## ENVIRONMENTAL ASSESSMENT FOR HYDROPOWER LICENSE

Kaukauna Hydro Project FERC Project No. 1510-018

Wisconsin

Federal Energy Regulatory Commission Office of Energy Projects Division of Hydropower Licensing 888 First Street, NE Washington, D.C. 20426

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## ACRONYMS AND ABBREVIATIONS

Conservancy Zone	1000 Islands Conservancy Zone	
APE	area of potential effect	
certification	water quality certification	
CFR	Code of Federal Regulations	
cfs	cubic feet per second	
Commission	Federal Energy Regulatory Commission	
Corps	U.S. Army Corps of Engineers	
CWA	Clean Water Act	
CZMA	Coastal Zone Management Act	
DO	dissolved oxygen	
EA	environmental assessment	
EPA	U.S. Environmental Protection Agency	
ESA	Endangered Species Act	
FERC	Federal Energy Regulatory Commission	
FPA	Federal Power Act	
FWS	U.S. Fish and Wildlife Service	
HPMP	Historic Properties Management Plan	
Interior	U.S. Department of the Interior	
IPaC	Information for Planning and Consultation	
Kaukauna	City of Kaukauna	
kV	kilovolts	
kW	kilowatt	
mg/L	milligrams per liter	
MISO	Midwest Independent System Operator, Inc.	
MRO	Midwest Reliability Organization	
MSL	mean sea level	
MW	megawatt	
MWh	megawatt-hours	
National Register	National Register of Historic Places	
NERC	North American Electric Reliability Corporation	
NHPA	National Historic Preservation Act	
NLEB	northern long-eared bat	
NPS	National Park Service	
PA	Programmatic Agreement	
PCB	Polychlorinated biphenyls	
RM	river mile	
TMDL	Total Maximum Daily Load	
TSS	total suspended solids	
USGS	U.S. Geological Survey	
Wisconsin DNR	Wisconsin Department of Natural Resources	

Wisconsin SCORP	Wisconsin Statewide Comprehensive Outdoor Recreation Plan
Wisconsin SHPO	Wisconsin State Historic Preservation Officer

#### **ENVIRONMENTAL ASSESSMENT**

## Federal Energy Regulatory Commission Office of Energy Projects Division of Hydropower Licensing Washington, DC

#### KAUKAUNA HYDRO PROJECT FERC Project No. 1510-018 – Wisconsin

#### **1.0 INTRODUCTION**

#### **1.1 APPLICATION**

On March 24, 2017, the City of Kaukauna – Kaukauna Utilities filed an application with the Federal Energy Regulatory Commission (Commission) on behalf of the City of Kaukauna, Wisconsin (Kaukauna) for a new license to continue to operate and maintain the Kaukauna Hydro Project No. 1510 (Kaukauna Project, or project).<sup>1</sup> The 4.8-megawatt (MW) project is located on the Lower Fox River in the City of Kaukauna, Outagamie County, Wisconsin (Figure 1). The project does not occupy federal land.

#### **1.2 PURPOSE OF ACTION AND NEED FOR POWER**

#### **1.2.1** Purpose of Action

The purpose of the Kaukauna Project is to provide a source of hydroelectric power. Therefore, under the provisions of the Federal Power Act (FPA), the Commission must decide whether to issue a new license to Kaukauna for the Kaukauna Project and what conditions should be placed on any license issued. In deciding whether to issue a license for a hydroelectric project, the Commission must determine that the project would be best adapted to a comprehensive plan for improving or developing the waterway. In addition to the power and developmental purposes for which licenses are issued (such as flood control, irrigation, and water supply), the Commission must give equal consideration to the purposes of: (1) energy conservation; (2) the protection, mitigation of damage to, and enhancement of fish and wildlife resources; (3) the protection of recreational opportunities; and (4) the preservation of other aspects of environmental quality.

