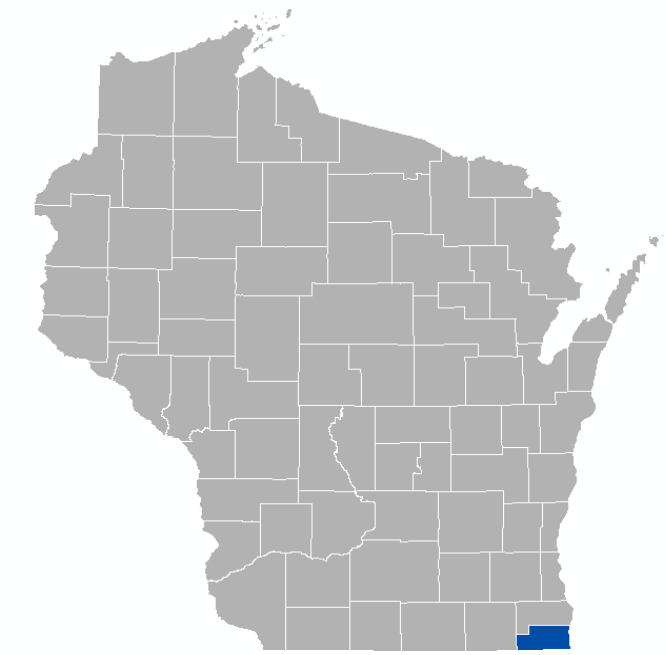
FLOOD INSURANCE STUDY

FEDERAL EMERGENCY MANAGEMENT AGENCY

VOLUME 1 OF 3



KENOSHA COUNTY, WISCONSIN

AND INCORPORATED AREAS

COMMUNITY NAME	CID	COMMUNITY NAME	CID
BRISTOL, VILLAGE OF	550595	PLEASANT PRAIRIE, VILLAGE OF	550613
GENOA CITY, VILLAGE OF*	550465	SALEM LAKES, VILLAGE OF	550505
KENOSHA, CITY OF	550209	SOMERS, VILLAGE OF	550406
KENOSHA COUNTY, UNINCORPORATED AREAS	550523	TWIN LAKES, VILLAGE OF	550211
PADDOCK LAKE, VILLAGE OF	550073		

*No Special Flood Hazard Areas Identified within Kenosha County

REVISED:

TBD **PRELIMINARY 03/28/2022**

FLOOD INSURANCE STUDY NUMBER
55059CV001C

Version Number 2.6.2.1

FEMA

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Published Separately

FLOOD INSURANCE STUDY REPORT
KENOSHA COUNTY, WISCONSIN

SECTION 1.0 – INTRODUCTION

1.1 The National Flood Insurance Program

The National Flood Insurance Program (NFIP) is a voluntary Federal program that enables property owners in participating communities to purchase insurance protection against losses from flooding. This insurance is designed to provide an alternative to disaster assistance to meet the escalating costs of repairing damage to buildings and their contents caused by floods.

For decades, the national response to flood disasters was generally limited to constructing flood-control works such as dams, levees, sea-walls, and the like, and providing disaster relief to flood victims. This approach did not reduce losses nor did it discourage unwise development. In some instances, it may have actually encouraged additional development. To compound the problem, the public generally could not buy flood coverage from insurance companies, and building techniques to reduce flood damage were often overlooked.

In the face of mounting flood losses and escalating costs of disaster relief to the general taxpayers, the U.S. Congress created the NFIP. The intent was to reduce future flood damage through community floodplain management ordinances, and provide protection for property owners against potential losses through an insurance mechanism that requires a premium to be paid for the protection.

The U.S. Congress established the NFIP on August 1, 1968, with the passage of the National Flood Insurance Act of 1968. The NFIP was broadened and modified with the passage of the Flood Disaster Protection Act of 1973 and other legislative measures. It was further modified by the National Flood Insurance Reform Act of 1994 and the Flood Insurance Reform Act of 2004. The NFIP is administered by the Federal Emergency Management Agency (FEMA), which is a component of the Department of Homeland Security (DHS).

Participation in the NFIP is based on an agreement between local communities and the Federal Government. If a community adopts and enforces floodplain management regulations to reduce future flood risks to new construction and substantially improved structures in Special Flood Hazard Areas (SFHAs), the Federal Government will make flood insurance available within the community as a financial protection against flood losses. The community's floodplain management regulations must meet or exceed criteria established in accordance with Title 44 Code of Federal Regulations (CFR) Part 60.3, *Criteria for land Management and Use*.

SFHAs are delineated on the community's Flood Insurance Rate Maps (FIRMs). Under the NFIP, buildings that were built before the flood hazard was identified on the community's FIRMs are generally referred to as "Pre-FIRM" buildings. When the NFIP was created, the U.S. Congress recognized that insurance for Pre-FIRM buildings would be prohibitively expensive if the premiums were not subsidized by the Federal Government. Congress also recognized that most of these floodprone buildings were

built by individuals who did not have sufficient knowledge of the flood hazard to make informed decisions. The NFIP requires that full actuarial rates reflecting the complete flood risk be charged on all buildings constructed or substantially improved on or after the effective date of the initial FIRM for the community or after December 31, 1974, whichever is later. These buildings are generally referred to as “Post-FIRM” buildings.

1.2 Purpose of this Flood Insurance Study Report

This Flood Insurance Study (FIS) report revises and updates information on the existence and severity of flood hazards for the study area. The studies described in this report developed flood hazard data that will be used to establish actuarial flood insurance rates and to assist communities in efforts to implement sound floodplain management.

In some states or communities, floodplain management criteria or regulations may exist that are more restrictive than the minimum Federal requirements. Contact your State NFIP Coordinator to ensure that any higher State standards are included in the community’s regulations.

1.3 Jurisdictions Included in the Flood Insurance Study Project

This FIS Report covers the entire geographic area of Kenosha County, Wisconsin.

The jurisdictions that are included in this project area, along with the Community Identification Number (CID) for each community and the 8-digit Hydrologic Unit Codes (HUC-8) sub-basins affecting each, are shown in Table 1. The Flood Insurance Rate Map (FIRM) panel numbers that affect each community are listed. If the flood hazard data for the community is not included in this FIS Report, the location of that data is identified.

Jurisdictions that have no identified SFHAs as of the effective date of this study are indicated in the table. Changed conditions in these communities (such as urbanization or annexation) or the availability of new scientific or technical data about flood hazards could make it necessary to determine SFHAs in these jurisdictions in the future.

Table 1: Listing of NFIP Jurisdictions

Community	CID	HUC-8 Sub-Basin(s)	Located on FIRM Panel(s)	If Not Included, Location of Flood Hazard Data
Bristol, Village of	550595	07120004	55059C0154D, 55059C0158D, 55059C0159D, 55059C0162D, 55059C0164E, 55059C0166D, 55059C0167D, 55059C0168D, 55059C0169D, 55059C0178D, 55059C0179D, 55059C0186D, 55059C0187D, 55059C0188D, 55059C0189D, 55059C0277E, 55059C0281D, 55059C0282D, 55059C0301D[1], 55059C0302D[1]	
Genoa City, Village of[2]	550465	07120006	55059C0118E, 55059C0231D	
Kenosha, City of	550209	04040002, 04190000, 07120004	55059C0088D, 55059C0089E, 55059C0176D, 55059C0177D, 55059C0178D, 55059C0179D, 55059C0181D, 55059C0182D, 55059C0183D, 55059C0184E, 55059C0192E, 55059C0201D, 55059C0202E, 55059C0203D[1], 55059C0204E, 55059C0208E, 55059C0211D, 55059C0212E, 55059C0216E	
Kenosha County, Unincorporated Areas	550523	04040002, 04190000, 07120004, 07120006	55059C0012E, 55059C0014D, 55059C0016E, 55059C0017E, 55059C0018E, 55059C0019D, 55059C0036D[1], 55059C0037D[1], 55059C0038D, 55059C0039D, 55059C0041D, 55059C0042D, 55059C0043D, 55059C0044D, 55059C0061D[1], 55059C0062D, 55059C0063D[1], 55059C0064D, 55059C0088D, 55059C0089E, 55059C0107E, 55059C0109E, 55059C0110E, 55059C0116E, 55059C0117E, 55059C0118E, 55059C0119D, 55059C0126E, 55059C0127E, 55059C0128E, 55059C0129E, 55059C0131E, 55059C0132E, 55059C0133E, 55059C0134D, 55059C0136E, 55059C0137E, 55059C0138D, 55059C0139D, 55059C0143E, 55059C0151E, 55059C0152E, 55059C0153D, 55059C0154D, 55059C0156D, 55059C0157D, 55059C0158D, 55059C0159D, 55059C0176D, 55059C0177D, 55059C0178D, 55059C0179D, 55059C0181D, 55059C0182D, 55059C0183D, 55059C0184E, 55059C0201D, 55059C0202E, 55059C0203D[1], 55059C0231D, 55059C0232D, 55059C0251D[1], 55059C0252D[1], 55059C0256E	

[1] Panel Not Printed

[2] No Special Flood Hazard Areas Identified within Kenosha County

Table 1: Listing of NFIP Jurisdictions *(continued)*

Community	CID	HUC-8 Sub-Basin(s)	Located on FIRM Panel(s)	If Not Included, Location of Flood Hazard Data
Paddock Lake, Village of	550073	07120004, 07120006	55059C0134D, 55059C0142E, 55059C0153D, 55059C0154D, 55059C0161E, 55059C0162D	
Pleasant Prairie, Village of	550613	04040002, 04190000, 07120004	55059C0179D, 55059C0183D, 55059C0184E, 55059C0187D, 55059C0188D, 55059C0189D, 55059C0191D, 55059C0192E, 55059C0193D, 55059C0194D, 55059C0203D[1], 55059C0211D, 55059C0212E, 55059C0213D, 55059C0214E, 55059C0216E, 55059C0218E, 55059C0302D[1], 55059C0306D, 55059C0307D, 55059C0326D, 55059C0327D, 55059C0331E	
Salem Lakes, Village of	550505	07120004, 07120006	55059C0129E, 55059C0133E, 55059C0134D, 55059C0137E, 55059C0139D, 55059C0141E, 55059C0142E, 55059C0143E, 55059C0144E, 55059C0153D, 55059C0154D, 55059C0161E, 55059C0162D, 55059C0163E, 55059C0164E, 55059C0256E, 55059C0257E, 55059C0276E, 55059C0277E	
Somers, Village of	550406	04040002, 04190000, 07120004	55059C0062D, 55059C0064D, 55059C0066D, 55059C0067D, 55059C0068D, 55059C0069D, 55059C0086D, 55059C0087D, 55059C0088D, 55059C0089E, 55059C0091E, 55059C0093E, 55059C0177D, 55059C0181D, 55059C0182D, 55059C0184E, 55059C0201D, 55059C0202E	
Village of Twin Lakes	550211	07120006	55059C0117E, 55059C0118E, 55059C0119D, 55059C0136E, 55059C0137E, 55059C0138D, 55059C0139D[1], 55059C0231D, 55059C0232D, 55059C0252D[1]	

[1] Panel Not Printed

1.4 Considerations for using this Flood Insurance Study Report

The NFIP encourages State and local governments to implement sound floodplain management programs. To assist in this endeavor, each FIS Report provides floodplain data, which may include a combination of the following: 10-, 4-, 2-, 1-, and 0.2-percent annual chance flood elevations (the 1-percent-annual-chance flood elevation is also referred to as the Base Flood Elevation (BFE)); 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/or in many components of the FIS Report, including Flood Profiles, Floodway Data tables, Summary of Non-Coastal Stillwater Elevations tables, and Coastal Transect Parameters tables (not all components may be provided for a specific FIS).

This section presents important considerations for using the information contained in this FIS Report and the FIRM, including changes in format and content. Figures 1, 2, and 3 present information that applies to using the FIRM with the FIS Report.

- Part or all of this FIS Report may be revised and republished at any time. In addition, part of this FIS Report may be revised by a Letter of Map Revision (LOMR), which does not involve republication or redistribution of the FIS Report. Refer to Section 6.5 of this FIS Report for information about the process to revise the FIS Report and/or FIRM.

  It is, therefore, the responsibility of the user to consult with community officials by contacting the community repository to obtain the most current FIS Report components. Communities participating in the NFIP have established repositories of flood hazard data for floodplain management and flood insurance purposes. Community map repository addresses are provided in Table 30, “Map Repositories,” within this FIS Report.

- New FIS Reports are frequently developed for multiple communities, such as entire counties. A countywide FIS Report incorporates previous FIS Reports for individual communities and the unincorporated area of the county (if not jurisdictional) into a single document and supersedes those documents for the purposes of the NFIP.

  The initial Countywide FIS Report for Kenosha County became effective on June 19, 2012. Refer to Table 27 for information about subsequent revisions to the FIRMs.

- FEMA does not impose floodplain management requirements or special insurance ratings based on Limit of Moderate Wave Action (LiMWA) delineations at this time. The LiMWA represents the approximate landward limit of the 1.5-foot breaking wave. If the LiMWA is shown on the FIRM, it is being provided by FEMA as information only. For communities that do adopt Zone VE building standards in the area defined by the LiMWA, additional Community Rating System (CRS) credits are available. Refer to Section 2.5.4 for additional information about the LiMWA.

The CRS is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. Visit the FEMA Web site at www.fema.gov/flood-insurance/rules-legislation/community-rating-system or contact your appropriate FEMA Regional Office for more information about this program.

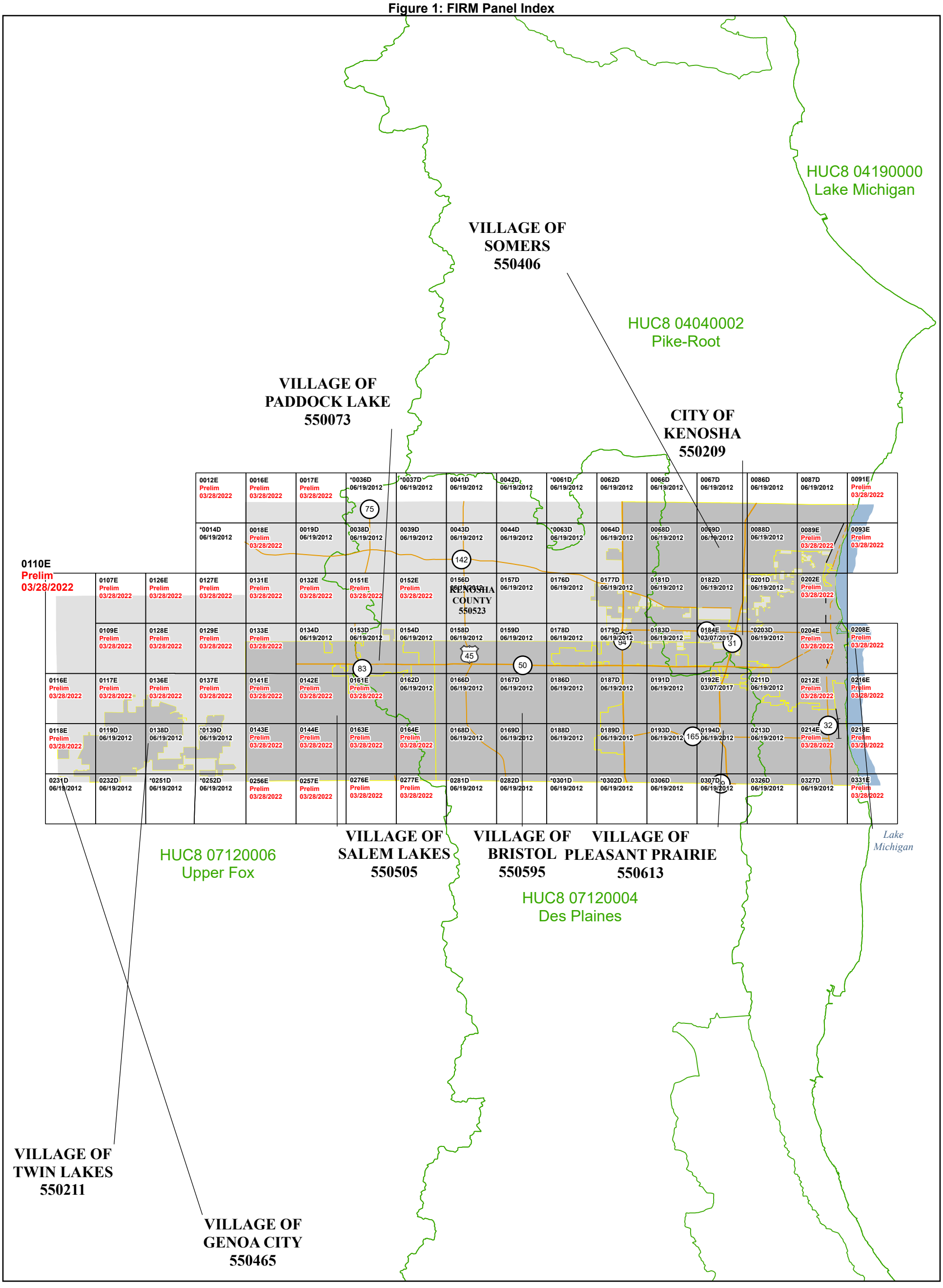
- FEMA does not design, build, inspect, operate, maintain, or certify levees. FEMA is responsible for accurately identifying flood hazards and communicating those hazards and risks to affected stakeholders. FEMA has identified one or more levee systems in this jurisdiction summarized in Table 8 of this FIS Report. For FEMA to accredit the identified levee systems, the levee systems must meet the criteria of the Code of Federal Regulations, Title 44, Section 65.10 (44 CFR 65.10), titled "Mapping of Areas Protected by Levee Systems."

  Information on the levee systems in this jurisdiction can be obtained from the USACE National Levee Database (https://levees.sec.usace.army.mil/). For additional information, the user should contact the appropriate jurisdiction floodplain administrator and the levee owner or sponsor.

- FEMA has developed a *Guide to Flood Maps* (FEMA 258) and online tutorials to assist users in accessing the information contained on the FIRM. These include how to read panels and step-by-step instructions to obtain specific information. To obtain this guide and other assistance in using the FIRM, visit the FEMA Web site at www.fema.gov/online-tutorials.

The FIRM Index in Figure 1 shows the overall FIRM panel layout within Kenosha County, and also displays the panel number and effective date for each FIRM panel in the county. Other information shown on the FIRM Index includes community boundaries, flooding sources, watershed boundaries, and USGS HUC-8 codes.

Figure 1: FIRM Panel Index



1 inch = 21,343 feet 1:256,112

N

feet
0 5,000 10,000 20,000 30,000

Map Projection:
GCS WGS 1984
Vertical Datum: NAVD88

THE INFORMATION DEPICTED ON THIS MAP AND SUPPORTING DOCUMENTATION ARE ALSO AVAILABLE IN DIGITAL FORMAT AT

HTTPS://MSC.FEMA.GOV

SEE FLOOD INSURANCE STUDY FOR ADDITIONAL INFORMATION

* PANEL NOT PRINTED - NO SPECIAL FLOOD HAZARD AREAS

NATIONAL FLOOD INSURANCE PROGRAM

FLOOD INSURANCE RATE MAP INDEX

KENOSHA COUNTY, WISCONSIN AND INCORPORATED AREAS

PANELS PRINTED:

0012, 0016, 0017, 0018, 0019, 0038, 0039, 0041, 0042, 0043, 0044, 0062, 0064, 0066, 0067, 0068, 0069, 0086, 0087, 0088, 0089, 0091, 0093, 0107, 0109, 0110, 0116, 0117, 0118, 0119, 0126, 0127, 0128, 0129, 0131, 0132, 0133, 0134, 0136, 0137, 0138, 0141, 0142, 0143, 0144, 0151, 0152, 0153, 0154, 0156, 0157, 0158, 0159, 0161, 0162, 0163, 0164, 0166, 0167, 0168, 0169, 0176, 0177, 0178, 0179, 0181, 0182, 0183, 0184, 0186, 0187, 0188, 0189, 0191, 0192, 0193, 0194, 0201, 0202, 0204, 0208, 0211, 0212, 0213, 0214, 0216, 0218, 0231, 0232, 0256, 0257, 0276, 0277, 0281, 0282, 0306, 0307, 0326, 0327, 0331

FEMA

MAP NUMBER
55059CIND1E

EFFECTIVE DATE
Prelim Issue Date: 03/28/2022

Each FIRM panel may contain specific notes to the user that provide additional information regarding the flood hazard data shown on that map. However, the FIRM panel does not contain enough space to show all the notes that may be relevant in helping to better understand the information on the panel. Figure 2 contains the full list of these notes.

Figure 2: FIRM Notes to Users

NOTES TO USERS

For information and questions about this Flood Insurance Rate Map (FIRM), available products associated with this FIRM including historic versions of this FIRM, how to order products, or the National Flood Insurance Program in general, please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Map Service Center website at msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the website. Users may determine the current map date for each FIRM panel by visiting the FEMA Map Service Center website or by calling the FEMA Map Information eXchange.

Communities annexing land on adjacent FIRM panels must obtain a current copy of the adjacent panel as well as the current FIRM Index. These may be ordered directly from the Map Service Center at the number listed above.

For community and countywide map dates, refer to Table 27 in this FIS Report.

To determine if flood insurance is available in the community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

PRELIMINARY FIS REPORT: FEMA maintains information about map features, such as street locations and names, in or near designated flood hazard areas. Requests to revise information in or near designated flood hazard areas may be provided to FEMA during the community review period, at the final Consultation Coordination Officer's meeting, or during the statutory 90-day appeal period. Approved requests for changes will be shown on the final printed FIRM.

The map is for use in administering the NFIP. It may not identify all areas subject to flooding, particularly from local drainage sources of small size. Consult the community map repository to find updated or additional flood hazard information.

