River gage at Rib Falls (Gage No. 05396000) has 33 years of record and the Eau Claire River gage (Gage No. 05397500) at Kelly has 52 years of record. These analyses followed the standard log-Pearson Type III method as outlined by the U.S. Water Resources Council (WRC) (Reference 5). These discharge-frequency relationships were transformed to other locations on the river using a drainage-area discharge analysis.

Peak discharges for the Little Rib River, Bull Junior Creek, and Johnson Creek in unincorporated Marathon County were computed using regional flood frequency equations (Reference 6) and compared to a log-Pearson Type III analysis of the Big Rib River at Rib Falls. Discharges for the 0.2- percent annual chance flood of all streams studied in detail in unincorporated Marathon County were determined by straight-line extrapolation of the calculated frequency curves on log-probability paper. The decrease in discharge going downstream Bull Junior Creek in the unincorporated areas of Marathon County is the result of water overtopping the roads near the intersection of U.S. Highway 51 and Kowalski Road. This water leaves the stream, following other paths to the Wisconsin River.

In the Village of Athens, values for the 10-, 2-, and 1-percent flood discharges at the eastern corporate limit and Degner Street for Black Creek were calculated using regional equations developed by Conger (Reference 6). The Conger method employs the following independent variables in a multiple-regression analysis: drainage area, main channel slope, lake and marsh area, main channel length, forest cover, soil index, precipitation intensity, and areal factors. The 0.2-percent flood discharges were defined by extension of the calculated frequency curve on a log-probability plot. Discharge values for the 10- and 2-percent discharges at the confluence with Black Creek for Potato Creek were calculated using the same regional equations (Reference 6). The 1- and 0.2-percent flood discharges were defined by extension of the calculated frequency curve on a log probability plot. The calculated discharges for Black Creek and Potato Creek correlated well with analyses of gage station data on other streams nearby.

In the Village of Athens, gage stations near the Black Creek include the New Wood River gage near Merrill with a record from 1952 to 1975; the Prairie River gage near Merrill with a record from 1921 to 1975; the Big Sandy Creek gage near Wausau with a record from 1963 to 1975; and the Big Eau Pleine gage near Colby with a record from 1962 to 1975. Gage stations near Potato Creek include the Bull Junior Creek gage near Rothschild with a record from 1967 to 1975; and the Pet Brook gage near Edgar with a record from 1961 to 1975. The gage data were made in accordance with the U.S. Water Resources Council Bulletin No. 17 (Reference 7).

In the Village of Marathon City, data from the USGS stream flow gaging station (no. 05-3960.00) located on the Big Rib River at Rib Falls were used in a log-Pearson Type III statistical analysis (Reference 7). The statistical analysis of the observed annual peak discharge values provided estimates of the l0-, 2-, l-, and 0.2-percent peak flood discharges. These were transferred to the downstream corporate limit and to State Highway 107 in Marathon City by a drainage-area ratio method. The discharge values were coordinated with the Marathon County FIS (Reference 8).

For the City of Wausau, flood-frequency discharges for the Wisconsin River at Rothschild and at Merrill were based on a study of all the stream flow gaging stations on the Wisconsin River by the USACE and the USGS. The flood-frequency

discharges for the Wisconsin River at Merrill were multiplied by the drainage area ratio between Wausau and Merrill to determine the corresponding discharges in Wausau upstream from the River. Merrill is about thirteen river miles upstream of Wausau.

In the City of Wausau, flood-frequency data available for the Wisconsin River at Rothschild, the Rib River at Rib Falls, and the Eau Claire River at Kelly were used to determine the flood-frequency discharges in Wausau for the Wisconsin River just downstream from the Rib River. A comparison of the peak discharges at these gaging stations with peak discharges of record in Wisconsin and other states is presented in Figure 1. The peak discharges recorded in Wisconsin are lower than those shown for other states for similar size drainage areas. The Wisconsin flood peaks plotted have recurrence intervals ranging from about 25 years to somewhat greater than 100 years. All flood peaks shown for other states, however, are for outstanding floods. Therefore, it is logical that most of the Wisconsin data points plot lower than the out-of-state data. In central Wisconsin, much greater peak discharges have occurred on the Rib River at Rib Falls than on the Eau Claire River at Kelly, although the drainage areas are nearly the same. This is primarily due to marked differences in basin characteristics. The Rib River drains an area underlain by impermeable crystalline rock overlain by thin glacial drift. The Eau Claire River, on the other hand, drains an area underlain by thick, extensive, and permeable glacial outwash (Reference 9).

In the City of Wausau, flood-frequency curves for the Eau Claire River at Kelly were developed from data in a report by Conger (Reference 6). Flood-frequency data for the Eau Claire River at the dam in Schofield were taken from Gannon (Reference 10).

A flood-frequency curve was computed in the City of Wausau for the Jim Moore Creek at the mouth of the Wisconsin River using a regional analysis (Reference 6). Flood discharges may be lower downstream from the golf course culvert than upstream because storage capacity in the backwater areas temporarily holds some of the floodwaters. Storage analyses were not made, however, in the computation of the flood-frequency discharges used in this study for Jim Moore Creek.

The City of Wausau Dam complex was analyzed using various methods in an attempt to develop a stage-discharge relationship that would fit available historic data near Barker's Island. These data were flood stages with peak discharges of about 23,000 cfs (May 1973) and 50,000 cfs (September 1941). The final method used was based on work compiled by Matthai (Reference 11). The basic equation in Matthai's report includes a discharge coefficient that was adjusted for this study to get the computed data to fit the historical data. A slope conveyance rating at Barker's Island also fits these historical data, but was concave down when plotted graphically, whereas the previous rating was concave up. The relationship based on Matthai was considered to be the better of the two.

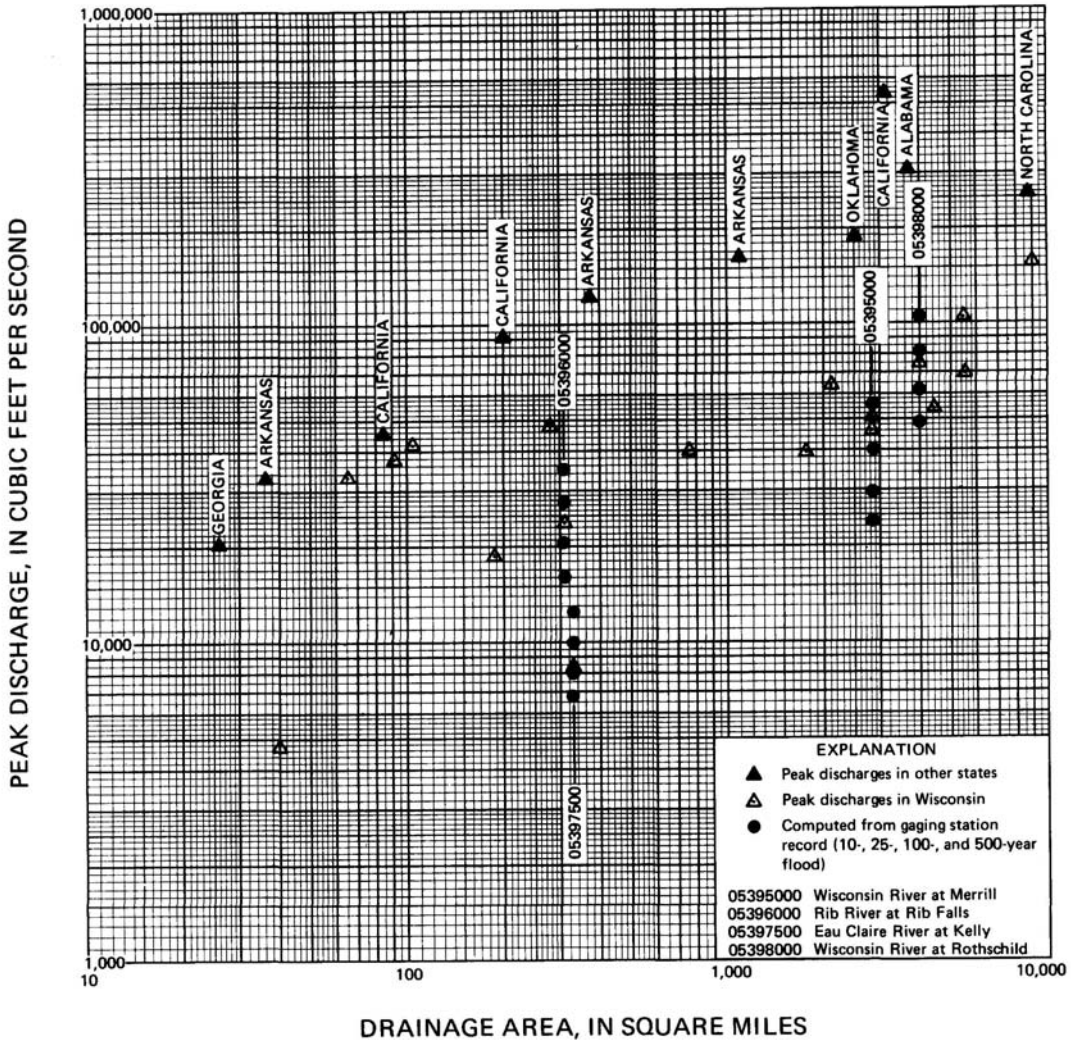


FIGURE 1	FEDERAL EMERGENCY MANAGEMENT AGENCY **MARATHON COUNTY, WI (AND INCORPORATED AREAS)**	**FREQUENCY – DISCHARGE, DRAINAGE AREA CURVES** **WISCONSIN RIVER, RIB RIVER, AND EAU CLAIRE RIVER**

This Countywide Analysis:

Flow rates for the Wisconsin River from the Dam at Mosinee to the Dam at Rothschild were updated to match data included in a 1980 USGS study (Reference 12). The 10-, 2-, and 0.2-percent flows match the unregulated annual maximum flows for gaging station 05398000 at Rothschild. The 1-percent flow represents the regulated annual maximum flow at the Rothschild gage.

A summary of the drainage area-peak discharge relationships for all of the streams studied by detailed methods is shown in Table 5, "Summary of Discharges".

TABLE 5 – SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-PERCENT ANNUAL CHANCE	2-PERCENT ANNUAL CHANCE	1-PERCENT ANNUAL CHANCE	0.2-PERCENT ANNUAL CHANCE
BIG RIB RIVER					
At confluence with Wisconsin River	489	22,400	35,600	41,600	54,600
Just upstream from Little Rib River	404	19,750	31,450	36,750	48,200
At Chicago and North Western railroad bridge	386	19,200	30,550	35,700	46,800
Just upstream from Artus Creek	372	18,750	29,800	34,850	45,700
At State Highway 107 at Marathon City	365	18,500	29,450	34,400	45,150
BLACK CREEK					
At east corporate limit of Athens	52.5	3,020	5,000	5,950	8,450
At Degner Street in Athens	40.5	2,400	4,050	4,820	7,000
BULL JUNIOR CREEK					
At confluence with Wisconsin River	37	940	1,590	1,940	2,790
At Adar Road	30	790	1,370	1,640	2,390
At County Highway X	27	950	1,530	1,800	2,550
At Town Road	15	930	1,500	1,750	2,450
EAU CLAIRE RIVER					
At Chicago, Milwaukee, St. Paul, & Pacific Railroad bridge at Schofield corporate limit	454	8,100	11,000	12,000	15,000
Just west of County Highway SS, at USGS Gaging Station at Kelly	375	6,500	8,960	9,900	12,000

TABLE 5 – SUMMARY OF DISCHARGES
(continued)

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-PERCENT ANNUAL CHANCE	2-PERCENT ANNUAL CHANCE	1-PERCENT ANNUAL CHANCE	0.2-PERCENT ANNUAL CHANCE
JOHNSON CREEK					
At County Highway C	29	1,500	2,400	2,850	3,950
At County Highway X	25	1,400	2,200	2,600	3,600
2,900 feet east and 300 feet north of the intersection of Locker Road and County Highway X	21	1,200	1,900	2,250	3,100
3,250 feet east and 5,050 feet north of the intersection of Locker Road and County Highway X	17	1,000	1,600	1,900	2,600
At State Highway 153	12	730	1,150	1,350	1,850
LITTLE RIB RIVER					
At confluence with Big Rib River	80.1	6,600	12,050	15,150	24,000
POTATO CREEK					
At confluence with Black Creek	11.8	1,100	1,850	2,200	3,100
WISCONSIN RIVER					
At Rothschild	4,000	49,000	63,000	64,000	80,000
Just upstream of Eau Claire River	3,590	42,000	61,800	71,100	94,100
At Washington Street in Wausau		18,125[1]/ 8,325[2]	29,000[1]/ 9,110[2]	34,680[1]/ 9,920[2]	47,224[1]/ 13,900[2]
Just upstream of Big Rib River	3,100	25,600	37,900	44,600	61,300

[1]West Channel [2]East Channel

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 City of Athens, the villages of Athens and Marathon City, and the unincorporated areas of Marathon County have a previously printed FIS report. The hydraulic analyses described in those reports have been compiled and summarized below.

Pre-Countywide Analysis:

Within the unincorporated areas of Marathon County, the Big Rib River and the Wisconsin River were found to have similar discharges at their confluence and have historically flooded simultaneously. Starting water surface elevations for the Big Rib River were taken from established flood profiles on the Wisconsin River (Reference 4). The step-backwater analysis for the 10-, 2-, l-, and 0.2-percent flood profiles on the Little Rib River were started from the 10-percent flood elevation on the Big Rib River.

On the Eau Claire River within unincorporated Marathon County, starting water-surface elevations (WSEL) were computed by standard procedures for computation of flow over dams (Reference 13). Starting WSELs for the Wisconsin River were computed by a rating curve at a downstream cross section. Starting WSEL for Bull Junior Creek and Johnson Creek were obtained by using a slope-area method. Water surface elevations of floods of the selected recurrence intervals were computed through use of the USGS E431 step-backwater computer program (Reference 14).

Within unincorporated Marathon County, the hydraulic analyses for the Wisconsin River near the City of Mosinee were taken from the Mosinee, Wisconsin Flood Insurance Study (Reference 3). However, no profiles were presented in the Mosinee FIS and therefore none can be presented in this study for the Wisconsin River near Mosinee.

Bull Junior Creek in unincorporated Marathon County was found to cause shallow flooding around the intersection of U.S. Highway 51 and Kowalski Road. After Bull Junior Creek floodwaters rise high enough to overtop the roads, the water that remains trapped behind the roads may flow either north or south depending on the flooding situation in the area. Depths from one to three feet can be expected.

In unincorporated Marathon County, sections of the Big Eau Pleine River, Eau Claire River, Rib River, Elm River, Big Sandy Creek, Norrie Creek, Dill Creek, South Branch Embarrass River, Comet Creek, Spanges Creek, Little Eau Pleine River, Plover River, upper and lower reaches of the Wisconsin River, lower reaches of Johnson Creek, Trappe River, Little Trappe River, Cain Creek, Little Cain Creek, Camp Creek, Prospect Creek, the 100-year flood elevation was approximated by using Flood-Prone Area Maps (Reference 15). For Black Creek, Beaver Creek, West Fork Rib River, Potato Creek, and Drewek Creek, the 1-percent flood elevation was approximated by aerial photographs (Reference 16).

Cross section data for Black Creek and Potato Creek in the Village of Athens were obtained from field surveys by the USGS. The source of starting water-surface elevations for the Black Creek was obtained by a slope-conveyance rating downstream from the Athens corporate limits. Starting water-surface elevations for the Potato Creek were obtained by a critical depth elevation at initial cross sections. Profiles of the l0-, 2-, l-, and 0.2-percent floods on Black Creek and Potato Creek

were computed by the standard step-backwater method using the USGS E431 computer program (Reference 14). Input to these analyses consisted of stream valley cross sections, bridge and culvert geometry, surface roughness, and peak-discharge data. The analysis for the elevation of the portion of Potato Creek studied by approximate methods included interpretation of aerial photographs (Reference 17), field observations, and best engineering judgment.

The starting water-surface elevations for the Big Rib River in the Village of Marathon City were obtained from the Marathon County FIS (Reference 8). Profiles for the l0-, 2-, l-, and 0.2-percent floods on the Big Rib River at Marathon City were also computed by the standard step-backwater method using the USGS E431 model (Reference 14). Input to the above analyses consisted of stream valley cross sections, bridge geometry, surface roughness, and peak discharge data.

Flood–frequency profiles in the City of Wausau on the Wisconsin River below the Wausau Dam were computed using step-backwater analysis. The starting elevations were taken from Krug and Grant (Reference 18). The computed profiles compare favorably and historic data for the 1941 flood. Above the Wausau Dam complex, at the Memorial Bridge, the starting elevations of flood profiles were determined on work based on Matthai (Reference 11). The Eau Claire River flood profiles in the City were taken from a previous study by Krug and Grant (Reference 18).

The starting elevations for the flood-frequency profiles for Jim Moore Creek in the City of Wausau were based on a slope-conveyance rating at the downstream side of Tenth Street. The slope used was that computed from the stage and discharge for a flood in September of 1972. Data on flood frequency discharges for the Tenth Street Bridge were obtained from the flood-frequency curves included in a Flood Report by the USGS. The 1-percent discharge at this bridge, having a drainage area of approximately 7.32 square miles, was determined to be 3,720 cfs from the above flood-frequency curve.

This Countywide Analysis:

The Wisconsin River from the Dam at Mosinee to the Dam at Rothschild was updated using a 1991 HEC-2 model completed by the USGS. Model includes updated flow rates as discussed in the Hydrologic section. The HEC-2 model was not only an update from the effective E431 model for this portion of the Wisconsin River, but also included additional surveyed cross sections at key points developed by the USACE.

The effective 1979 USGS Step Backwater Program results were used to extend the Eau Claire River profile to its mouth within the Eau Claire Flowage.

Roughness factors (Manning's "n" values) used in the hydraulic computations were chosen by engineering judgment and were based on field observations of the streams

and floodplain areas. Roughness factors for all streams studied by detailed methods are shown in Table 6, "Manning's “n” Values."

TABLE 6 – MANNING'S “n” VALUES

Stream	Channel “n”	Overbank “n”
Black Creek	0.035 – 0.065	0.055 – 0.110
Bull Junior Creek	0.040 – 0.045	0.050 – 0.120
Eau Claire River	0.035 – 0.050	0.050 – 0.150
Johnson Creek	0.040 – 0.055	0.060 – 0.150
Little Rib River	0.032 – 0.055	0.045 – 0.150
Potato Creek	0.035	0.065 – 0.110
Wisconsin River	0.026 – 0.050	0.050 – 0.110

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 (NGVD29). With the completion of the North American Vertical Datum of 1988 (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 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 Marathon County is 0.0 feet.

For additional 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:

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

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1-percent annual chance (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 within the unincorporated areas of Marathon County, the boundaries were interpolated using 7.5-minute series topographic maps at a scale of 1:24000, with a contour interval of 10 feet (Reference 19), and 15-Minute Series topographic maps at a scale of 1:62500 with a contour interval of 10 feet (Reference 20).

Between the cross sections within the Village of Athens, boundaries were interpolated using USGS quadrangle maps and aerial photos modified by familiarity with the topography of the valleys (References 17 and 21). The boundary of the floodway was delineated using the left and right flowage limits of the cross sections which, in almost all cases, coincided with the 1-percent annual chance natural valley flood limits. The approximate flood boundaries were delineated using the same topographic maps (Reference 21).

Between the cross sections within the Village of Marathon City, the boundaries were interpolated using topographic maps enlarged to a scale of 1:4800 (Reference 22), aerial photographs (Reference 23), and field inspection.

For this countywide study, the 1- and 0.2-percent annual chance floodplain boundaries in the City of Wausau and the Town of Rib Mountain were re-delineated using a digital terrain model that meets the National Map Accuracy Standards for mapping at a scale of 1:1200. Floodplain boundaries were also redelineated in the Village of Weston using 2-foot contours that meet National Map Accuracy Standards for mapping at a scale of 1:2400. Floodplain boundaries in the remainder of the county were digitally converted from the previously effective FIRM.

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

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

4.2 Floodways

Encroachment on floodplains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the NFIP, a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of the 1-percent-annual-chance floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent floodplain areas, that must be kept free of encroachment so that the base flood can be carried without substantial increases in flood heights. Minimum Federal

standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced. However, Wisconsin has established a more strict policy and does not allow any increase in the regional flood height for flood fringe developments (Reference 24). The increase shown in Table 7, "Floodway Data" for certain stream segments were calculated before this policy went into effect, and are shown as the regulatory elevation to remain in compliance with the current regulation. The floodways in this FIS are presented to local agencies as minimum standards that can be adopted directly or that can be used as a basis for additional floodway studies.

The floodways presented in this 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"). The computed floodways are shown on the FIRM (Exhibit 2). In cases where the floodway and 1-percent-annual-chance floodplain boundaries are either close together or collinear, only the floodway boundary is shown.

For this countywide study, floodways computed in the 1973 USGS study (Reference 4) for the Wisconsin River, Eau Claire River, and Jim Moore Creek were added.

For this countywide study's redelineation efforts, the floodways were not recalculated. As a result, there were areas where the previous floodway did not fit within the boundaries of the redelineated 1-percent annual chance floodplain. In these areas, the floodway was reduced. Water surface elevations, with and without a floodway, the mean velocity in the floodway, and the location and area at each surveyed cross section as determined by the hydraulic methods can be seen in Table 7.

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 2, "Floodway Schematic."