<sup>&</sup>lt;sup>1</sup> The Commission issued the current license for the project on January 30, 1989, with an effective date of April 1, 1989 and a term of 30 years. *See City of Kaukauna, Wisconsin*, 46 FERC ¶ 62,102 (1989) (1989 License Order). The original license for the project was issued on March 21, 1939, with an expiration date of March 31, 1989.

Issuing a new license for the Kaukauna Project would allow Kaukauna to generate electricity at the project for the term of the new license, making electric power from a renewable resource available to the regional grid.

This environmental assessment (EA) analyzes the effects associated with operation of the project, alternatives to the project, and makes recommendations to the Commission on whether to issue a license, and under what terms and conditions.

The EA assesses the environmental and economic effects of: (1) operating and maintaining the project as proposed by Kaukauna; and (2) operating and maintaining the projects as proposed by Kaukauna, with additional staff-recommended measures (staff alternative). We also consider the effects of the no-action alternative. Under the no-action alternative, the project would continue to operate as it does under the existing license, and no new environmental protection, mitigation, or enhancement measures would be implemented. The primary issues associated with licensing the project are maintaining the water quality of the Lower Fox River, managing invasive species to protect aquatic and terrestrial resources, providing safe recreation opportunities at the project, and protecting threatened and endangered species.



Figure 1. Location of the Kaukauna Project and other hydroelectric projects in the Lower Fox River Basin (Source: Staff).

#### **1.2.2** Need for Power

The Kaukauna Project has an installed capacity of 4.8 MW and an average annual generation of about 29,704 megawatt hours (MWh). The project provides power that helps meet part of the region's power requirements, resource diversity, and capacity needs.

The power generated is delivered to the Kaukauna Utilities' distribution system for sale to retail customers. To assess the need for power, we looked at the needs in the operating region in which the project is located. The North American Electric Reliability Corporation (NERC) annually forecasts electrical supply and demand nationally and regionally for a 10-year period. The Kaukauna Project is located within NERC's Midwest Reliability Organization (MRO) region, and NERC's Midcontinent Independent System Operator Inc. (MISO) assessment area. According to NERC's 2017 Long-Term Reliability Assessment, the summer internal demand for MISO is projected to increase by 0.3 percent from 2018 to 2027. The anticipated reserve margin (*i.e.*, the primary metric used to evaluate the adequacy of projected generation resources to serve forecasted peak load) is forecasted to range from 19.23 percent in 2018 to 14.56 percent in 2027. The MISO assessment area is forecasted to meet MISO's target reserve margin of 15.8 percent through the year 2022, but fall below 15.8 percent beginning in 2023 and continuing through 2027 (NERC 2017).

We conclude that power from the Kaukauna Project would help continue to meet the need for power in the MRO region. The project provides power that can displace non-renewable, fossil-fired generation and contributes to a diversified generation mix. Displacing the operation of non-renewable facilities may avoid some power plant emissions and create an environmental benefit.

## **1.3 STATUTORY AND REGULATORY REQUIREMENTS**

A new license for the project would be subject to numerous requirements under the FPA and other applicable statutes. The major regulatory and statutory requirements are described below.

#### **1.3.1 Federal Power Act**

#### **1.3.1.1** Section 18 Fishway Prescriptions

Section 18 of the FPA states that the Commission is to require construction, operation, and maintenance by a licensee of such fishways as may be prescribed by the Secretaries of the U.S. Department of Commerce (Commerce) or the U.S. Department of Interior (Interior). Neither Commerce nor Interior filed a preliminary fishway prescription for the project or requested a reservation of authority to prescribe fishways.

## **1.3.1.2** Section 10(j) Recommendations

Under section 10(j) of the FPA, each hydroelectric license issued by the Commission must include conditions based on recommendations provided by federal and state fish and wildlife agencies for the protection, mitigation, or enhancement of fish and wildlife resources affected by the project. The Commission is required to include these conditions in any new license unless it determines that they are inconsistent with the purposes and requirements of the FPA or other applicable law. Before rejecting or modifying an agency recommendation, the Commission is required to attempt to resolve any such inconsistency with the agency, giving due weight to the recommendations, expertise, and statutory responsibilities of such agency.