BASE FLOOD ELEVATIONS: For more detailed information in areas where Base Flood Elevations (BFEs) and/or floodways have been determined, consult the Flood Profiles and Floodway Data and/or Summary of Non-Coastal Stillwater Elevations tables within this FIS Report. Use the flood elevation data within the FIS Report in conjunction with the FIRM for construction and/or floodplain management.

Coastal Base Flood Elevations shown on the map apply only landward of the zero elevation referenced to Low Water Datum of Lake Michigan, administratively established by the National Oceanic and Atmospheric Administration at 176.0 meters (577.5 feet) above zero point International Great Lakes Datum of 1985. This lake-wide elevation is approximately equal to an elevation of 577.6 feet North American Vertical Datum of 1988 (NAVD88). Coastal flood elevations are also provided in the Coastal Transect Parameters table in the FIS Report for this jurisdiction. Elevations shown in the Coastal Transect Parameters table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on the FIRM.

Figure 2. FIRM Notes to Users *(continued)*

FLOODWAY INFORMATION: 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 FIS Report for this jurisdiction.

FLOOD CONTROL STRUCTURE INFORMATION: Certain areas not in Special Flood Hazard Areas may be protected by flood control structures. Refer to Section 4.3 "Dams and Other Flood Hazard Reduction Measures" of this FIS Report for information on flood control structures for this jurisdiction.

PROJECTION INFORMATION: The projection used in the preparation of the map was Universal Transverse Mercator (UTM) Zone 16N. The horizontal datum was the World Geodetic System (WGS) of 1984. Differences in datum, spheroid, projection or State Plane 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 the FIRM.

ELEVATION DATUM: Flood elevations on the FIRM are referenced to 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 North American Vertical Datum of 1988, visit the National Geodetic Survey website at www.ngs.noaa.gov.

Local vertical monuments may have been used to create the map. To obtain current monument information, please contact the appropriate local community listed in Table 30 of this FIS Report.

BASE MAP INFORMATION: Base map information shown on the FIRM was provided by the US Geological Survey. This information was last updated in the fall of 2020. For information about base maps, refer to Section 6.2 “Base Map” in this FIS Report.

The map reflects more detailed and up-to-date stream channel configurations than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables may reflect stream channel distances that differ from what is shown on the map.

Corporate limits shown on the map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after the map was published, map users should contact appropriate community officials to verify current corporate limit locations.

NOTES FOR FIRM INDEX

REVISIONS TO INDEX: As new studies are performed and FIRM panels are updated within Kenosha County, Wisconsin, corresponding revisions to the FIRM Index will be incorporated within the FIS Report to reflect the effective dates of those panels. Please refer to Table 27 of this FIS Report to determine the most recent FIRM revision date for each community. The most recent FIRM panel effective date will correspond to the most recent index date.

Figure 2. FIRM Notes to Users *(continued)*

SPECIAL NOTES FOR SPECIFIC FIRM PANELS

This Notes to Users section was created specifically for Kenosha County, Wisconsin and Incorporated Areas, effective TBD.

ACCREDITED LEVEE SYSTEM: Check with your local community to obtain more information on the levee system(s) shown as providing flood hazard reduction on this panel. To mitigate flood hazards in residual risk areas, property owners and residents are encouraged to review the community's emergency preparedness plan and to consider flood insurance and floodproofing or other risk reduction measures. For more information on flood insurance, interested parties should visit www.fema.gov/flood-insurance.

FLOOD RISK REPORT: A Flood Risk Report (FRR) may be available for many of the flooding sources and communities referenced in this FIS Report. The FRR is provided to increase public awareness of flood risk by helping communities identify the areas within their jurisdictions that have the greatest risks. Although non-regulatory, the information provided within the FRR can assist communities in assessing and evaluating mitigation opportunities to reduce these risks. It can also be used by communities developing or updating flood risk mitigation plans. These plans allow communities to identify and evaluate opportunities to reduce potential loss of life and property. However, the FRR is not intended to be the final authoritative source of all flood risk data for a project area; rather, it should be used with other data sources to paint a comprehensive picture of flood risk.

Each FIRM panel contains an abbreviated legend for the features shown on the maps. However, the FIRM panel does not contain enough space to show the legend for all map features. Figure 3 shows the full legend of all map features. Note that not all of these features may appear on the FIRM panels in Kenosha County.

Figure 3: Map Legend for FIRM

SPECIAL FLOOD HAZARD AREAS: *The 1% annual chance flood, also known as the base flood or 100-year flood, has a 1% chance of happening or being exceeded each year. Special Flood Hazard Areas are subject to flooding by the 1% annual chance flood. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood. 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. See note for specific types. If the floodway is too narrow to be shown, a note is shown.*

Special Flood Hazard Areas subject to inundation by the 1% annual chance flood (Zones A, AE, AH, AO, AR, A99, V and VE)

Zone A — The flood insurance rate zone that corresponds to the 1% annual chance floodplains. No base (1% annual chance) flood elevations (BFEs) or depths are shown within this zone.

Zone AE — The flood insurance rate zone that corresponds to the 1% annual chance floodplains. Base flood elevations derived from the hydraulic analyses are shown within this zone, either at cross section locations or as static whole-foot elevations that apply throughout the zone.

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

Zone AO — The flood insurance rate zone that corresponds to the areas of 1% 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 hydraulic analyses are shown within this zone.

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

Zone V — The flood insurance rate zone that corresponds to the 1% annual chance coastal floodplains that have additional hazards associated with storm waves. Base flood elevations are not shown within this zone.

Zone VE — Zone VE is the flood insurance rate zone that corresponds to the 1% annual chance coastal floodplains that have additional hazards associated with storm waves. Base flood elevations derived from the coastal analyses are shown within this zone as static whole-foot elevations that apply throughout the zone.

Regulatory Floodway determined in Zone AE.

Figure 3: Map Legend for FIRM *(continued)*

OTHER AREAS OF FLOOD HAZARD

Shaded Zone X: Areas of 0.2% annual chance flood hazards and areas of 1% annual chance flood hazards with average depths of less than 1 foot or with drainage areas less than 1 square mile.

Future Conditions 1% Annual Chance Flood Hazard – Zone X: The flood insurance rate zone that corresponds to the 1% annual chance floodplains that are determined based on future-conditions hydrology. No base flood elevations or flood depths are shown within this zone.

Area with Reduced Flood Hazard due to Accredited or Provisionally Accredited Levee System: Area is shown as reduced flood hazard from the 1-percent-annual-chance or greater flood by a levee system. Overtopping or failure of any levee system is possible. See Notes to Users for important information.

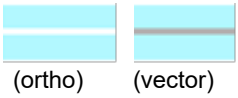
Area with Undetermined Flood Hazard due to Non-Accredited Levee System: Analysis and mapping procedures for non-accredited levee systems were applied resulting in a flood insurance rate zone where flood hazards are undetermined, but possible.

OTHER AREAS

Zone D (Areas of Undetermined Flood Hazard): The flood insurance rate zone that corresponds to unstudied areas where flood hazards are undetermined, but possible.

Unshaded Zone X: Areas of minimal flood hazard.

FLOOD HAZARD AND OTHER BOUNDARY LINES



Flood Zone Boundary (white line on ortho-photography-based mapping; gray line on vector-based mapping)

Limit of Study

Jurisdiction Boundary

Limit of Moderate Wave Action (LiMWA): Indicates the inland limit of the area affected by waves greater than 1.5 feet

GENERAL STRUCTURES

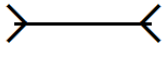
Aqueduct
Channel
Culvert
Storm Sewer

Channel, Culvert, Aqueduct, or Storm Sewer

Dam
Jetty
Weir

Dam, Jetty, Weir

Levee, Dike or Floodwall



Bridge

Bridge

Figure 3: Map Legend for FIRM *(continued)*

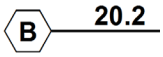
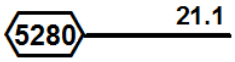
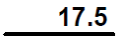
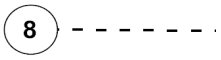
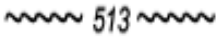
REFERENCE MARKERS	
	River mile Markers
CROSS SECTION & TRANSECT INFORMATION	
	Lettered Cross Section with Regulatory Water Surface Elevation (BFE)
	Numbered Cross Section with Regulatory Water Surface Elevation (BFE)
	Unlettered Cross Section with Regulatory Water Surface Elevation (BFE)
	Coastal Transect
	Profile Baseline: Indicates the modeled flow path of a stream and is shown on FIRM panels for all valid studies with profiles or otherwise established base flood elevation.
	Coastal Transect Baseline: Used in the coastal flood hazard model to represent the 0.0-foot elevation contour and the starting point for the transect and the measuring point for the coastal mapping.
	Base Flood Elevation Line (shown for flooding sources for which no cross sections or profile are available)
ZONE AE (EL 16)	Static Base Flood Elevation value (shown under zone label)
ZONE AO (DEPTH 2)	Zone designation with Depth
ZONE AO (DEPTH 2) (VEL 15 FPS)	Zone designation with Depth and Velocity

Figure 3: Map Legend for FIRM *(continued)*

BASE MAP FEATURES	
Missouri Creek	River, Stream or Other Hydrographic Feature
234	Interstate Highway
234	U.S. Highway
234	State Highway
234	County Highway
MAPLE LANE	Street, Road, Avenue Name, or Private Drive if shown on Flood Profile
RAILROAD	Railroad
	Horizontal Reference Grid Line
	Horizontal Reference Grid Ticks
+	Secondary Grid Crosshairs
Land Grant	Name of Land Grant
7	Section Number
R. 43 W. T. 22 N.	Range, Township Number
^{42}**76**^{000m}**E**	Horizontal Reference Grid Coordinates (UTM)
365000 FT	Horizontal Reference Grid Coordinates (State Plane)
80° 16’ 52.5”	Corner Coordinates (Latitude, Longitude)

SECTION 2.0 – FLOODPLAIN MANAGEMENT APPLICATIONS

2.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1-percent-annual chance (100-year) flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2-percent-annual-chance (500-year) flood is employed to indicate additional areas of flood hazard in the community.

Each flooding source included in the project scope has been studied and mapped using professional engineering and mapping methodologies that were agreed upon by FEMA and Kenosha County as appropriate to the risk level. Flood risk is evaluated based on factors such as known flood hazards and projected impact on the built environment. Engineering analyses were performed for each studied flooding source to calculate its 1-percent-annual-chance flood elevations; elevations corresponding to other floods (e.g. 10-, 4-, 2-, 0.2-percent annual chance, etc.) may have also been computed for certain flooding sources. Engineering models and methods are described in detail in Section 5.0 of this FIS Report. The modeled elevations at cross sections were used to delineate the floodplain boundaries on the FIRM; between cross sections, the boundaries were interpolated using elevation data from various sources. More information on specific mapping methods is provided in Section 6.0 of this FIS Report.

Depending on the accuracy of available topographic data (Table 22), study methodologies employed (Section 5.0), and flood risk, certain flooding sources may be mapped to show both the 1-percent and 0.2-percent-annual-chance floodplain boundaries, regulatory water surface elevations (BFEs), and/or a regulatory floodway. Similarly, other flooding sources may be mapped to show only the 1-percent-annual-chance floodplain boundary on the FIRM, without published water surface elevations. In cases where the 1-percent and 0.2-percent-annual-chance floodplain boundaries are close together, only the 1-percent-annual-chance floodplain boundary is shown on the FIRM. Figure 3, “Map Legend for FIRM”, describes the flood zones that are used on the FIRMs to account for the varying levels of flood risk that exist along flooding sources within the project area. Table 2 and Table 3 indicate the flood zone designations for each flooding source and each community within Kenosha County, respectively.

Table 2, “Flooding Sources Included in this FIS Report,” lists each flooding source, including its study limits, affected communities, mapped zone on the FIRM, and the completion date of its engineering analysis from which the flood elevations on the FIRM and in the FIS Report were derived. Descriptions and dates for the latest hydrologic and hydraulic analyses of the flooding sources are shown in Table 12. Floodplain boundaries for these flooding sources are shown on the FIRM (published separately) using the symbology described in Figure 3. On the map, the 1% annual chance floodplain corresponds to the SFHAs. The 0.2-percent-annual-chance floodplain shows areas that, although out of the regulatory floodplain, are still subject to flood hazards.

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. The procedures to remove these areas from the SFHA are described in Section 6.5 of this FIS Report.

Table 2: Flooding Sources Included in this FIS Report

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Area (mi^2) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Airport Creek	Kenosha, City of; Kenosha County, Unincorporated Areas	Confluence with Pike Creek	Approximately 5,000 feet upstream of its confluence with Pike Creek	04040002	0.9	*	N	AE	1983
Barnes Creek	Pleasant Prairie, Village of	Confluence with Barnes Creek North Outlet and Barnes Creek South Outlet	Approximately 0.5 miles upstream of Sheridan Road	04040002	1.1	*	N	AE	1982
Barnes Creek North Outlet	Pleasant Prairie, Village of	Confluence with Lake Michigan	Confluence with Barnes Creek	04040002	0.2	*	N	AE	1982
Barnes Creek South Outlet	Pleasant Prairie, Village of	Confluence with Lake Michigan	Confluence with Barnes Creek	04040002	0.7	*	N	AE	1982
Bassett Creek	Kenosha County, Unincorporated Areas	Confluence with Fox River	Approximately 1.6 miles upstream of County Highway JI	07120006	3.2	*	N	AE	1969
Bassett Creek Tributary	Kenosha County, Unincorporated Areas; Twin Lakes, Village of	Confluence with Bassett Creek	Approximately 800 feet upstream of Ice House Trail	07120006	0.6	*	Y	AE	1981
Brighton Creek	Bristol, Village of; Kenosha County, Unincorporated Areas; Salem Lakes, Village of	Confluence with Des Plaines River	Immediately upstream of State Highway 75	07120004	10.5	*	N	AE	2003
Camp Lake	Salem Lakes, Village of	Entire Shoreline	Entire Shoreline	07120006	*	1.2	N	AE	1996
Center Creek	Kenosha, City of; Bristol, Village of	Confluence with Des Plaines River	State Highway 50	07120004	2.3	*	N	AE	2003

* Not applicable for this Flood Risk Project

Table 2: Flooding Sources Included in this FIS Report *(continued)*

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Area (mi^2) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Center Lake	Salem Lakes, Village of	Entire Shoreline	Entire Shoreline	07120006	*	0.4	N	AE	1996
Des Plaines River	Bristol, Village of; Kenosha County, Unincorporated Areas, Pleasant Prairie, Village of	Wisconsin / Illinois State Boundary	Kenosha / Racine County Boundary	07120004	21.1	*	Y	AE	2003
Dutch Gap Canal	Bristol, Village of	Wisconsin / Illinois State Boundary	Downstream side of County Highway C	07120004	4.0	*	N	AE	2003
East Branch Pike Creek	Kenosha, City of; Kenosha County, Unincorporated Areas	Just downstream of 43rd Street	47th Avenue	04040002	2.1	*	Y	AE	1980
Fox River	Kenosha County, Unincorporated Areas; Salem Lakes, Village of	Wisconsin / Illinois State Boundary	Kenosha / Racine County Boundary	07120006	12.2	*	Y	AE	2015
Fox River Zone A Tributaries	Kenosha County, Unincorporated Areas; Paddock Lake, Village of; Salem Lakes, Village of; Twin Lakes, Village of	Various	Various	07120006	21.2	*	N	A	2015
Jerome Creek	Pleasant Prairie, Village of	Confluence with Des Plaines River	Approximately 750 feet upstream of 93rd Street	07120004	4.6	*	Y	AE	2003
Kenosha Branch	Kenosha, City of; Kenosha County, Unincorporated Areas	Confluence with Pike River	Approximately 700 feet upstream of 22nd Avenue	04040002	0.9	*	N	AE	1983

* Not applicable for this Flood Risk Project

Table 2: Flooding Sources Included in this FIS Report *(continued)*

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Area (mi^2) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Kilbourn Road Ditch	Kenosha, City of; Kenosha County, Unincorporated Areas; Pleasant Prairie, Village of; Somers, Village of	Confluence with Des Plaines River	Kenosha / Racine County Boundary	07120004	10.9	*	Y	AE	2003
Lake Elizabeth	Kenosha County, Unincorporated Areas; Twin Lakes, Village of	Entire Shoreline within County	Entire Shoreline within County	07120006	*	1.2	N	AE	1980
Lake Mary	Twin Lakes, Village of	Entire Shoreline	Entire Shoreline	07120006	*	0.5	N	AE	1980
Lake Michigan	Kenosha, City of; Pleasant Prairie, Village of; Somers, Village of	Entire Coastline	Entire Coastline	04190000	15.7	*	N	AE, AO, VE	2017
Mud Lake Outlet	Bristol, Village of	Confluence with Dutch Gap Canal	Approximately 2,500 feet upstream of 187th Street	07120004	1.4	*	N	AE	2003
Nelson Creek	Somers, Village of	Confluence with Sorenson Creek	Kenosha / Racine County Boundary	04040002	0.8	*	N	AE	1983
New Munster Creek	Kenosha County, Unincorporated Areas	Confluence with Fox River	Approximately 4,800 feet upstream of 376th Avenue	07120006	5.3	*	Y	AE	2015
Peterson Creek	Kenosha County, Unincorporated Areas	Confluence with Fox River	Immediately downstream of 308th Avenue	07120006	1.9	*	N	AE	1969

* Not applicable for this Flood Risk Project

Table 2: Flooding Sources Included in this FIS Report *(continued)*

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Area (mi^2) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Pike Creek	Kenosha, City of; Kenosha County, Unincorporated Areas; Pleasant Prairie, Village of; Somers, Village of	Confluence with Pike River	Just upstream of 75th Street	04040002	7.6	*	N	AE	1983
Pike River	Kenosha, City of	Confluence with Lake Michigan	Approximately 100 feet downstream of Alford Park Drive	04040002	0.2	*	N	AE	1983
Pike River	Kenosha, City of; Somers, Village of	Approximately 100 feet downstream of Alford Park Drive	Approximately 600 feet upstream of Sheridan Road	04040002	1.7	*	N	AE	2014
Pike River	Kenosha, City of; Kenosha County, Unincorporated Areas; Somers, Village of	Approximately 600 feet upstream of Sheridan Road	Kenosha / Racine County Boundary	04040002	10.9	*	N	AE	1983
Pleasant Prairie Tributary	Pleasant Prairie, Village of	Confluence with Des Plaines River	Just downstream of Wilmot Road	07120004	1.0	*	Y	AE	2003
Pond 3	Pleasant Prairie, Village of	Entire Shoreline	Entire Shoreline	07120004	*	0.009	N	AE	2003
Pond 4	Pleasant Prairie, Village of	Entire Shoreline	Entire Shoreline	07120004	*	0.002	N	AE	2003
Powers Lake Tributary	Kenosha County, Unincorporated Areas	Confluence with East Branch Nippersink Creek	Approximately 650 feet upstream of County Highway P	07120006	1.1	*	Y	AE	2015
Salem Branch Brighton Creek	Bristol, Village of; Paddock Lake, Village of; Salem Lakes, Village of	Confluence with Brighton Creek	Approximately 13,000 feet upstream of confluence with Brighton Creek	07120004	2.5	*	N	AE	2003

* Not applicable for this Flood Risk Project

Table 2: Flooding Sources Included in this FIS Report *(continued)*

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Area (mi^2) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
School Tributary	Somers, Village of	Confluence with Pike Creek	Approximately 3,300 feet upstream of County Highway EA	04040002	2.5	*	N	AE	1975
Silver Lake Outlet	Salem Lakes, Village of	Confluence with Fox River	Approximately 0.45 miles upstream of County Highway B	07120006	0.9	*	Y	AE	1977
Somers Branch	Somers, Village of	Confluence with Pike Creek	Approximately 110 feet downstream of 12th Street	04040002	2.5	*	N	AE	1983
Sorenson Creek	Somers, Village of	Confluence with Pike River	Kenosha / Racine County Boundary	04040002	1.6	*	N	AE	1983
Tributary to Somers Branch	Somers, Village of	Confluence with Somers Branch	Approximately 3,200 feet upstream of its confluence with Somers Branch	04040002	0.6	*	N	AE	1983
Union Grove Industrial Tributary	Kenosha County, Unincorporated Areas	Confluence with Des Plaines River	Kenosha / Racine County Boundary	07120004	1.2	*	N	AE	2003
Unnamed Tributary to Brighton Creek	Kenosha County, Unincorporated Areas	Confluence with Brighton Creek	Approximately 4,100 feet upstream of County Highway EW	07120004	1.8	*	N	A	2015
Unnamed Tributary to Camp Lake	Salem Lakes, Village of	Wisconsin / Illinois State Boundary	Immediately upstream of Wilmot Road	07120006	1.5	*	N	AE	1996
Unnamed Tributary to Center Lake	Salem Lakes, Village of	1,700 feet downstream of 89th Street	Approximately 1,700 feet upstream of 89th Street	07120006	0.7	*	N	AE	1996