FLOODING SOURCE		FLOODWAY			1-PERCENT-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
BIG RIB RIVER								
A	2,746	1,932	20,560	2.0	1,167.5	1,167.5	1,167.5	0.0
B	3,854	3,042	29,560	1.4	1,167.6	1,167.6	1,167.6	0.0
C	7,075	3,268	21,960	1.9	1,168.1	1,168.1	1,168.1	0.0
D	7,920	2,533	14,540	2.9	1,168.6	1,168.6	1,168.6	0.0
E	10,138	1,955	13,880	3.0	1,169.9	1,169.9	1,169.9	0.0
F	12,038	2,415	18,035	2.3	1,171.0	1,171.0	1,171.0	0.0
G	15,048	3,435	19,860	1.9	1,172.4	1,172.4	1,172.4	0.0
H	20,909	2,144	19,150	1.9	1,174.2	1,174.2	1,174.2	0.0
I	22,651	2,088	16,820	2.2	1,175.2	1,175.2	1,175.2	0.0
J	24,130	3,177	23,630	1.6	1,176.5	1,176.5	1,176.5	0.0
K	24,922	3,141	21,510	1.7	1,176.8	1,176.8	1,176.8	0.0
L	27,350	3,450	24,480	1.5	1,177.9	1,177.9	1,177.9	0.0
M	29,040	3,890	21,040	1.8	1,178.8	1,178.8	1,178.8	0.0
N	30,835	3,757	29,260	1.3	1,179.5	1,179.5	1,179.5	0.0
O	33,528	3,323	25,190	1.5	1,180.3	1,180.3	1,180.3	0.0
P	34,637	3,700	22,420	1.6	1,181.0	1,181.0	1,181.0	0.0
Q	36,960	1,979	14,110	2.6	1,182.3	1,182.3	1,182.3	0.0
R	37,910	2,998	16,170	2.3	1,182.7	1,182.7	1,182.7	0.0
S	39,811	2,722	21,930	1.7	1,184.7	1,184.7	1,184.7	0.0
T	41,078	2,772	22,910	1.6	1,185.3	1,185.3	1,185.3	0.0
U	42,346	2,820	21,400	1.7	1,185.9	1,185.9	1,185.9	0.0
V	43,243	2,012	16,360	2.3	1,186.4	1,186.4	1,186.4	0.0
W	44,141	1,450	12,340	2.9	1,187.2	1,187.2	1,187.2	0.0
X	44,669	604	6,280	5.7	1,187.5	1,187.5	1,187.5	0.0
Y	45,619	863	8,990	4.0	1,188.5	1,188.5	1,188.5	0.0

[1]FEET ABOVE CONFLUENCE WITH WISCONSIN RIVER

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARATHON COUNTY, WI

AND INCORPORATED AREAS

FLOODWAY DATA

BIG RIB RIVER

FLOODING SOURCE		FLOODWAY			1-PERCENT-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
BIG RIB RIVER (CONTINUED)								
Z	46,253	916	8,240	4.3	1,189.5	1,189.5	1,189.5	0.0
AA	47,045	1,231	10,750	3.3	1,190.6	1,190.6	1,190.6	0.0
AB	47,942	1,289	11,570	3.1	1,191.0	1,191.0	1,191.0	0.0
AC	48,998	1,650	15,760	2.3	1,191.7	1,191.7	1,191.7	0.0
AD	49,843	2,427	20,620	1.7	1,192.2	1,192.2	1,192.2	0.0
AE	50,688	2,415	17,890	2.0	1,192.7	1,192.7	1,192.7	0.0
AF	51,586	2,006	21,230	1.7	1,193.3	1,193.3	1,193.3	0.0
AG	52,483	2,501	21,580	1.7	1,193.7	1,193.7	1,193.7	0.0
AH	53,222	2,629	28,050	1.3	1,194.2	1,194.2	1,194.2	0.0
AI	54,490	1,517	13,280	2.7	1,194.4	1,194.4	1,194.4	0.0
AJ	55,282	1,668	21,410	1.7	1,194.9	1,194.9	1,194.9	0.0
AK	55,915	1,916	20,560	1.7	1,195.0	1,195.0	1,195.0	0.0
AL	56,813	2,111	13,660	2.6	1,195.3	1,195.3	1,195.3	0.0
AM	57,710	2,550	27,570	1.3	1,196.1	1,196.1	1,196.1	0.0
AN	59,875	3,054	28,250	1.2	1,196.2	1,196.2	1,196.2	0.0
AO	60,720	2,647	13,930	2.5	1,196.2	1,196.2	1,196.2	0.0
AP	61,459	1,821	8,200	4.3	1,196.5	1,196.5	1,196.5	0.0
AQ	62,357	1,515	10,410	3.4	1,197.1	1,197.1	1,197.1	0.0
AR	64,310	2,499	12,720	2.7	1,198.7	1,198.7	1,198.7	0.0
AS	64,786	2,224	13,710	2.5	1,199.9	1,199.9	1,199.9	0.0
AT	66,211	1,643	10,390	3.4	1,201.1	1,201.1	1,201.1	0.0
AU	67,267	1,699	11,000	3.2	1,202.3	1,202.3	1,202.3	0.0
AV	68,218	1,900	11,770	3.0	1,202.8	1,202.8	1,202.8	0.0
AW	72,547	2,080	20,700	1.7	1,203.8	1,203.8	1,203.8	0.0

[1]FEET ABOVE CONFLUENCE WITH WISCONSIN RIVER

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARATHON COUNTY, WI

AND INCORPORATED AREAS

FLOODWAY DATA

BIG RIB RIVER

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
BIG RIB RIVER (CONTINUED)								
AX	73,709[1]	1,870	14,500	2.4	1,204.0	1,204.0	1,204.0	0.0
AY	74,501[1]	960	10,600	3.2	1,204.3	1,204.3	1,204.3	0.0
AZ	75,134[1]	860	9,500	3.6	1,204.5	1,204.5	1,204.5	0.0
BA	76,085[1]	1,570	11,300	3.1	1,205.0	1,205.0	1,205.0	0.0
BB	78,302[1]	1,610	14,600	2.4	1,205.7	1,205.7	1,205.7	0.0
BC	80,995[1]	1,443	12,710	2.7	1,206.7	1,206.7	1,206.7	0.0
BD	82,685[1]	797	7,260	4.7	1,208.2	1,208.2	1,208.2	0.0
BLACK CREEK								
A	40,392[2]	275	916	6.5	1,313.2	1,313.2	1,313.2	0.0
B	40,814[2]	340	1,280	4.7	1,315.4	1,315.4	1,315.4	0.0
C	41,184[2]	190	945	6.3	1,316.2	1,316.2	1,316.2	0.0
D	41,976[2]	220	981	4.9	1,318.5	1,318.5	1,318.5	0.0
E	42,451[2]	260	1,020	4.7	1,320.7	1,320.7	1,320.7	0.0
F	42,874[2]	390	888	5.4	1,322.4	1,322.4	1,322.4	0.0
G	43,296[2]	140	802	6.0	1,324.2	1,324.2	1,324.2	0.0
H	43,507[2]	200	1,260	3.9	1,327.3	1,327.3	1,327.3	0.0
I	43,824[2]	370	1,710	2.8	1,327.8	1,327.8	1,327.8	0.0
J	44,246[2]	130	731	6.6	1,328.0	1,328.0	1,328.0	0.0
K	44,669[2]	130	812	5.9	1,330.1	1,330.1	1,330.1	0.0
L	45,038[2]	160	961	5.0	1,331.6	1,331.6	1,331.6	0.0
M	45,355[2]	90	428	11.3	1,335.2	1,335.2	1,335.2	0.0
N	45,619[2]	170	1,120	4.3	1,339.9	1,339.9	1,339.9	0.0
O	45,936[2]	100	472	10.2	1,341.6	1,341.6	1,341.6	0.0

[1]FEET ABOVE CONFLUENCE WITH WISCONSIN RIVER, [2]FEET ABOVE CONFLUENCE WITH BIG RIB RIVER

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARATHON COUNTY, WI

AND INCORPORATED AREAS

FLOODWAY DATA

BIG RIB RIVER - BLACK CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
BLACK CREEK (CONTINUED)								
P	46,200[1]	110	509	9.5	1,348.2	1,348.2	1,348.2	0.0
Q	46,886[1]	130	619	7.8	1,353.7	1,353.7	1,353.7	0.0
R	47,678[1]	170	1,050	4.6	1,358.2	1,358.2	1,358.2	0.0
S	47,890[1]	240	1,460	3.3	1,361.4	1,361.4	1,361.4	0.0
T	49,421[1]	450	2,360	2.1	1,362.8	1,362.8	1,362.8	0.0
BULL JUNIOR CREEK								
A	637[2]	149	315	6.2	1,146.7	1,141.3[3]	1,141.3	0.0
B	845[2]	350	955	2.0	1,146.7	1,142.9[3]	1,142.9	0.0
C	1,056[2]	300	875	2.2	1,146.7	1,143.1[3]	1,143.1	0.0
D	1,848[2]	208	715	2.7	1,146.7	1,144.1[3]	1,144.1	0.0
E	2534[2]	160	465	4.2	1,146.7	1,146.3[3]	1,146.3	0.0
F	3,168[2]	233	775	2.5	1,148.0	1,148.0	1,148.0	0.0
G	3,590[2]	121	285	6.8	1,148.7	1,148.7	1,148.7	0.0
H	4,013[2]	134	565	3.4	1,151.4	1,151.4	1,151.4	0.0
I	4,118[2]	81	560	3.5	1,152.8	1,152.8	1,152.8	0.0
J	4,171[2]	94	380	5.1	1,152.8	1,152.8	1,152.8	0.0
K	5,016[2]	434	1,905	1.0	1,153.6	1,153.6	1,153.6	0.0
L	5,914[2]	278	1,190	1.6	1,153.8	1,153.8	1,153.8	0.0
M	6,706[2]	233	850	2.3	1,154.2	1,154.2	1,154.2	0.0
N	6,917[2]	114	495	3.9	1,154.3	1,154.3	1,154.3	0.0
O	7,709[2]	171	620	3.1	1,155.4	1,155.4	1,155.4	0.0
P	8,448[2]	183	685	2.8	1,156.2	1,156.2	1,156.2	0.0
Q	9,293[2]	344	1,275	1.5	1,157.2	1,157.2	1,157.2	0.0

[1]FEET ABOVE CONFLUENCE WITH BIG RIB RIVER, [2]FEET ABOVE MOUTH AT WISCONSIN RIVER, [3]ELEVATION COMPUTED WITHOUT CONSIDERATION OF BACKWATER EFFECTS FROM WISCONSIN RIVER

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARATHON COUNTY, WI

AND INCORPORATED AREAS

FLOODWAY DATA

BLACK CREEK - BULL JUNIOR CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT-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
BULL JUNIOR CREEK (CONTINUED)								
R	10,402	919	2,305	0.8	1,157.8	1,157.8	1,157.8	0.0
S	12,619	784	2,190	0.9	1,158.7	1,158.7	1,158.7	0.0
T	14,256	429	725	2.7	1,160.8	1,160.8	1,160.8	0.0
U	14,362	530	1,104	1.8	1,161.2	1,161.2	1,161.2	0.0
V	15,734	427	88	2.2	1,162.4	1,162.4	1,162.4	0.0
W	16,579	324	1,000	2.0	1,163.4	1,163.4	1,163.4	0.0
X	18,110	391	1,115	1.7	1,164.6	1,164.6	1,164.6	0.0
Y	19,166	640	1,400	1.4	1,165.6	1,165.6	1,165.6	0.0
Z	20,381	474	1,305	1.5	1,166.6	1,166.6	1,166.6	0.0
AA	21,278	885	2,140	0.9	1,167.2	1,167.2	1,167.2	0.0
AB	22,704	563	1,185	1.6	1,168.3	1,168.3	1,168.3	0.0
AC	23,496	695	1,795	1.1	1,168.9	1,168.9	1,168.9	0.0
AD	24,552	728	1,660	1.2	1,169.4	1,169.4	1,169.4	0.0
AE	25,450	720	2,650	0.7	1,169.8	1,169.8	1,169.8	0.0
AF	27,086	886	1,365	1.4	1,170.3	1,170.3	1,170.3	0.0
AG	28,248	230	455	3.6	1,172.8	1,172.8	1,172.8	0.0
AH	28,406	662	1,845	0.8	1,173.6	1,173.6	1,173.6	0.0
AI	29,410	631	1,480	1.1	1,173.8	1,173.8	1,173.8	0.0
AJ	30,466	1,110	1,185	1.4	1,174.7	1,174.7	1,174.7	0.0
AK	31,574	1,011	2,240	0.2	1,175.8	1,175.8	1,175.8	0.0
AL	32,472	773	1,415	1.2	1,176.1	1,176.1	1,176.1	0.0
AM	33,000	579	1,300	1.4	1,176.7	1,176.7	1,176.7	0.0
AN	33,581	584	1,285	1.4	1,177.4	1,177.4	1,177.4	0.0
AO	34,531	749	2,000	0.9	1,178.3	1,178.3	1,178.3	0.0

[1]FEET ABOVE MOUTH AT WISCONSIN RIVER

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARATHON COUNTY, WI

AND INCORPORATED AREAS

FLOODWAY DATA

BULL JUNIOR CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT-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
BULL JUNIOR CREEK (CONTINUED)								
AP	35,957	802	2,370	0.8	1,178.6	1,178.6	1,178.6	0.0
AQ	37,013	671	1,665	1.1	1,179.4	1,179.4	1,179.4	0.0
AR	38,491	821	2,230	0.8	1,180.3	1,180.3	1,180.3	0.0
AS	39,811	728	1,840	1.0	1,181.0	1,181.0	1,181.0	0.0
AT	41,237	736	1,785	1.0	1,181.6	1,181.6	1,181.6	0.0
AU	42,821	852	1,290	1.4	1,183.3	1,183.3	1,183.3	0.0
AV	43,666	514	1,855	1.0	1,184.1	1,184.1	1,184.1	0.0
AW	44,774	562	1,685	1.1	1,184.4	1,184.4	1,184.4	0.0
AX	45,408	582	1,635	1.1	1,184.8	1,184.8	1,184.8	0.0
AY	45,514	454	1,485	1.2	1,185.7	1,185.7	1,185.7	0.0
AZ	46,517	532	1,575	1.1	1,186.1	1,186.1	1,186.1	0.0
BA	47,784	312	800	2.2	1,187.1	1,187.1	1,187.1	0.0
BB	49,104	643	1,630	1.1	1,189.0	1,189.0	1,189.0	0.0
BC	50,054	533	1,520	1.2	1,189.9	1,189.9	1,189.9	0.0
BD	51,269	443	1,200	1.5	1,191.2	1,191.2	1,191.2	0.0
BE	52,272	490	1,175	1.5	1,192.3	1,192.3	1,192.3	0.0
BF	53,170	297	885	2.0	1,193.5	1,193.5	1,193.5	0.0
BG	54,120	206	580	1.9	1,194.4	1,194.4	1,194.4	0.0
BH	55,440	361	1,215	0.9	1,194.9	1,194.9	1,194.9	0.0
EAU CLAIRE RIVER								
A	7,339	336	2,055	5.8	1,169.6	1,169.6	1,169.6	0.0
B	8,501	372	2,442	4.9	1,171.3	1,171.3	1,171.3	0.0
C	9,451	722	3,696	3.2	1,172.1	1,172.1	1,172.1	0.0

[1]FEET ABOVE MOUTH AT WISCONSIN RIVER

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARATHON COUNTY, WI

AND INCORPORATED AREAS

FLOODWAY DATA

BULL JUNIOR CREEK - EAU CLAIRE RIVER

FLOODING SOURCE		FLOODWAY			1-PERCENT-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
EAU CLAIRE RIVER (CONTINUED)								
D	12,619	1,371	7,045	1.7	1,173.5	1,173.5	1,173.5	0.0
E	13,570	655	3,520	3.4	1,174.2	1,174.2	1,174.2	0.0
F	14,098	713	3,198	3.7	1,174.4	1,174.4	1,174.4	0.0
G	16,262	1,162	5,073	2.4	1,175.4	1,175.4	1,175.4	0.0
H	17,107	1,408	5,902	2.0	1,176.6	1,176.6	1,176.6	0.0
I	20,856	691	3,589	3.3	1,178.5	1,178.5	1,178.5	0.0
J	21,173	374	2,709	4.4	1,178.9	1,178.9	1,178.9	0.0
K	21,384	422	2,862	4.2	1,179.1	1,179.1	1,179.1	0.0
L	22,598	955	6,649	1.8	1,179.8	1,179.8	1,179.8	0.0
M	27,298	1,645	6,056	1.6	1,180.9	1,180.9	1,180.9	0.0
N	29,410	1,247	6,310	1.6	1,182.1	1,182.1	1,182.1	0.0
O	31,363	1,118	4,270	2.3	1,183.2	1,183.2	1,183.2	0.0
P	33,106	566	2,436	4.1	1,185.3	1,185.3	1,185.3	0.0
Q	34,003	239	1,569	6.3	1,186.8	1,186.8	1,186.8	0.0
R	35,218	285	1,846	5.4	1,189.1	1,189.1	1,189.1	0.0
S	35,429	175	1,764	5.6	1,189.3	1,189.3	1,189.3	0.0
T	36,643	228	1,651	6.0	1,191.0	1,191.0	1,191.0	0.0
U	38,122	720	4,036	2.4	1,193.2	1,193.2	1,193.2	0.0
V	39,019	837	4,381	2.3	1,193.9	1,193.9	1,193.9	0.0
W	40,022	1,174	4,560	2.2	1,194.8	1,194.8	1,194.8	0.0
X	41,870	1,319	6,556	1.6	1,197.0	1,197.0	1,197.0	0.0
Y	43,085	1,126	5,963	1.7	1,197.4	1,197.4	1,197.4	0.0
Z	45,091	205	1,265	7.8	1,199.7	1,199.7	1,199.7	0.0
AA	46,517	355	2,470	4.0	1,202.6	1,202.6	1,202.6	0.0

[1]FEET ABOVE MOUTH AT WISCONSIN RIVER

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARATHON COUNTY, WI

AND INCORPORATED AREAS

FLOODWAY DATA

EAU CLAIRE RIVER

FLOODING SOURCE		FLOODWAY			1-PERCENT-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
EAU CLAIRE RIVER (CONTINUED)								
AB	47,731	422	3,003	3.3	1,203.8	1,203.8	1,203.8	0.0
AC	48,946	644	3,409	2.9	1,204.8	1,204.8	1,204.8	0.0
AD	49,790	381	2,566	3.9	1,205.3	1,205.3	1,205.3	0.0
AE	51,322	226	1,616	6.1	1,207.3	1,207.3	1,207.3	0.0
AF	52,958	341	1,363	7.3	1,212.9	1,212.9	1,212.9	0.0
AG	53,170	355	1,932	5.1	1,214.0	1,214.0	1,214.0	0.0
AH	54,226	534	2,950	3.4	1,216.4	1,216.4	1,216.4	0.0
AI	55,176	1,013	5,000	2.0	1,217.7	1,217.7	1,217.7	0.0
AJ	56,760	1,547	4,350	2.3	1,219.5	1,219.5	1,219.5	0.0
AK	58,766	447	2,730	3.6	1,222.0	1,222.0	1,222.0	0.0
AL	60,245	554	1,800	5.5	1,223.9	1,223.9	1,223.9	0.0
AM	62,146	1,513	6,350	1.6	1,226.6	1,226.6	1,226.6	0.0
AN	63,518	1,290	6,230	1.6	1,227.3	1,227.3	1,227.3	0.0
AO	64,838	1,043	4,440	2.2	1,228.3	1,228.3	1,228.3	0.0
AP	66,581	1,254	5,920	1.7	1,229.3	1,229.3	1,229.3	0.0
AQ	69,802	981	3,510	2.8	1,231.2	1,231.2	1,231.2	0.0
AR	71,438	803	3,440	2.9	1,233.9	1,233.9	1,233.9	0.0
AS	72,706	1,381	7,520	1.3	1,235.4	1,235.4	1,235.4	0.0
AT	73,814	498	2,510	3.9	1,236.0	1,236.0	1,236.0	0.0
AU	74,184	467	2,900	3.4	1,237.0	1,237.0	1,237.0	0.0
AV	75,240	937	3,860	2.6	1,237.6	1,237.6	1,237.6	0.0
AW	77,088	734	3,350	3.0	1,239.5	1,239.5	1,239.5	0.0
AX	77,986	788	3,630	2.7	1,240.1	1,240.1	1,240.1	0.0
AY	79,306	931	6,140	1.6	1,240.6	1,240.6	1,240.6	0.0

[1]FEET ABOVE MOUTH AT WISCONSIN RIVER

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARATHON COUNTY, WI

AND INCORPORATED AREAS

FLOODWAY DATA

EAU CLAIRE RIVER

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
EAU CLAIRE RIVER (CONTINUED)								
AZ	81,206[1]	1,012	5,830	1.7	1,241.1	1,241.1	1,241.1	0.0
BA	82,579[1]	553	3,480	2.8	1,241.9	1,241.9	1,241.9	0.0
BB	83,635[1]	526	2,960	3.4	1,243.0	1,243.0	1,243.0	0.0
BC	84,427[1]	558	2,700	3.7	1,243.8	1,243.8	1,243.8	0.0
BD	85,694[1]	630	3,360	2.9	1,245.1	1,245.1	1,245.1	0.0
BE	87,014[1]	339	2,680	3.7	1,246.0	1,246.0	1,246.0	0.0
BF	88,546[1]	313	2,030	4.9	1,247.2	1,247.2	1,247.2	0.0
BG	89,549[1]	545	3,890	2.6	1,248.2	1,248.2	1,248.2	0.0
BH	90,816[1]	642	3,080	3.2	1,248.7	1,248.7	1,248.7	0.0
BI	91,925[1]	561	3,030	3.3	1,249.6	1,249.6	1,249.6	0.0
BJ	92,189[1]	277	2,040	4.9	1,249.7	1,249.7	1,249.7	0.0
JIM MOORE CREEK								
A-K	*	*	*	*	*	*	*	*
JOHNSON CREEK								
A	18,427[2]	770	3,710	0.8	1,127.7	1,127.7	1,127.7	0.0
B	19,589[2]	754	3,350	0.9	1,127.8	1,127.8	1,127.8	0.0
C	20,486[2]	330	1,210	2.4	1,127.9	1,127.9	1,127.9	0.0
D	22,070[2]	351	1,050	2.7	1,129.5	1,129.5	1,129.5	0.0
E	22,968[2]	613	1,970	1.5	1,130.5	1,130.5	1,130.5	0.0
F	24,922[2]	342	1,320	2.2	1,131.2	1,131.2	1,131.2	0.0
G	25,714[2]	277	960	3.0	1,131.9	1,131.9	1,131.9	0.0
H	27,720[2]	446	910	3.1	1,135.1	1,135.1	1,135.1	0.0

[1]FEET ABOVE MOUTH AT WISCONSIN RIVER, [2]FEET ABOVE MOUTH AT LAKE DU BAY, *DATA NOT AVAILABLE

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARATHON COUNTY, WI

AND INCORPORATED AREAS

FLOODWAY DATA

EAU CLAIRE RIVER - JIM MOORE CREEK - JOHNSON CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT-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
JOHNSON CREEK (CONTINUED)								
I	27,826	543	2,640	1.1	1,140.0	1,140.0	1,140.0	0.0
J	28,406	556	3,420	0.8	1,140.1	1,140.1	1,140.1	0.0
K	29,779	454	2,400	1.2	1,140.3	1,140.3	1,140.3	0.0
L	30,677	673	3,890	0.7	1,140.5	1,140.5	1,140.5	0.0
M	31,627	704	2,300	1.2	1,140.6	1,140.6	1,140.6	0.0
N	32,630	177	850	3.4	1,141.2	1,141.2	1,141.2	0.0
O	34,056	263	1,040	2.7	1,142.9	1,142.9	1,142.9	0.0
P	35,323	597	2,540	1.0	1,143.7	1,143.7	1,143.7	0.0
Q	35,640	644	2,230	1.2	1,146.3	1,146.3	1,146.3	0.0
R	36,854	696	1,000	2.6	1,146.7	1,146.7	1,146.7	0.0
S	38,227	840	1,850	1.4	1,148.6	1,148.6	1,148.6	0.0
T	39,178	667	1,400	1.9	1,149.8	1,149.8	1,149.8	0.0
U	40,392	536	1,390	1.9	1,151.8	1,151.8	1,151.8	0.0
V	41,712	613	1,300	1.7	1,154.0	1,154.0	1,154.0	0.0
W	43,349	104	340	6.6	1,157.4	1,157.4	1,157.4	0.0
X	44,616	629	3,040	0.7	1,160.0	1,160.0	1,160.0	0.0
Y	46,042	299	640	3.5	1,160.5	1,160.5	1,160.5	0.0
Z	47,256	563	1,080	2.1	1,163.4	1,163.4	1,163.4	0.0
AA	48,206	298	810	2.8	1,165.4	1,165.4	1,165.4	0.0
AB	49,157	435	1,000	1.9	1,167.0	1,167.0	1,167.0	0.0
AC	49,843	413	920	2.1	1,167.8	1,167.8	1,167.8	0.0
AD	50,635	447	720	2.6	1,169.7	1,169.7	1,169.7	0.0
AE	51,902	432	1,270	1.5	1,171.2	1,171.2	1,171.2	0.0
AF	53,222	185	430	4.5	1,173.1	1,173.1	1,173.1	0.0