No federal or state fish and wildlife agency filed recommendations under section 10(j).

## 1.3.2 Clean Water Act

Under section 401(a)(1) of the Clean Water Act (CWA), 33 U.S.C. § 1341(a)(1), a license applicant must obtain either a water quality certification (certification) from the appropriate state pollution control agency verifying that any discharge from the project would comply with applicable provisions of the CWA, or a waiver of such certification. A waiver occurs if the state agency does not act on a request for certification within a reasonable period of time, not to exceed one year after receipt of such request.

On December 1, 2017, Kaukauna applied to the Wisconsin Department of Natural Resources (Wisconsin DNR) for a certification for the Kaukauna Project. Wisconsin DNR received the request for certification on December 4, 2017. Wisconsin DNR has not yet acted on the application.

## 1.3.3 Endangered Species Act

Section 7 of the Endangered Species Act (ESA), 16 U.S.C. § 1536, requires federal agencies to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species or result in the destruction or adverse modification of the critical habitat of such species. On June 29, 2018, we accessed the U.S. Fish and Wildlife Service's (FWS) Information for Planning and Consultation (IPaC) database to determine federally listed species that could occur in the project vicinity. According to the IPaC database, the northern long-eared bat (*Myotis*)

*septentrionalis*) could occur in the project vicinity.<sup>2</sup> No critical habitat for this species is present in the project vicinity.

Our analysis of project impacts on the northern long-eared bat is presented in section 3.3.3.2, *Threatened and Endangered Species – Environmental Effects*. Based on available information, we conclude that licensing the project would not be likely to adversely affect the northern long-eared bat.

## **1.3.4** Coastal Zone Management Act

The Coastal Zone Management Act (CZMA) of 1972, as amended, requires review of the project's consistency with a state's Coastal Management Program for projects within or affecting the coastal zone. Under section 307(c)(3)(A) of the CZMA, 16 U.S.C. § 1456(c)(3)(A), the Commission cannot issue a license for a project within or affecting a state's coastal zone unless the state's CZMA agency concurs with the license applicant's certification of consistency with the state's CZMA Program, or the agency's concurrence is conclusively presumed by its failure to act within 180 days of its receipt of the applicant's certification.

The project is not located within the state-designated Coastal Management Zone, which extends to 15 counties on the state boundary with Lake Superior and Lake Michigan, and the project would not affect Wisconsin's coastal resources. Therefore, the project is not subject to Wisconsin's coastal zone program review and no consistency certification is needed for the action. On March 30, 2016, Kaukauna requested concurrence from the Wisconsin Coastal Resources Management Program that a consistency review for the project is not required. On June 8, 2016, the Wisconsin Coastal Resources Management Program that the Kaukauna Project is outside of Wisconsin's coastal zone and does not need to be reviewed for consistency.<sup>3</sup>

## 1.3.5 National Historic Preservation Act

Section 106 of the National Historic Preservation Act (NHPA), 54 U.S.C. § 306108, requires that a federal agency "take into account" how its undertakings could affect historic properties. Historic properties are districts, sites, buildings, structures, traditional cultural properties, and objects significant in American history, architecture,

<sup>&</sup>lt;sup>2</sup> See Interior's official list of threatened and endangered species, accessed by staff using the IPaC database (https://ecos.fws.gov/ipac/) on June 29, 2018, and filed on July 10, 2018.

<sup>&</sup>lt;sup>3</sup> See Kaukauna's March 24, 2017 license application, Volume 4, Section 3, p. 168.

engineering, and culture that are eligible for inclusion in the National Register of Historic Places (National Register).