* Not applicable for this Flood Risk Project

Table 2: Flooding Sources Included in this FIS Report *(continued)*

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Area (mi^2) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Unnamed Tributary to Pike Creek	Somers, Village of	Confluence with Pike Creek	Approximately 3,800 feet upstream of County Highway EA	04040002	1.3	*	N	AE	1981
Unnamed Tributary No. 1 to Center Creek	Bristol, Village of; Kenosha, City of	Confluence with Center Creek	Approximately 5,700 feet upstream of 75th Street	07120004	2.0	*	N	AE	2003
Unnamed Tributary No. 1 to Des Plaines River	Pleasant Prairie, Village of	Wisconsin / Illinois State Boundary	Approximately 5,400 feet upstream of Springbrook Road	07120004	2.1	*	Y	AE	2003
Unnamed Tributary No. 1 to Hooker Lake	Salem Lakes, Village of	Confluence with Hooker Lake	Approximately 5,650 feet upstream of 89th Street	07120004	1.9	*	N	AE	2016
Unnamed Tributary No. 1 to Kilbourn Road Ditch	Pleasant Prairie, Village of	Confluence with Kilbourn Road Ditch	Approximately 3,800 feet upstream of its confluence with Kilbourn Road Ditch	07120004	0.6	*	Y	AE	2003
Unnamed Tributary No. 1 to Salem Branch Brighton Creek	Bristol, Village of	Confluence with Salem Branch Brighton Creek	Downstream side of 85th Street	07120004	1.3	*	N	AE	2003
Unnamed Tributary No. 1A to Des Plaines River	Pleasant Prairie, Village of	Confluence with Unnamed Tributary No. 1 to Des Plaines River	Wisconsin / Illinois State Boundary	07120004	1.1	*	Y	AE, AO	2003

* Not applicable for this Flood Risk Project

Table 2: Flooding Sources Included in this FIS Report *(continued)*

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Area (mi^2) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Unnamed Tributary No. 1B to Des Plaines River	Pleasant Prairie, Village of	Confluence with Unnamed Tributary No. 1 to Des Plaines River	Just downstream of its confluence with Unnamed Tributary No. 1C to Des Plaines River	07120004	1.1	*	Y	AE	2003
Unnamed Tributary No. 1C to Des Plaines River	Pleasant Prairie, Village of	Confluence with Unnamed Tributary No. 1B to Des Plaines River	Approximately 8,100 feet upstream of its confluence with Unnamed Tributary No. 1B	07120004	1.5	*	Y	AE	2003
Unnamed Tributary No. 1E to Des Plaines River	Bristol, Village of; Pleasant Prairie, Village of	Confluence with Unnamed Tributary No. 2 to Des Plaines River	Approximately 3,100 feet upstream of Interstate 94	07120004	2.6	*	Y	AE	2003
Unnamed Tributary No. 1F to Des Plaines River	Bristol, Village of; Pleasant Prairie, Village of	Confluence with Unnamed Tributary No. 1E to Des Plaines River	Approximately 5,700 feet upstream of its confluence	07120004	0.9	*	Y	AE	2003
Unnamed Tributary No. 2 to Des Plaines River	Pleasant Prairie, Village of	Confluence with Unnamed Tributary No. 1E to Des Plaines River	Approximately 5,700 feet upstream of Interstate 94	07120004	1.8	*	Y	AE	2003
Unnamed Tributary No. 2 to Jerome Creek	Pleasant Prairie, Village of	Confluence with Jerome Creek	Divergence from Unnamed Tributary No. 3 to Jerome Creek	07120004	0.8	*	Y	AE	2003
Unnamed Tributary No. 2 to Salem Branch Brighton Creek	Paddock Lake, Village of	Confluence with Salem Branch Brighton Creek	Approximately 1,000 feet upstream of 75th Street	07120004	0.8	*	N	AE	2003

* Not applicable for this Flood Risk Project

Table 2: Flooding Sources Included in this FIS Report *(continued)*

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Area (mi^2) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Unnamed Tributary No. 3 to Dutch Gap Canal	Bristol, Village of	Confluence with Dutch Gap Canal	Approximately 5,000 feet upstream of U.S. Highway 45	07120004	1.7	*	N	AE	2003
Unnamed Tributary No. 3 to Jerome Creek	Kenosha, City of; Pleasant Prairie, Village of	Confluence with Jerome Creek	Downstream side of 70th Avenue	07120004	1.4	*	Y	AE	2003
Unnamed Tributary No. 3 to Salem Branch Brighton Creek	Paddock Lake, Village of; Salem Lakes, Village of	Confluence with Salem Branch Brighton Creek	Approximately 2,850 feet upstream of 84th Street	07120004	1.1	*	N	AE	2003
Unnamed Tributary No. 4 to Dutch Gap Canal	Bristol, Village of	Confluence with Unnamed Tributary No. 3 to Dutch Gap Canal	Approximately 3,370 feet upstream of 107th Street	07120004	1.0	*	N	AE	2003
Unnamed Tributary No. 4 to Jerome Creek	Pleasant Prairie, Village of	Confluence with Jerome Creek	Approximately 5,000 feet upstream of 93rd Street	07120004	2.0	*	Y	AE	2003
Unnamed Tributary No. 4 to Jerome Creek Overflow	Pleasant Prairie, Village of	Confluence with Jerome Creek	Divergence from Unnamed Tributary 4 to Jerome Creek	07120004	0.7	*	Y	AE	2003
Unnamed Tributary No. 5 to Des Plaines River	Pleasant Prairie, Village of	Confluence with Des Plaines River	80th Avenue	07120004	1.7	*	Y	AE	2003
Unnamed Tributary No. 5 to Kilbourn Road Ditch	Kenosha, City of; Kenosha County, Unincorporated Areas	Confluence with Kilbourn Road Ditch	Downstream side of 128th Avenue	07120004	0.8	*	N	AE	2003

* Not applicable for this Flood Risk Project

Table 2: Flooding Sources Included in this FIS Report *(continued)*

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Area (mi^2) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Unnamed Tributary No. 5B to Des Plaines River	Pleasant Prairie, Village of	Confluence with Unnamed Tributary No. 5 to Des Plaines River	Approximately 1,900 feet upstream of its confluence	07120004	0.3	*	Y	AE	2003
Unnamed Tributary No. 6 to Brighton Creek	Kenosha County, Unincorporated Areas; Paddock Lake, Village of; Salem Lakes, Village of	Confluence with Brighton Creek	Approximately 1,700 feet upstream of 60th Street	07120004	2.6	*	N	AE	2003
Unnamed Tributary No. 7 to Des Plaines River	Bristol, Village of; Pleasant Prairie, Village of	Confluence with Des Plaines River	Downstream side of 136th Avenue	07120004	1.9	*	Y	AE	2003
Unnamed Tributary No. 8 to Kilbourn Road Ditch	Kenosha County, Unincorporated Areas; Somers, Village of	Confluence with Kilbourn Road Ditch	Approximately 350 feet upstream of Interstate 94	07120004	0.8	*	N	AE	2003
Unnamed Tributary No. 8 to Kilbourn Road Ditch Overflow	Somers, Village of	Confluence with Kilbourn Road Ditch	Approximately 2,500 feet upstream of its confluence with Kilbourn Road Ditch	07120004	0.5	*	N	AE	2003
Unnamed Tributary No. 13 to Kilbourn Road Ditch	Somers, Village of	Confluence with Kilbourn Road Ditch	Approximately 400 feet upstream of Interstate 94	07120004	0.5	*	N	AE	2003
Unnamed Tributary No. 15 to Kilbourn Road Ditch	Somers, Village of	Confluence with Kilbourn Road Ditch	Approximately 2,300 feet upstream of its confluence with Kilbourn Road Ditch	07120004	0.4	*	N	AE	2003

* Not applicable for this Flood Risk Project

Table 2: Flooding Sources Included in this FIS Report *(continued)*

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Area (mi^2) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Vern Wolf Lake	Kenosha County, Unincorporated Areas	Entire Shoreline	Entire Shoreline	07120004	*	0.3	N	AE	2003
Von Gunten Creek	Kenosha, City of; Kenosha County, Unincorporated Areas	300 feet downstream of 30th Avenue	Approximately 2,200 feet upstream of 30th Avenue	04040002	0.5	*	Y	AE	1982

* Not applicable for this Flood Risk Project

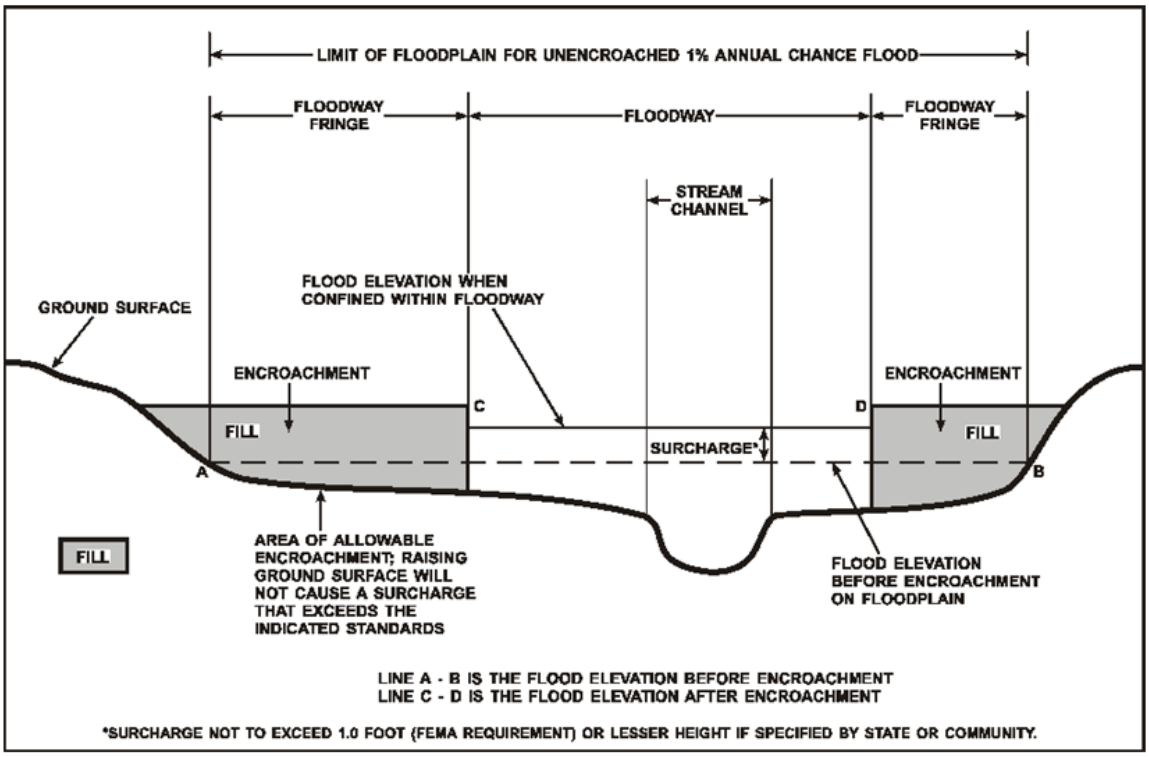
2.2 Floodways

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 balancing floodplain development against increasing flood hazard. With this approach, the area of the 1-percent-annual-chance floodplain on a river is divided into a floodway and a floodway fringe based on hydraulic modeling. The floodway is the channel of a stream, plus any adjacent floodplain areas, that must be kept free of encroachment in order to carry the 1-percent-annual-chance flood. The floodway fringe is the area between the floodway and the 1-percent-annual-chance floodplain boundaries where encroachment is permitted. The floodway must be wide enough so that the floodway fringe could be completely obstructed without increasing the water-surface elevation of the 1-percent-annual-chance flood more than 1 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 4.

To participate in the NFIP, Federal regulations require communities to limit increases caused by encroachment to 1.0 foot, provided that hazardous velocities are not produced. Regulations for Wisconsin require communities in Kenosha County to limit increases caused by encroachment to 0.00 feet and several communities have adopted additional restrictions. The floodways in this project are presented to local agencies as minimum standards that can be adopted directly or that can be used as a basis for additional floodway projects.

Figure 4: Floodway Schematic



Floodway widths presented in this FIS Report and on the FIRM were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. For certain stream segments, floodways were adjusted so that the amount of floodwaters conveyed on each side of the floodplain would be reduced equally. The results of the floodway computations have been tabulated for selected cross sections and are shown in Table 23, “Floodway Data.”

All floodways that were developed for this FIS project are shown on the FIRM using the symbology described in Figure 3. In cases where the floodway and l% annual chance floodplain boundaries are either close together or collinear, only the floodway boundary has been shown on the FIRM. For information about the delineation of floodways on the FIRM, refer to Section 6.3.

2.3 Base Flood Elevations

The hydraulic characteristics of flooding sources were analyzed to provide estimates of the elevations of floods of the selected recurrence intervals. The Base Flood Elevation (BFE) is the elevation of the 1% annual chance flood. These BFEs are most commonly rounded to the whole foot, as shown on the FIRM, but in certain circumstances or locations they may be rounded to 0.1 foot. Cross section lines shown on the FIRM may also be labeled with the BFE rounded to 0.1 foot. Whole-foot BFEs derived from engineering analyses that apply to coastal areas, areas of ponding, or other static areas with little elevation change may also be shown at selected intervals on the FIRM.

BFEs are primarily intended for flood insurance rating purposes. Cross sections with BFEs shown on the FIRM correspond to the cross sections shown in the Floodway Data table and Flood Profiles in this FIS Report. For construction and/or floodplain management purposes, users are cautioned to use the flood elevation data presented in this FIS Report in conjunction with the data shown on the FIRM. For example, the user may use the FIRM to determine the stream station of a location of interest and then use the profile to determine the 1-percent annual chance elevation at that location. Because only selected cross sections may be shown on the FIRM for riverine areas, the profile should be used to obtain the flood elevation between mapped cross sections. Additionally, for riverine areas, whole-foot elevations shown on the FIRM may not exactly reflect the elevations derived from the hydraulic analyses; therefore, elevations obtained from the profile may more accurately reflect the results of the hydraulic analysis.

2.4 Non-Encroachment Zones

This section is not applicable to this Flood Risk Project.

2.5 Coastal Flood Hazard Areas

For most areas along rivers, streams, and small lakes, BFEs and floodplain boundaries are based on the amount of water expected to enter the area during a 1-percent-annual-chance flood and the geometry of the floodplain. Floods in these areas are typically caused by runoff from storm events. However, for areas on, or near, the Great Lakes, ocean coasts, large rivers, or other large bodies of water, the BFE and floodplain boundaries may be based on additional components that include storm surge and wave dynamics.

Coastal flooding sources that are included in this Flood Risk Project are shown in Table 2.

2.5.1 Water Elevations and the Effects of Waves

Specific terminology is used in coastal analyses to indicate which components have been included in evaluating flood hazards.

The stillwater elevation (SWEL or still water level) is the surface of the water resulting from astronomical tides, storm surge, and freshwater inputs, but excluding wave setup contribution or the effects of waves.

- *Astronomical tides* are periodic rises and falls in large bodies of water caused by the rotation of the earth and by the gravitational forces exerted by the earth, moon and sun. Tidal-induced fluctuations in the Great Lakes are small and their presence is masked by the normal fluctuations due to atmospheric forcing. The Great Lakes can

be treated as if no tidal signal exists, and this contribution to water levels is neglected.

- *Storm surge, inclusive of wind setup and seiche-induced fluctuation,* is the additional water depth that occurs during large storm events. These events can bring air pressure changes and strong winds that force water up against the shore. The most common cause of a large seiche in the Great Lakes is the oscillating water level after a storm that moves over the lake, with the downwind portion of the lake subject to wind setup as water piles up against the coast and the upwind portion subject to a decrease in water levels.
- *Freshwater inputs* include rainfall that falls directly on the body of water, runoff from surfaces and overland flow, and inputs from rivers.

The 1-percent-annual-chance stillwater elevation is the stillwater elevation that has been calculated for a storm surge from a 1-percent-annual-chance storm. The 1-percent-annual-chance storm surge can be determined from analyses of water level station records, statistical study of regional historical storms, or other modeling approaches. Stillwater elevations for storms of other frequencies can be developed using similar approaches.

The total stillwater elevation (also referred to as the mean water level) is the stillwater elevation plus wave setup contribution but excluding the other effects of waves, such as wave runup and overland wave propagation.

- *Wave setup* is the increase in stillwater elevation at the shoreline caused by the reduction of waves in shallow water. It occurs as breaking wave momentum is transferred to the water column.

Like the stillwater elevation, the total stillwater elevation is based on a storm of a particular frequency, such as the 1-percent-annual-chance storm. Wave setup is typically estimated using standard engineering practices or calculated using models, since water level stations are often located in areas sheltered from wave action and do not capture wave height or wave setup information.

Coastal analyses may examine the effects of overland waves by analyzing storm-induced erosion, overland wave propagation, wave runup, and/or wave overtopping.

- *Storm-induced erosion* is the modification of existing topography by erosion caused by a specific storm event, as opposed to long-term erosion that occurs over time.
- *Overland wave propagation* describes the combined effects of variation in ground elevation, vegetation, and physical features on wave characteristics as waves move onshore.
- *Wave runup* is the uprush of water from wave action on a shore barrier. It is a function of the roughness and geometry of the shoreline at the point where the stillwater elevation intersects the land, as shown in Figure 5a.
- *Wave overtopping* refers to wave runup that occurs when waves pass over the crest of a barrier, as shown in Figure 5b.

Figure 5a: Wave Runup Transect Schematic

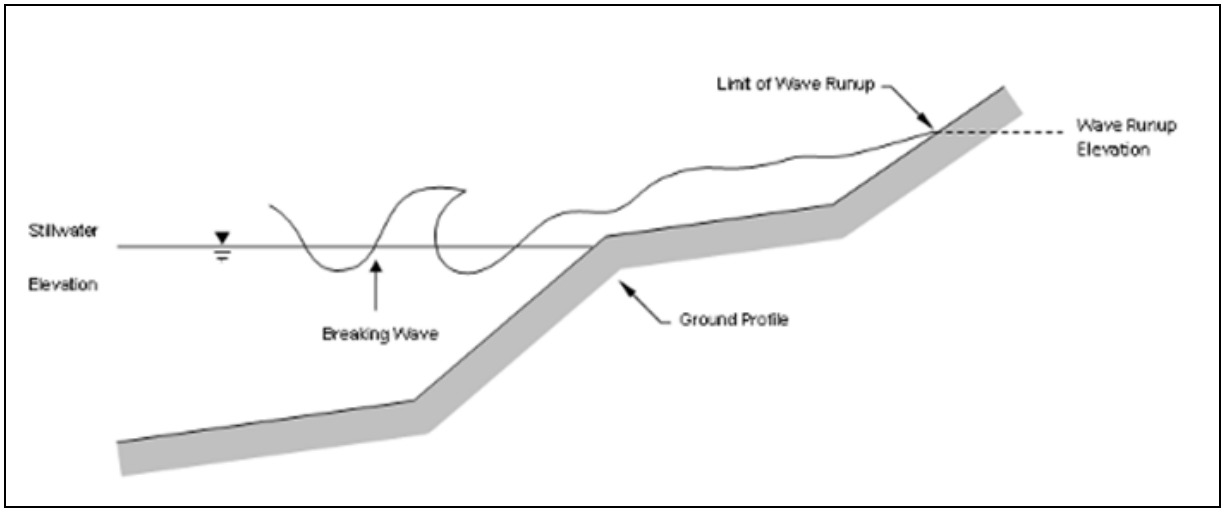
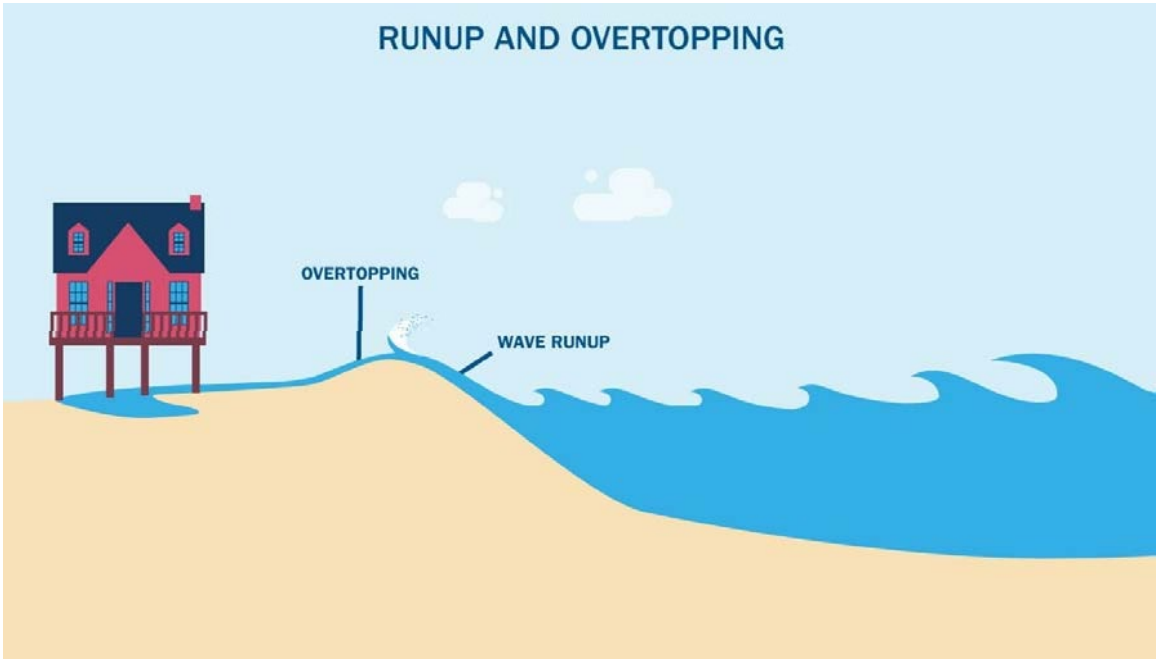


Figure 5b: Wave Overtopping Schematic



2.5.2 Floodplain Boundaries and BFEs for Coastal Areas

For coastal communities along the Atlantic and Pacific Oceans, the Gulf of Mexico, the Great Lakes, and the Caribbean Sea, flood hazards must take into account how storm surges, waves, and extreme tides interact with factors such as topography and vegetation. Storm surge and waves must also be considered in assessing flood risk for certain communities on rivers or large inland bodies of water.

Beyond areas that are affected by waves and tides, coastal communities can also have riverine floodplains with designated floodways, as described in previous sections.