[1]FEET ABOVE MOUTH AT LAKE DU BAY

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARATHON COUNTY, WI

AND INCORPORATED AREAS

FLOODWAY DATA

JOHNSON CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
JOHNSON CREEK (CONTINUED)								
AG	54,331[1]	294	1,170	1.6	1,175.7	1,175.7	1,175.7	0.0
AH	56,021[1]	49	220	8.8	1,178.1	1,178.1	1,178.1	0.0
AI	56,179[1]	680	1,900	1.0	1,180.4	1,180.4	1,180.4	0.0
AJ	57,288[1]	752	650	2.9	1,181.2	1,181.2	1,181.2	0.0
AK	58,186[1]	203	480	3.9	1,183.8	1,183.8	1,183.8	0.0
AL	59,770[1]	129	390	4.8	1,187.1	1,187.1	1,187.1	0.0
AM	59,928[1]	282	1,320	1.4	1,191.1	1,191.1	1,191.1	0.0
AN	61,406[1]	242	720	2.6	1,191.9	1,191.9	1,191.9	0.0
AO	62,462[1]	179	640	3.0	1,193.0	1,193.0	1,193.0	0.0
AP	63,466[1]	228	580	3.3	1,195.0	1,195.0	1,195.0	0.0
AQ	64,258[1]	258	510	2.7	1,198.4	1,198.4	1,198.4	0.0
AR	65,314[1]	76	220	6.3	1,201.9	1,201.9	1,201.9	0.0
AS	66,634[1]	250	610	2.2	1,206.1	1,206.1	1,206.1	0.0
AT	67,267[1]	161	340	4.0	1,208.1	1,208.1	1,208.1	0.0
LITTLE RIB RIVER								
A	4,910[2]	856	6,190	2.4	1,173.7	1,173.7	1,173.7	0.0
B	5,386[2]	1,000	6,360	2.3	1,174.6	1,174.6	1,174.6	0.0
C	5,966[2]	804	6,036	2.5	1,175.3	1,175.3	1,175.3	0.0
D	6,230[2]	594	5,696	2.7	1,175.5	1,175.5	1,175.5	0.0
E	6,917[2]	500	5,524	2.7	1,176.1	1,176.1	1,176.1	0.0
F	7,234[2]	180	1,690	9.0	1,176.2	1,176.2	1,176.2	0.0
G	7,392[2]	146	1,687	9.0	1,176.2	1,176.2	1,176.2	0.0
H	7,814[2]	157	1,482	10.2	1,178.3	1,178.3	1,178.3	0.0

[1]FEET ABOVE MOUTH AT LAKE DU BAY, [2]FEET ABOVE CONFLUENCE WITH BIG RIB RIVER

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARATHON COUNTY, WI

AND INCORPORATED AREAS

FLOODWAY DATA

JOHNSON CREEK - LITTLE RIB RIVER

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
LITTLE RIB RIVER								
I	7,867[1]	715	8,530	1.8	1,181.2	1,181.2	1,181.2	0.0
J	9,082[1]	1,092	12,713	1.2	1,181.6	1,181.6	1,181.6	0.0
K	9,926[1]	1,104	13,290	1.1	1,181.8	1,181.8	1,181.8	0.0
L	10,560[1]	1,249	14,004	1.1	1,181.9	1,181.9	1,181.9	0.0
M	11,458[1]	850	8,423	1.8	1,182.4	1,182.4	1,182.4	0.0
POTATO CREEK								
A	370[2]	50	205	10.8	1,317.9	1,314.9[3]	1,314.9	0.0
B	528[2]	240	416	5.3	1,319.3	1,319.3	1,319.3	0.0
C	845[2]	240	446	4.9	1,320.5	1,320.5	1,320.5	0.0
D	950[2]	150	589	3.7	1,323.0	1,323.0	1,323.0	0.0
E	1,267[2]	215	528	4.2	1,323.4	1,323.4	1,323.4	0.0
F	1,531[2]	200	696	3.2	1,324.9	1,324.9	1,324.9	0.0
G	1,901[2]	200	704	3.1	1,325.5	1,325.5	1,325.5	0.0
H	2,218[2]	120	377	5.8	1,325.9	1,325.9	1,325.9	0.0
WISCONSIN RIVER								
A	268.63[4]	3,538	23,529	5.1	1,146.7	1,146.7	1,146.7	0.0
B	269.31[4]	2,492	20,388	5.9	1,147.9	1,147.9	1,147.9	0.0
C	279.73[4]	1,976	16,357	5.8	1,148.6	1,148.6	1,148.6	0.0
D	270.15[4]	1,372	16,235	5.9	1,149.3	1,149.3	1,149.3	0.0
E	270.78[4]	1,631	16,481	6.2	1,150.5	1,150.5	1,150.5	0.0
F	271.27[4]	898	11,465	6.5	1,151.4	1,151.4	1,151.4	0.0
G	271.90[4]	1,100	11,411	7.1	1,152.7	1,152.7	1,152.7	0.0
H	272.43[4]	925	11,610	6.8	1,153.8	1,153.8	1,153.8	0.0

[1]FEET ABOVE CONFLUENCE WITH BIG RIB RIVER, [2]FEET ABOVE CONFLUENCE WITH BLACK CREEK, [3]ELEVATION COMPUTED WITHOUT CONSIDERATION OF BACKWATER EFFECTS FROM BLACK RIVER, [4]MILES ABOVE MOUTH AT MISSISSIPPI RIVER

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARATHON COUNTY, WI

AND INCORPORATED AREAS

FLOODWAY DATA

LITTLE RIB RIVER - POTATO CREEK - WISCONSIN RIVER

FLOODING SOURCE		FLOODWAY			1-PERCENT-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
WISCONSIN RIVER (CONTINUED)								
I	273.14	902	13,780	5.1	1,155.1	1,155.1	1,155.1	0.0
J	273.44	577	10,992	5.8	1,155.4	1,155.4	1,155.4	0.0
K	273.46	629	13,652	4.7	1,155.7	1,155.7	1,155.7	0.0
L	273.88	800	11,875	6.5	1,156.0	1,156.0	1,156.0	0.0
M	274.22	686	11,154	6.1	1,156.6	1,156.6	1,156.6	0.0
N	274.67	557	10,241	6.6	1,157.2	1,157.2	1,157.2	0.0
O	274.87	502	10,093	6.3	1,157.6	1,157.6	1,157.6	0.0
P	275.11	473	10,372	6.2	1,158.0	1,158.0	1,158.0	0.0
Q	275.28	509	11,353	5.6	1,158.3	1,158.3	1,158.3	0.0
R	275.44	786	31,882	2.1	1,158.8	1,158.8	1,158.8	0.0
S - AX	*	*	*	*	*	*	*	*

[1]MILES ABOVE MOUTH AT MISSISSIPPI RIVER, *DATA NOT AVAILABLE

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

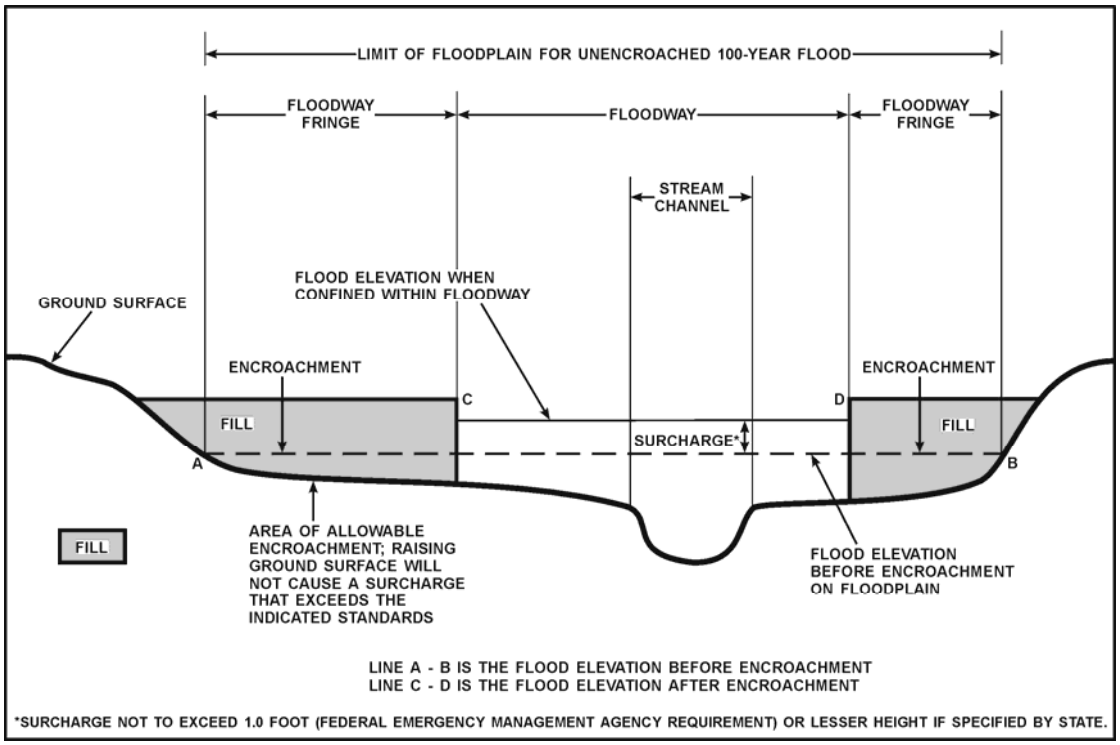
MARATHON COUNTY, WI

AND INCORPORATED AREAS

FLOODWAY DATA

WISCONSIN RIVER

FIGURE 2 – FLOODWAY SCHEMATIC



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. The zones are as follows:

Zone A

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

Zone AE

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

Zone AO

Zone AO is the flood insurance rate zone that corresponds to areas of 1-percent-annual-chance shallow flooding (usually sheet flow on sloping terrain) where

average depths are between 1 and 3 feet. Average whole-foot depths derived from the detailed hydraulic analyses are shown within this zone.

Zone X

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

6.0 FLOOD INSURANCE RATE MAP

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

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

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

The countywide FIRM presents flooding information for the entire geographic area of Marathon 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 8, “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)
Abbotsford, City of (Dual County Community) (Clark County)	July 22, 2010	None	July 22, 2010	None
Athens, Village of	May 31, 1974	May 14, 1976	August 15, 1980	None
[1]Birnamwood, Village of (Dual County Community) (Shawano County)	May 31, 1974	May 14, 1976	August 19, 1985	None
Brokaw, Village of	December 17, 1973	May 21, 1976	June 1, 1988	None
Colby, City of (Dual County Community) (Clark County)	May 31, 1974	March 19, 1976 March 23, 1979	September 18, 1985	None
[1]Dorchester, Village of (Dual County Community) (Clark County)	N/A	None	N/A	None
Edgar, Village of	December 3, 1976	None	September 30, 1988	None
Elderon, Village of	July 19, 1974	July 30, 1976	July 22, 2010	None
Fenwood, Village of	August 2, 1974	May 14, 1976	July 22, 2010	None
Hatley, Village of	July 19, 1974	May 14, 1976	September 27, 1985	None

[1]No Special Flood Hazard Areas identified

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARATHON COUNTY, WI AND INCORPORATED AREAS

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)
Kronenwetter, Village of	August 3, 1981[1]	None	August 3, 1981[1]	None
Marathon City, Village of	November 30, 1973	May 21, 1976	August 15, 1980	None
Marathon County (Unincorporated Areas)	February 1, 1979	None	February 1, 1979	August 3, 1981
[2]Marshfield, City of (Dual County Community) (Wood County)	February 17, 2010[3]	None	February 17, 2010[3]	None
Mosinee, City of	December 16, 1973	None	December 16, 1973	July 1, 1974 November 14, 1975
Rothschild, Village of	May 11, 1973	None	May 11, 1973	July 1, 1974 May 21, 1976 January 21, 1977 March 31, 1978
Schofield, City of	July 13, 1973	None	July 13, 1973	July 1, 1974 March 12, 1976 February 8, 1980
[4]Spencer, Village of	N/A	None	N/A	None

[1]Formerly shown on the Marathon County (Unincorporated Areas) Flood Insurance Rate Map [2]No Special Flood Hazard Areas identified within Marathon County
[3]Wood County and Incorporated Areas Flood Insurance Rate Map [4]No Special Flood Hazard Areas identified

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARATHON COUNTY, WI AND INCORPORATED AREAS

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)
Stratford, Village of	December 17, 1973	May 21, 1976	May 1, 1987	None
[1]Unity, Village of (Dual County Community) (Clark County)	September 20, 1974	June 4, 1976	July 6, 2010[2]	None
Wausau, City of	January 5, 1978	None	January 5, 1978	None
Weston, Village of	August 3, 1981[3]	None	August 3, 1981[3]	None

[1]No Special Flood Hazard Areas identified within Marathon County [2]Clark County and Incorporated Areas Flood Insurance Rate Map
[3]Formerly shown on the Marathon County (Unincorporated Areas) Flood Insurance Rate Map

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARATHON COUNTY, WI 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.

The countywide studies for Clark, Lincoln, Portage, and Wood counties in Wisconsin are in progress and might impact the information presented in this countywide FIS report.

8.0 LOCATION OF DATA

Information concerning the pertinent data used in preparation of this FIS can be obtained by contacting Federal Insurance and Mitigation Division, FEMA Region V, 536 South Clark Street, Sixth Floor, Chicago, Illinois 60605.

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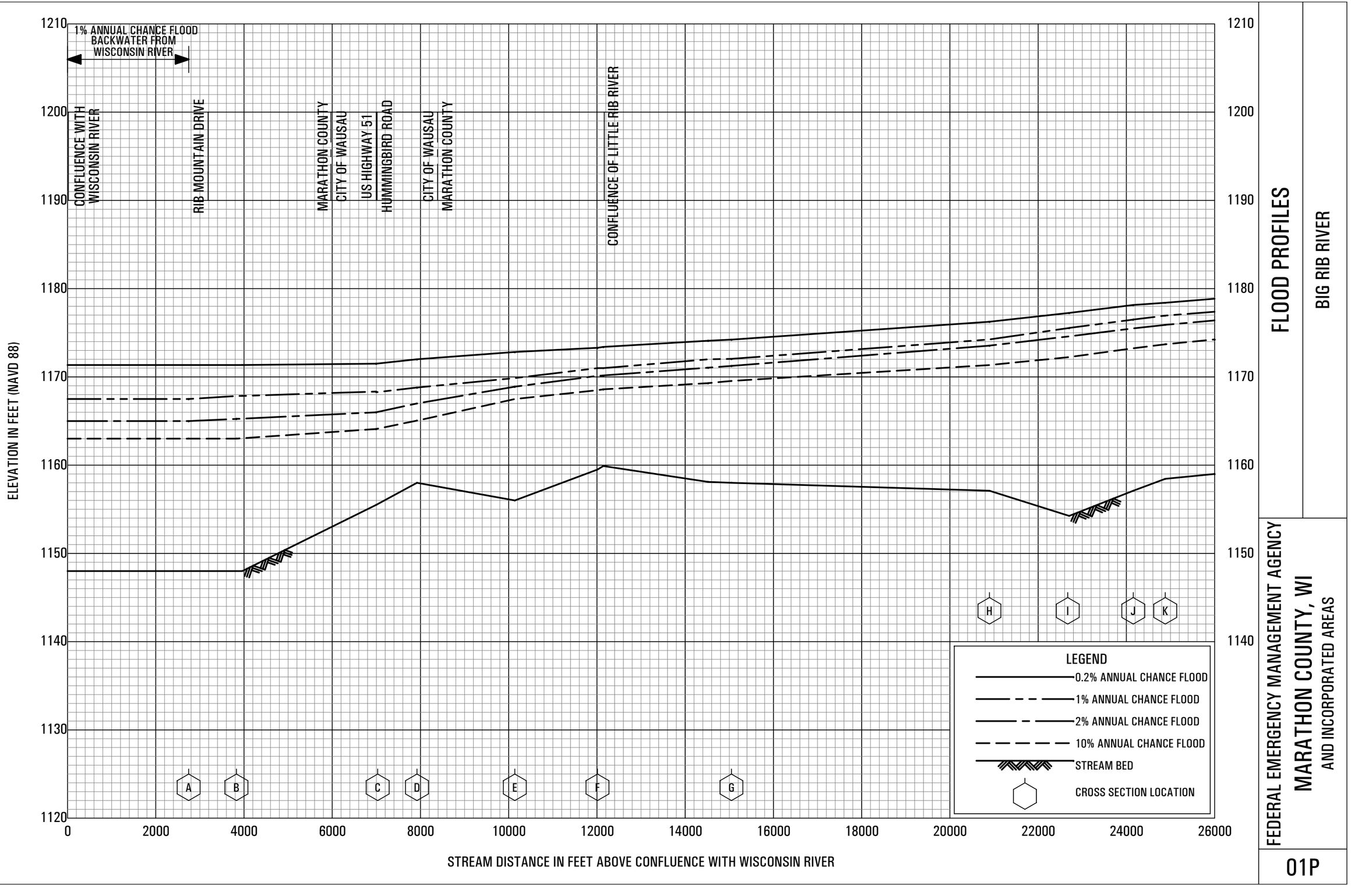

FLOOD PROFILES

BIG RIB RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARATHON COUNTY, WI

AND INCORPORATED AREAS

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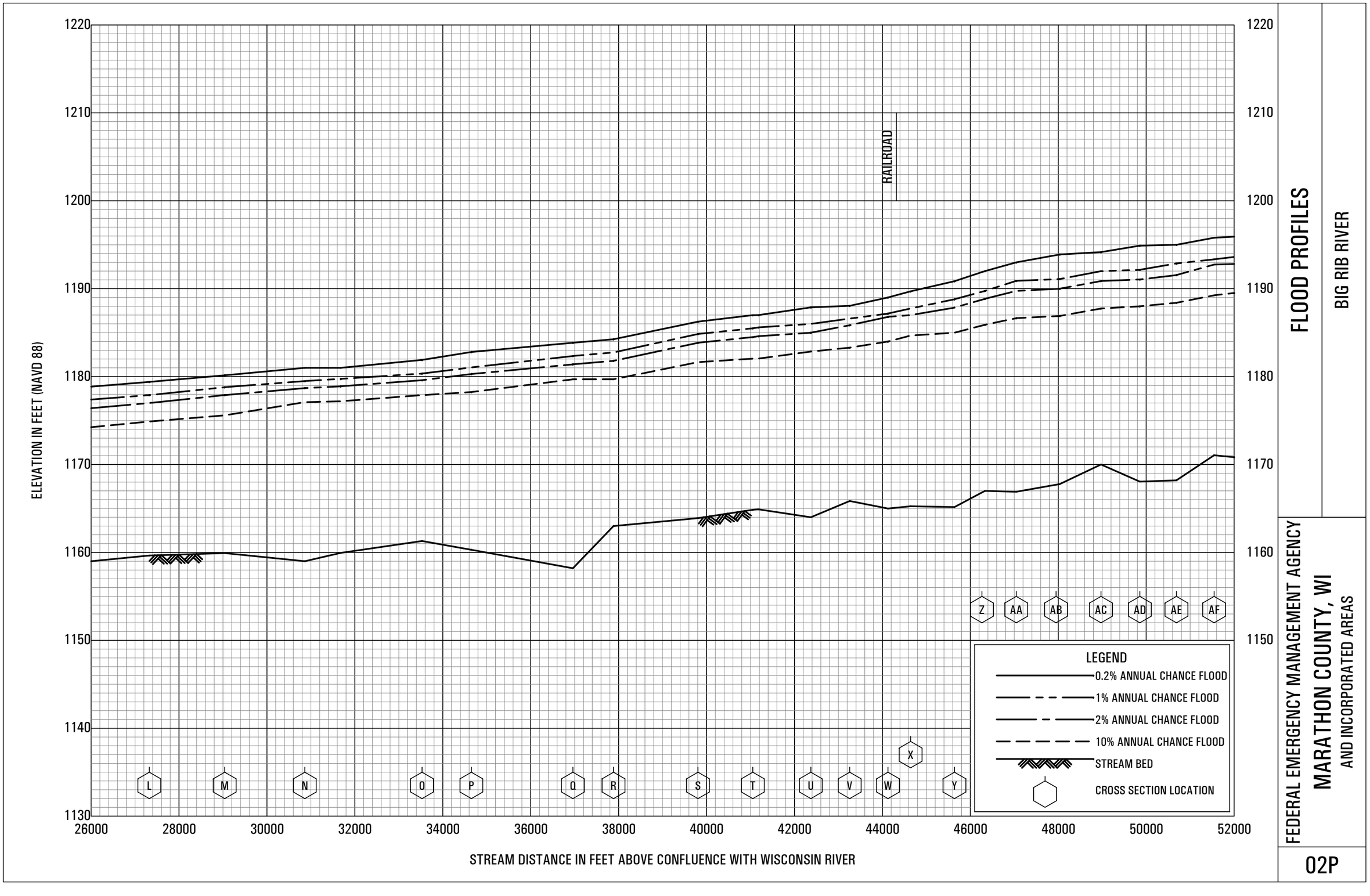

FLOOD PROFILES

BIG RIB RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARATHON COUNTY, WI

AND INCORPORATED AREAS

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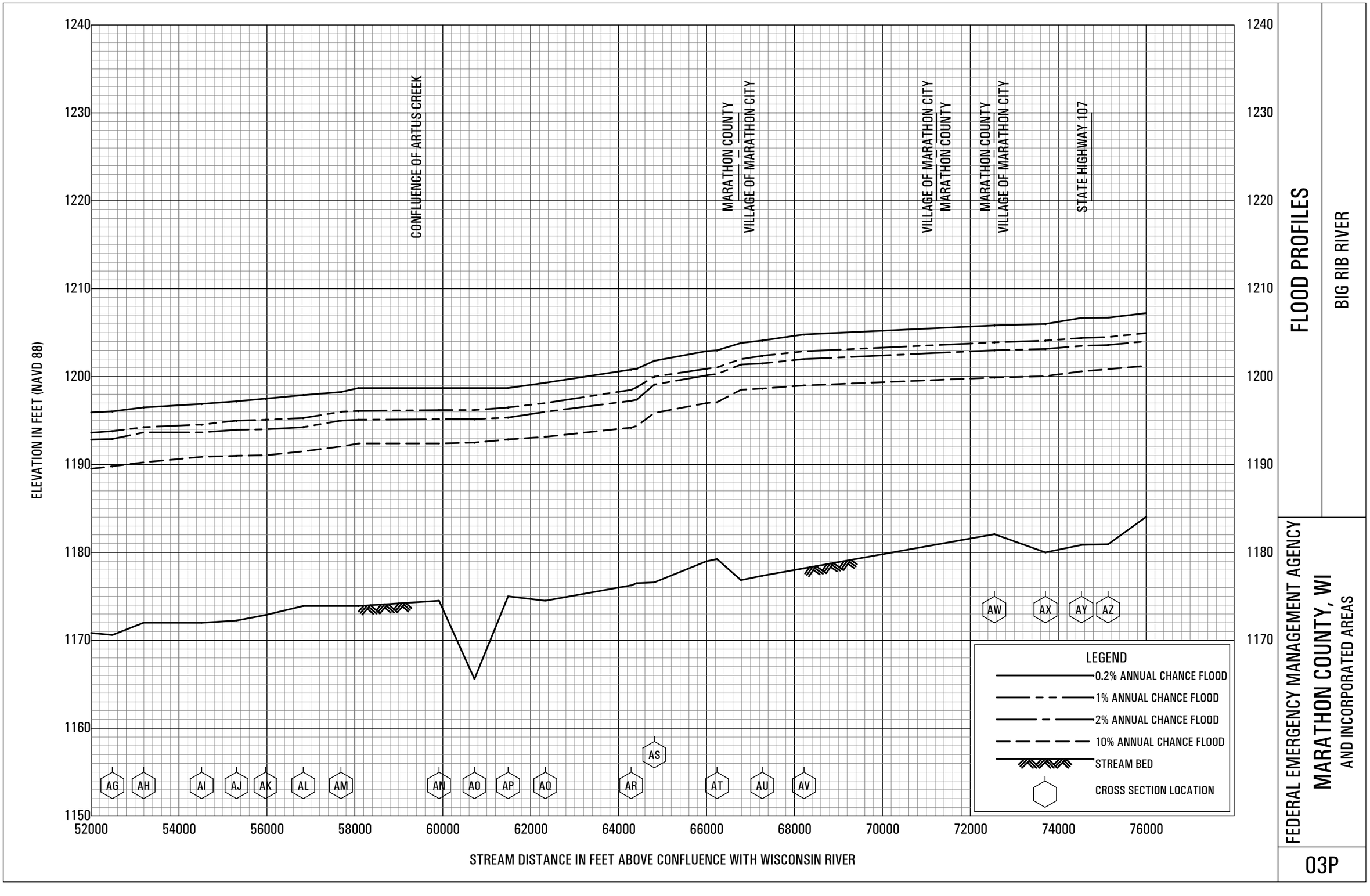