In response to Kaukauna's October 7, 2013 request, Commission staff designated Kaukauna as its non-federal representative on December 5, 2013, for the purposes of conducting section 106 consultation under the NHPA. Pursuant to section 106, and as the Commission's designated non-federal representative, Kaukauna initiated consultation with the Wisconsin State Historic Preservation Officer (Wisconsin SHPO) to identify historic properties within the project's area of potential effects (APE) and determine the National Register-eligibility of, and potential adverse effects on, any historic properties located in the APE. Kaukauna submitted a consultation letter to the SHPO indicating that: (1) historic properties are located within the project APE; (2) the project will have no adverse effect on historic properties; and (3) the project would be undertaken using the terms and conditions of a Programmatic Agreement (FERC, *et al.*, 1993). On June 15, 2016, the Wisconsin SHPO stated that it agreed with Kaukauna that the project would have no adverse effects on historic properties.<sup>4</sup>

The Programmatic Agreement (PA) referenced in Kaukauna's consultation letter to the Wisconsin SHPO was executed by Commission staff and the Wisconsin SHPO on December 16, 1993, to meet the requirements of section 106 of the NHPA (FERC, *et al.*, 1993). The PA contains principles and procedures for the protection of historic properties from the adverse effects of a hydroelectric project, and provides for the implementation of a historic properties management plan (HPMP) for the project.

Our analysis presented in section 3.3.5, *Cultural Resources*, concludes that relicensing the project as proposed and with the staff-recommended measures would not have an adverse effect on cultural resources.

## 1.4 PUBLIC REVIEW AND COMMENT

The Commission's regulations (18 C.F.R. § 16.8) require applicants to consult with appropriate resource agencies, tribes, and other entities before filing an application for a license. This consultation is the first step in complying with the Fish and Wildlife Coordination Act (16 U.S.C. § 661, *et seq.*), ESA, NHPA, and other federal statutes. Pre-filing consultation must be completed and documented according to the Commission's regulations.

<sup>&</sup>lt;sup>4</sup> See Kaukauna's March 24, 2017 license application, Appendix E-26, Wisconsin SHPO's Form.

## 1.4.1 Scoping

Before preparing this EA, staff conducted scoping to determine what issues and alternatives should be addressed. A scoping document was distributed to interested agencies and others on June 20, 2017. It was noticed in the Federal Register on June 26, 2017. The following entities provided timely, written comments on the scoping document:

Commenting Entity	<b>Date Filed</b>
U.S. Environmental Protection Agency (EPA)	July 27, 2017
David L. Farin	August 4, 2017

A revised scoping document, addressing these comments,<sup>5</sup> was issued on October 30, 2017.

## 1.4.2 Interventions

On November 21, 2017, the Commission issued a notice accepting the application and setting January 20, 2018 as the deadline for filing motions to intervene and protests. In response, Wisconsin DNR filed a notice of intervention on November 27, 2017. No entities filed in opposition to issuance of a license.

## **1.4.3** Comments on the Application

On November 21, 2017, the Commission issued a notice setting January 20, 2018 as the deadline for filing comments, recommendations, terms and conditions, and prescriptions. The following entities responded:<sup>6</sup>

<sup>&</sup>lt;sup>5</sup> In addition to the comments listed above, the revised scoping document addressed untimely comments filed by the National Park Service, Midwest Region (NPS) on August 21, 2017, and Kaukauna on October 12, 2017.

<sup>&</sup>lt;sup>6</sup> Interior notified the Commission on January 17, 2018 that it did not have any comments.

<b>Commenting Entity</b>	<b>Date Filed</b>
Wisconsin DNR	January 10, 2018
NPS	January 16, 2018 <sup>7</sup>

The applicant filed reply comments on March 6, 2018.

#### 2.0 PROPOSED ACTION AND ALTERNATIVES

#### 2.1 NO ACTION ALTERNATIVE

Under the no-action alternative, the project would continue to operate under the terms and conditions of the existing license, and no new environmental protection, mitigation, or enhancement measures would be implemented. We use this alternative to establish baseline environmental conditions for comparison with other alternatives.

#### 2.1.1 Existing Project Facilities

The Kaukauna Project is located at river mile (RM) 23 on the Lower Fox River in the City of Kaukauna, Wisconsin. The Kaukauna Project facilities are shown in Figure 2.