Floodplain Boundaries

In many coastal areas, storm surge is the principle component of flooding. The extent of the 1-percent-annual-chance floodplain in these areas is derived from the stillwater elevation for the 1-percent-annual-chance storm. The methods used for calculation of stillwater elevations for coastal areas are described in Section 5.3 of this FIS Report.

In areas dominated by overland wave propagation, the coastal BFEs represent the wave dissipation and generation as the wave propagates landward from the shoreline. The landward extent of the 1-percent-annual-chance floodplain is determined by the stillwater elevation with the addition of wave setup, where applicable. The methods used for calculation of wave setup and overland wave propagation are described in Section 5.3 of this FIS Report.

In some areas, the 1-percent-annual-chance floodplain is determined based on the limit of wave runup or wave overtopping for the 1-percent-annual-chance storm surge. The Special Flood Hazard Area (SFHA) extent is determined based on the elevation of the land in relation to the wave runup elevation or the amount of wave overtopping. For areas dominated by wave runup, the coastal BFE can vary from reach to reach. Where wave runup exceeds the crest of a coastal feature, the SFHA extent is determined by the limit of the overtopping zone. The methods that were used for calculation of wave runup and overtopping hazards are described in Section 5.3 of this FIS Report.

Table 25 presents the types of coastal analyses that were used in mapping the 1-percent-annual-chance floodplain in coastal areas.

Coastal BFEs

Coastal BFEs are calculated as the stillwater elevation for the 1-percent-annual-chance storm plus the additional flood hazard from wave effects (storm-induced erosion, wave setup, overland wave propagation, wave runup, and wave overtopping).

Where they apply, coastal BFEs are calculated along transects extending from offshore to the limit of coastal flooding onshore. Results of these analyses are accurate until local topography, vegetation, or development type and density within the community undergoes major changes.

Parameters that were included in calculating coastal BFEs for each transect included in this FIS Report are presented in Table 16, “Coastal Transect Parameters.” The locations of transects are shown in Figure 9, “Transect Location Map.” More detailed information about the methods used in coastal analyses and the results of intermediate steps in the coastal analyses are presented in Section 5.3 of this FIS Report. Additional information on specific mapping methods is provided in Section 6.4 of this FIS Report.

2.5.3 Coastal High Hazard Areas

Certain areas along the open coast and other areas may have higher risk of experiencing structural damage caused by wave action and/or high-velocity water during the 1-percent-annual-chance flood. These areas will be identified on the FIRM as Coastal High Hazard Areas.

- *Coastal High Hazard Area (CHHA)* is a SFHA extending from offshore to the inland limit of the primary frontal dune (PFD) or any other area subject to damages caused by wave action and/or high-velocity water during the 1-percent-annual-chance flood.

- *Primary Frontal Dune (PFD)* is a continuous or nearly continuous mound or ridge of sand with relatively steep slopes immediately landward and adjacent to the beach. The PFD is subject to erosion and overtopping from high tides and waves during major coastal storms.

The landward limit of the PFD occurs at a point where there is a distinct change from a relatively steep slope to a relatively mild slope; this point represents the landward extension of Zone VE.

No PFDs were identified within this county.

CHHAs are designated as “VE” zones (for “velocity wave zones”) and are subject to more stringent regulatory requirements and a different flood insurance rate structure. BFEs are assigned to Zones VE on the FIRM. More detailed information about the identification and designation of Zone VE is presented in Section 6.4 of this FIS Report.

Areas that are not within the CHHA but are SFHAs may still be impacted by coastal flooding and damaging waves; these areas are shown as “AE” zones on the FIRM.

Figure 6a, “Coastal Transect Schematic (Wave Runup and Overtopping),” illustrates the relationship between the base flood elevation, the 1-percent-annual-chance stillwater elevation, and the ground profile as well as the location of the Zone VE and Zone AE/AO in areas subject to wave runup and overtopping.

Figure 6a: Coastal Transect Schematic (Wave Runup and Overtopping)

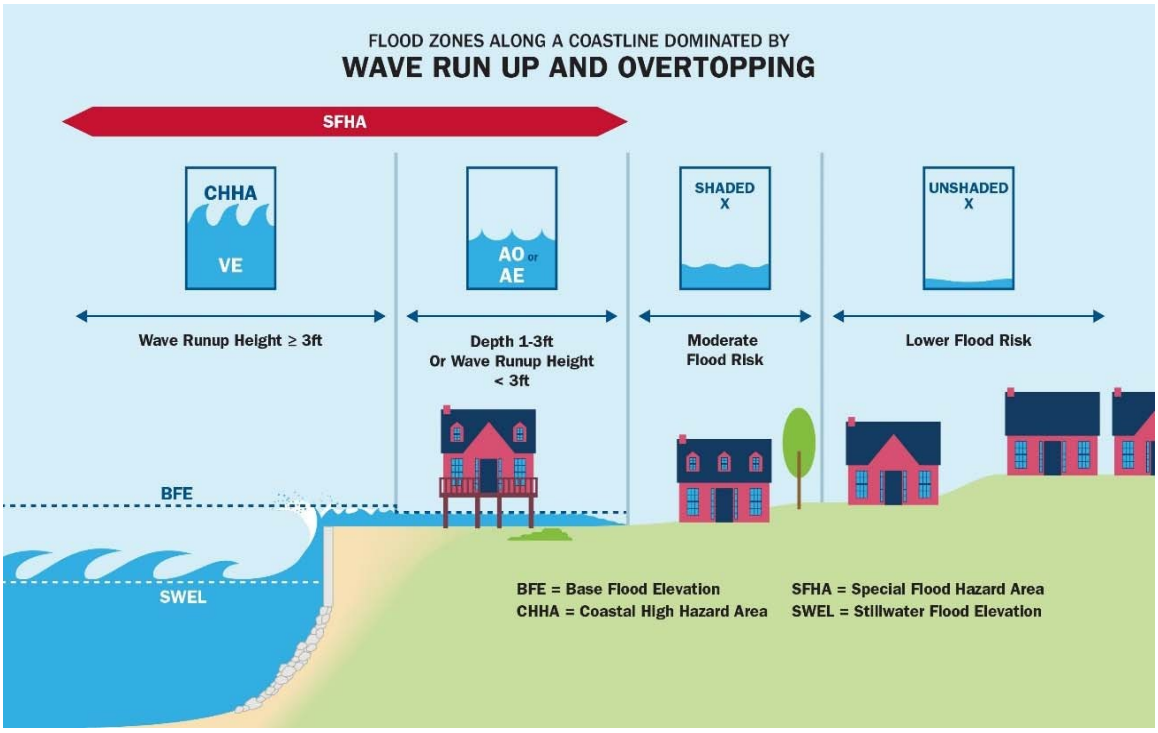
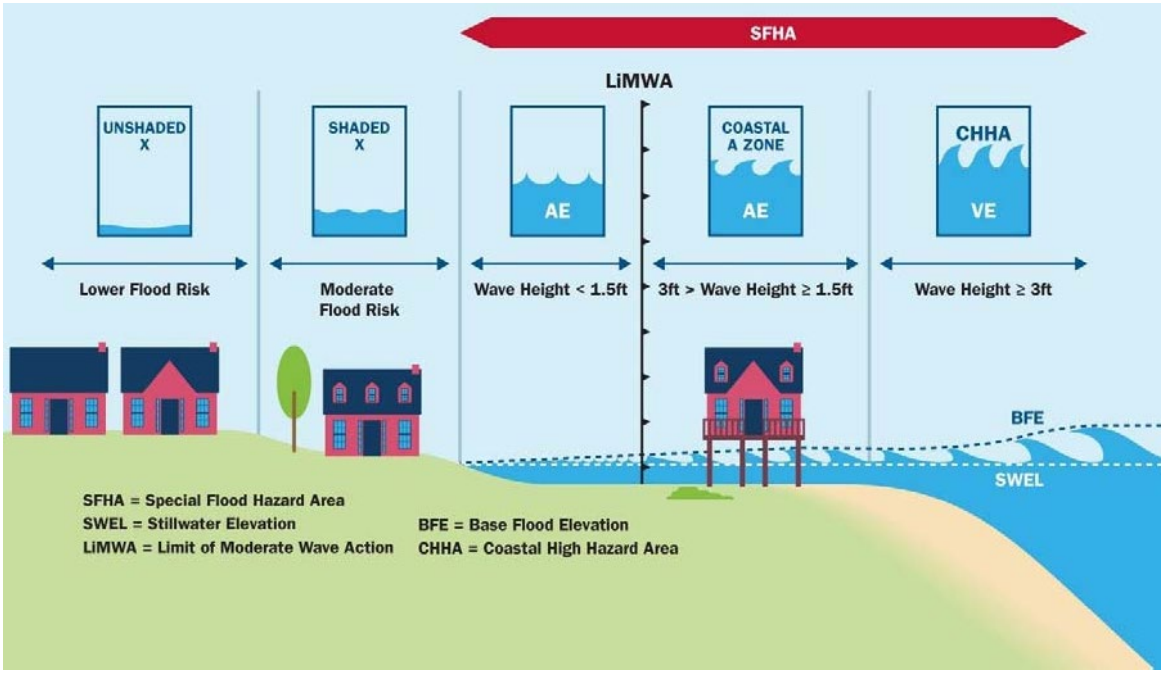


Figure 6b, “Coastal Transect Schematic (Overland Wave Propagation),” illustrates the relationship between the base flood elevation, the 1-percent-annual-chance stillwater elevation, and the ground profile as well as the location of the Zone VE and Zone AE in areas subject to overland wave propagation. This figure also illustrates energy dissipation and regeneration of a wave as it moves inland.

Figure 6b: Coastal Transect Schematic (Overland Wave Propagation)



Methods used in coastal analyses in this Flood Risk Project are presented in Section 5.3 and mapping methods are provided in Section 6.4 of this FIS Report.

Coastal floodplains are shown on the FIRM using the symbology described in Figure 3, “Map Legend for FIRM.” The BFE mapped on the FIRM at the shoreline is determined by the 1-percent-annual-chance total water elevation, which includes the stillwater elevation plus wave effects. The 1-percent-annual-chance total water elevations are included in Table 16, along with the statistical stillwater elevations. If the BFE on the FIRM is higher than the stillwater elevations shown in Table 16 due to the presence of wave effects, the higher elevation should be used for construction and/or floodplain management purposes.

2.5.4 Limit of Moderate Wave Action

Laboratory tests and field investigations have shown that wave heights as little as 1.5 feet can cause damage to and failure of typical Zone AE building construction. Wood-frame, light gage steel, and masonry walls on shallow footings or slabs are subject to damage when exposed to waves less than 3 feet in height. Other flood hazards associated with coastal waves (floating debris, high velocity flow, erosion, and scour) can also damage Zone AE construction.

Therefore, a LiMWA boundary may be shown on the FIRM as an informational layer to assist coastal communities in safe rebuilding practices. The LiMWA represents the approximate landward limit of the 1.5-foot breaking wave. The location of the LiMWA relative to Zone VE and Zone AE is shown in Figure 6b.

The effects of wave hazards in Zone AE between Zone VE (or the shoreline where Zone VE is not identified) and the LiMWA boundary are similar to, but less severe than, those in Zone VE where 3-foot or greater breaking waves are projected to occur during the 1-percent-annual-chance flooding event. Communities are therefore encouraged to adopt and enforce more stringent floodplain management requirements than the minimum NFIP requirements in areas lakeward of the LiMWA. The NFIP Community Rating System provides credits for these actions.

In areas where wave runup elevations dominate over wave crest elevations (Figure 6a), the LiMWA should not be shown on the FIRM. Examples of runup dominated areas include shorelines with steeply sloped beaches, bluffs, or flood protection structures that lie parallel to the shore. Similarly, in areas where the Zone VE designation is based on the presence of a PFD or wave overtopping, the LiMWA is not shown on the FIRM.

The LiMWA was not applicable for any transects within this county.

SECTION 3.0 – INSURANCE APPLICATIONS

3.1 National Flood Insurance Program Insurance Zones

For flood insurance applications, the FIRM designates flood insurance rate zones as described in Figure 3, “Map Legend for FIRM.” Flood insurance zone designations are assigned to flooding sources based on the results of the hydraulic or coastal analyses. Insurance agents use the zones shown on the FIRM and depths and base flood elevations in this FIS Report in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

The 1% annual chance floodplain boundary corresponds to the boundary of the areas of special flood hazards (e.g. Zones A, AE, V, VE, etc.), and the 0.2-percent-annual-chance floodplain boundary corresponds to the boundary of areas of additional flood hazards.

Table 3 lists the flood insurance zones in Kenosha County.

Table 3: Flood Zone Designations by Community

Community	Flood Zone(s)
Bristol, Village of	A, AE, X
Genoa City, Village of	X
Kenosha, City of	A, AE, AO, VE, X
Kenosha County, Unincorporated Areas	A, AE, X
Paddock Lake, Village of	A, AE, X
Pleasant Prairie, Village of	A, AE, AO, VE, X
Salem Lakes, Village of	A, AE, X
Somers, Village of	A, AE, VE, X
Twin Lakes, Village of	A, AE, X

SECTION 4.0 – AREA STUDIED

4.1 Basin Description

Table 4 contains a description of the characteristics of the HUC-8 sub-basins within which each community falls. The table includes the main flooding sources within each basin, a brief description of the basin, and its drainage area.

Table 4: Basin Characteristics

HUC-8 Sub-Basin Name	HUC-8 Sub-Basin Number	Primary Flooding Source	Description of Affected Area	Drainage Area (square miles)
Des Plaines	07120004	Des Plaines River	Encompasses the central portion of Kenosha County	1,455
Lake Michigan	04190000	Lake Michigan	Entire surface water area of Lake Michigan	22,457
Pike-Root	04040002	Root River	Encompasses the Eastern portion of Kenosha County draining into Lake Michigan	418
Upper Fox	07120006	Fox River	Encompasses the Western portion of Kenosha County	1,543

4.2 Principal Flood Problems

Table 5 contains a description of the principal flood problems that have been noted for Kenosha County by flooding source.

Table 5: Principal Flood Problems

Flooding Source	Description of Flood Problems
Bassett Creek Tributary	Most major floods on Bassett Creek Tributary have occurred in the spring and early summer and are the result of locally heavy thunderstorms. Floods on the tributary are characterized by moderate peak flows, with relatively small volumes. More recent flooding events occurred between March and June of 2013 within Wheatland Township that caused minor property damage.
Fox River	Most flooding has occurred in late winter or early spring. The Fox River watershed experienced major floods in July 1938 and March-April 1960. In 1960, the U.S. Geological Survey (USGS) Wilmot gage (No. 055465) on the Fox River indicated a 7,520 cubic feet per second (cfs) peak discharge, which is approximately a 37-year flood. On the upper Fox River, this flood was estimated to be approximately a 50-year flood event. In 1960, 1.5 inches of rainfall fell over the entire watershed. The combination of this rainfall and the melting of the 24 inches of snow cover caused the 1960 flooding. Damage to residential, commercial, and agricultural property caused by the 1960 flood was estimated at $45,000.
Pike River	Major flooding on the Pike River has occurred in September 1965, June 1969, and April 1973 (SCS 1979). A contributory cause of the flooding of the Pike River is blockage of the river mouth by windblown ice, or sand deposition from Lake Michigan. Pike Creek, a predominantly urban drainageway with alternating closed conduit and open channel sections, overflows its banks almost yearly just upstream from the entrance to the most downstream closed conduit section. Obstructions that collect at the entrance to this enclosed section increase flooding severity.

Table 6 contains information about historic flood elevations in the communities within Kenosha County.

Table 6: Historic Flooding Elevations

Flooding Source	Location	Historic Peak (Feet NAVD88)	Event Date	Approximate Recurrence Interval (years)	Source of Data
Fox River	Peak stage at USGS gage 05545750 downstream of County Highway JB	750.7	June 15, 2008	50	Stage recorded at USGS gage

4.3 Dams and Other Flood Hazard Reduction Measures

Table 7 contains information about non-levee flood protection measures within Kenosha County such as dams, jetties, and or dikes. Levees are addressed in Section 4.4 of this FIS Report.

Table 7: Dams and Other Flood Hazard Reduction Measures

Flooding Source	Structure Name	Type of Measure	Location	Description of Measure
Brighton Creek	Bong Recreation Area 8 Dam	Dam	Wolf Lake	Dam
Lake Mary	Lake Mary Dam	Dam	Lake Mary	Dam
Lake Michigan	10045 Lakeshore Drive	Revetment	10045 Lakeshore Drive	Revetment
Lake Michigan	101 122nd	Revetment	101 122nd	Revetment
Lake Michigan	10203 Lakeshore Drive	Revetment	10203 Lakeshore Drive	Revetment
Lake Michigan	104 122nd	Revetment	104 122nd	Revetment
Lake Michigan	10415 Lakeshore Drive	Seawall	10415 Lakeshore Drive	Seawall
Lake Michigan	11331 Lakeshore Drive	Revetment	11331 Lakeshore Drive	Revetment
Lake Michigan	11367 Lakeshore Drive	Revetment	11367 Lakeshore Drive	Revetment
Lake Michigan	114 68th Place	Revetment	114 68th Place	Revetment
Lake Michigan	115 68th Place	Seawall	115 68th Place	Seawall
Lake Michigan	11739 Lakeshore Drive	Revetment	11739 Lakeshore Drive	Revetment
Lake Michigan	11909 Lakeshore Drive	Revetment	11909 Lakeshore Drive	Revetment
Lake Michigan	12003 Lakeshore Drive	Revetment	12003 Lakeshore Drive	Revetment

Table 7: Dams and Other Flood Hazard Reduction Measures *(continued)*

Flooding Source	Structure Name	Type of Measure	Location	Description of Measure
Lake Michigan	12008 Lakeshore Drive	Revetment	12008 Lakeshore Drive	Revetment
Lake Michigan	12379 1st Court	Revetment	12379 1st Court	Revetment
Lake Michigan	12501 Lakeshore Drive	Revetment	12501 Lakeshore Drive	Revetment
Lake Michigan	12705 Lakeshore Drive	Revetment	12705 Lakeshore Drive	Revetment
Lake Michigan	129 S Lakeshore Drive	Revetment	129 S Lakeshore Drive	Revetment
Lake Michigan	2001 Alford Park Drive	Revetment	2001 Alford Park Drive	Revetment
Lake Michigan	277 Sheridan Road	Revetment	277 Sheridan Road	Revetment
Lake Michigan	425 Sheridan Road	Seawall	425 Sheridan Road	Seawall
Lake Michigan	6501 3rd Avenue	Revetment	6501 3rd Avenue	Revetment
Lake Michigan	6903 2nd Avenue	Revetment	6903 2nd Avenue	Revetment
Lake Michigan	8615 Lakeshore Drive	Revetment	8615 Lakeshore Drive	Revetment
Lake Michigan	Celebration Place	Revetment	Celebration Place	Revetment
Lake Michigan	Eichelman Park	Revetment	Eichelman Park	Revetment
Lake Michigan	John F. Kennedy Park	Revetment	John F. Kennedy Park	Revetment
Lake Michigan	Prairie Harbor Yacht Club	Revetment	Prairie Harbor Yacht Club	Revetment
Lake Michigan	Prairie Harbor Yacht Club	Seawall	Prairie Harbor Yacht Club	Seawall
Lake Michigan	Shoreline East of 102 S Lakeshore Drive	Seawall	Shoreline East of 102 S Lakeshore Drive	Seawall
Lake Michigan	Simmons Island Marina	Seawall	Simmons Island Marina	Seawall
Lake Michigan	Simmons Island Marina	Revetment	Simmons Island Marina	Revetment
Lake Michigan	South of Water Treatment Plant	Revetment	South of Water Treatment Plant	Revetment
Lake Michigan	Southport Marina	Revetment	Southport Marina	Revetment
Lake Michigan	Water Treatment Plant	Revetment	Water Treatment Plant	Revetment
Salem Branch Brighton Creek	Hooker Lake Dam	Dam	Hooker Lake	Dam

Table 7: Dams and Other Flood Hazard Reduction Measures *(continued)*

Flooding Source	Structure Name	Type of Measure	Location	Description of Measure
Silver Lake Outlet	Silver Lake Dam	Dam	Silver Lake	Dam
Unnamed Tributary to Camp Lake	Camp Lake Dam	Dam	Camp Lake	Dam
Unnamed Tributary No. 2 to Salem Branch Brighton Creek	Paddock Lake Dam	Dam	Paddock Lake	Dam
Unnamed Tributary No. 3 to Dutch Gap Canal	Lake George Dam	Dam	George Lake	Dam

4.4 Levee Systems

For purposes of the NFIP, FEMA only recognizes levee systems that meet, and continue to meet, minimum design, operation, and maintenance standards that are consistent with comprehensive floodplain management criteria. The Code of Federal Regulations, Title 44, Section 65.10 (44 CFR 65.10) describes the information needed for FEMA to determine if a levee system reduces the flood hazard from the 1-percent-annual-chance flood. This information must be supplied to FEMA by the community or other party when a flood risk study or restudy is conducted, when FIRMs are revised, or upon FEMA request. FEMA reviews the information for the purpose of establishing the appropriate flood hazard zone.

Levee systems that are determined to reduce the hazard from the 1-percent-annual-chance flood are accredited by FEMA. FEMA can also grant provisional accreditation to a levee system that was previously accredited on an effective FIRM and for which FEMA is awaiting data and/or documentation to demonstrate compliance with 44 CFR 65.10. These levee systems are referred to as Provisionally Accredited Levees, or PALs. Provisional accreditation provides communities and levee owners with a specified timeframe to obtain the necessary data to confirm the levee system's accreditation status. Accredited levee systems and PALs are shown on the FIRM using the symbology shown in Figure 3. If the required information for a PAL is not submitted within the required timeframe, or if information indicates that a levee system no longer meets 44 CFR 65.10, FEMA will consider the levee system as non-accredited and issue an effective FIRM showing the levee-impacted area as a SFHA or Zone D.