FLOOD PROFILES

BIG RIB RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARATHON COUNTY, WI

AND INCORPORATED AREAS

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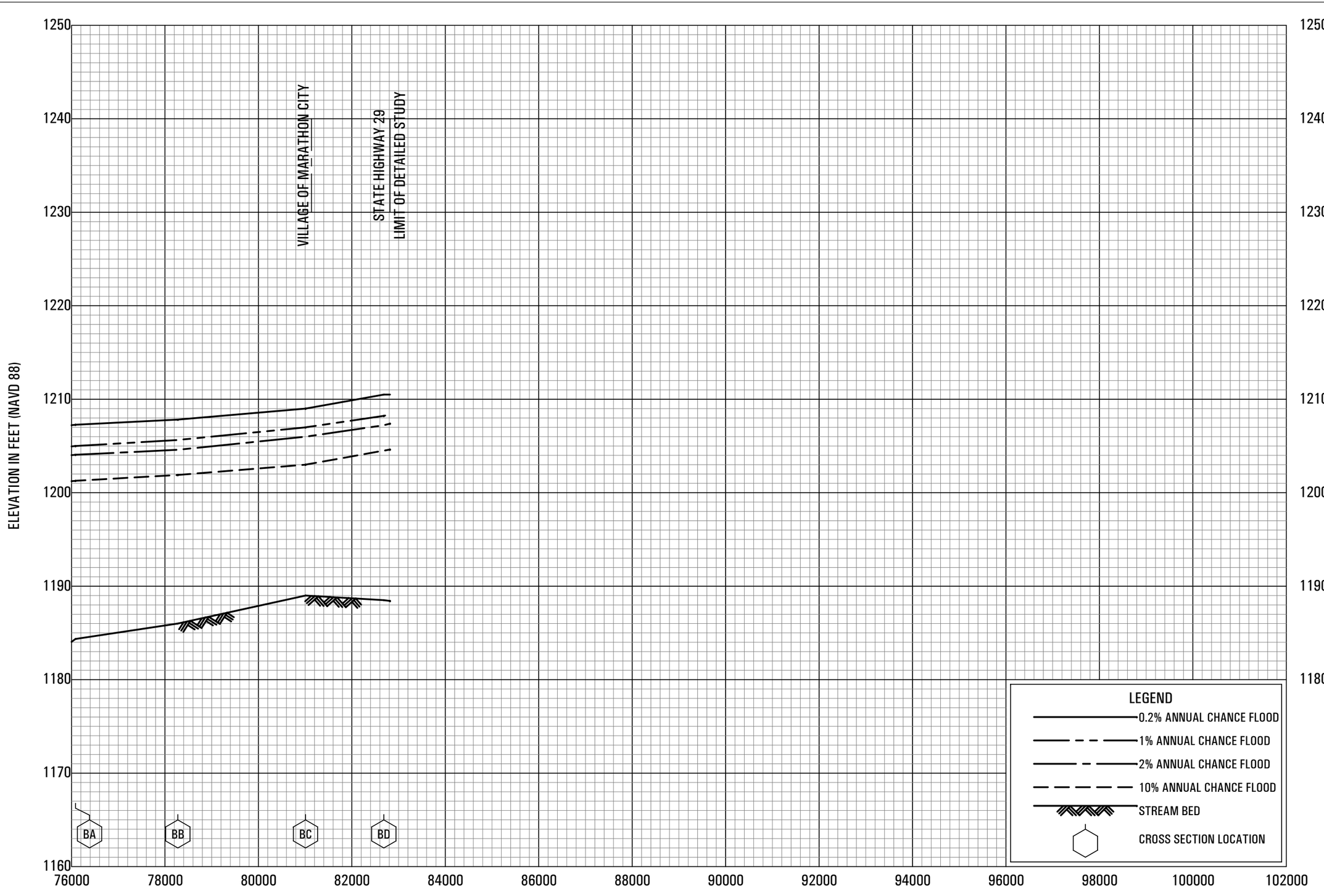

FLOOD PROFILES

BIG RIB RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARATHON COUNTY, WI

AND INCORPORATED AREAS

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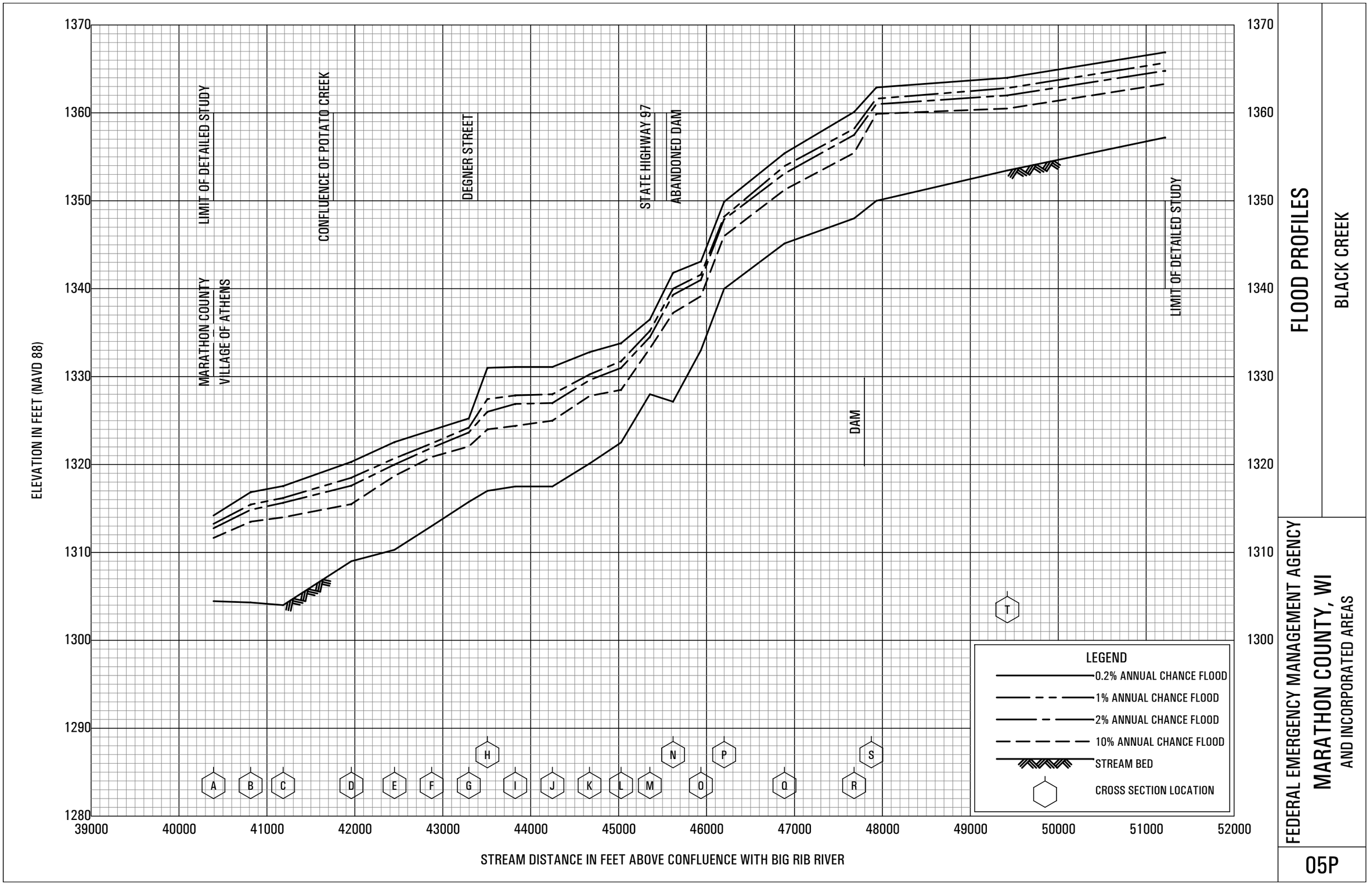

FLOOD PROFILES

BLACK CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARATHON COUNTY, WI

AND INCORPORATED AREAS

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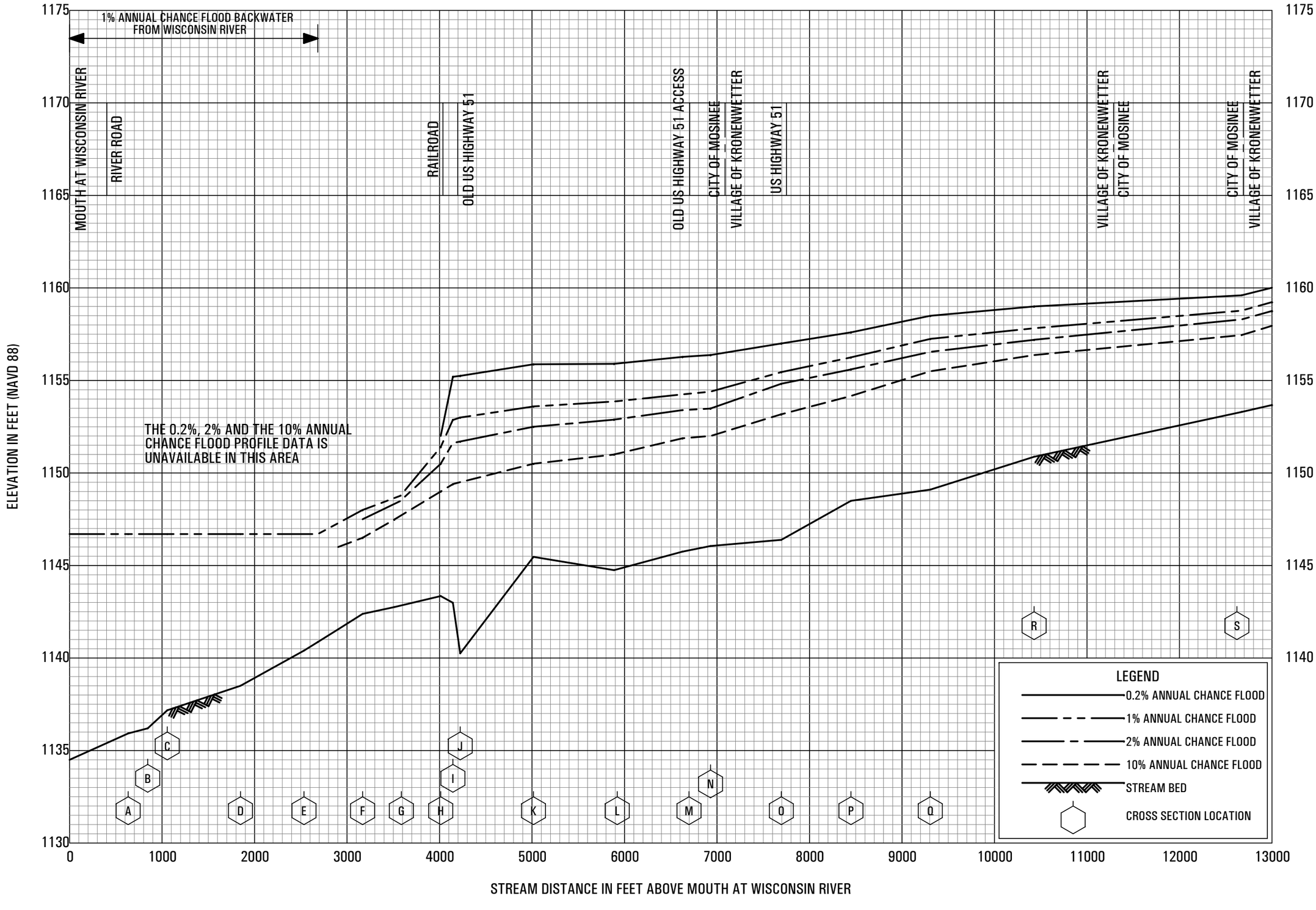

FLOOD PROFILES

BULL JUNIOR CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARATHON COUNTY, WI

AND INCORPORATED AREAS

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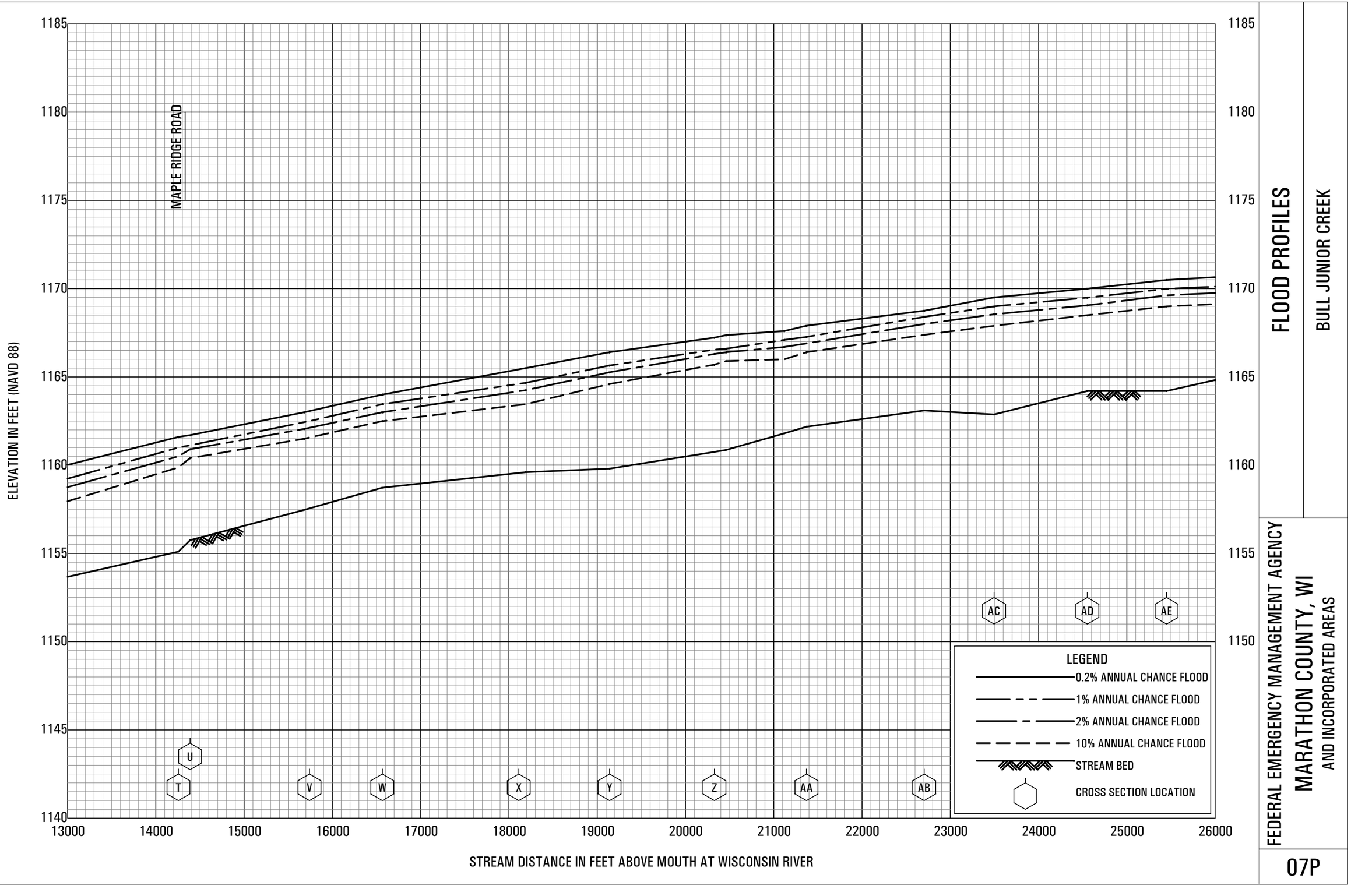


FLOOD PROFILES

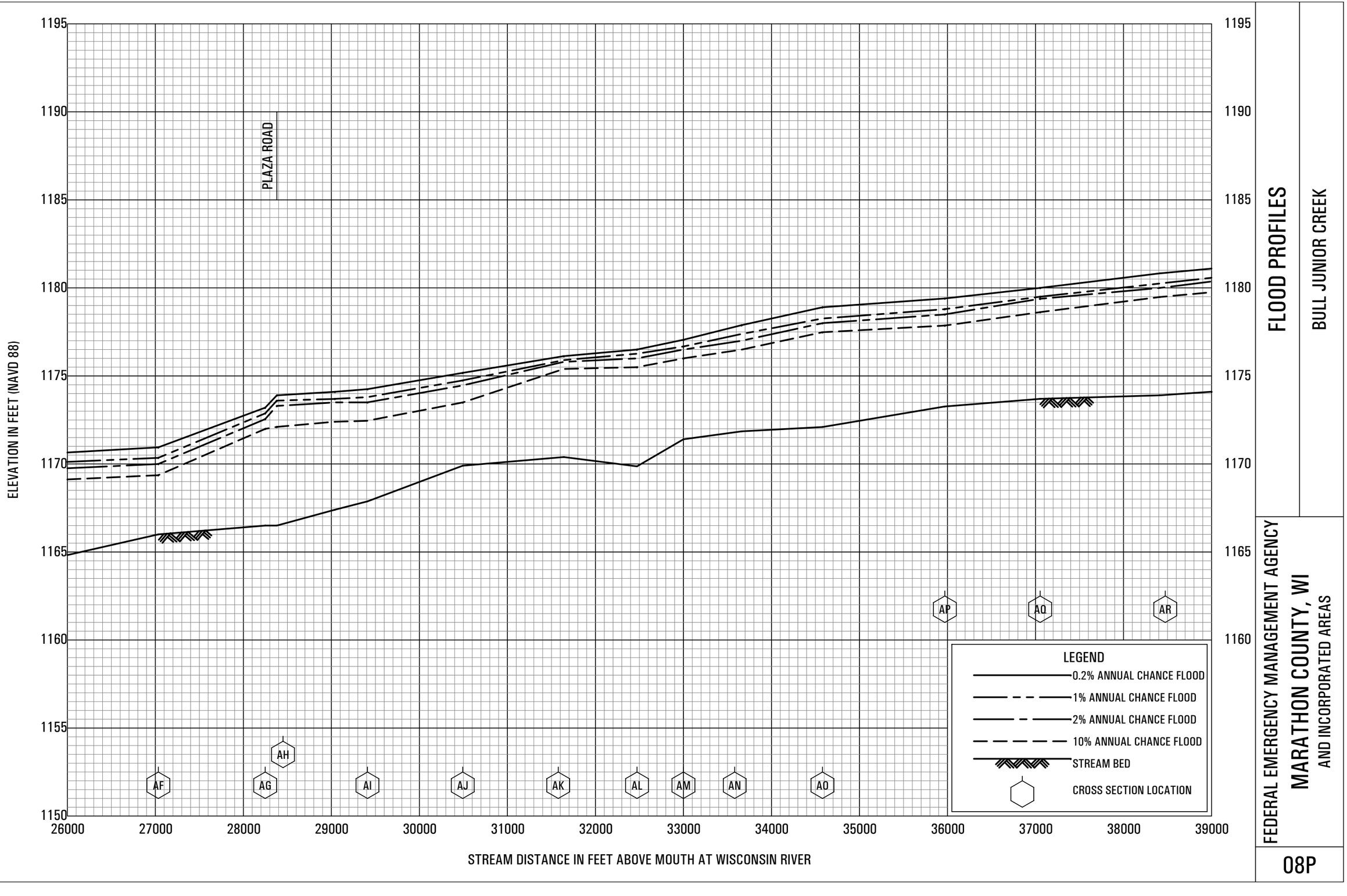
BULL JUNIOR CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARATHON COUNTY, WI

AND INCORPORATED AREAS

07P



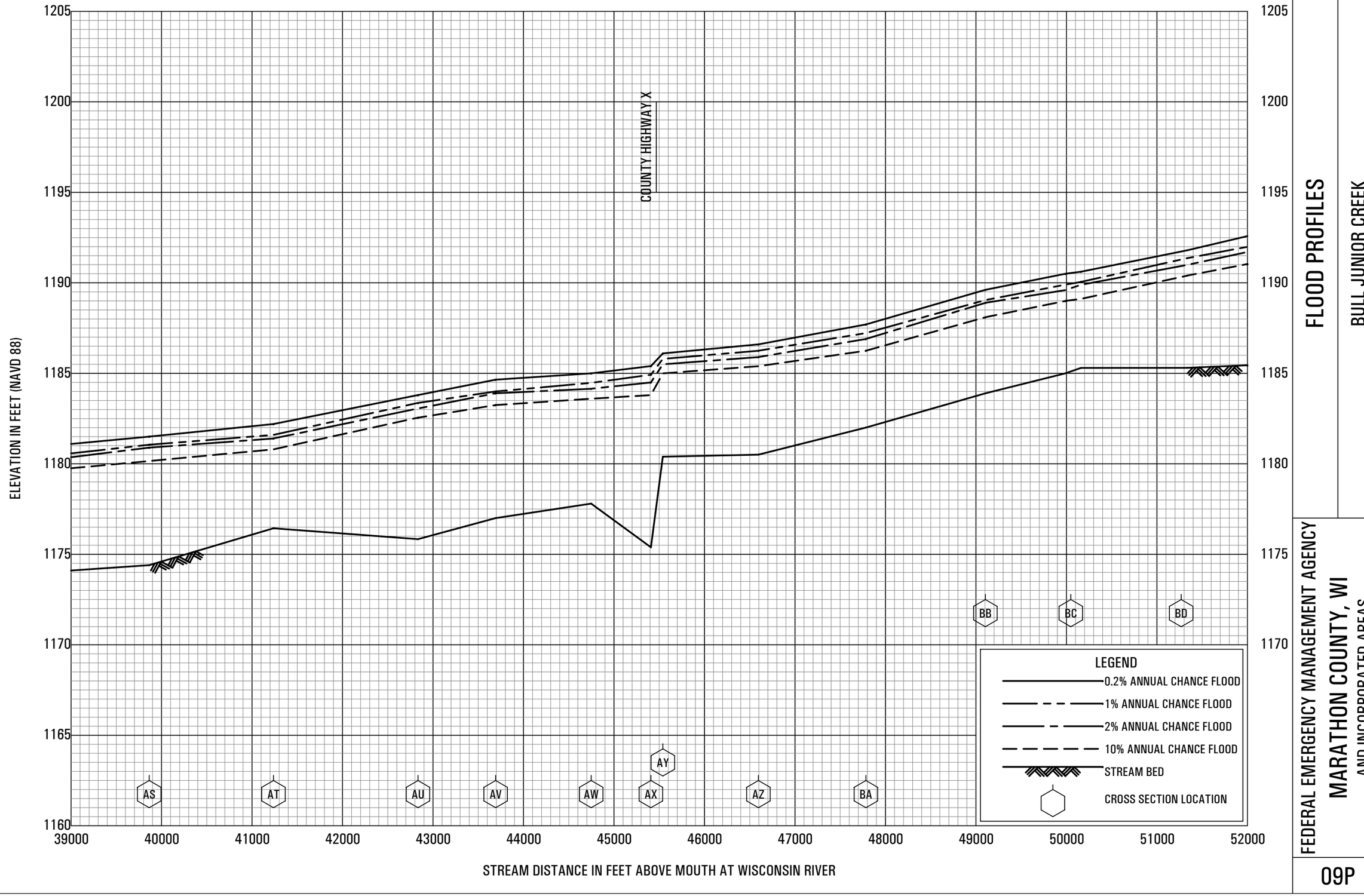
FLOOD PROFILES

BULL JUNIOR CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARATHON COUNTY, WI