The project includes: (1) an approximately 3,842-foot-long dam that includes: (a) a 930-foot-long, 14-foot-high masonry retaining wall section (left forebay dam) with a 4foot-wide trash sluice; (b) a 92-foot-long, 25-foot-high concrete intake and powerhouse section; (c) a 292-foot-long, 26- to 30-foot-high masonry and concrete retaining wall section (right forebay dam); (d) a 34-foot-long, 11-foot-high trash sluice; (e) a 66-footlong, 18-foot-high gated spillway section with two 30-foot-wide, 8.8-foot-high spillway gates with a lower elevation of approximately 622 feet above mean sea level (msl) and an upper elevation of approximately 631 msl; and (f) a 2,428-foot-long, 0.5- to 10-foot-high concrete and natural rock overflow ogee spillway with a crest elevation of 629.0 msl that includes: (i) a 1,305-foot-long, 10-foot-high concrete spillway section; (ii) a 32-footlong, 7-foot-high concrete spillway section; (iii) a 125-foot-long, 6-foot-high concrete spillway section; (iv) a 75-foot-long natural rock section; (v) a 569-foot-long, 5-foot-high concrete spillway section; and (vi) a 322-foot-long, 5-foot-high concrete spillway section; (2) a 19-acre, 1.5-mile-long impoundment with a total storage capacity of 400 acre-feet at a normal maximum surface elevation of 629.0 feet msl; (3) a 25-foot-high, 88-foot-wide intake structure with seven 11-foot-high, 7-foot-wide head gates and a continuous 25-

<sup>&</sup>lt;sup>7</sup> Although the NPS stated that its filing was only a response to Kaukauna's comments on the scoping document, we will consider NPS's comments on the merits based on the fact that they were filed between the issuance of the Commission's November 21, 2017 notice and the January 20, 2018 deadline for filing comments, recommendations, terms and conditions, and prescriptions.

foot-high, 88-foot-wide trashrack with 5-inch clear-bar spacing; (4) a 92-foot-long, 47.5foot-high concrete and brick powerhouse containing two 2.4-MW vertical Kaplan turbine-generator units for a total installed capacity of 4.8 MW; (5) a 440-foot-wide, 49foot-deep, 1,200-foot-long excavated tailrace; (6) two 68-foot-long, 2.4-kilovolt generator leads that connect the turbine-generator units to the licensee's local distribution system; and (7) appurtenant facilities.

There are no formal recreation sites located at the project.



Figure 2. Kaukauna Project facilities (Source: Kaukauna).

#### 2.1.2 Existing Project Boundary

The current project boundary for the Kaukauna Project as established in the Commission's 1989 License Order encompasses approximately 50.25 acres, including the impoundment up to a contour elevation of 629.0 feet msl, the bypassed reach, tailrace, and land that is needed for project purposes, including land associated with the dam, powerhouse, transmission line, and appurtenant facilities.

## 2.1.3 Project Safety

The Kaukauna Project has been operating for more than 29 years under its existing license. During this time, Commission staff has conducted operational inspections focusing on the continued safety of the structures, identification of unauthorized modifications, efficiency and safety of operations, compliance with the terms of the license, and proper maintenance.

As part of the licensing process, Commission staff will evaluate the continued adequacy of the project's facilities under a new license. Special articles will be included in any license issued, as appropriate. Commission staff will continue to inspect the project during the term of any new license to assure continued adherence to Commissionapproved plans and specifications, special license articles relating to construction (if any), operation and maintenance, and accepted engineering practices and procedures.

## 2.1.4 Current Project Operation

The project is located downstream of Lake Winnebago on the Lower Fox River. The U.S. Army Corps of Engineers (Corps) manages releases from Lake Winnebago and nine federal dams on the Lower Fox River downstream of Lake Winnebago, including the Kaukauna and Rapide Croche Dams that are located approximately 1 mile upstream and 4 miles downstream of the Kaukauna Project, respectively. The Kaukauna Project has little to no capacity for storage and therefore operates in a run-of-river mode using the flows regulated by the Corps in the Lower Fox River.