FEMA coordinated with the USACE, the local communities, and other organizations to compile a list of levee systems that exist within Kenosha County. Table 8, "Levee Systems," lists all accredited levee systems, PALs, and non-accredited levee systems shown on the FIRM for this FIS Report. Other categories of levees may also be included in the table. The Levee ID shown in this table may not match numbers based on other identification systems that were listed in previous FIS Reports. Levee systems identified in the table are displayed on the FIRM with notes to users to indicate their flood hazard mapping status.

Please note that the information presented in Table 8 is subject to change at any time. For that reason, the latest information regarding the levee systems presented in the

table may be obtained by accessing the National Levee Database. For additional information, contact the levee owner/sponsor or the local community shown in Table 30.

Table 8: Levee Systems

Community	Flooding Source(s)	NLD Levee System ID	NLD Levee System Name	Levee System Status on Effective FIRM	FIRM Panel(s)	Levee Owner(s) / Sponsor(s)
Pleasant Prairie, Village of	Unnamed Tributary No. 2 to Jerome Creek	1505001204	Pleasant Prairie Ash Landfill Floodplain Levee	Accredited	55059C0184E, 55059C0192E	Pleasant Prairie Ash Landfill

SECTION 5.0 – ENGINEERING METHODS

For the flooding sources 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 are expected to be equaled or exceeded at least once on the average during any 10-, 25-, 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-, 25-, 50-, 100-, and 500-year floods, have a 10-, 4-, 2-, 1-, and 0.2-percent-annual-chance, respectively, of being equaled or exceeded during any year.

Although the recurrence interval represents the long-term, average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood that equals or exceeds the 100-year flood (1-percent chance of annual exceedance) during the term of a 30-year mortgage is approximately 26 percent (about 3 in 10); for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

The engineering analyses described here incorporate the results of previously issued Letters of Map Change (LOMCs) listed in Table 26, “Incorporated Letters of Map Change”, which include Letters of Map Revision (LOMRs). For more information about LOMRs, refer to Section 6.5, “FIRM Revisions.”

5.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak elevation-frequency relationships for floods of the selected recurrence intervals for each flooding source studied. Hydrologic analyses are typically performed at the watershed level. Depending on factors such as watershed size and shape, land use and urbanization, and natural or man-made storage, various models or methodologies may be applied. A summary of the hydrologic methods applied to develop the discharges used in the hydraulic analyses for each stream is provided in Table 12. Greater detail (including assumptions, analysis, and results) is available in the archived project documentation.

A summary of the discharges is provided in Table 9. A summary of stillwater elevations developed for non-coastal flooding sources is provided in Table 10. (Coastal stillwater elevations are discussed in Section 5.3 and shown in Table 16.) Stream gage information is provided in Table 11.

Table 9: Summary of Discharges

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)				
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Airport Creek	Just above confluence with Pike River	1.6	260	*	340	370	*
Barnes Creek	At mouth	4.1	400	*	513	582	757
Barnes Creek North Outlet	At confluence with Lake Michigan	4.1	400	*	513	582	757
Barnes Creek South Outlet	At confluence with Lake Michigan	4.1	19	*	23	26	33
Bassett Creek	At County Highway W (Fox River Road)	8.8	365	*	640	765	1,150
Bassett Creek Tributary	At downstream corporate limits	1.4	45	*	95	130	220
Bassett Creek Tributary	Above railroad grade bridge	0.1	15	*	25	35	60
Brighton Creek	At confluence with Des Plaines River	27.1	676	*	1,070	1,250	*
Center Creek	At confluence with Des Plaines River	10.3	168	*	308	383	*
Des Plaines River	At State Boundary	121.4	1,600	*	2,310	2,600	*
Des Plaines River	Just upstream of the confluence with Jerome Creek	103.8	1,590	*	2,420	2,790	*
Des Plaines River	Downstream of confluence of Kilbourn Road Ditch	95.0	1,600	*	2,460	2,840	*
Des Plaines River	Upstream from confluence of Kilbourn Road Ditch	70.3	1,120	*	1,650	1,880	*

*Data not available

Table 9: Summary of Discharges *(continued)*

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)				
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Des Plaines River	Upstream from confluence of Root River	60.8	1,090	*	1,650	1,890	*
Des Plaines River	Upstream from confluence of Brighton Creek	21.0	420	*	702	847	*
Des Plaines River	At Upstream County Boundary	2.3	112	*	219	291	*
Dutch Gap Canal	At State Boundary	18.0	431	*	673	787	*
East Branch Pike Creek	At River Mile 0.96	7.1	2,250	*	2,550	2,650	2,900
East Branch Pike Creek	At River Mile 2.21	1.8	280	*	385	430	540
East Branch Pike Creek	At River Mile 3.12	1.1	190	*	270	305	395
Fox River	At Wisconsin / Illinois State Line	829.3	4,891	6,396	7,771	9,391	14,277
Fox River	At USGS Streamgage 05545750 / County Highway JB	769.3	4,376	5,762	7,011	8,494	13,036
Jerome Creek	At confluence with Des Plaines River	5.9	158	*	202	220	*
Jerome Creek	At 88th Avenue (County Highway H)	5.5	110	*	131	141	*
Jerome Creek	Downstream of the confluence of Unnamed Tributary No. 2 To Jerome Creek	4.3	58	*	66	70	*
Kenosha Branch	At confluence with Pike River	1.1	250	*	375	425	*
Kilbourn Road Ditch	At confluence with Des Plaines River	23.7	944	*	1,430	1,670	*

* Data not available

Table 9: Summary of Discharges *(continued)*

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)				
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Kilbourn Road Ditch	At 75th Street / State Highway 50	22.3	883	*	1,340	1,550	*
Kilbourn Road Ditch	Downstream of County Highway S	17.1	656	*	1,110	1,370	*
Kilbourn Road Ditch	Upstream of County Highway A	9.0	406	*	634	772	*
Mud Lake Outlet	At confluence with Dutch Gap Canal	2.4	90	*	117	128	*
Nelson Creek	At confluence with Sorenson Creek	0.7	119	*	208	236	*
Nelson Creek	At County Hwy KR	0.4	140	*	225	255	*
New Munster Creek	At State Highway 83	7.8	431	638	839	1,181	2,088
New Munster Creek	At County Highway KD	7.0	433	639	841	1,191	2,043
New Munster Creek	At confluence approximately 900 feet upstream of 368th Avenue	5.3	423	598	917	1,280	2,026
New Munster Creek	At 376th Avenue	1.2	86	132	176	230	364
New Munster Creek	Approximately 5,000 feet upstream of 376th Avenue	0.6	25	49	73	103	182
Peterson Creek	At County Highway W (Fox River Road)	12.6	405	*	630	730	1,000
Pike Creek	At confluence with Pike River	18.8	1,000	*	1,590	1,900	*
Pike Creek	Downstream of County Highway L	10.8	530	*	1,140	1,420	*
Pike Creek	At State Highway 142	7.2	440	*	650	720	*

* Data not available

Table 9: Summary of Discharges *(continued)*

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)				
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Pike Creek	At County Highway K	2.7	310	*	550	610	*
Pike River	At confluence with Lake Michigan	50.8	2,430	*	3,560	4,130	*
Pike River	Approximately 3,200 Feet upstream of confluence With Lake Michigan (RM 0.61)	50.1	2,431	*	3,560	4,130	*
Pike River	At County Highway Y	39.4	2,260	*	3,510	4,170	*
Pleasant Prairie Tributary	At confluence with Des Plaines River	*	385	*	509	562	*
Powers Lake Tributary	At Powers Lake Outlet (Powers Lake Road)	2.9	21	27	31	35	51
Powers Lake Tributary	At County Highway P	1.4	54	58	60	61	67
Powers Lake Tributary	Approximately 600 feet upstream of County Highway P	0.6	44	56	66	76	103
Salem Branch Brighton Creek	At confluence with Brighton Creek	7.0	286	*	456	543	*
School Tributary	At Mouth	2.7	610	*	1,005	1,185	1,540
Silver Lake Outlet	At County Highway B	6.4	105	*	150	170	220
Silver Lake Outlet	At County Highway F	6.0	55	*	75	85	110
Somers Branch	At confluence with Pike Creek	2.7	110	*	255	320	*
Somers Branch	At County Highway E	2.2	115	*	270	320	*

* Data not available

Table 9: Summary of Discharges *(continued)*

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)				
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Sorenson Creek	At confluence with Pike River	3.2	630	*	1,010	1,080	*
Sorenson Creek	At County Highway KR	2.0	720	*	1,150	1,240	*
Tributary to Somers Branch	At confluence with Somers Branch	1.1	130	*	159	172	216
Union Grove Industrial Tributary	At confluence with Des Plaines River	2.6	163	*	456	557	*
Unnamed Tributary to Camp Lake	At inlet	*	46	*	69	75	*
Unnamed Tributary to Center Lake	At inlet	*	150	*	220	250	*
Unnamed Tributary to Pike Creek	At confluence with Pike Creek	1.4	335	*	555	650	885
Unnamed Tributary No. 1 to Center Creek	At confluence with Center Creek	*	168	*	308	383	*
Unnamed Tributary No. 1 to Des Plaines River	At Wisconsin State Boundary	4.3	270	*	500	629	*
Unnamed Tributary No. 1 to Hooker Lake	At confluence with Hooker Lake	0.7	104	*	192	241	*
Unnamed Tributary No. 1 to Kilbourn Road Ditch	At confluence with Kilbourn Road Ditch	0.2	30	*	45	55	*
Unnamed Tributary No. 1 to Salem Branch Brighton Creek	At confluence with Salem Branch Brighton Creek	2.4	155	*	269	329	*
Unnamed Tributary No. 1A to Des Plaines River	At confluence with Unnamed Tributary No. 1 to Des Plaines River	0.6	66	*	102	120	*

* Data not available

Table 9: Summary of Discharges *(continued)*

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)				
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Unnamed Tributary No. 1A to Des Plaines River	Upstream of Highway 31	0.3	13	*	19	23	*
Unnamed Tributary No. 1B to Des Plaines River	At confluence with Unnamed Tributary No. 1B to Des Plaines River	2.0	249	*	424	514	*
Unnamed Tributary No. 1C to Des Plaines River	At confluence with Unnamed Tributary No. 1 to Des Plaines River	0.9	197	*	347	426	*
Unnamed Tributary No. 1C to Des Plaines River	Upstream of County Highway ML	0.2	54	*	89	108	*
Unnamed Tributary No. 1E to Des Plaines River	At confluence with Unnamed Tributary No. 2 to Des Plaines River	2.0	218	*	319	366	*
Unnamed Tributary No. 1E to Des Plaines River	Upstream of Village of Pleasant Prairie Corporate Limit	0.4	93	*	129	144	*
Unnamed Tributary No. 1F to Des Plaines River	At confluence with Unnamed Tributary No. 1E to Des Plaines River	1.0	65	*	112	136	*
Unnamed Tributary No. 2 to Des Plaines River	At confluence with Des Plaines River	0.6	149	*	229	268	*
Unnamed Tributary No. 2 to Jerome Creek	At confluence with Jerome Creek	0.3	36	*	41	43	*
Unnamed Tributary No. 2 to Salem Branch Brighton Creek	At confluence with Salem Branch Brighton Creek	0.8	69	*	97	110	*
Unnamed Tributary No. 3 to Dutch Gap Canal	At confluence with Dutch Gap Canal	3.5	63	*	106	129	*

* Data not available

Table 9: Summary of Discharges *(continued)*

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)				
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Unnamed Tributary No. 3 to Jerome Creek	At confluence with Jerome Creek	0.7	19	*	23	25	*
Unnamed Tributary No. 3 to Jerome Creek	Just upstream of divergence with Unnamed Tributary No. 2 to Jerome Creek	*	35	*	39	41	*
Unnamed Tributary No. 3 to Salem Branch Brighton Creek	At confluence with Salem Branch Brighton Creek	0.7	34	*	48	55	*
Unnamed Tributary No. 4 to Dutch Gap Canal	At confluence with Dutch Gap Canal	1.6	35	*	62	77	*
Unnamed Tributary No. 4 to Jerome Creek	At confluence with Jerome Creek	2.7	218[1]	*	340[2]	399[3]	*
Unnamed Tributary No. 4 to Jerome Creek	Upstream Of 93rd Street	0.9	256	*	403	476	*
Unnamed Tributary No. 4 to Jerome Creek Overflow	At confluence with Unnamed Tributary to Jerome Creek	*	44	*	151	201	*
Unnamed Tributary No. 5 to Des Plaines River	At confluence with Des Plaines River	2.4	200	*	246	264	*
Unnamed Tributary No. 5 to Des Plaines River	Just upstream of County Highway H	1.6	200	*	228	238	*

* Data not available

[1]Of this total, about 45 cfs would be expected to overflow to Jerome Creek, bypassing the reach of Unnamed Tributary No. 4 to Jerome Creek at and downstream from Green Bay Road/State Highway 31.

[2]Of this total, about 150 cfs would be expected to overflow to Jerome Creek, bypassing the reach of Unnamed Tributary No. 4 to Jerome Creek at and downstream from Green Bay Road/State Highway 31.

[3]Of this total, about 200 cfs would be expected to overflow to Jerome Creek, bypassing the reach of Unnamed Tributary No. 4 to Jerome Creek at and downstream from Green Bay Road/State Highway 31.

Table 9: Summary of Discharges *(continued)*

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)				
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Unnamed Tributary No. 5 to Des Plaines River	Downstream of 80th Avenue	1.0	285	*	380	423	*
Unnamed Tributary No. 5 to Kilbourn Road Ditch	At confluence with Kilbourn Road Ditch	0.9	73	*	128	162	*
Unnamed Tributary No. 5B to Des Plaines River	At confluence with Unnamed Tributary No. 5 Des Plaines River	2.4	316	*	422	467	*
Unnamed Tributary No. 6 to Brighton Creek	At confluence with Brighton Creek	2.4	100	*	154	174	*
Unnamed Tributary No. 7 to Des Plaines River	At Interstate 94	2.4	275	*	384	434	*
Unnamed Tributary No. 8 to Kilbourn Road Ditch	At confluence with Kilbourn Road Ditch	2.8	288	*	630	838	*
Unnamed Tributary No. 8 to Kilbourn Road Ditch Overflow	At confluence with Unnamed Tributary No. 8 to Kilbourn Road Ditch	2.8	*	*	15	38	*
Unnamed Tributary No. 13 to Kilbourn Road Ditch	At confluence with Kilbourn Road Ditch	0.7	74	*	165	222	*
Unnamed Tributary No. 15 to Kilbourn Road Ditch	At confluence with Kilbourn Road Ditch	0.9	79	*	166	219	*
Von Gunten Creek	At 39th Avenue	0.7	170	*	250	285	370

* Data not available

Figure 7: Frequency Discharge-Drainage Area Curves

[Not Applicable to this Flood Risk Project]

Table 10: Summary of Non-Coastal Stillwater Elevations

Flooding Source	Location	Elevations (feet NAVD88)				
		10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Camp Lake	Entire shoreline within the county	741.8	*	742.3	742.4	*
Center Lake	Entire shoreline within the county	743.0	*	743.8	744.1	*
Lake Elizabeth	Entire shoreline within the county	793.5	*	794.5	794.8	795.5
Lake Mary	Entire shoreline within the county	794.1	*	794.5	794.8	795.5
Pond 3	Entire shoreline within the county	*	*	*	730.7	*
Pond 4	Entire shoreline within the county	*	*	*	726.7	*
Vern Wolf Lake	Entire shoreline within the county	792.0	*	792.3	792.4	*

* Data not available

Table 11: Stream Gage Information used to Determine Discharges

[Not Applicable to this Flood Risk Project]

5.2 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. Base flood elevations on the FIRM represent the elevations shown on the Flood Profiles and in the Floodway Data tables in the FIS Report. Rounded whole-foot elevations may be shown on the FIRM in coastal areas, areas of ponding, and other areas with static base flood elevations. These whole-foot elevations may not exactly reflect the elevations derived from the hydraulic analyses. Flood elevations shown on the FIRM are primarily intended for flood insurance rating purposes. For construction and/or floodplain management purposes, users are cautioned to use the flood elevation data presented in this FIS Report in conjunction with the data shown on the FIRM. The hydraulic analyses for this FIS were based on unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

For streams for which hydraulic analyses were based on cross sections, locations of selected cross sections are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway was computed (Section 6.3), selected cross sections are also listed on Table 23, “Floodway Data.”

A summary of the methods used in hydraulic analyses performed for this project is provided in Table 12. Roughness coefficients are provided in Table 13. Roughness coefficients are values representing the frictional resistance water experiences when passing overland or through a channel. They are used in the calculations to determine water surface elevations. Greater detail (including assumptions, analysis, and results) is available in the archived project documentation.

Table 12: Summary of Hydrologic and Hydraulic Analyses

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Airport Creek	Confluence with Pike Creek	Approximately 5,000 feet upstream of its confluence with Pike Creek	HSP	HEC-2	1983	AE	Flows are based on 2000 planned land use and existing channel conditions.
Barnes Creek	Confluence with Barnes Creek North Outlet and Barnes Creek South Outlet	Approximately 0.5 miles upstream of Sheridan Road	1971 Regression Equations, SCS Unit Hydrograph, & Cook's Empirical Method	HEC-2	1982	AE	
Barnes Creek North Outlet	Confluence with Lake Michigan	Confluence with Barnes Creek	1971 Regression Equations, SCS Unit Hydrograph, & Cook's Empirical Method	HEC-2	1982	AE	Backwater elevations from Lake Michigan elevation-frequency data were used as starting water-surface elevations, which were recomputed using the 10-, 2-, 1-, and 0.2-percent frequency discharge values. When available, historical flood data were used to check computed profiles.
Barnes Creek South Outlet	Confluence with Lake Michigan	Confluence with Barnes Creek	1971 Regression Equations, SCS Unit Hydrograph, & Cook's Empirical Method	HEC-2	1982	AE	Barnes Creek South Outlet was redelineated using 1981 WSELs and new topo as part of an FY13 coastal study due to a reduction in coastal flooding that dominated the creek in the previous effective.
Bassett Creek	Confluence with Fox River	Approximately 1.6 miles upstream of County Highway JI	HSP	HEC-2	1969	AE	The 0.2-percent frequency discharge was developed by log-normal extrapolation.
Bassett Creek Tributary	Confluence with Bassett Creek	Approximately 800 feet upstream of Ice House Trail	SCS Runoff Equations	HEC-2	1981	AE w/ Floodway	
Brighton Creek	Confluence with Des Plaines River	Immediately upstream of State Highway 75	HSPF	HEC-2	2003	AE	
Camp Lake	Entire Shoreline	Entire Shoreline	HEC-1 & UNET	HEC-2	1996	AE	

Table 12: Summary of Hydrologic and Hydraulic Analyses *(continued)*

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Center Creek	Confluence with Des Plaines River	State Highway 50	HSPF	HEC-2	2003	AE	
Center Lake	Entire Shoreline	Entire Shoreline	HEC-1 & UNET	HEC-2	1996	AE	
Des Plaines River	Wisconsin / Illinois State Boundary	Kenosha / Racine County Boundary	HSPF	HEC-2	2003	AE w/ Floodway	There is an area of divided flow located along the Des Plaines River at the Interstate Highway 94 overpass. As the Des Plaines River flows from the west to the east, the flooding hits an area of high ground, and the main channel veers to the north around the high ground and goes under Interstate Highway 94. The other portion of the flooding flows to the south around the high ground and rejoins the main channel approximately 10,000 feet further downstream. For the starting water surface elevation, a 1995 HEC-2 model was used in the 1995 Lake County, Illinois FIS.
Dutch Gap Canal	Wisconsin / Illinois State Boundary	Downstream side of County Highway C	HSPF	HEC-2	2003	AE	
East Branch Pike Creek	Just downstream of 43rd Street	47th Avenue	HSP	HEC-2	1980	AE w/ Floodway	Flows are based on 2000 planned land use and existing channel conditions.
Fox River	Wisconsin / Illinois State Boundary	Kenosha / Racine County Boundary	HEC-HMS 3.5	HEC-RAS 4.1	2015	AE w/ Floodway	Floodplain storage was explicitly accounted for at the Vernon Marsh State Wildlife Area, Tichigan Lake, and Lake Geneva. The HEC-HMS model was calibrated to match the June, 2008 flood event for the USGS stream gages at Waukesha and New Munster, and to match stage records at the Waterford and Rochester Dams.
Fox River Zone A Tributaries	Various	Various	HEC-HMS 3.5	HEC-RAS 4.1	2015	A	
Jerome Creek	Confluence with Des Plaines River	Approximately 750 feet upstream of 93rd Street	HSPF	HEC-2	2003	AE w/ Floodway	

Table 12: Summary of Hydrologic and Hydraulic Analyses *(continued)*

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Kenosha Branch	Confluence with Pike River	Approximately 700 feet upstream of 22nd Avenue	HSP	HEC-2	1983	AE	Flows are based on 2000 planned land use and existing channel conditions.
Kilbourn Road Ditch	Confluence with Des Plaines River	Kenosha / Racine County Boundary	HSPF	HEC-2	2003	AE w/ Floodway	
Lake Elizabeth	Entire Shoreline within County	Entire Shoreline within County	HEC-1	N/A	1980	AE	
Lake Mary	Entire Shoreline	Entire Shoreline	HEC-1	N/A	1980	AE	
Mud Lake Outlet	Confluence with Dutch Gap Canal	Approximately 2,500 feet upstream of 187th Street	HSPF	HEC-2	2003	AE	
Nelson Creek	Confluence with Sorenson Creek	Kenosha / Racine County Boundary	HSP	HEC-2	1983	AE	Flows are based on 2000 planned land use and existing channel conditions.
New Munster Creek	Confluence with Fox River	Approximately 4,800 feet upstream of 376th Avenue	HEC-HMS 3.5	HEC-RAS 4.1	2015	AE w/ Floodway	Floodplain storage was taken into account where permanent water bodies existed, such as ponds, lakes, or manmade detention structures, or where there were significant wetlands identified in the Wisconsin Wetland Inventory.
Peterson Creek	Confluence with Fox River	Immediately downstream of 308th Avenue	HSP	HEC-2	1969	AE	The 0.2-percent frequency discharge was developed by log-normal extrapolation.
Pike Creek	Confluence with Pike River	Just upstream of 75th Street	HSP	HEC-2	1983	AE	Flows are based on 2000 planned land use and existing channel conditions. Areas on Pike Creek where the creek is enclosed may experience flooding because of inadequate storm sewer capacities. These areas are shown on the FIRM.
Pike River	Confluence with Lake Michigan	Approximately 100 feet downstream of Alford Park Drive	HSPF	HEC-2	1983	AE	
Pike River	Approximately 100 feet downstream of Alford Park Drive	Approximately 600 feet upstream of Sheridan Road	HSPF	HEC-RAS 4.1	2014	AE	LOMR 13-05-8170P

Table 12: Summary of Hydrologic and Hydraulic Analyses *(continued)*

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Pike River	Approximately 600 feet upstream of Sheridan Road	Kenosha / Racine County Boundary	HSPF	HEC-2	1983	AE	
Pleasant Prairie Tributary	Confluence with Des Plaines River	Just downstream of Wilmot Road	HSPF	HEC-2	2003	AE w/ Floodway	
Pond 3	Entire Shoreline	Entire Shoreline	HSPF	HEC-2	2003	AE	
Pond 4	Entire Shoreline	Entire Shoreline	HSPF	HEC-2	2003	AE	
Powers Lake Tributary	Confluence with East Branch Nippersink Creek	Approximately 650 feet upstream of County Highway P	HEC-HMS 3.5	HEC-RAS 4.1	2015	AE w/ Floodway	Floodplain storage was taken into account where permanent water bodies existed, such as ponds, lakes, or manmade detention structures, or where there were significant wetlands identified in the Wisconsin Wetland Inventory. It should be noted that the resulting 1% annual chance flood elevation on Powers Lake is 833.9' (10-day duration storm), while the 1% annual chance elevation of the East Branch Nippersink Creek at the confluence with Powers Lake Tributary is 835.0' (6-hour duration storm). The East Branch elevation is a result of the backwater that occurs at Powers Lake Road downstream. The 1% annual chance discharge at Powers Lake Road does account for floodwaters spilling from the East Branch into Powers Lake (flowing west to east). This was modeled with a diversion in HEC-HMS and showed a total volume of 57 acre-feet would divert into Powers Lake. With a total lake area of 451 acres, the diverted water would raise the lake elevation by less than two inches. Therefore, it would not be realistic to map a backwater elevation of 835.0' over the lake, as the storm volume could not fill it to this level.