AND INCORPORATED AREAS



FLOOD PROFILES

BULL JUNIOR CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARATHON COUNTY, WI

AND INCORPORATED AREAS

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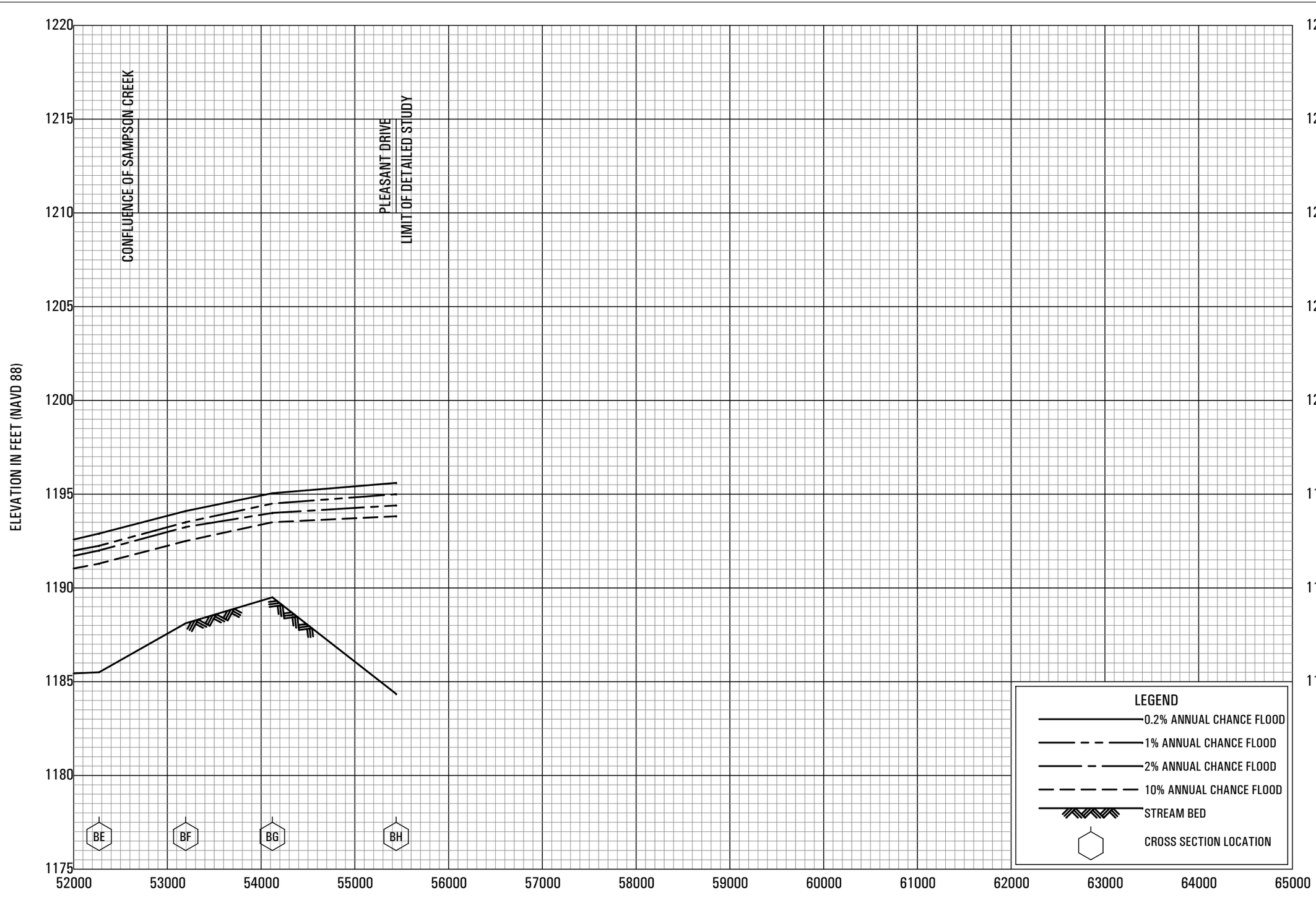

FLOOD PROFILES

BULL JUNIOR CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARATHON COUNTY, WI

AND INCORPORATED AREAS

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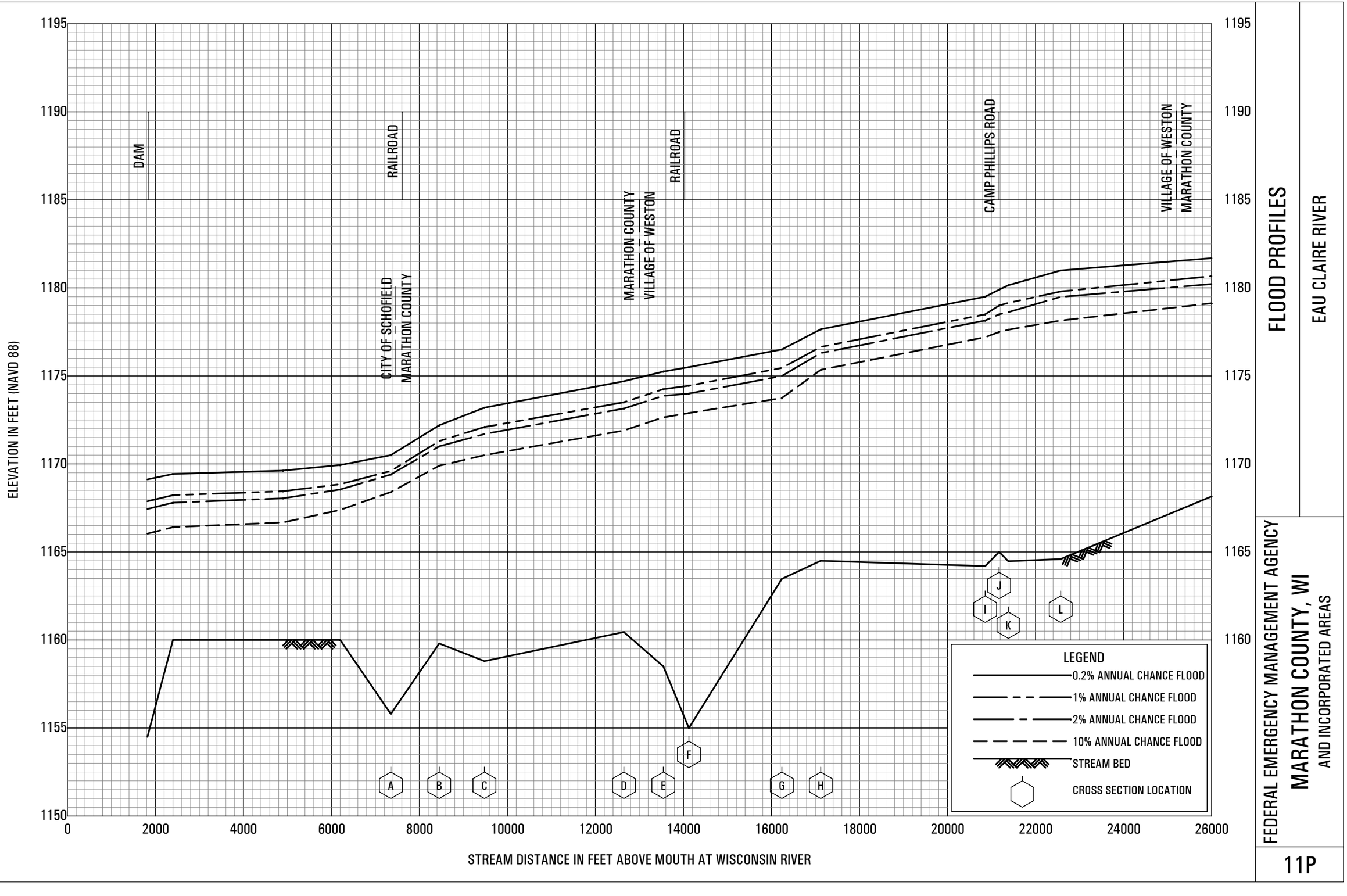

FLOOD PROFILES

EAU CLAIRE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARATHON COUNTY, WI

AND INCORPORATED AREAS

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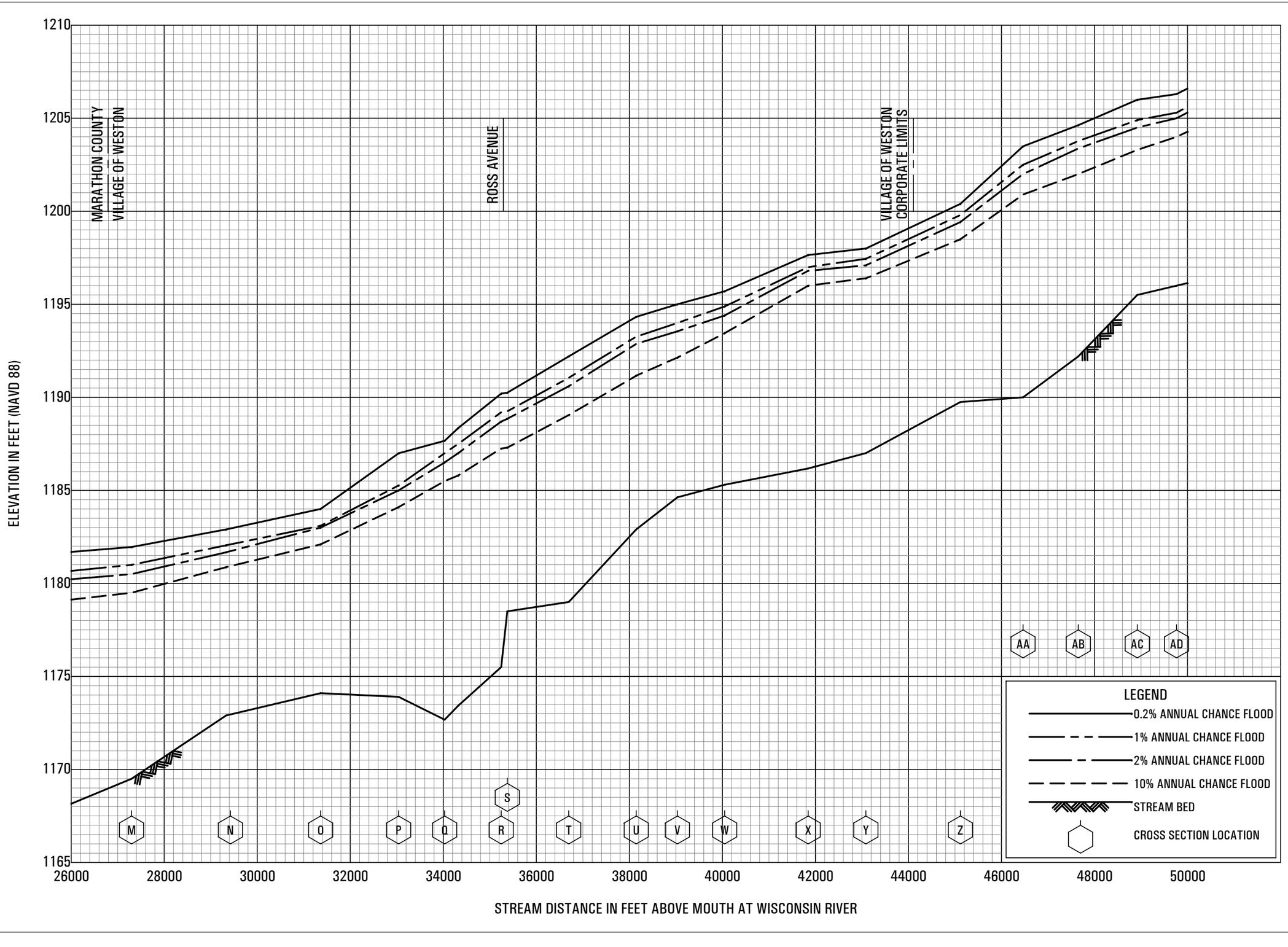


FLOOD PROFILES

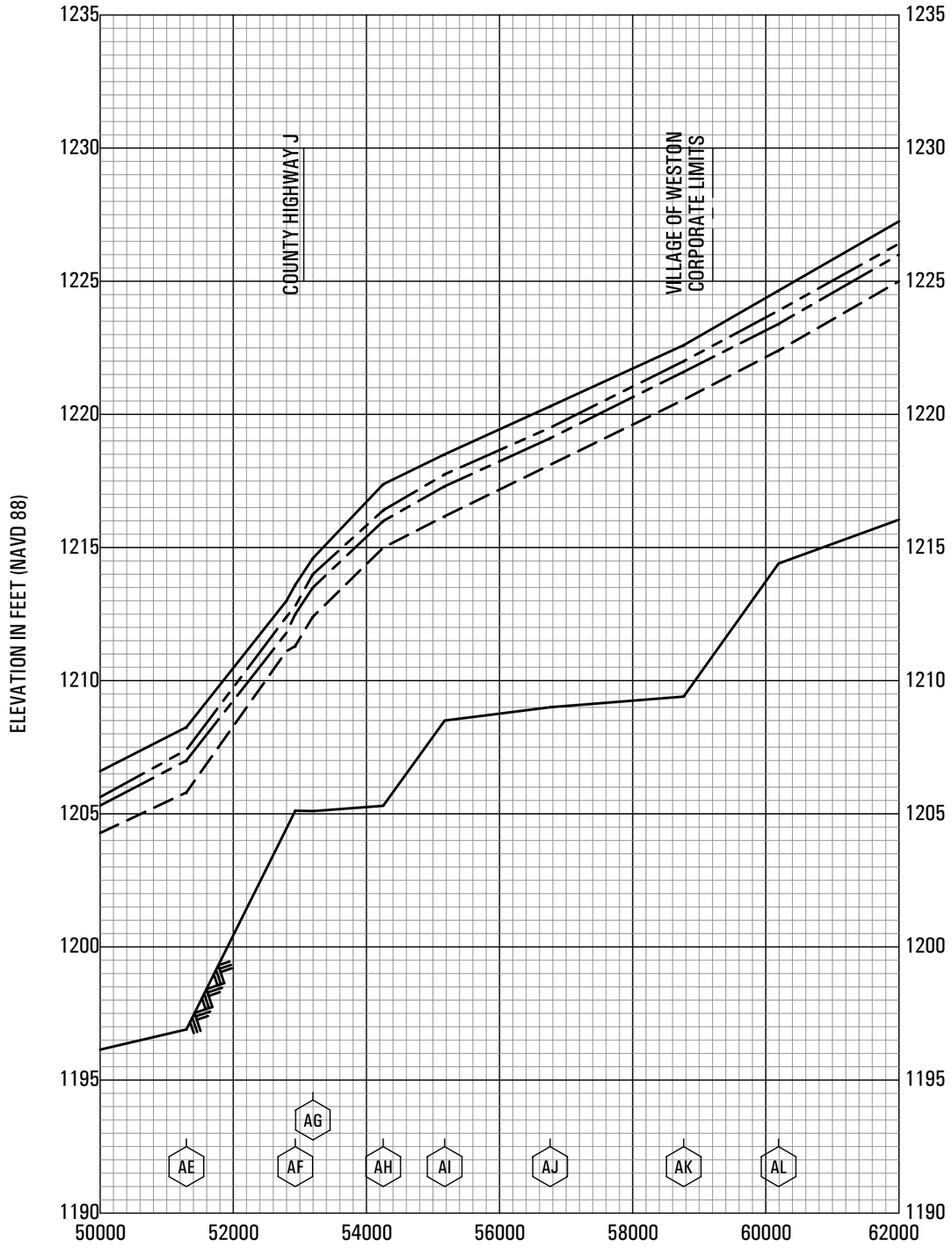
EAU CLAIRE RIVER

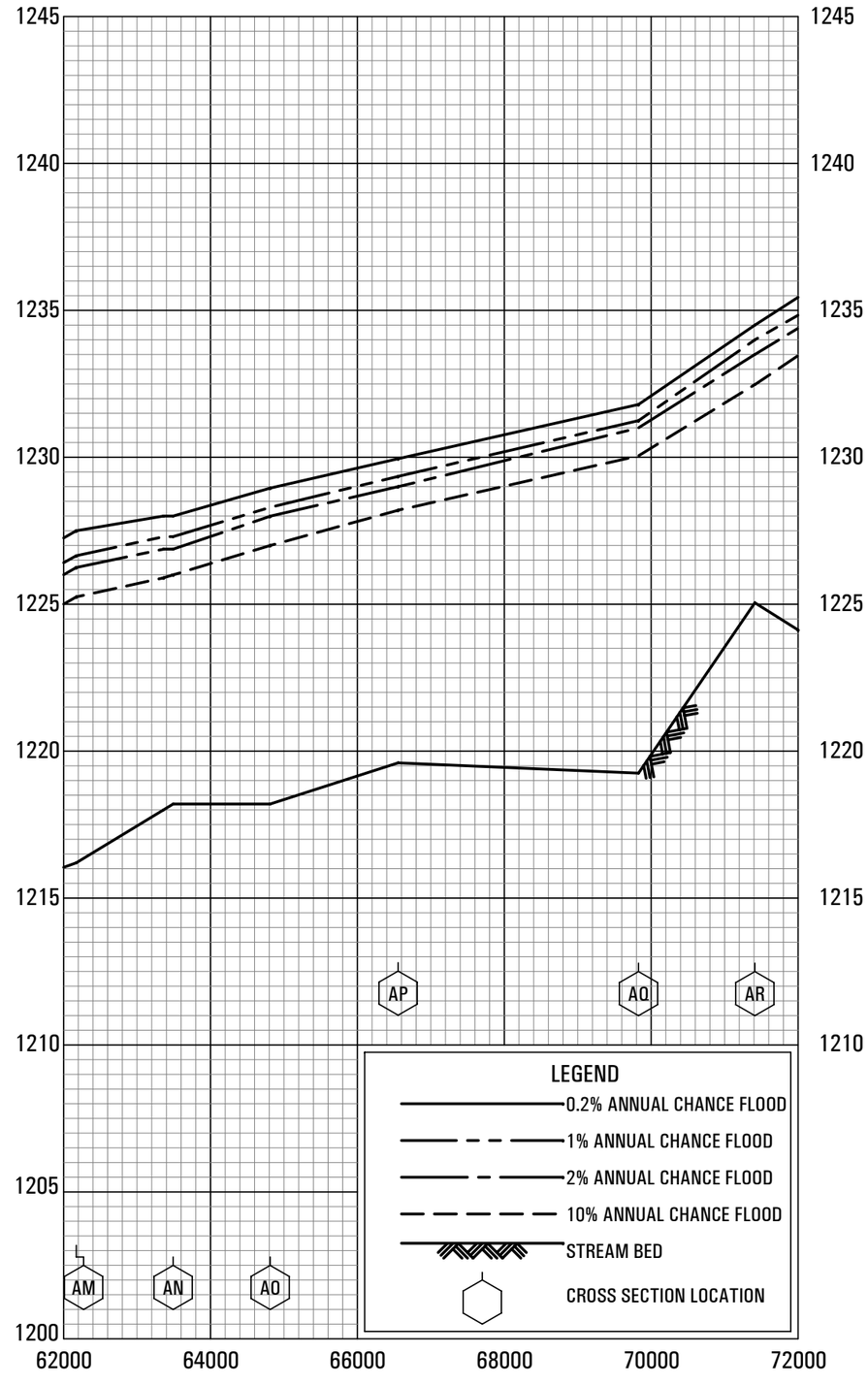
FEDERAL EMERGENCY MANAGEMENT AGENCY

MARATHON COUNTY, WI

AND INCORPORATED AREAS

12P





STREAM DISTANCE IN FEET ABOVE MOUTH AT WISCONSIN RIVER

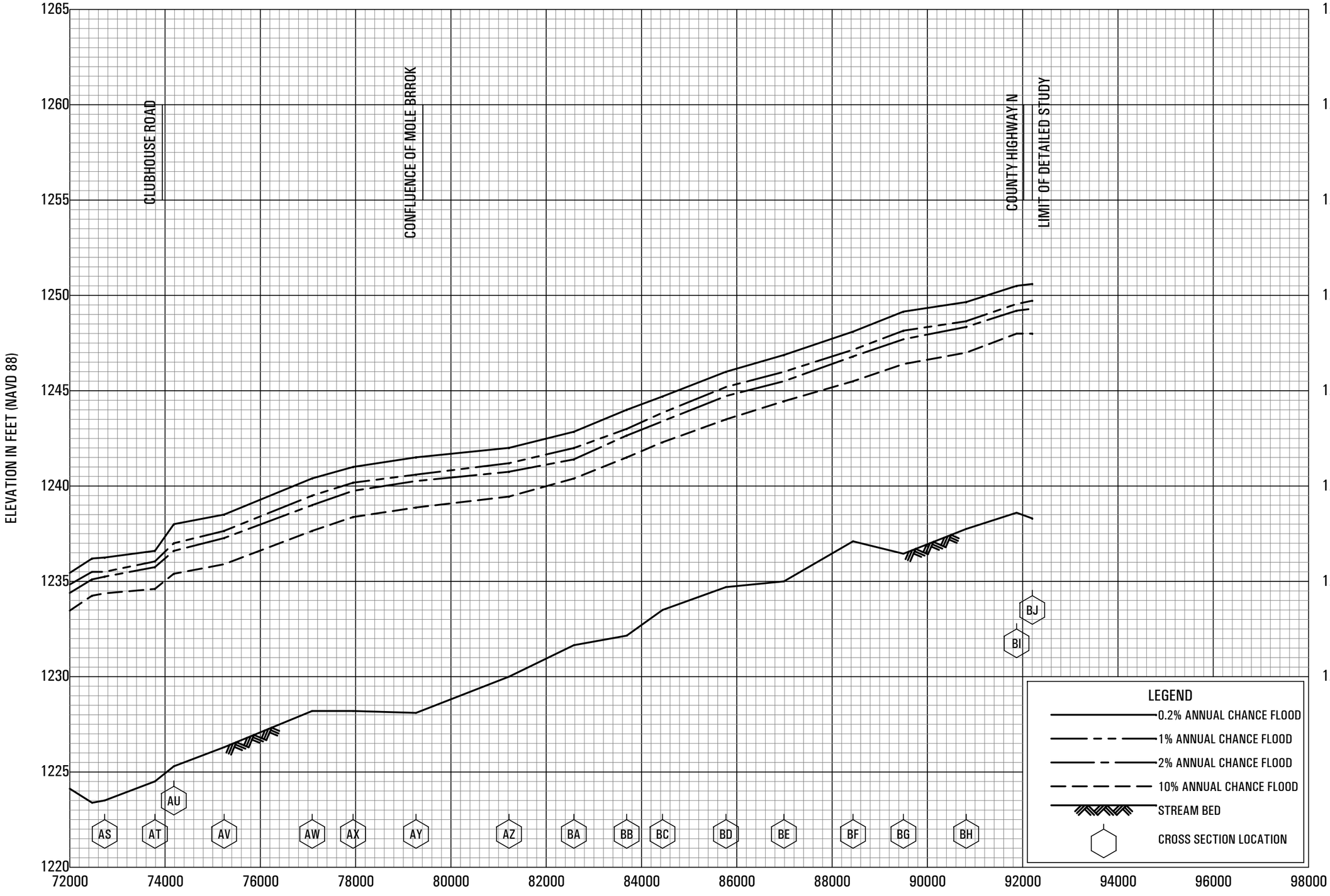
FLOOD PROFILES

EAU CLAIRE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARATHON COUNTY, WI