Kaukauna staff remotely operate the project in an instantaneous run-of-river mode and maintain a target normal impoundment elevation at the crest of the overflow spillway (629.0 feet msl) for the protection of fish and wildlife resources in the Lower Fox River, as required by the 1989 License Order. In operating the project, Kaukauna is required to minimize fluctuations of the impoundment surface elevation by maintaining a sufficient discharge such that outflow from the project approximates inflow to the impoundment.

Generation at the project occurs on a year-round basis, and is typically highest during the spring season (March through June), when river flow is highest in the Lower Fox River. Project generation flows are conveyed from the project impoundment to the intake, and into the project powerhouse, where it is then discharged to the Lower Fox River through the project tailrace. The project creates an approximately 3,500-foot-long bypassed reach of Lower Fox River, including part of the 1000 Islands Nature Conservancy Zone (Conservancy Zone), a natural area owned by Kaukauna.

The project has a minimum hydraulic capacity of 470 cubic feet per second (cfs) and a collective maximum capacity of 3,000 cfs. When river flow is less than or greater than the hydraulic capacity of the turbines at the Kaukauna Project (*i.e.*, 470 cfs and 3,000 cfs, respectively), water is spilled from the impoundment into the Lower Fox River by passing flows through the spillway gates or directly over the ogee spillway sections.

## 2.2 APPLICANT'S PROPOSAL

## 2.2.1 Proposed Project Facilities

Kaukauna proposes to remove 25.3 acres of land and water from the existing project boundary downstream of the dam and powerhouse, including a significant section of the bypassed reach and tailrace area that it states is no longer serving a project purpose.

## 2.2.2 Proposed Operation and Environmental Measures

Kaukauna proposes to:

- Continue to operate the project in a run-of-river mode and maintain a target normal impoundment elevation at the crest of the overflow spillway at the dam (629.0 feet msl) to protect fish and wildlife resources;
- Notify FERC and the Wisconsin DNR in advance of temporary, planned modifications to run-of-river operation, and consult with Wisconsin DNR to reduce project impacts on water quality;
- Implement any measures that are recommended by Wisconsin DNR during consultation on temporary, planned modification to run-of-river operation;
- Notify FERC, Wisconsin DNR, and FWS following unplanned run-of-river deviations to allow Kaukauna to track deviations and assess any unanticipated adverse impact upon aquatic resources that result from persistent deviations;
- Establish a minimum impoundment elevation of 628.5 feet msl (0.5 foot less than the overflow spillway crest elevation of 629.0 feet msl) to provide Kaukauna with the flexibility to respond to changing river conditions;
- File a report with FERC and the Wisconsin DNR following any deviations from run-of-river operation or minimum headwater elevation, including: (1) an

identification of the cause, severity, and duration of the incident and any observed or reported adverse environmental impacts resulting from the incident; (2) operation data necessary to determine compliance with license requirements; (3) a description of any corrective measures implemented at the time of occurrence and measures to ensure that similar incidents do not recur; and (4) comments or correspondence received from the Wisconsin DNR regarding the incident;

- Develop an impoundment drawdown plan that includes provisions for mitigating the effects of any future drawdowns of the impoundment on aquatic resources;
- Develop a woody debris management plan that includes provisions for mitigating the effect of removing debris from the trashracks on downstream habitat;
- Cooperate with Wisconsin DNR on the implementation of the Lower Green Bay Remedial Action Plan to facilitate the management of contaminated sediment in the Lower Fox River by providing reasonable access to the project area for agencies involved with the implementation of the Remedial Action Plan and temporarily modifying run-of-river operation as needed during the removal or treatment of contaminated sediments;
- Develop an operation monitoring plan that identifies the monitoring locations and protocol for a headwater gage, and identifies a method for determining flows released from the powerhouse, through the spillway gates, and over the spillway;
- Install erosion and siltation controls during any ground disturbing activities within the project boundary to reduce impacts on water quality and aquatic resources;
- Develop an invasive species monitoring plan that includes provisions for monitoring and mitigating the spread of invasive species;
- Implement measures to protect the federally threatened northern long-eared bat, including: (1) avoid tree removal at the project unless the tree poses a threat to human life or property, or removal occurs outside of the pup season (June 1 through July 31); and (2) only remove live bats from structures within the project boundary following consultation with FWS and in accordance with FWS recommendations;
- Install boater safety exclusion cables in the forebay canal, upstream of the powerhouse intake;
- Continue to maintain existing safety signage and warnings as required, including warnings for recreationists in the area of the project boundary; and