Table 12: Summary of Hydrologic and Hydraulic Analyses *(continued)*

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Salem Branch Brighton Creek	Confluence with Brighton Creek	Approximately 13,000 feet upstream of confluence with Brighton Creek	HSPF	HEC-2	2003	AE	
School Tributary	Confluence with Pike Creek	Approximately 3,300 feet upstream of County Highway EA	1971 Regression Equations, SCS Unit Hydrograph, & Cook's Empirical Method	WSP-2	1975	AE	
Silver Lake	Entire Shoreline	Entire Shoreline	Unknown	HEC-2	1977	AE	
Silver Lake Outlet	Confluence with Fox River	Approximately 0.45 miles upstream of County Highway B	Unknown	HEC-2	1977	AE w/ Floodway	
Somers Branch	Confluence with Pike Creek	Approximately 110 feet downstream of 12th Street	HSP	HEC-2	1983	AE	Flows are based on 2000 planned land use and existing channel conditions.
Sorenson Creek	Confluence with Pike River	Kenosha / Racine County Boundary	HSP	HEC-2	1983	AE	Flows are based on 2000 planned land use and existing channel conditions.
Tributary to Somers Branch	Confluence with Somers Branch	Approximately 3,200 feet upstream of its confluence with Somers Branch	1971 Regression Equations, SCS Unit Hydrograph, & Cook's Empirical Method	WSP-2	1983	AE	
Union Grove Industrial Tributary	Confluence with Des Plaines River	Kenosha / Racine County Boundary	HSPF	HEC-2	2003	AE	
Unnamed Tributary to Brighton Creek	Confluence with Brighton Creek	Approximately 4,100 feet upstream of County Highway EW	HEC-HMS 3.5	HEC-RAS 4.1	2015	A	
Unnamed Tributary to Camp Lake	Wisconsin / Illinois State Boundary	Immediately upstream of Wilmot Road	HEC-1 & UNET	HEC-2	1996	AE	
Unnamed Tributary to Center Lake	1,700 feet downstream of 89th Street	Approximately 1,700 feet upstream of 89th Street	HEC-1 & UNET	HEC-2	1996	AE	

Table 12: Summary of Hydrologic and Hydraulic Analyses *(continued)*

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Unnamed Tributary to Pike Creek	Confluence with Pike Creek	Approximately 3,800 feet upstream of County Highway EA	1971 Regression Equations, SCS Unit Hydrograph, & Cook's Empirical Method	HEC-2	1981	AE	
Unnamed Tributary No. 1 to Center Creek	Confluence with Center Creek	Approximately 5,700 feet upstream of 75th Street	HSPF	HEC-2	2003	AE	
Unnamed Tributary No. 1 to Des Plaines River	Wisconsin / Illinois State Boundary	Approximately 5,400 feet upstream of Springbrook Road	HSPF	HEC-2	2003	AE w/ Floodway	
Unnamed Tributary No. 1 to Hooker Lake	Confluence with Hooker Lake	Approximately 5,650 feet upstream of 89th Street	HSPF	HEC-RAS 4.1	2016	AE	
Unnamed Tributary No. 1 to Kilbourn Road Ditch	Confluence with Kilbourn Road Ditch	Approximately 3,800 feet upstream of its confluence with Kilbourn Road Ditch	HSPF	HEC-2	2003	AE w/ Floodway	
Unnamed Tributary No. 1 to Salem Branch Brighton Creek	Confluence with Salem Branch Brighton Creek	Downstream side of 85th Street	HSPF	HEC-2	2003	AE	
Unnamed Tributary No. 1A to Des Plaines River	Confluence with Unnamed Tributary No. 1 to Des Plaines River	Wisconsin / Illinois State Boundary	HSPF	HEC-2	2003	AE w/ Floodway, AO	
Unnamed Tributary No. 1B to Des Plaines River	Confluence with Unnamed Tributary No. 1 to Des Plaines River	Just downstream of its confluence with Unnamed Tributary No. 1C to Des Plaines River	HSPF	HEC-2	2003	AE w/ Floodway	

Table 12: Summary of Hydrologic and Hydraulic Analyses *(continued)*

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Unnamed Tributary No. 1C to Des Plaines River	Confluence with Unnamed Tributary No. 1B to Des Plaines River	Approximately 8,100 feet upstream of its confluence with Unnamed Tributary No. 1B	HSPF	HEC-2	2003	AE w/ Floodway	
Unnamed Tributary No. 1E to Des Plaines River	Confluence with Unnamed Tributary No. 2 to Des Plaines River	Approximately 3,100 feet upstream of Interstate 94	HSPF	HEC-2	2003	AE w/ Floodway	
Unnamed Tributary No. 1F to Des Plaines River	Confluence with Unnamed Tributary No. 1E to Des Plaines River	Approximately 5,700 feet upstream of its confluence	HSPF	HEC-2	2003	AE w/ Floodway	
Unnamed Tributary No. 2 to Des Plaines River	Confluence with Unnamed Tributary No. 1E to Des Plaines River	Approximately 5,700 feet upstream of Interstate 94	HSPF	HEC-2	2003	AE w/ Floodway	
Unnamed Tributary No. 2 to Jerome Creek	Confluence with Jerome Creek	Divergence from Unnamed Tributary No. 3 to Jerome Creek	HSPF	HEC-2	2003	AE w/ Floodway	
Unnamed Tributary No. 2 to Salem Branch Brighton Creek	Confluence with Salem Branch Brighton Creek	Approximately 1,000 feet upstream of 75th Street	HSPF	HEC-2	2003	AE	
Unnamed Tributary No. 3 to Dutch Gap Canal	Confluence with Dutch Gap Canal	Approximately 5,000 feet upstream of U.S. Highway 45	HSPF	HEC-2	2003	AE	
Unnamed Tributary No. 3 to Jerome Creek	Confluence with Jerome Creek	Downstream side of 70th Avenue	HSPF	HEC-2	2003	AE w/ Floodway	

Table 12: Summary of Hydrologic and Hydraulic Analyses *(continued)*

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Unnamed Tributary No. 3 to Salem Branch Brighton Creek	Confluence with Salem Branch Brighton Creek	Approximately 2,850 feet upstream of 84th Street	HSPF	HEC-2	2003	AE	
Unnamed Tributary No. 4 to Dutch Gap Canal	Confluence with Unnamed Tributary No. 3 to Dutch Gap Canal	Approximately 3,370 feet upstream of 107th Street	HSPF	HEC-2	2003	AE	
Unnamed Tributary No. 4 to Jerome Creek	Confluence with Jerome Creek	Approximately 5,000 feet upstream of 93rd Street	HSPF	HEC-2	2003	AE w/ Floodway	
Unnamed Tributary No. 4 to Jerome Creek Overflow	Confluence with Jerome Creek	Divergence from Unnamed Tributary 4 to Jerome Creek	HSPF	HEC-2	2003	AE w/ Floodway	
Unnamed Tributary No. 5 to Des Plaines River	Confluence with Des Plaines River	80th Avenue	HSPF	HEC-2	2003	AE w/ Floodway	
Unnamed Tributary No. 5 to Kilbourn Road Ditch	Confluence with Kilbourn Road Ditch	Downstream side of 128th Avenue	HSPF	HEC-2	2003	AE	
Unnamed Tributary No. 5B to Des Plaines River	Confluence with Unnamed Tributary No. 5 to Des Plaines River	Approximately 1,900 feet upstream of its confluence	HSPF	HEC-2	2003	AE w/ Floodway	
Unnamed Tributary No. 6 to Brighton Creek	Confluence with Brighton Creek	Approximately 1,700 feet upstream of 60th Street	HSPF	HEC-2	2003	AE	
Unnamed Tributary No. 7 to Des Plaines River	Confluence with Des Plaines River	Downstream side of 136th Avenue	HSPF	HEC-2	2003	AE w/ Floodway	

Table 12: Summary of Hydrologic and Hydraulic Analyses *(continued)*

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Unnamed Tributary No. 8 to Kilbourn Road Ditch	Confluence with Kilbourn Road Ditch	Approximately 350 feet upstream of Interstate 94	HSPF	HEC-2	2003	AE	
Unnamed Tributary No. 8 to Kilbourn Road Ditch Overflow	Confluence with Kilbourn Road Ditch	Approximately 2,500 feet upstream of its confluence with Kilbourn Road Ditch	HSPF	HEC-2	2003	AE	
Unnamed Tributary No. 13 to Kilbourn Road Ditch	Confluence with Kilbourn Road Ditch	Approximately 400 feet upstream of Interstate 94	HSPF	HEC-2	2003	AE	
Unnamed Tributary No. 15 to Kilbourn Road Ditch	Confluence with Kilbourn Road Ditch	Approximately 2,300 feet upstream of its confluence with Kilbourn Road Ditch	HSPF	HEC-2	2003	AE	
Vern Wolf Lake	Entire Shoreline	Entire Shoreline	HSPF	HEC-2	2003	AE	
Von Gunten Creek	300 feet downstream of 30th Avenue	Approximately 2,200 feet upstream of 30th Avenue	ILLUDAS	HEC-2	1982	AE w/ Floodway	

Table 13: Roughness Coefficients

Flooding Source	Channel “n”	Overbank “n”
Airport Creek	0.020 – 0.045	0.05
Barnes Creek	0.035 – 0.050	0.060 – 0.110
Barnes Creek North Outlet	0.035 – 0.050	0.060 – 0.110
Barnes Creek South Outlet	0.035 – 0.050	0.060 – 0.110
Bassett Creek	0.035 – 0.050	0.060 – 0.110
Bassett Creek Tributary	0.024 – 0.070	0.050 – 0.100
Brighton Creek	0.030 – 0.060	0.050 – 0.150
Center Creek	0.030 – 0.120	0.045 – 0.120
Des Plaines River	0.024 – 0.065	0.050 – 0.120
Dutch Gap Canal	0.050 – 0.080	0.050 – 0.100
East Branch Pike Creek	0.015 – 0.070	0.035 – 0.100
Fox River	0.023 – 0.040	0.050 – 0.120
Jerome Creek	0.013 – 0.100	0.045 – 0.090
Kenosha Branch	0.035 – 0.045	0.050 – 0.060
Kilbourn Road Ditch	0.024 – 0.080	0.045 – 0.250
Mud Lake Outlet	0.050 – 0.080	0.060 – 0.120
Nelson Creek	0.015 – 0.060	0.050 – 0.080
New Munster Creek	0.035 – 0.040	0.050 – 0.120
Peterson Creek	0.035 – 0.050	0.060 – 0.110
Pike Creek	0.020 – 0.080	0.020 – 0.090
Pike River	0.035 – 0.080	0.030 – 0.120
Pleasant Prairie Tributary	0.040 – 0.060	0.060 – 0.100
Powers Lake Tributary	0.030 – 0.045	0.050 – 0.120
Salem Branch Brighton Creek	0.030 – 0.065	0.050 – 0.095
School Tributary	0.035 – 0.050	0.060 – 0.110
Silver Lake Outlet	0.030 – 0.040	0.030 – 0.090
Somers Branch	0.015 – 0.060	0.050 – 0.120
Sorenson Creek	0.015 – 0.060	0.040 – 0.100
Tributary to Somers Branch	0.035 – 0.050	0.060 – 0.110
Union Grove Industrial Tributary	0.040 – 0.075	0.040 – 0.100

Table 13: Roughness Coefficients *(continued)*

Flooding Source	Channel "n"	Overbank "n"
Unnamed Tributary to Camp Lake	0.035 – 0.050	0.060 – 0.100
Unnamed Tributary to Center Lake	0.045 – 0.065	0.055 – 0.200
Unnamed Tributary to Pike Creek	0.024 – 0.120	0.030 – 0.120
Unnamed Tributary No. 1 to Center Creek	0.035 – 0.055	0.055 – 0.200
Unnamed Tributary No. 1 to Des Plaines River	0.013 – 0.100	0.050 – 0.180
Unnamed Tributary No. 1 to Hooker Lake	0.050 – 0.100	0.055 – 0.220
Unnamed Tributary No. 1 to Kilbourn Road Ditch	0.024 – 0.120	0.030 – 0.120
Unnamed Tributary No. 1 to Salem Branch Brighton Creek	0.024 – 0.100	0.055 – 0.180
Unnamed Tributary No. 1A to Des Plaines River	0.013 – 0.070	0.040 – 0.150
Unnamed Tributary No. 1B to Des Plaines River	0.045 – 0.055	0.055 – 0.120
Unnamed Tributary No. 1C to Des Plaines River	0.050 – 0.090	0.050 – 0.065
Unnamed Tributary No. 1E to Des Plaines River	0.013 – 0.080	0.055 – 0.080
Unnamed Tributary No. 1F to Des Plaines River	0.024 – 0.080	0.070 – 0.125
Unnamed Tributary No. 2 to Des Plaines River	0.045 – 0.065	0.055 – 0.070
Unnamed Tributary No. 2 to Jerome Creek	*	*
Unnamed Tributary No. 2 to Salem Branch Brighton Creek	0.030 – 0.090	0.055 – 0.120
Unnamed Tributary No. 3 to Dutch Gap Canal	0.013 – 0.065	0.060 – 0.120
Unnamed Tributary No. 3 to Jerome Creek	*	*
Unnamed Tributary No. 3 to Salem Branch Brighton Creek	0.035 – 0.075	0.055 – 0.120
Unnamed Tributary No. 4 to Dutch Gap Canal	0.030 – 0.080	0.055 – 0.120

*Data not available

Table 13: Roughness Coefficients *(continued)*

Flooding Source	Channel "n"	Overbank "n"
Unnamed Tributary No. 4 to Jerome Creek	0.024 – 0.100	0.055 – 0.200
Unnamed Tributary No. 4 to Jerome Creek Overflow	0.035 – 0.050	0.060 – 0.110
Unnamed Tributary No. 5 to Des Plaines River	0.045 – 0.055	0.050 – 0.065
Unnamed Tributary No. 5 to Kilbourn Road Ditch	0.050 – 0.065	0.060 – 0.120
Unnamed Tributary No. 5B to Des Plaines River	0.035	0.05
Unnamed Tributary No. 6 to Brighton Creek	0.013 – 0.090	0.024 – 0.120
Unnamed Tributary No. 7 to Des Plaines River	0.050 – 0.075	0.055 – 0.090
Unnamed Tributary No. 8 to Kilbourn Road Ditch	0.045 – 0.050	0.050 – 0.055
Unnamed Tributary No. 8 to Kilbourn Road Ditch Overflow	0.055	0.055
Unnamed Tributary No. 13 to Kilbourn Road Ditch	0.013 – 0.070	0.060 – 0.090
Unnamed Tributary No. 15 to Kilbourn Road Ditch	0.024 – 0.050	0.050 – 0.060
Von Gunten Creek	0.035 – 0.080	0.035 – 0.050

*Data not available

5.3 Coastal Analyses

For the areas of Kenosha County that are impacted by coastal flooding processes, coastal flood hazard analyses were performed to provide estimates of coastal BFEs. Coastal BFEs reflect the increase in water levels during a flood event due to storm surge as well as overland wave effects.

The following subsections provide summaries of how each coastal process was considered for this FIS Report. Greater detail (including assumptions, analysis, and results) is available in the archived project documentation. Table 14 summarizes the methods and/or models used for the coastal analyses. Refer to Section 2.5.1 for descriptions of the terms used in this section.

Table 14: Summary of Coastal Analyses

Flooding Source	Study Limits From	Study Limits To	Hazard Evaluated	Model or Method Used	Date Analysis was Completed
Lake Michigan	Entire coastline of Kenosha County, WI	Entire coastline of Kenosha County, WI	Lake-wide Storm Surge	Advanced Circulation Model (ADCIRC)	03/10/2017
Lake Michigan	Entire coastline of Kenosha County, WI	Entire coastline of Kenosha County, WI	Lake-wide Wave Generation	Simulating Waves Nearshore Model (SWAN)	03/10/2017
Lake Michigan	Entire coastline of Kenosha County, WI	Entire coastline of Kenosha County, WI	Event- Based Erosion	Cross-Shore Numerical Model (CSHORE)	06/30/2017
Lake Michigan	Entire coastline of Kenosha County, WI	Entire coastline of Kenosha County, WI	Structure Failure Analysis	FEMA Guidance for Flood Risk Analysis and Mapping – Coastal Structures	10/01/2017
Lake Michigan	Entire coastline of Kenosha County, WI	Entire coastline of Kenosha County, WI	Statistical Analyses	GPD with Q-Q Optimization	10/01/2017
Lake Michigan	Entire coastline of Kenosha County, WI	Entire coastline of Kenosha County, WI	Wave Setup	Direct Integration Method (DIM)	09/27/2017
Lake Michigan	Entire coastline of Kenosha County, WI	Entire coastline of Kenosha County, WI	Wave Runup	Stockdon, Van Gent, and Shore Protection Manual (SPM)[1]	06/30/2017

[1] U.S. Army Corps of Engineers (USACE) Shore Protection Manual (SPM). (USACE, 1984)

Table 14: Summary of Coastal Analyses *(continued)*

Flooding Source	Study Limits From	Study Limits To	Hazard Evaluated	Model or Method Used	Date Analysis was Completed
Lake Michigan	Entire coastline of Kenosha County, WI	Entire coastline of Kenosha County, WI	Wave Overtopping	EurOtop Manual; Plateau Method	10/01/2017

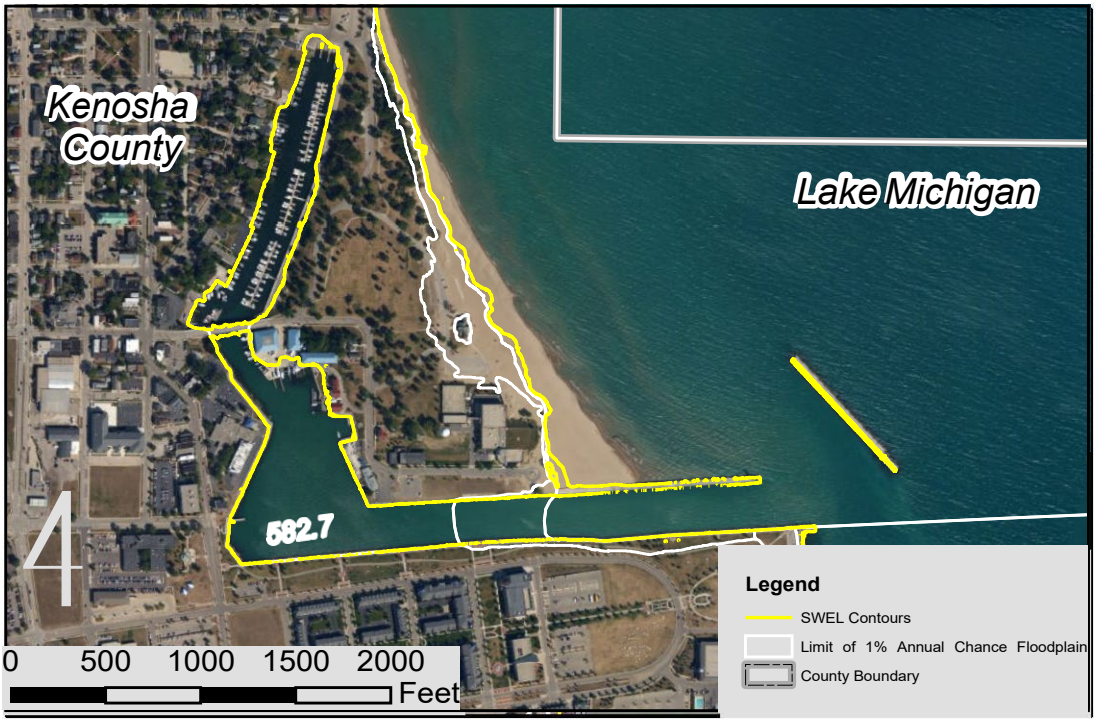
[1] U.S. Army Corps of Engineers (USACE) Shore Protection Manual (SPM). (USACE, 1984)

5.3.1 Stillwater Elevations

The stillwater elevations for the 1-percent-annual-chance flood were determined for areas subject to coastal flooding. The models and methods that were used to determine storm surge and wave setup are listed in Table 14. The stillwater elevation that was used for each transect in the coastal analyses is shown in Table 16, "Coastal Transect Parameters." Figure 8 shows an example of the stillwater elevations for the 1-percent-annual-chance flood that was determined for this coastal analysis; wave setup is computed at each transect location and added to the stillwater elevation to determine a total stillwater elevation.