AND INCORPORATED AREAS



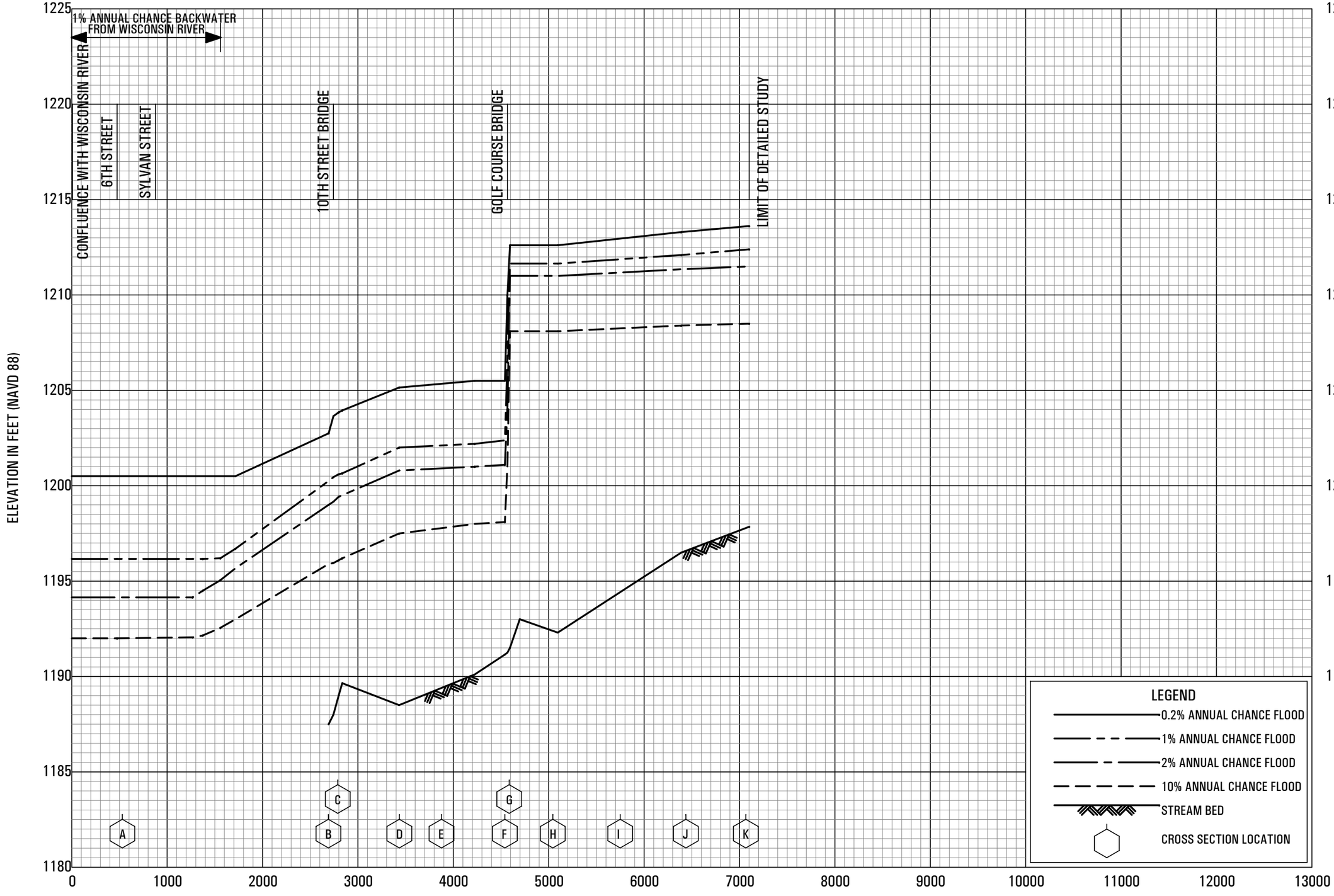
FLOOD PROFILES

EAU CLAIRE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARATHON COUNTY, WI

AND INCORPORATED AREAS



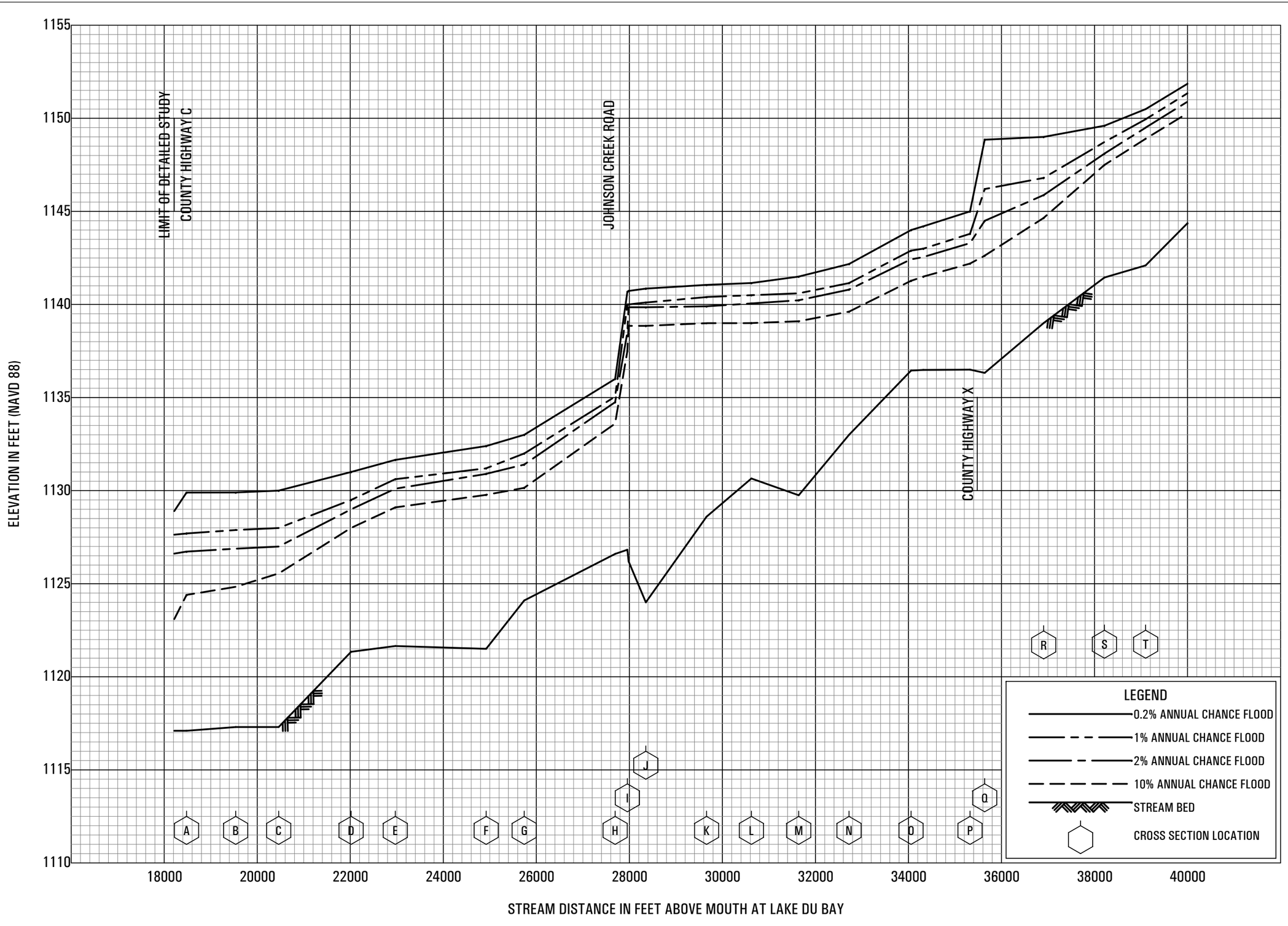
FLOOD PROFILES

JIM MOORE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARATHON COUNTY, WI

AND INCORPORATED AREAS



FLOOD PROFILES

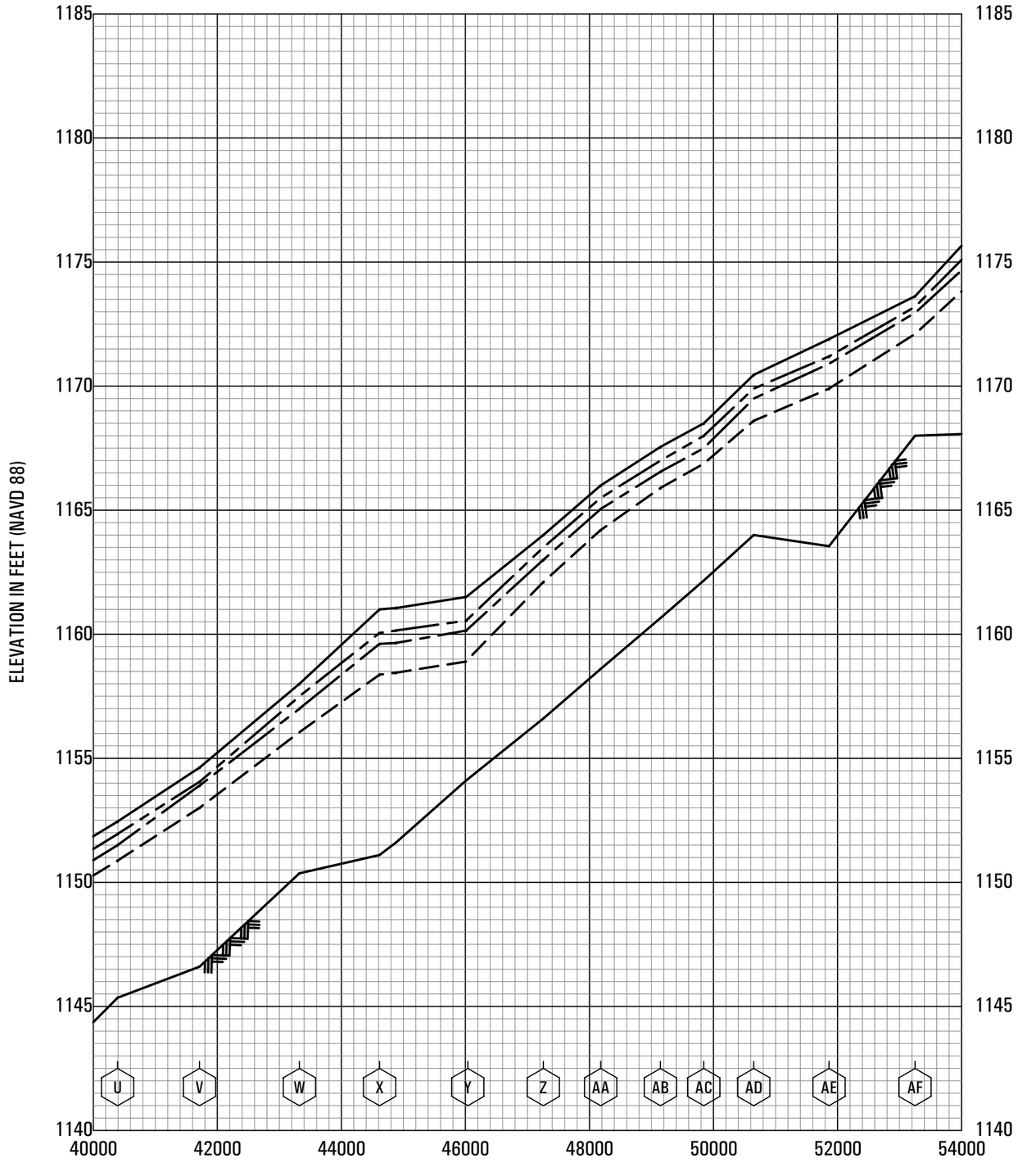
JOHNSON CREEK

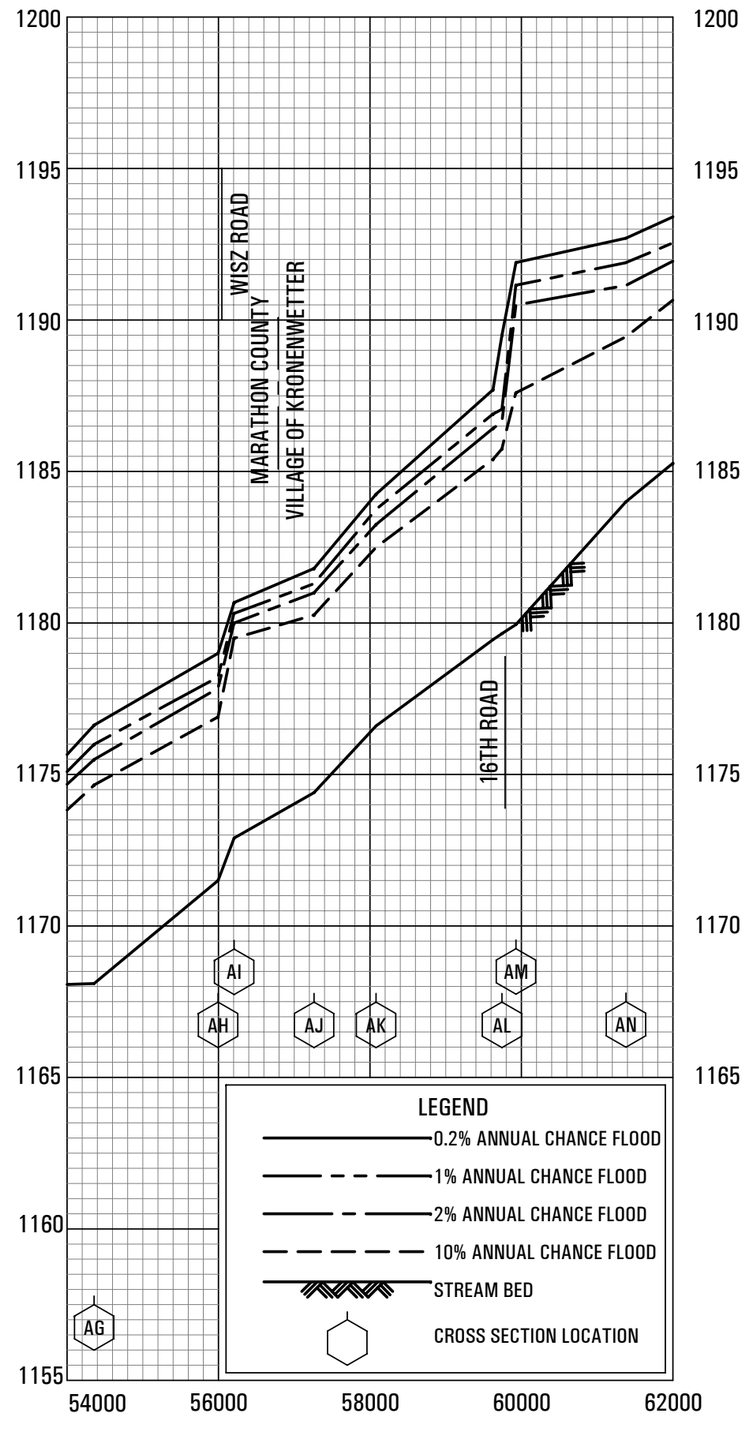
FEDERAL EMERGENCY MANAGEMENT AGENCY

MARATHON COUNTY, WI

AND INCORPORATED AREAS

16P





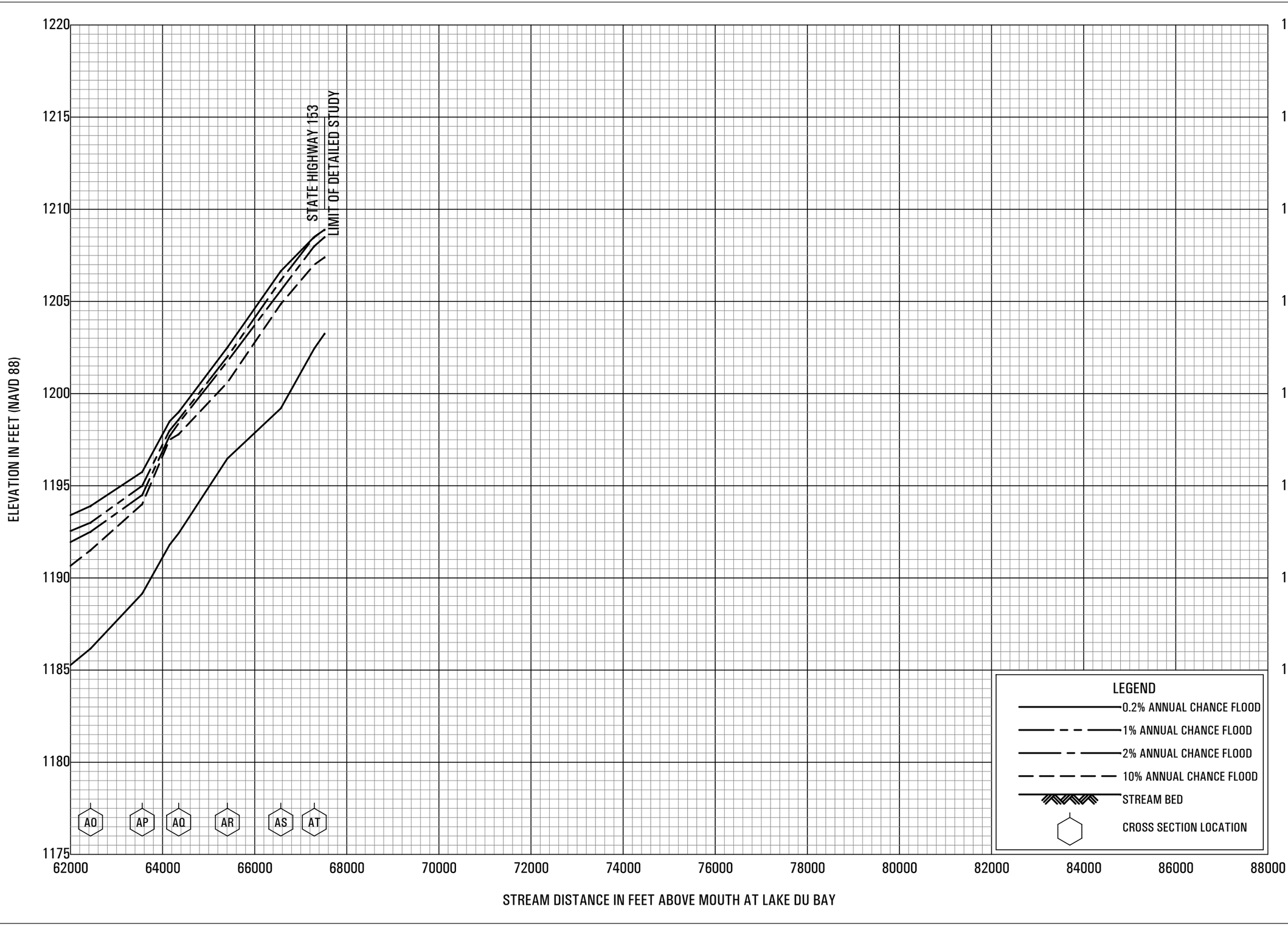
FLOOD PROFILES

JOHNSON CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARATHON COUNTY, WI

AND INCORPORATED AREAS



FLOOD PROFILES

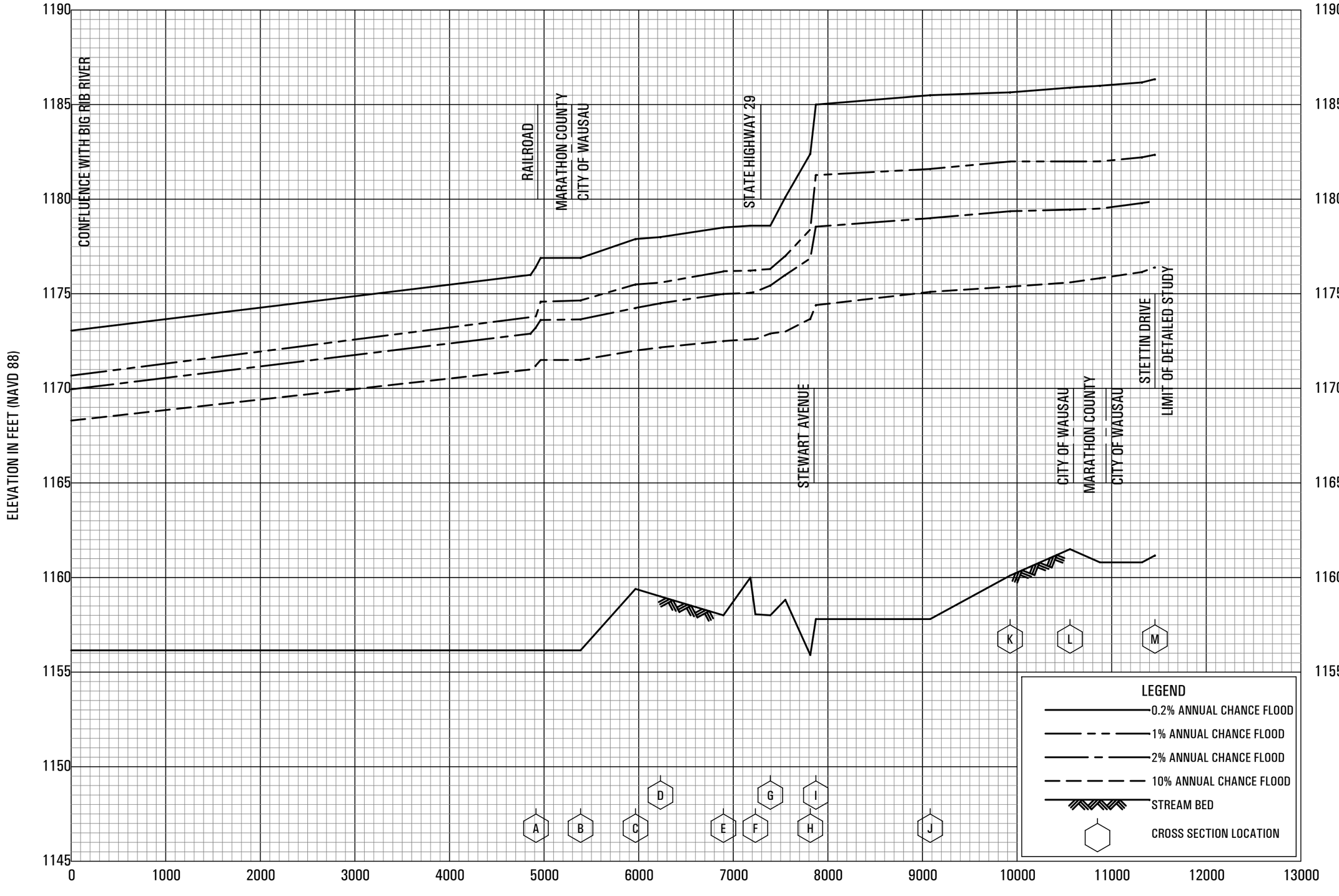
JOHNSON CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARATHON COUNTY, WI