• Implement a proposed HPMP that is consistent with the statewide PA to protect historic properties within the project's APE.

## 2.3 STAFF ALTERNATIVE

Under the staff alternative, the project would be operated as proposed by Kaukauna, with the following modifications and additional staff-recommended measures:

- Develop an operation monitoring plan as proposed by Kaukauna, with the following additional provisions: (1) monitoring run-of-river operation and impoundment elevation levels to document compliance with the operational conditions of any new license; (2) standard operating procedures to be implemented (a) outside of normal operating conditions, including during scheduled facility shutdowns, impoundment drawdowns, and impoundment refilling, and (b) during emergency conditions such as unscheduled facility shutdowns and maintenance, in order to minimize project effects on environmental resources; (3) notifying the Commission of deviations and reporting deviations to the Commission; and (4) maintaining a log of project operations;
- Develop an impoundment drawdown plan as proposed by Kaukauna, but include the provisions of the plan in the staff-recommended operation monitoring plan, and include provisions for maintaining downstream flows at near natural flow levels during any impoundment drawdown and for refilling the impoundment following the drawdown;
- Develop a woody debris management plan as proposed by Kaukauna, with additional provisions that identify the frequency and methods for managing woody debris and trash at the project, including the frequency and methods for: (1) removing and sorting debris that collects on project structures; (2) passing organic debris downstream of the project; and (3) removing and disposing of trash;
- Develop an invasive species monitoring plan as proposed by Kaukauna, with the following additional provisions for controlling invasive species and reducing the effects of invasive species on wildlife habitat in the vicinity of the project: (1) identifying target invasive species; (2) defining the treatment area(s) in the vicinity of the project; (3) describing the techniques to be used to control invasive species; (4) monitoring treatment area(s) for invasive species on an annual basis for three consecutive years following invasive species treatment; and (5) filing a report with the Commission following the monitoring period, including an analysis of whether additional invasive species control is necessary;
- To help ensure safe access points are available for boaters to exit the Lower Fox River before reaching the project spillway, install signs indicating the direction

and approximate distance to the existing Elm Street access point that is part of the Badger-Rapide Croche Hydroelectric Project No. 2677; and

• Install signage on the proposed boater safety exclusion cables in the forebay canal to indicate the direction and approximate distance to the Elm Street access point.

# 2.4 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS

The following alternatives were considered but have been eliminated from further analysis because they are not reasonable in the circumstances of this case: (1) issuing a non-power license, (2) Federal Government takeover of the project, and (3) retiring the project.

## 2.4.1 Issuing a Non-Power License

A non-power license is a temporary license that the Commission would terminate when it determines that another governmental agency will assume regulatory authority and supervision over the land and facilities covered by the non-power license. At this point, no agency has suggested a willingness or ability to do so. No party has sought a non-power license for the project and we have no basis for concluding that the project should no longer be used to produce power.

## 2.4.2 Federal Government Takeover of the Project

Federal takeover and operation of the project would require Congressional approval. While that fact alone would not preclude further consideration of this alternative, there is currently no evidence to indicate that federal takeover should be recommended to Congress. No party has suggested federal takeover would be appropriate, and no federal agency has expressed an interest in operating the project.