Stillwater elevations and starting wave conditions for Kenosha County were determined from the lake-wide wave and storm surge study conducted for Lake Michigan by FEMA and Strategic Alliance for Risk Reduction (STARR 2016). The study was performed using the coupled SWAN + ADCIRC hydrodynamic and wave model on a mesh of 1,045,141 nodes and validated using water levels and waves for six historical storms. The model was then used to simulate 150 selected historic storms based on historic peak water levels and peak wave heights. When available, ice coverage was accounted for in validation and production events. The modeled data were used to create a history of water elevation and wave height records from which the 10-, 2-, 1-, and 0.2-percent-annual-chance of exceedance elevations were calculated.

Figure 8: 1% Annual Chance Total Stillwater Elevations for Coastal Areas



Storm Surge Statistics

Storm surge is modeled based on characteristics of actual storms responsible for significant coastal flooding. The characteristics of these storms are typically determined by statistical study of the regional historical record of storms or by statistical study of water level stations.

When historic records are used to calculate storm surge, characteristics such as the strength, size, track, etc., of storms are identified by site. Storm data was used in conjunction with numerical hydrodynamic models to determine the corresponding storm surge levels. An extreme value analysis was performed on the storm surge modeling results to determine a stillwater elevation for the 1-percent-annual-chance event.

In an oceanic environment, water level stations can be used instead of historic records of storms when the available station record for the area represents both the astronomical tide component and the storm surge component. Great Lakes studies rely on water level stations to identify the highest water level storm events from the historic record. The selected storms are then used to simulate storm surge and wave heights across the study area. Table 15 provides the water level station name, managing agency, station type, station identifier, start date, end date, and statistical methodology applied to each station to determine the stillwater elevations.

Table 15: Water Level Station Analysis Specifics

Station Name	Managing Agency of Station	Station Type	Start Date	End Date[1]	Statistical Methodology
Mackinaw City, MI (9075080)	National Oceanic and Atmospheric Administration (NOAA)	Stage	1960	2009	N/A
Ludington, MI (9087023)	NOAA	Stage	1960	2009	N/A
Holland, MI (9087031)	NOAA	Stage	1960	2009	N/A
Calumet Harbor, IL (9087044)	NOAA	Stage	1960	2009	N/A
Milwaukee, WI (9087057)	NOAA	Stage	1960	2009	N/A
Kewaunee, WI (9087068)	NOAA	Stage	1973	2009	N/A
Sturgeon Bay, WI (9087072)	NOAA	Stage	1960	2009	N/A
Green Bay, WI (9087079)	NOAA	Stage	1960	2009	N/A
Port Inland, MI (9087096)	NOAA	Stage	1964	2009	N/A

[1]Available data within study period of record (1960-2009).

5.3.2 Waves

Starting wave heights and wave periods for Kenosha County were determined from the lake-wide wave and storm surge study conducted for Lake Michigan by FEMA and STARR II as described in Section 5.3.1. The modeled data were used to create a history of wave height and wave period records which was used to determine starting wave conditions for the transect analysis.

Wave Setup Analysis

Wave setup was computed based on the wave and water level modeling results through the methods and models listed in Table 14. To adequately capture the complex hydrodynamics of wave-breaking across the surf zone, wave setup was calculated at each transect using the Direct Integration Method (DIM).

5.3.3 Coastal Erosion

A single storm episode can cause extensive erosion in coastal areas. Storm-induced erosion was evaluated using the methods listed in Table 14 to determine the modification to existing topography that is expected to be associated with coastal flooding events. The post-event eroded profile was used for the subsequent transect-based onshore wave hazard analyses.

5.3.4 Wave Hazard Analyses

Overland wave hazards were evaluated to determine the combined effects of ground elevation, vegetation, and physical features on overland wave propagation and wave runup. These analyses were performed at representative transects where waves are expected to be present during the floods of the selected recurrence intervals. The results of these analyses were used to determine elevations for the 1-percent-annual-chance flood. The transect analysis was performed with elevations in the vertical datum of IGLD85 and ultimately converted to NAVD88 for mapping.

Transect locations were chosen with consideration given to the physical land characteristics as well as development type and density so that they would closely represent conditions in their locality. Additional consideration was given to changes in the total stillwater elevation. Transects were spaced close together in areas of complex topography and dense development or where total stillwater elevations varied. In areas having more uniform characteristics, transects were spaced at larger intervals. Transects shown in Figure 9, “Transect Location Map,” are also depicted on the FIRM. Table 16 provides the location, stillwater elevations, and total water elevations for all coastal analysis transects. Starting wave conditions are also provided for each transect evaluated for overland wave hazards. In this table, “starting” indicates the parameter value at the beginning of the transect.

Wave Height Analysis

Wave height analyses were performed to determine wave heights and corresponding wave crest elevations for the areas inundated by coastal flooding and subject to overland wave propagation hazards. Refer to Figure 6b for a schematic of a coastal transect evaluated for overland wave propagation hazards.

The methodology for analyzing the effects of wave heights associated with coastal storm surge flooding is described in a report prepared by the National Academy of Sciences (NAS). This method is based on three major concepts. First, depth-limited waves in shallow water reach maximum breaking height that is equal to 0.78 times the stillwater depth. The wave crest is 70 percent of the total wave height above the stillwater level. The second major concept is that wave height may be diminished by dissipation of energy due to the presence of obstructions, such as sand dunes, dikes and seawalls, buildings and vegetation. The amount of energy dissipation is a function of the physical characteristics of the obstruction and is determined by procedures prescribed in the NAS Report. The third major concept is that wave height can be regenerated in open fetch areas due to the transfer of wind energy to the water. This added energy is related to fetch length and depth.

Along each transect, wave heights and wave crest elevations were computed considering the combined effects of changes in ground elevation, vegetation, and physical features. The joint probability method (JPM) is used to compute five theoretical combinations of wave and water level conditions that have a joint 1-percent-annual-chance probability of occurrence. These theoretical combinations were simulated to determine the water levels, which include wave setup, and wave conditions at the shoreline. Wave heights and wave crest elevations were modeled using the methods and models listed in Table 14.

Wave Runup and Overtopping Analysis

Wave runup is the uprush of water caused by wave action on a shore barrier exceeding the total stillwater level. As part of the coastal study, an evaluation of wave runup is conducted to determine the total water elevation due to storm surge, wave setup, and wave runup, and whether that total water elevation is the dominant coastal flood hazard for an area. Wave runup is evaluated for areas having dune barrier systems, coastal bluffs, as well as sloped and vertical structures.

Wave runup elevations were calculated for each coastal transect using the methods and models listed in Table 14, which follow the FEMA Guidelines and Specifications. For gently sloping shorelines (slopes less than 1:10), the Stockdon equations were applied (Stockdon et al. 2006). For steeper (but non-vertical) sloping shorelines, the van Gent method was performed (van Gent 2001). For vertical structures, runup elevations were determined using the guidance in Figure D-14 of the FEMA Guidelines and Specifications obtained from the SPM (USACE 1984). The SPM results in a mean wave runup value, which was multiplied by 2.2 to obtain the 2-percent runup height.

Wave overtopping occurs when the potential wave runup elevation is greater than the topographic feature crest elevation. The overtopping rate will depend on the incident water level and wave conditions, the barrier geometry and roughness characteristics, and the upland slope. Overtopping rates were calculated using the methods and models listed in Table 14, which follow the FEMA Guidelines and Specifications.

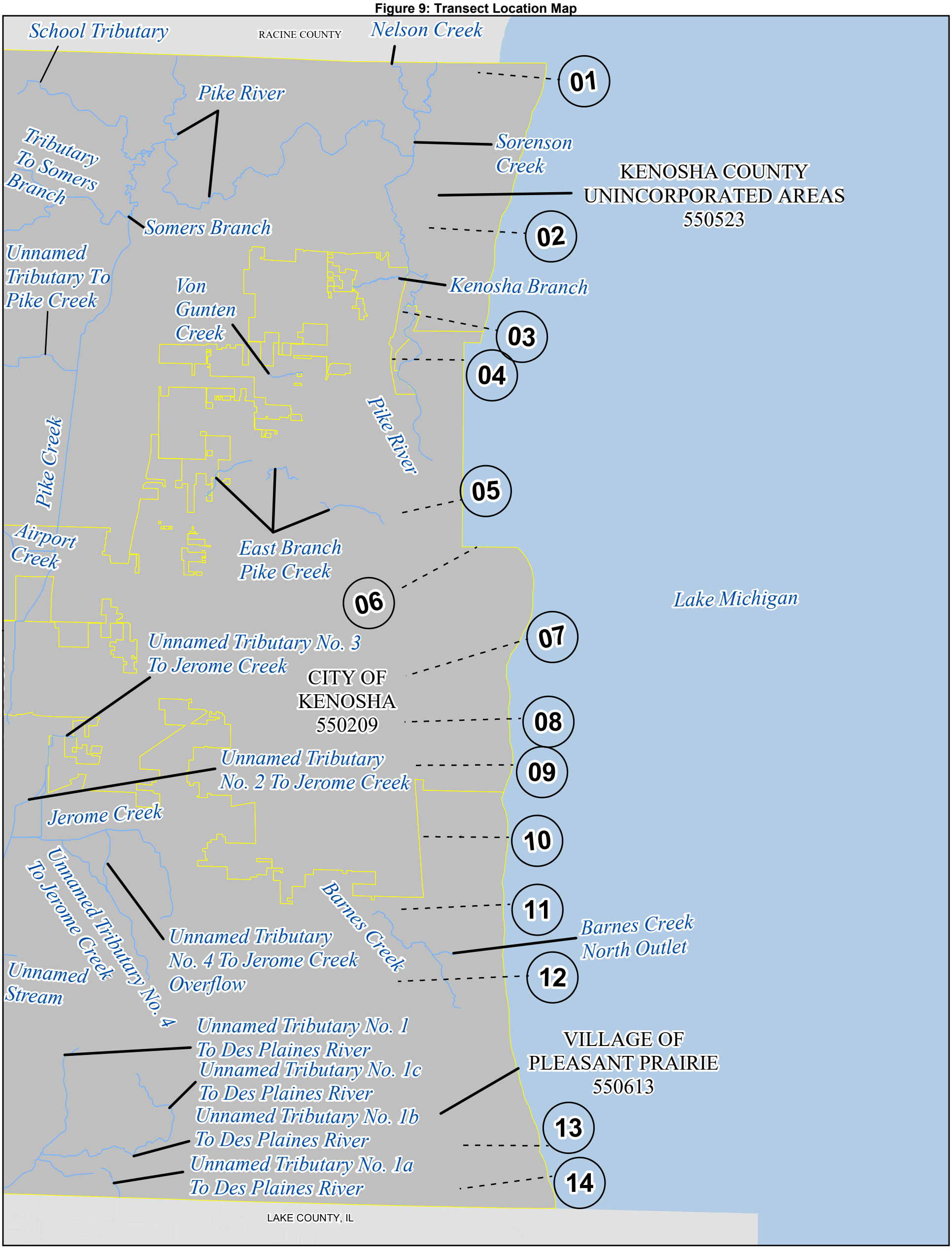
Wave overtopping behavior is determined based on the slope landward of the barrier crest. Where the shoreline geometry is characterized by a low-crested bluff or structure backed by a positively-sloping, nearly level upland, the Plateau Method was applied to calculate an adjusted runup elevation and the inland extent of runup. Where the shoreline geometry is characterized by a negative slope landward of the barrier crest, the overtopping water will result in sheet flow on the negative slope and may propagate until it reaches another flooding source or ponding area.

Table 16: Coastal Transect Parameters

Flood Source	Coastal Transect	Starting Wave Conditions for the 1% Annual Chance[1,2]		Starting Stillwater Elevations (feet NAVD88)					1% Annual Chance Total Water Elevation[3] (feet NAVD88)
		Significant Wave Height H_s (feet)	Peak Wave Period T_p (second)	10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance	
Lake Michigan	1	*	*	582.1	582.3	582.5	582.6	582.7	591.3†
Lake Michigan	2	*	*	582.1	582.4	582.5	582.6	582.7	590.5
Lake Michigan	3	*	*	582.1	582.4	582.5	582.6	582.7	592.1
Lake Michigan	4	*	*	582.2	582.4	582.5	582.6	582.7	590.3
Lake Michigan	5	*	*	582.2	582.4	582.5	582.6	582.7	594.7†
Lake Michigan	6	*	*	582.2	582.4	582.5	582.6	582.7	586.1
Lake Michigan	7	*	*	582.1	582.4	582.5	582.6	582.7	590.8†
Lake Michigan	8	*	*	582.1	582.4	582.5	582.6	582.7	592.5
Lake Michigan	9	*	*	582.1	582.4	582.5	582.6	582.8	592.8†
Lake Michigan	10	*	*	582.1	582.4	582.5	582.6	582.7	589.7
Lake Michigan	11	*	*	582.2	582.4	582.5	582.6	582.8	587.3
Lake Michigan	12	*	*	582.2	582.4	582.6	582.6	582.8	587.2
Lake Michigan	13	*	*	582.2	582.4	582.5	582.6	582.7	592.1†
Lake Michigan	14	*	*	582.2	582.4	582.5	582.6	582.8	588.5

[1]Wave data provided for WHAFIS-dominant transects only. The 1% starting wave parameters are not applicable for runup transects since a response-based approach is utilized.
[2]Wave data correspond to the 1-percent-annual-chance floodplain but may not be directly associated with the 1-percent-annual-chance SWEL.
[3]Includes wave action representative of 1% Total Water Level (for wave runup and overtopping) or 1% Wave Crest Elevation (for overland wave propagation).
†Reported 1% Total Water Elevation corresponds to the raw potential runup and not the capped runup or adjusted plateau runup value.
* Not calculated for this Flood Risk Project

Figure 9: Transect Location Map



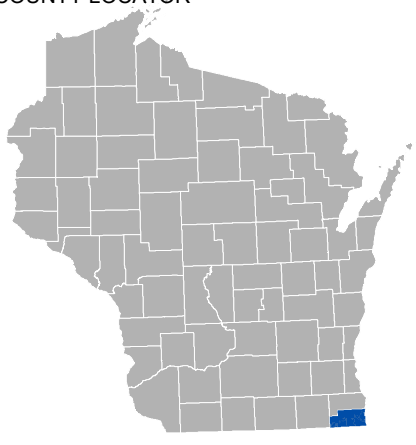
1 inch = 1 miles

Miles

0 0.5 1

Map Projection:
Universal Transverse Mercator Zone 16N;
North American Datum 1983

COUNTY LOCATOR



NATIONAL FLOOD INSURANCE PROGRAM

Transect Locator Map

PANELS WITH TRANSECTS:

0089, 0091, 0093, 0202, 0204, 0208, 0212, 0214, 0216, 0218, 0331

FEMA

5.4 Alluvial Fan Analyses

This section is not applicable to this Flood Risk Project.

Table 17: Summary of Alluvial Fan Analyses

[Not Applicable to this Flood Risk Project]

Table 18: Results of Alluvial Fan Analyses

[Not Applicable to this Flood Risk Project]

SECTION 6.0 – MAPPING METHODS

6.1 Vertical and Horizontal Control

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 FIRMs are referenced to NAVD88. These flood elevations must be compared to structure and ground elevations referenced to the same vertical datum. For information regarding conversion between NGVD29 and NAVD88 or other datum conversion, visit the National Geodetic Survey website at www.ngs.noaa.gov.

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 archived project documentation associated with the FIS Report and the FIRMs for this community. Interested individuals may contact FEMA to access these data.

To obtain current elevation, description, and/or location information for benchmarks in the area, please visit the NGS website at www.ngs.noaa.gov.

The datum conversion locations and values that were calculated for Kenosha County are provided in Table 19.

Table 19: Countywide Vertical Datum Conversion

[Not Applicable to this Flood Risk Project]

Table 20: Stream-by-Stream Vertical Datum Conversion

[Not Applicable to this Flood Risk Project]

6.2 Base Map

The FIRMs and FIS Report for this project have been produced in a digital format. The flood hazard information was converted to a Geographic Information System (GIS) format that meets FEMA's FIRM database specifications and geographic information standards. This information is provided in a digital format so that it can be incorporated into a local GIS and be accessed more easily by the community. The FIRM Database includes most of the tabular information contained in the FIS Report in such a way that the data can be associated with pertinent spatial features. For example, the information contained in the Floodway Data table and Flood Profiles can be linked to the cross sections that are shown on the FIRMs. Additional information about the FIRM Database and its contents can be found in FEMA's *Guidelines and Standards for Flood Risk Analysis and Mapping*, www.fema.gov/flood-maps/guidance-partners/guidelines-standards.

Base map information shown on the FIRM was derived from the sources described in Table 21.

Table 21: Base Map Sources

Data Type	Data Provider	Data Date	Data Scale	Data Description
2005 NAIP DOP Imagery	USDA FSA Aerial Photography Field Office	2005	1:40,000	Spatial and attribute information for location of roads, railroads, bridges, streams, and other physical features shown for FIRMs dated prior to 03/08/2017. (USDA, 2005)
Kenosha County Municipal Boundaries	Kenosha County Department of Planning and Development	2006	1:12,000	Spatial and attribute information for municipal boundaries in Kenosha County, Wisconsin for FIRMs dated prior to 03/08/2017. (KCDPD, 2006)
Kenosha County Municipal Boundaries – 2021	Wisconsin Department of Natural Resources	2021	1:5,000	Spatial and attribute information for Political Boundaries for Upper Fox and Coastal Study for FIRMs dated later than 03/07/2017. (WDNR, 2021)
USGS National Map: Orthoimagery for Kenosha County	US Geological Survey	2020*		Orthorectified digital aerial photographs and satellite images of 1-meter (m) pixel resolution or finer for FIRMs dated later than 03/07/2017. (USGS, 2020)
Watershed Boundary Dataset (WBD), HUC8 Boundaries	US Geological Survey	2017	1:24,000	Spatial and attribute information for subbasins (NHD, 2017)
Wisconsin 2000 Roads	Office of Land Information Services, Wisconsin DOA	2000	1:100,000	Spatial and attribute information for transportation network in Kenosha County, WI for FIRMs dated prior to 03/08/2017. (USCB, 2000)
Wisconsin 2010 Census roads and railroads	Wisconsin Department of Natural Resources	2015	1:6,000	Spatial and attribute information of transportation lines for FIRMs dated later than 03/07/2017. (WDNR, 2015)
Wisconsin Hydrological Features	Wisconsin Department of Natural Resources	2004	1:24,000	Spatial and attribute information for hydrologic network in Kenosha County, WI (WDNR, 2004)

* Most recently refreshed data

Table 21: Base Map Sources *(continued)*

Data Type	Data Provider	Data Date	Data Scale	Data Description
Wisconsin PLSS sections from 1:24K Landnet	Wisconsin Department of Natural Resources	1996	1:24,000	Spatial and attribute information for PLSS areas and boundaries (WDNR, 1996)

* Most recently refreshed data

6.3 Floodplain and Floodway Delineation

The FIRM shows tints, screens, and symbols to indicate floodplains and floodways as well as the locations of selected cross sections used in the hydraulic analyses and floodway computations.

For riverine flooding sources, the mapped floodplain boundaries shown on the FIRM have been delineated using the flood elevations determined at each cross section; between cross sections, the boundaries were interpolated using the topographic elevation data described in Table 22. For each coastal flooding source studied as part of this FIS Report, the mapped floodplain boundaries on the FIRM have been delineated using the flood and wave elevations determined at each transect; between transects, boundaries were delineated using land use and land cover data, the topographic elevation data described in Table 22, and knowledge of coastal flood processes. In ponding areas, flood elevations were determined at each junction of the model; between junctions, boundaries were interpolated using the topographic elevation data described in Table 22.

In cases where the 1-percent and 0.2-percent-annual-chance floodplain boundaries are close together, only the 1% 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.

The floodway widths presented in this FIS Report and on the FIRM 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. Table 2 indicates the flooding sources for which floodways have been determined. The results of the floodway computations for those flooding sources have been tabulated for selected cross sections and are shown in Table 23, “Floodway Data.”