AND INCORPORATED AREAS

18P



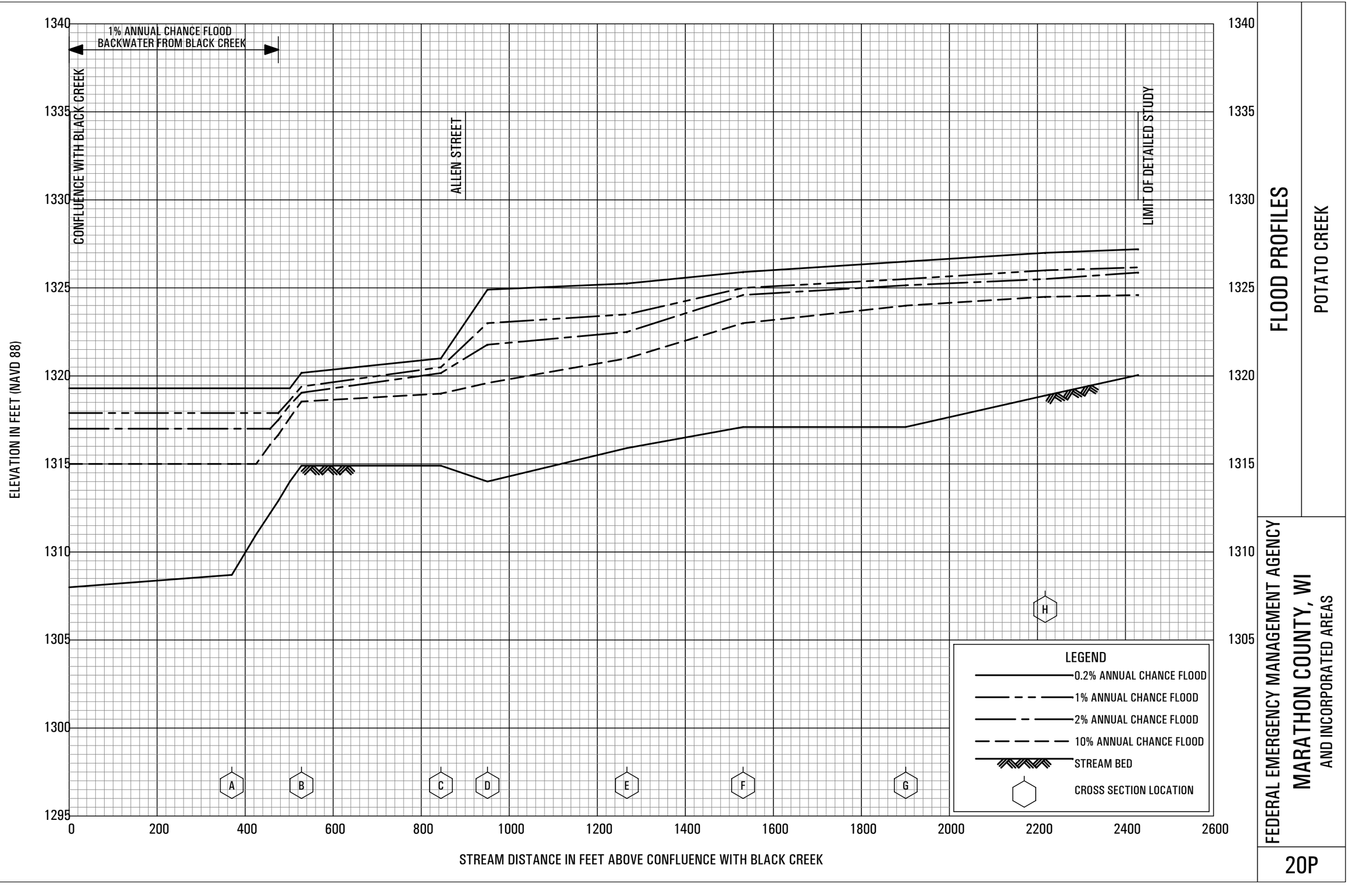
FLOOD PROFILES

LITTLE RIB RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARATHON COUNTY, WI

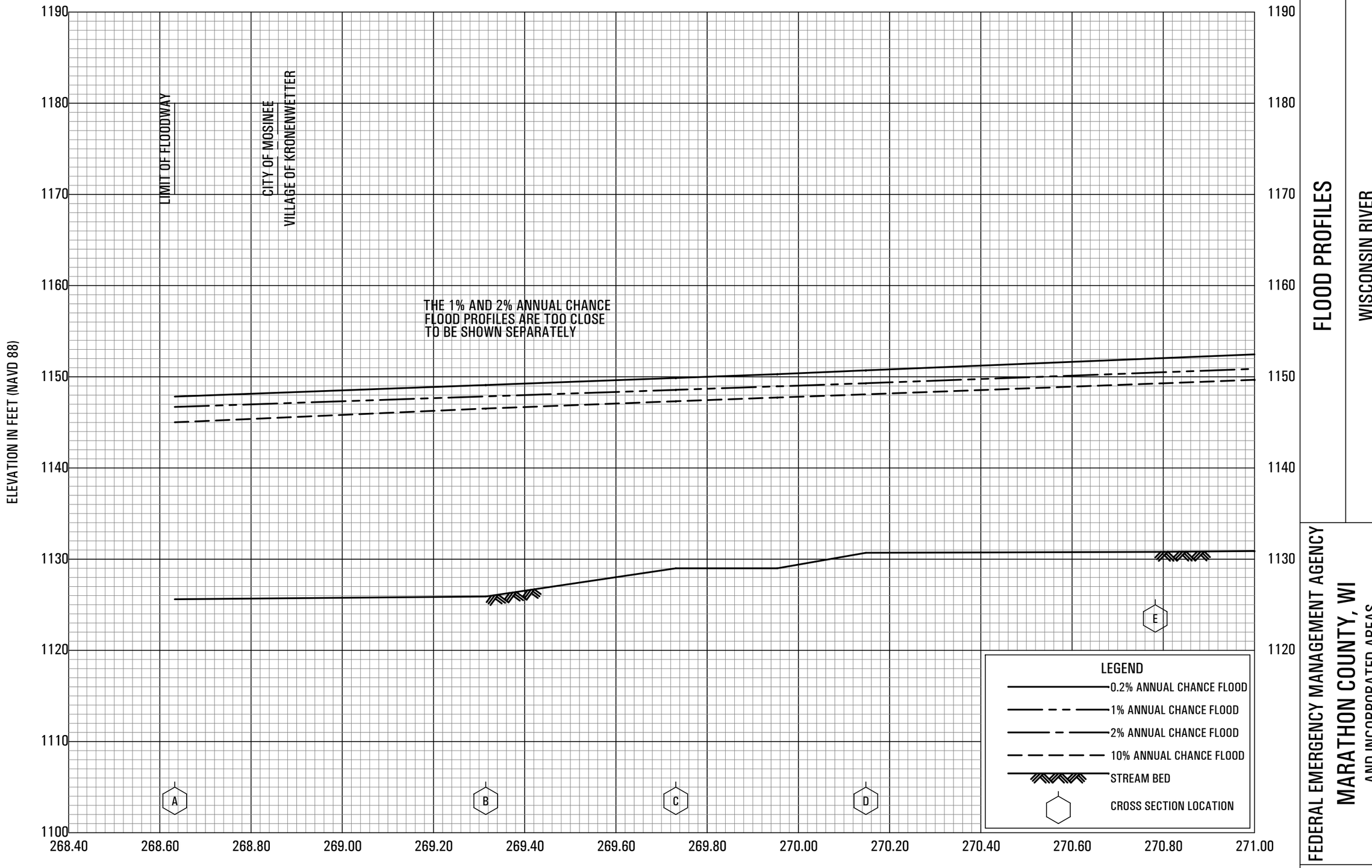
AND INCORPORATED AREAS



FLOOD PROFILES

POTATO CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY
MARATHON COUNTY, WI
AND INCORPORATED AREAS



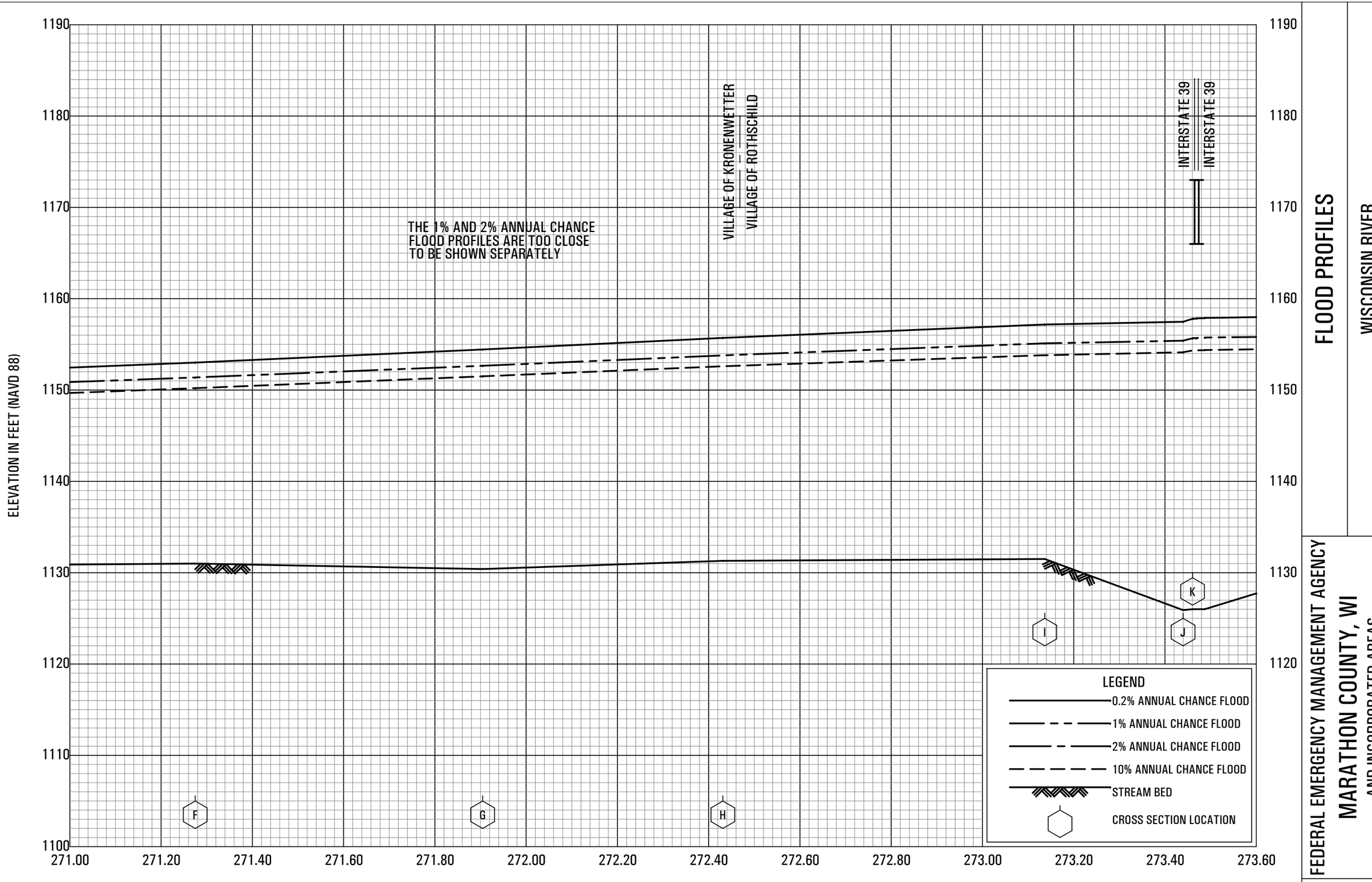
FLOOD PROFILES

WISCONSIN RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARATHON COUNTY, WI

AND INCORPORATED AREAS



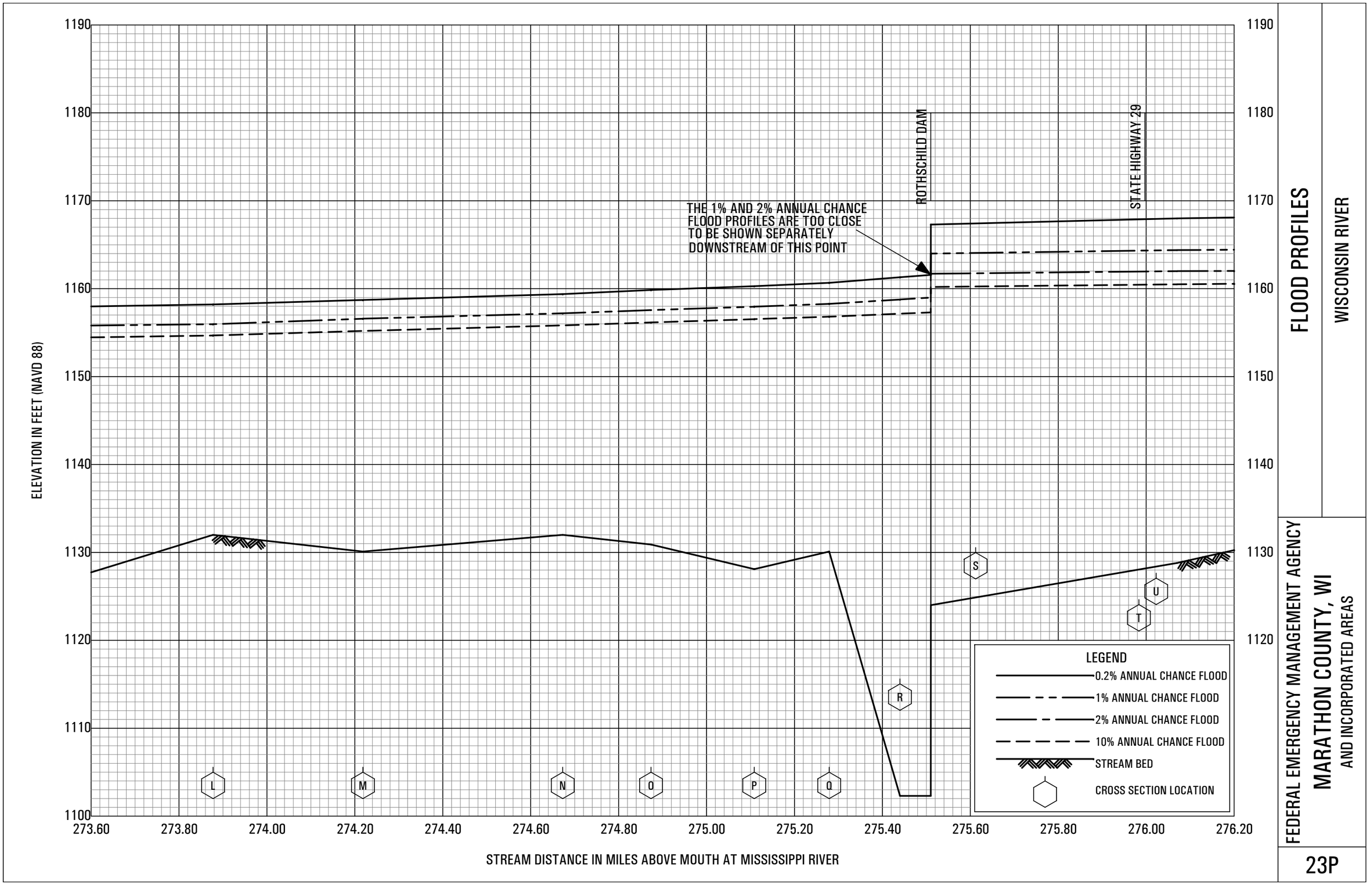
FLOOD PROFILES

WISCONSIN RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARATHON COUNTY, WI

AND INCORPORATED AREAS



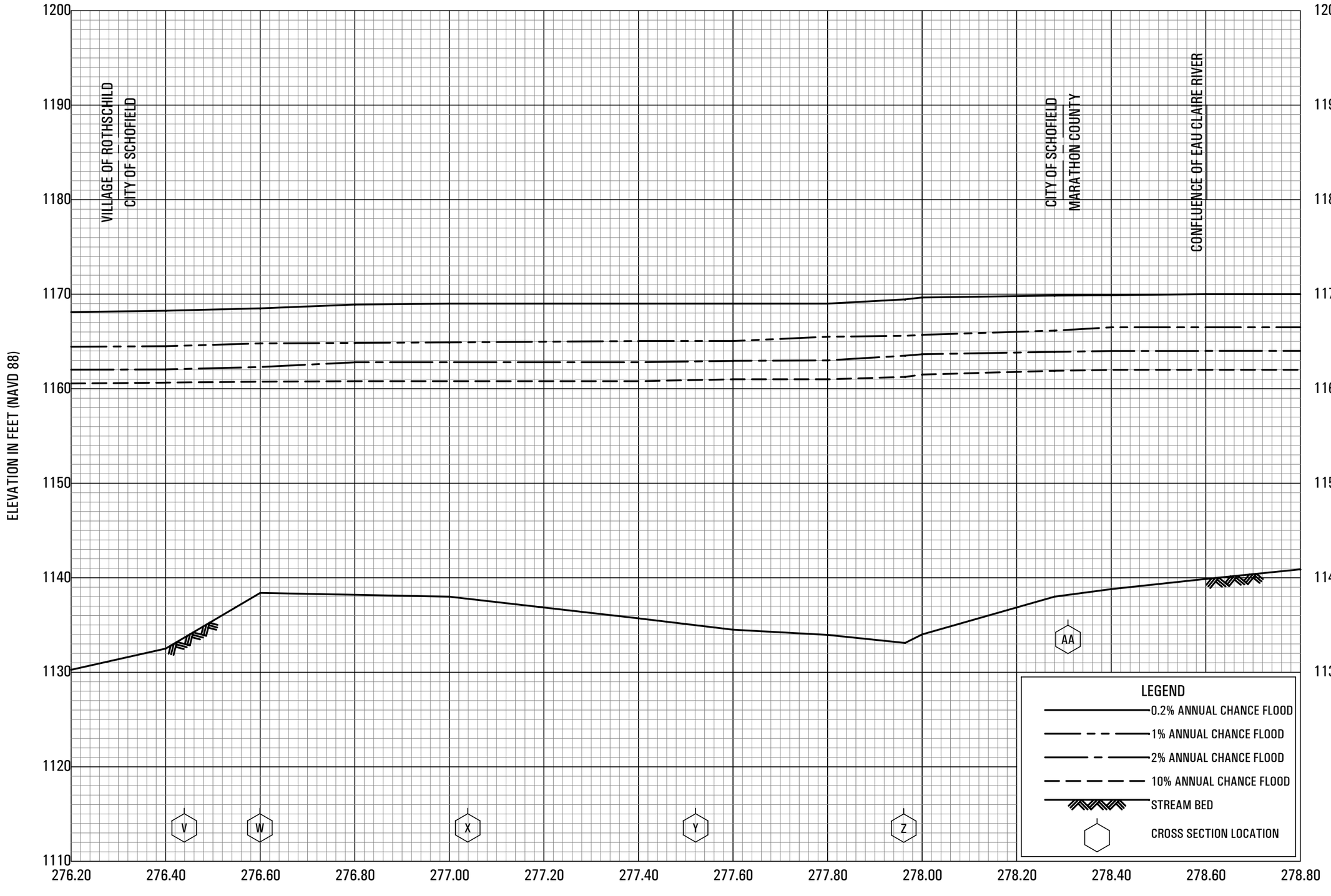
FLOOD PROFILES

WISCONSIN RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARATHON COUNTY, WI

AND INCORPORATED AREAS



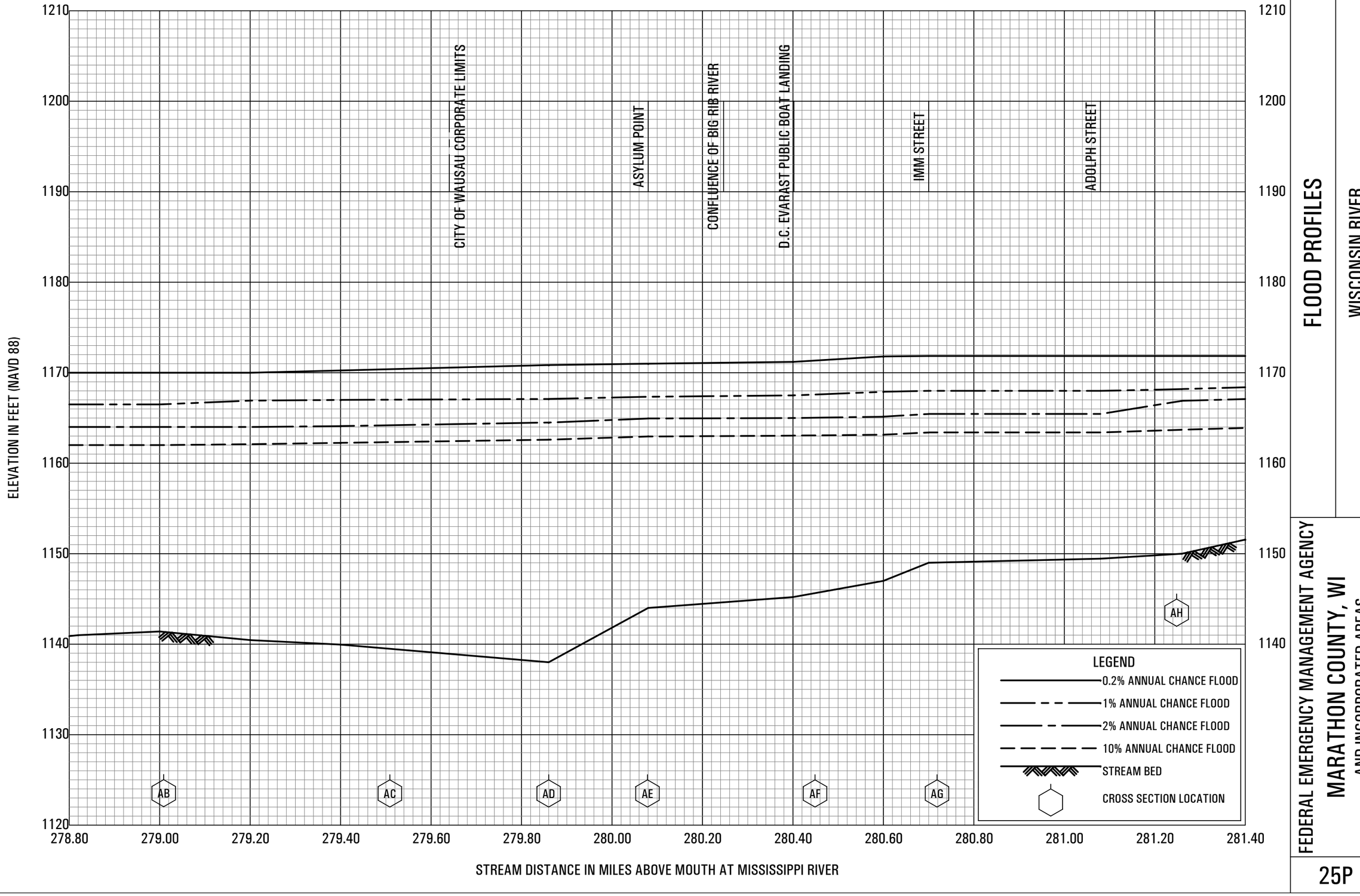
FLOOD PROFILES

WISCONSIN RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARATHON COUNTY, WI

AND INCORPORATED AREAS



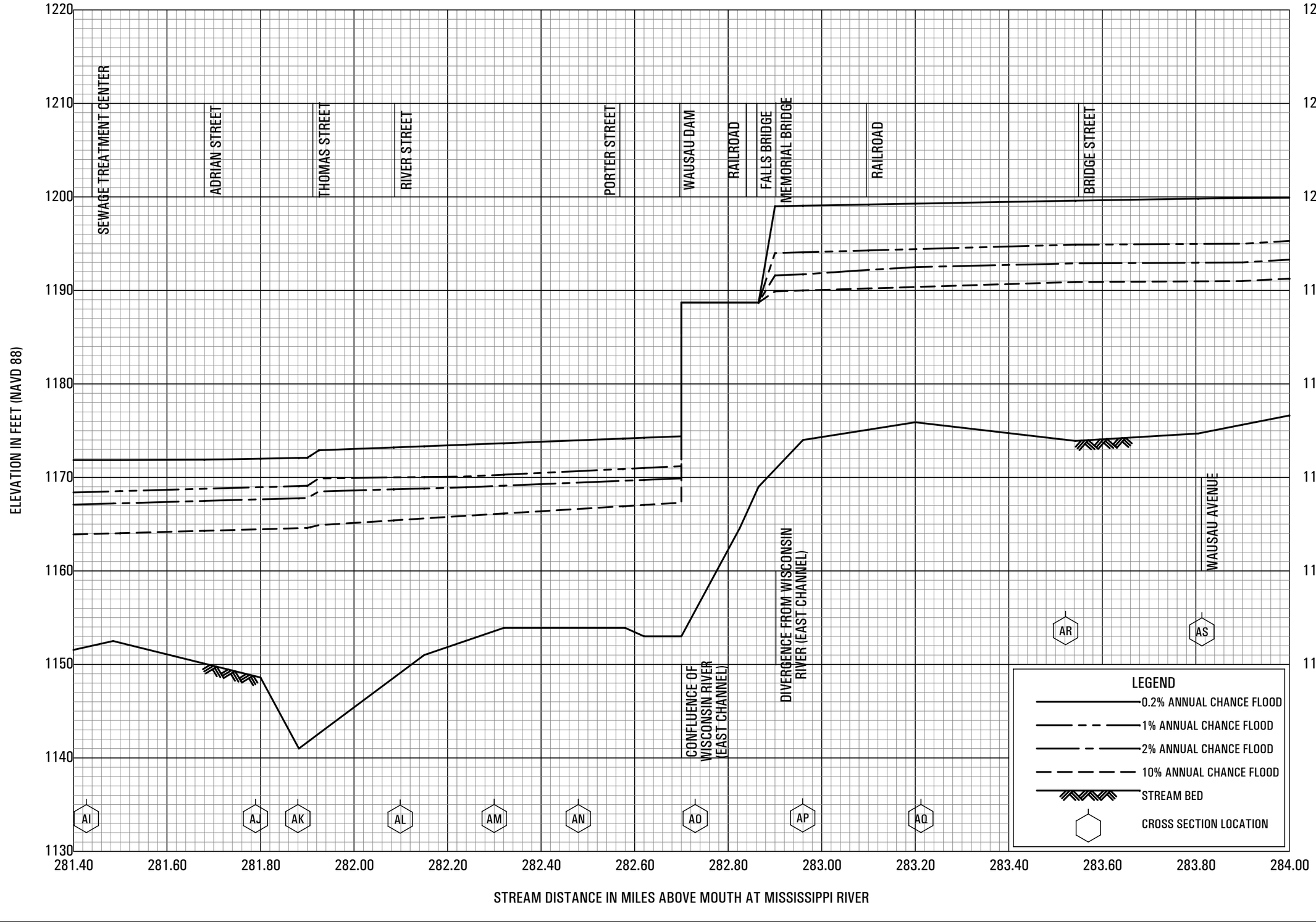
FLOOD PROFILES

WISCONSIN RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARATHON COUNTY, WI

AND INCORPORATED AREAS



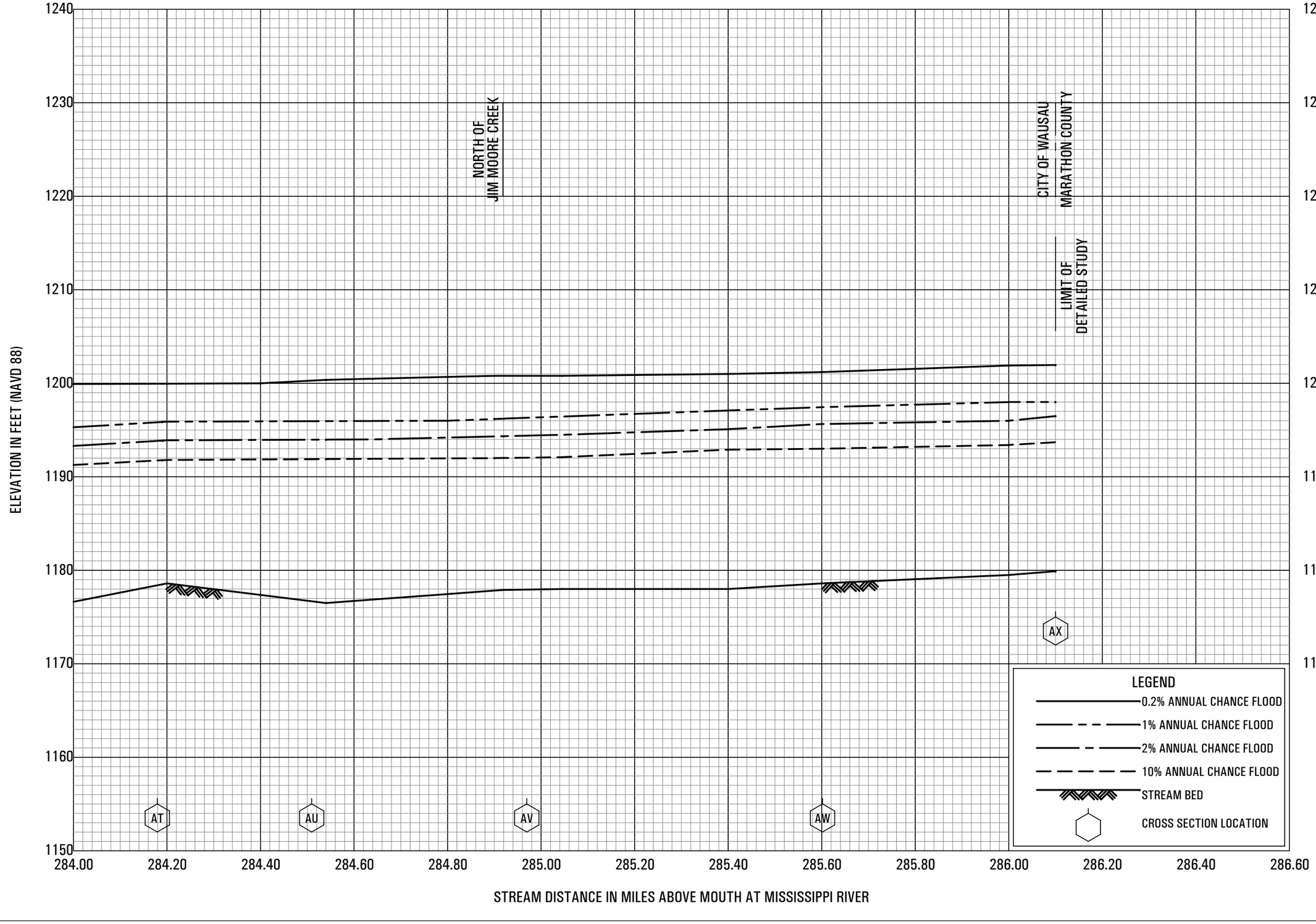
FLOOD PROFILES

WISCONSIN RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARATHON COUNTY, WI

AND INCORPORATED AREAS



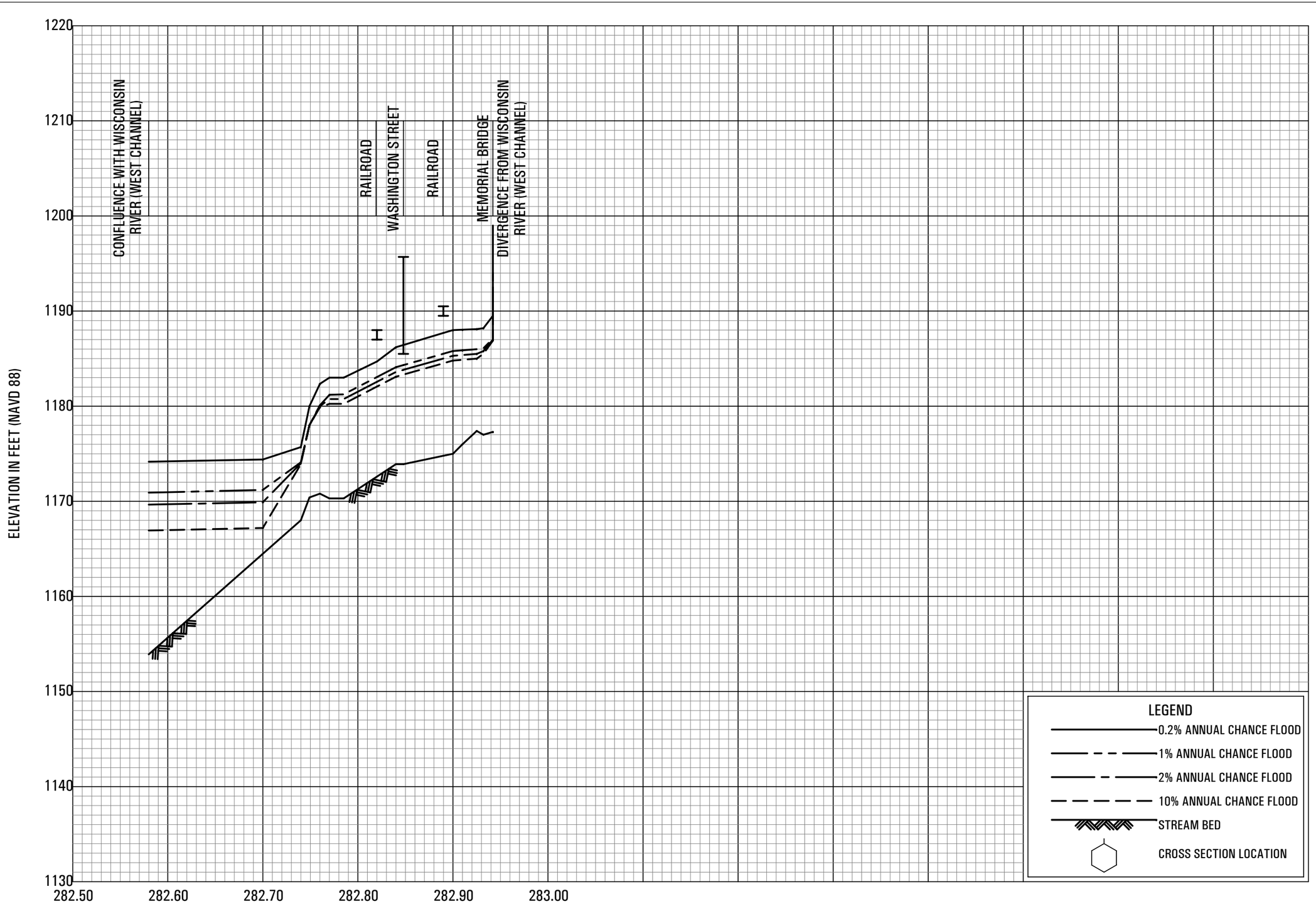
FLOOD PROFILES

WISCONSIN RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARATHON COUNTY, WI

AND INCORPORATED AREAS



FLOOD PROFILES

WISCONSIN RIVER EAST CHANNEL

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARATHON COUNTY, WI

AND INCORPORATED AREAS

28P

NOTES TO USERS

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Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures.** Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 16. The **horizontal datum** was NAD83, GRS1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum.** For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://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, MD 20910- 3282

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713- 3242,** or visit its website at http://www.ngs.noaa.gov/.

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Contact the **FEMA Map Service Center** at 1- 800- 358- 9616 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, *a Flood Insurance Study report,* and/or digital versions of this map. The FEMA Map Service Center may also be reached by Fax at 1- 800- 358- 9620 and its website at http://www.msc.fema.gov/.

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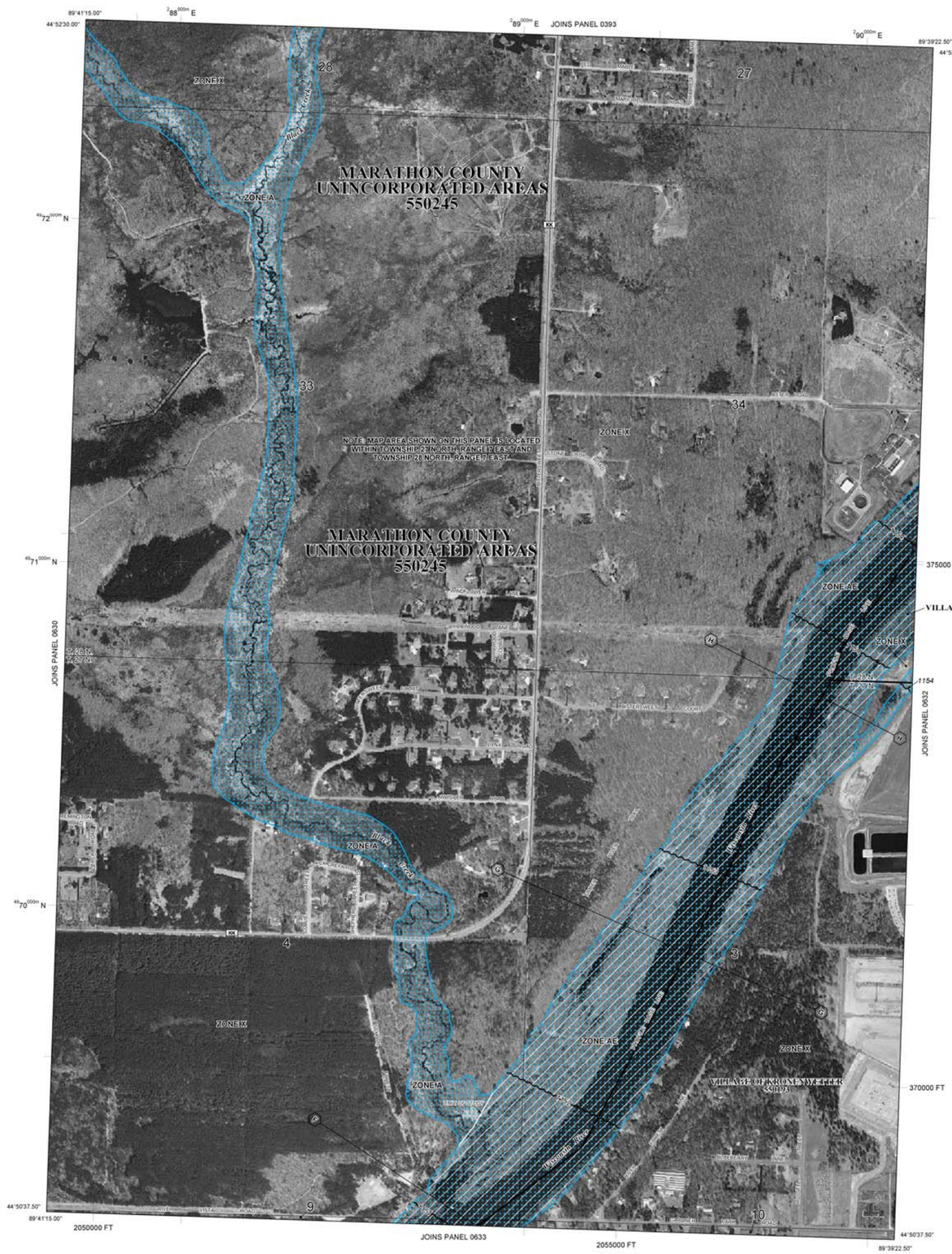

LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

	1% annual chance floodplain boundary
	0.2% annual chance floodplain boundary
	Floodway boundary
	Zone D boundary
	CBRS and OPA boundary
	Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
513	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988 (NAVD 88)

A — A	Cross section line
23 — 23	Transect line
97°07'30", 32°22'30"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
4275 000m N	1000-meter Universal Transverse Mercator grid ticks, zone 16
6000000 FT	5000-foot grid ticks: Wisconsin State Plane coordinate system, central zone (FIPSZONE 4802), Lambert Conformal Conic
DX5510	Bench mark (see explanation in Notes to Users section of this FIRM panel)
M1.5	River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
July 22, 2010
EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

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MAP SCALE 1" = 500'
250 0 500 1000 FEET
150 0 150 300 METERS

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0631F

FIRM
FLOOD INSURANCE RATE MAP
MARATHON COUNTY, WISCONSIN
AND INCORPORATED AREAS

PANEL 631 OF 1000
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)
CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
MARATHON COUNTY	550245	0631	F
KRONENWETTER, VILLAGE OF	550193	0631	F
ROTHSCHILD, VILLAGE OF	555577	0631	F

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
55073C0631F
EFFECTIVE DATE
JULY 22, 2010

Federal Emergency Management Agency

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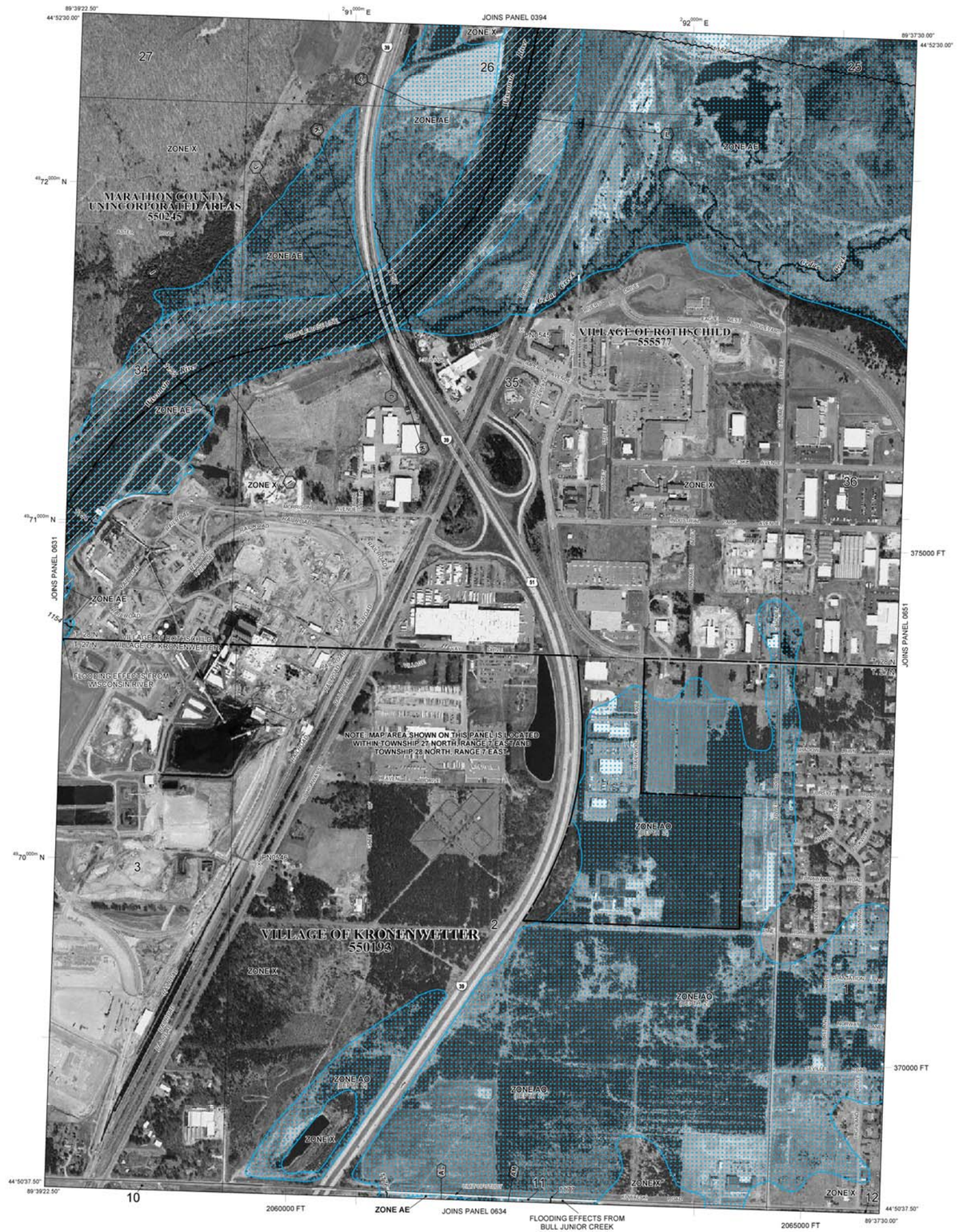

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- Zone D boundary
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- 513 — Base Flood Elevation line and value; elevation in feet*
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* Referenced to the North American Vertical Datum of 1988 (NAVD 88)

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- 23 — 23 — Transect line
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- M1.5 — River Mile

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July 22, 2010
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150 0 150 300 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0632F

FIRM
FLOOD INSURANCE RATE MAP
MARATHON COUNTY, WISCONSIN
AND INCORPORATED AREAS

PANEL 632 OF 1000
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
MARATHON COUNTY	550245	0632	F
KRONENWETTER, VILLAGE OF	550193	0632	F
ROTHSCHILD, VILLAGE OF	555577	0632	F

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
55073C0632F

EFFECTIVE DATE
JULY 22, 2010

Federal Emergency Management Agency