Table 22: Summary of Topographic Elevation Data used in Mapping

Community	Flooding Source	Source for Topographic Elevation Data			
		Description	Vertical Accuracy	Horizontal Accuracy	Citation
Kenosha County, Unincorporated Areas; Paddock Lake, Village of; Salem Lakes, Village of; Twin Lakes, Village of	Fox River, New Munster Creek, Powers Lake Tributary, Hoosier Creek Canal, Unnamed Tributary to Brighton Creek, Zone A studies within HUC 07120006	2013 Kenosha County, WI 5-foot Digital Elevation Model (DEM)	5.5 cm RMSEz	*	WDNR, 2013
Entire Coastline of Kenosha County, WI	Lake Michigan	2013 Kenosha County LiDAR for coastal study	15 cm RMSEz	0.5 m RMSE	JALBTCX, 2013
Bristol, Village of; Kenosha, City of; Kenosha County, Unincorporated Areas; Paddock Lake, Village of; Pleasant Prairie, Village of; Salem Lakes, Village of; Somers, Village of; Twin Lakes, Village of	All other streams not mentioned above	2005 Topographic Map of Kenosha County, Wisconsin, Scale 1:2,400, Contour Interval 2 feet	*	*	Kenosha, 2005

*Data not available

BFEs shown at cross sections on the FIRM represent the 1-percent-annual-chance water surface elevations shown on the Flood Profiles and in the Floodway Data tables in the FIS Report. Rounded whole-foot elevations may be shown on the FIRM in coastal areas, areas of ponding, and other areas with static base flood elevations.

Table 23: Floodway Data

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
AIRPORT CREEK								
A	1,742[1]	*	*	*	677.0	*	*	*
B	2,006[1]	*	*	*	677.0	*	*	*
C	2,851[1]	*	*	*	679.9	*	*	*
D	3,696[1]	*	*	*	679.9	*	*	*
E	4,910[1]	*	*	*	688.0	*	*	*
BARNES CREEK NORTH OUTLET - BARNES CREEK								
A	264[2]	*	*	*	[3]	585.2	*	*
B	370[2]	*	*	*	587.8	*	*	*
C	634[2]	*	*	*	587.9	*	*	*
D	1,188[2]	*	*	*	588.3	*	*	*
E	1,584[2]	*	*	*	589.5	*	*	*
F	1,690[2]	*	*	*	589.7	*	*	*
G	1,901[2]	*	*	*	590.6	*	*	*
H	2,878[2]	*	*	*	594.3	*	*	*
I	4,256[2]	*	*	*	598.8	*	*	*
J	4,594[2]	*	*	*	601.5	*	*	*
K	4,805[2]	*	*	*	606.8	*	*	*
L	5,702[2]	*	*	*	606.9	*	*	*
M	7,265[2]	*	*	*	606.9	*	*	*

[1]Feet above confluence with Pike Creek [2]Feet above confluence with Lake Michigan

[3]Controlled by coastal flooding. See Flood Insurance Rate Map for regulatory base flood elevations *Data not available

TABLE 23

FEDERAL EMERGENCY MANAGEMENT AGENCY

KENOSHA COUNTY, WI

AND INCORPORATED AREAS

FLOODWAY DATA

FLOODING SOURCE: AIRPORT CREEK - BARNES CREEK NORTH OUTLET - BARNES CREEK

Table 23: Floodway Data *(continued)*

LOCATION		FLOODWAY				1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	WIDTH REDUCED FROM PRIOR STUDY (FEET)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
BARNES CREEK SOUTH OUTLET									
A	180[1]	*	*	*	*	583.7	583.7	*	*
B	650[1]	*	*	*	*	583.8	583.8	*	*
C	1,700[1]	*	*	*	*	583.8	583.8	*	*
D	1,900[1]	*	*	*	*	584.1	584.1	*	*
E	2,440[1]	*	*	*	*	584.3	584.3	*	*
F	3,300[1]	*	*	*	*	588.9	*	*	*
BASSETT CREEK									
A-F	*	*	*	*	*	*	*	*	*
BASSETT CREEK TRIBUTARY									
A	880[2]	34	139	0.9	162	781.2	781.2	781.2	0.0
B	1,330[2]	23	39	3.3	0	782.7	782.7	782.7	0.0
C	2,447[2]	6	36	3.6	0	790.4	790.4	790.4	0.0
D	2,850[2]	58	137	0.9	0	790.8	790.8	790.8	0.0
E	3,044[2]	5	15	2.3	0	790.9	790.9	790.9	0.0
F	3,696[2]	47	52	0.6	25	791.5	791.5	791.5	0.0

[1]Feet above confluence with Lake Michigan [2]Feet above confluence with Bassett Creek

*Data not available

TABLE 23

FEDERAL EMERGENCY MANAGEMENT AGENCY

KENOSHA COUNTY, WI

AND INCORPORATED AREAS

FLOODWAY DATA

FLOODING SOURCE: BARNES CREEK SOUTH OUTLET - BASSETT CREEK - BASSETT CREEK TRIBUTARY

Table 23: Floodway Data *(continued)*

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	1,616	*	*	*	696.0	*	*	*
B	2,070	*	*	*	698.5	*	*	*
C	2,952	*	*	*	699.9	*	*	*
D	4,926	*	*	*	705.4	*	*	*
E	5,856	*	*	*	707.1	*	*	*
F	8,865	*	*	*	707.7	*	*	*
G	10,222	*	*	*	711.8	*	*	*
H	11,943	*	*	*	713.2	*	*	*
I	14,319	*	*	*	718.7	*	*	*
J	15,513	*	*	*	720.4	*	*	*
K	17,815	*	*	*	721.0	*	*	*
L	18,628	*	*	*	723.3	*	*	*
M	18,987	*	*	*	725.3	*	*	*
N	20,640	*	*	*	731.7	*	*	*
O	21,901	*	*	*	735.2	*	*	*
P	22,899	*	*	*	737.4	*	*	*
Q	24,800	*	*	*	741.5	*	*	*
R	28,676	*	*	*	741.8	*	*	*
S	29,726	*	*	*	743.2	*	*	*
T	31,844	*	*	*	745.5	*	*	*
U	32,567	*	*	*	747.1	*	*	*
V	33,000	*	*	*	750.2	*	*	*
W	33,470	*	*	*	750.4	*	*	*
X	35,302	*	*	*	752.7	*	*	*
Y	38,850	*	*	*	763.1	*	*	*
Z	40,292	*	*	*	767.2	*	*	*

[1]Feet above confluence with Des Plaines River

*Data not available

Table 23: Floodway Data *(continued)*

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
AA	41,163	*	*	*	769.0	*	*	*
AB	41,691	*	*	*	772.6	*	*	*
AC	43,064	*	*	*	772.8	*	*	*
AD	44,389	*	*	*	774.5	*	*	*
AE	46,216	*	*	*	776.0	*	*	*
AF	48,624	*	*	*	781.4	*	*	*
AG	50,198	*	*	*	783.2	*	*	*
AH	50,925	*	*	*	786.2	*	*	*
AI	51,569	*	*	*	788.2	*	*	*
AJ	52,011	*	*	*	788.4	*	*	*
AK	54,671	*	*	*	788.5	*	*	*

[1]Feet above confluence with Des Plaines River

*Data not available

TABLE 23

FEDERAL EMERGENCY MANAGEMENT AGENCY

KENOSHA COUNTY, WI

AND INCORPORATED AREAS

FLOODWAY DATA

FLOODING SOURCE: BRIGHTON CREEK

Table 23: Floodway Data *(continued)*

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
CENTER CREEK								
A	2,476[1]	*	*	*	680.4	*	*	*
B	3,289[1]	*	*	*	681.1	*	*	*
C	3,553[1]	*	*	*	681.3	*	*	*
D	4,372[1]	*	*	*	683.8	*	*	*
E	5,349[1]	*	*	*	685.9	*	*	*
F	7,065[1]	*	*	*	688.5	*	*	*
G	7,946[1]	*	*	*	690.8	*	*	*
H	8,448[1]	*	*	*	691.2	*	*	*
I	8,496[1]	*	*	*	692.3	*	*	*
J	8,923[1]	*	*	*	692.8	*	*	*
K	9,441[1]	*	*	*	696.3	*	*	*
L	10,053[1]	*	*	*	697.7	*	*	*
M	11,484[1]	*	*	*	701.8	*	*	*
N	12,133[1]	*	*	*	704.9	*	*	*
DES PLAINES RIVER								
A	0[2]	2,031	10,362	0.3	675.4	675.4	675.4	0.0
B	3,622[2]	907	3,741	0.7	675.5	675.5	675.5	0.0
C	3,658[2]	907	3,814	0.7	675.6	675.6	675.6	0.0
D	6,987[2]	5,120	37,972	0.1	675.7	675.7	675.7	0.0
E	15,403[2]	202	1,861	1.5	675.8	675.8	675.8	0.0

[1]Feet above confluence with Des Plaines River [2]Feet above Wisconsin state line

*Data not available

Table 23: Floodway Data *(continued)*

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
F	15,443	202	1,861	1.5	675.8	675.8	675.8	0.0
G	20,623	1,469	7,073	0.4	676.2	676.2	676.2	0.0
H	24,593	603	3,086	0.9	676.9	676.9	676.9	0.0
I	26,033	1,373	6,505	0.4	677.2	677.2	677.2	0.0
J	29,728	122	1,023	2.8	677.9	677.9	677.9	0.0
K	29,759	122	1,024	2.8	677.9	677.9	677.9	0.0
L	33,496	114	861	2.2	679.0	679.0	679.0	0.0
M	33,738	*	*	*	679.1	*	*	*
N	34,268	*	*	*	679.3	*	*	*
O	38,328	*	*	*	679.4	*	*	*
P	41,438	*	*	*	680.0	*	*	*
Q	42,868	*	*	*	680.5	*	*	*
R	44,822	*	*	*	680.9	*	*	*
S	48,468	*	*	*	681.4	*	*	*
T	50,818	*	*	*	682.1	*	*	*
U	51,626	*	*	*	682.3	*	*	*
V	52,526	*	*	*	683.0	*	*	*
W	55,472	*	*	*	683.6	*	*	*
X	57,679	*	*	*	684.3	*	*	*
Y	59,834	*	*	*	686.1	*	*	*
Z	61,864	*	*	*	687.2	*	*	*
AA	63,010	*	*	*	688.3	*	*	*
AB	64,341	*	*	*	690.2	*	*	*
AC	65,524	*	*	*	690.3	*	*	*
AD	68,497	*	*	*	690.5	*	*	*
AE	68,865	*	*	*	690.6	*	*	*

[1]Feet above Wisconsin state line

*Data not available

TABLE 23

FEDERAL EMERGENCY MANAGEMENT AGENCY

KENOSHA COUNTY, WI

AND INCORPORATED AREAS

FLOODWAY DATA

FLOODING SOURCE: DES PLAINES RIVER

Table 23: Floodway Data *(continued)*

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
AF	69,636	*	*	*	691.2	*	*	*
AG	71,632	*	*	*	691.6	*	*	*
AH	73,532	*	*	*	692.2	*	*	*
AI	75,311	*	*	*	693.6	*	*	*
AJ	76,462	*	*	*	694.4	*	*	*
AK	78,192	*	*	*	694.7	*	*	*
AL	79,572	*	*	*	694.8	*	*	*
AM	83,041	*	*	*	695.0	*	*	*
AN	85,219	*	*	*	695.4	*	*	*
AO	86,639	*	*	*	695.4	*	*	*
AP	90,703	*	*	*	695.4	*	*	*
AQ	91,870	*	*	*	695.7	*	*	*
AR	92,773	*	*	*	696.8	*	*	*
AS	93,818	*	*	*	698.5	*	*	*
AT	94,506	*	*	*	698.8	*	*	*
AU	95,615	*	*	*	699.1	*	*	*
AV	96,752	*	*	*	699.5	*	*	*
AW	97,597	*	*	*	699.8	*	*	*
AX	99,877	*	*	*	700.3	*	*	*
AY	100,717	*	*	*	700.5	*	*	*
AZ	102,167	*	*	*	700.6	*	*	*
BA	105,037	*	*	*	700.9	*	*	*
BB	106,463	*	*	*	702.2	*	*	*
BC	107,187	*	*	*	704.3	*	*	*
BD	107,953	*	*	*	705.4	*	*	*
BE	109,099	*	*	*	706.2	*	*	*
BF	111,499	*	*	*	706.2	*	*	*
BG	111,922	*	*	*	706.2	*	*	*

[1]Feet above Wisconsin state line

*Data not available

TABLE 23

FEDERAL EMERGENCY MANAGEMENT AGENCY

KENOSHA COUNTY, WI

AND INCORPORATED AREAS

FLOODWAY DATA

FLOODING SOURCE: DES PLAINES RIVER

Table 23: Floodway Data *(continued)*

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	444	*	*	*	757.2	*	*	*
B	1,769	*	*	*	757.9	*	*	*
C	3,374	*	*	*	758.1	*	*	*
D	5,893	*	*	*	758.3	*	*	*
E	7,128	*	*	*	758.4	*	*	*
F	8,385	*	*	*	758.5	*	*	*
G	10,713	*	*	*	758.5	*	*	*
H	12,318	*	*	*	758.6	*	*	*
I	14,779	*	*	*	758.7	*	*	*
J	16,986	*	*	*	758.8	*	*	*
K	18,227	*	*	*	758.8	*	*	*
L	20,824	*	*	*	758.8	*	*	*
M	21,442	*	*	*	759.0	*	*	*

[1]Feet above Wisconsin state line

*Data not available

Table 23: Floodway Data *(continued)*

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	1.046	340	4,640	0.6	602.9	602.9	602.9	0.0
B	1.385	353	3,201	0.7	603.0	603.0	603.0	0.0
C	1.610	255	2,229	0.9	606.6	606.6	606.6	0.0
D	1.788	248	1,979	0.3	606.6	606.6	606.6	0.0
E	2.345	84	261	1.6	615.6	615.6	615.6	0.0
F	2.822	95	171	2.5	627.1	627.1	627.1	0.0
G	3.317	194	286	1.1	650.3	650.3	650.3	0.0

[1]Miles above mouth at Lake Michigan

TABLE 23

FEDERAL EMERGENCY MANAGEMENT AGENCY

KENOSHA COUNTY, WI

AND INCORPORATED AREAS

FLOODWAY DATA

FLOODING SOURCE: EAST BRANCH PIKE CREEK

Table 23: Floodway Data *(continued)*

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	617	688	3,610	2.4	742.9	742.9	742.9	0.0
B	2,009	856	4,379	1.9	743.3	743.3	743.3	0.0
C	2,841	864	4,590	1.9	743.5	743.5	743.5	0.0
D	3,940	734	4,760	1.8	743.8	743.8	743.8	0.0
E	5,569	1,095	6,922	1.2	744.1	744.1	744.1	0.0
F	6,491	222	1,911	4.5	744.2	744.2	744.2	0.0
G	6,624	241	2,208	3.9	744.6	744.6	744.6	0.0
H	8,036	1,090	5,219	1.6	745.1	745.1	745.1	0.0
I	9,871	1,760	9,867	0.9	745.4	745.4	745.4	0.0
J	11,777	1,842	9,812	0.9	745.6	745.6	745.6	0.0
K	13,075	1,513	8,385	1.0	745.8	745.8	745.8	0.0
L	13,843	1,452	7,519	1.1	745.9	745.9	745.9	0.0
M	14,852	1,201	5,968	1.4	746.0	746.0	746.0	0.0
N	15,719	976	5,337	1.6	746.2	746.2	746.2	0.0
O	16,634	1,189	7,545	1.1	746.4	746.4	746.4	0.0
P	17,397	1,086	6,524	1.3	746.5	746.5	746.5	0.0
Q	19,224	490	2,978	2.9	746.9	746.9	746.9	0.0
R	19,561	173	1,801	4.7	747.1	747.1	747.1	0.0
S	21,030	1,495	9,705	0.9	748.0	748.0	748.0	0.0
T	24,998	1,454	10,326	0.8	748.3	748.3	748.3	0.0
U	26,559	1,667	11,816	0.7	748.4	748.4	748.4	0.0
V	28,253	1,221	6,858	1.2	748.5	748.5	748.5	0.0
W	29,361	1,168	5,888	1.4	748.6	748.6	748.6	0.0
X	33,124	2,052	12,204	0.7	749.0	749.0	749.0	0.0
Y	35,995	1,958	9,526	0.9	749.2	749.2	749.2	0.0
Z	40,116	3,892	20,036	0.4	749.5	749.5	749.5	0.0

[1]Feet above Wisconsin State Boundary

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
AA	45,346	1,534	9,593	0.9	749.6	749.6	749.6	0.0
AB	46,806	1,262	8,301	1.0	749.8	749.8	749.8	0.0
AC	47,895	786	5,756	1.5	749.9	749.9	749.9	0.0
AD	48,461	370	3,222	2.6	750.0	750.0	750.0	0.0
AE	49,314	1,103	8,473	1.0	750.2	750.2	750.2	0.0
AF	50,690	1,638	11,313	0.8	750.3	750.3	750.3	0.0
AG	52,919	1,025	5,798	1.5	750.4	750.4	750.4	0.0
AH	54,734	1,640	7,855	1.1	750.6	750.6	750.6	0.0
AI	56,097	1,545	8,871	1.0	750.8	750.8	750.8	0.0
AJ	58,329	1,159	5,833	1.5	750.9	750.9	750.9	0.0
AK	59,663	1,131	6,145	1.4	751.1	751.1	751.1	0.0
AL	61,196	1,021	6,041	1.4	751.3	751.3	751.3	0.0
AM	62,782	708	5,128	1.7	751.5	751.5	751.5	0.0
AN	64,488	866	4,102	2.1	751.7	751.7	751.7	0.0

[1]Feet above Wisconsin State Boundary

TABLE 23

FEDERAL EMERGENCY MANAGEMENT AGENCY

KENOSHA COUNTY, WI

AND INCORPORATED AREAS

FLOODWAY DATA

FLOODING SOURCE: FOX RIVER

Table 23: Floodway Data *(continued)*

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	2,123	824	1,421	0.2	676.2	676.2	676.2	0.0
B	2,978	349	820	0.3	676.2	676.2	676.2	0.0
C	4,422	15	127	1.1	676.6	676.6	676.6	0.0
D	4,516	15	148	1.0	678.0	678.0	678.0	0.0
E	5,224	197	276	0.5	678.1	678.1	678.1	0.0
F	5,631	136	239	0.6	678.2	678.2	678.2	0.0
G	5,911	17	123	1.1	678.2	678.2	678.2	0.0
H	5,957	17	123	1.1	678.2	678.2	678.2	0.0
I	6,337	160	675	0.2	678.3	678.3	678.3	0.0
J	6,967	282	789	0.2	678.3	678.3	678.3	0.0
K	7,495	18	148	1.0	678.3	678.3	678.3	0.0
L	7,555	18	149	0.9	678.3	678.3	678.3	0.0
M	8,655	42	117	1.2	678.5	678.5	678.5	0.0
N	10,664	5	27	2.5	679.5	679.5	679.5	0.0
O	10,765	5	32	2.2	680.4	680.4	680.4	0.0
P	11,018	430	1,556	0.1	680.5	680.5	680.5	0.0
Q	12,084	370	1,052	0.1	680.5	680.5	680.5	0.0
R	12,406	104	584	0.1	680.5	680.5	680.5	0.0
S	12,690	104	484	0.2	681.1	681.1	681.1	0.0
T	14,073	17	113	2.0	681.2	681.2	681.2	0.0
U	14,473	200	609	0.4	681.6	681.6	681.6	0.0
V	16,559	465	1,490	0.2	681.6	681.6	681.6	0.0
W	17,231	379	457	0.5	681.6	681.6	681.6	0.0
X	17,409	301	395	0.6	681.6	681.6	681.6	0.0
Y	17,752	259	406	0.6	681.7	681.7	681.7	0.0
Z	17,973	375	221	1.0	681.8	681.8	681.8	0.0

[1]Feet above confluence with Des Plaines River

TABLE 23

FEDERAL EMERGENCY MANAGEMENT AGENCY

KENOSHA COUNTY, WI

AND INCORPORATED AREAS

FLOODWAY DATA

FLOODING SOURCE: JEROME CREEK

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
AA	19,108	415	300	0.8	682.4	682.4	682.4	0.0
AB	20,396	137	79	0.8	682.7	682.7	682.7	0.0
AC	22,091	29	25	1.4	689.0	689.0	689.0	0.0
AD	22,503	60	15	2.3	693.9	693.9	693.9	0.0
AE	23,464	21	15	1.2	703.7	703.7	703.7	0.0
AF	23,505	55	160	0.1	706.7	706.7	706.7	0.0
AG	23,711	133	245	0.1	706.7	706.7	706.7	0.0
AH	24,286	28	12	1.6	714.9	714.9	714.9	0.0

[1]Feet above confluence with Des Plaines River

Table 23: Floodway Data *(continued)*

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	370	*	*	*	593.0[2]	*	*	*
B	1,426	*	*	*	593.9	*	*	*
C	2,693	*	*	*	598.1	*	*	*
D	3,907	*	*	*	602.8	*	*	*
E	4,541	*	*	*	610.6	*	*	*
F	4,699	*	*	*	614.2	*	*	*
G	5,122	*	*	*	619.0	*	*	*
H	5,438	*	*	*	619.0	*	*	*

[1]Feet above confluence with Pike River

[2]Includes backwater effects from Pike River *Data not available

TABLE 23

FEDERAL EMERGENCY MANAGEMENT AGENCY

KENOSHA COUNTY, WI

AND INCORPORATED AREAS

FLOODWAY DATA

FLOODING SOURCE: KENOSHA BRANCH