## 2.4.3 Project Decommissioning

As the Commission has previously held, decommissioning is not a reasonable alternative to relicensing a project in most cases, when appropriate protection, mitigation, and enhancement measures are available.<sup>8</sup> The Commission does not speculate about possible decommissioning measures at the time of relicensing, but rather waits until an applicant actually proposes to decommission a project, or there are serious resource

<sup>&</sup>lt;sup>8</sup> See, e.g., Eagle Crest Energy Co., 153 FERC ¶ 61,058, at P 67 (2015); Public Utility District No. 1 of Pend Oreille County, 112 FERC ¶ 61,055, at P 82 (2005); Midwest Hydro, Inc., 111 FERC ¶ 61,327, at PP 35-38 (2005).

concerns that cannot be addressed with appropriate license measures, making decommissioning a reasonable alternative to relicensing.<sup>9</sup> This is consistent with NEPA and the Commission's obligation under section 10(a) of the FPA to issue licenses that balance developmental and environmental interests.

Project retirement could be accomplished with or without dam removal.<sup>10</sup> Either alternative would involve denial of the license application and surrender or termination of the existing license with appropriate conditions.

No participant has recommended project retirement, there are no critical resource concerns, and we have no basis for recommending project retirement. The Kaukauna Project is a source of clean, renewable energy. This source of power would be lost if the project was retired. There also could be significant costs associated with retiring the project's powerhouse and appurtenant facilities.

Project retirement without dam removal would involve retaining the dam and disabling or removing equipment used to generate power. Certain project works could remain in place and could be used for historic or other purposes. This approach would require the State of Wisconsin to assume regulatory control and supervision of the remaining facilities. However, no participant has advocated for this alternative, and we do not have any basis for recommending it. Removing the dam would be more costly than retiring it in place, and removal could have substantial, negative environmental effects.

## 3.0 ENVIRONMENTAL ANALYSIS

This section includes: (1) a general description of the project vicinity, (2) an explanation of the scope of our cumulative effects analysis, and (3) our analysis of the

<sup>10</sup> In the unlikely event that the Commission denies relicensing of a project or a licensee decides to surrender an existing project, the Commission must approve a surrender "upon such conditions with respect to the disposition of such works as may be determined by the Commission." 18 C.F.R. § 6.2 (2017). This can include simply shutting down the power operations, removing all or parts of the project (including the dam), or restoring the site to its pre-project condition.

<sup>&</sup>lt;sup>9</sup> See generally Project Decommissioning at Relicensing; Policy Statement, FERC Stats. & Regs., Regulations Preambles (1991-1996), ¶ 31,011 (1994); see also City of Tacoma, Washington, 110 FERC ¶ 61,140 (2005) (finding that unless and until the Commission has a specific decommissioning proposal, any further environmental analysis of the effects of project decommissioning would be both premature and speculative).

proposed action and other recommended environmental measures. Sections are organized by resource area (aquatic, recreation, *etc.*). Historic and current conditions are described under each resource area. The existing conditions are the baseline against which the environmental effects of the proposed action and alternatives are compared, including an assessment of the effects of proposed protection, mitigation, and enhancement measures, and any cumulative effects of the proposed action and alternatives. Staff conclusions and recommended measures are discussed in section 5.1, *Comprehensive Development and Recommended Alternative*.<sup>11</sup>

#### 3.1 GENERAL DESCRIPTION OF THE RIVER BASIN

The Kaukauna Project is located on the Lower Fox River in northeastern Wisconsin, where the relatively flat topography is characteristic of the area's glaciated lowland valleys. Upstream of the project, the Wolf River and Fox River converge at Lake Butte des Morts. From Lake Butte des Morts, the Fox River flows for approximately 3 miles to Lake Winnebago, the largest inland lake in Wisconsin. The Fond du Lac River and numerous smaller tributaries flow into Lake Winnebago.<sup>12</sup> From Lake Winnebago, the Lower Fox River flows approximately 39 miles northeast to Green Bay, on the western shore of Lake Michigan. The Lower Fox River empties a drainage basin of approximately 5,980 square miles. Flow along the 39-mile stretch of the Lower Fox River is controlled by a series of 13 dams. The Corps operates nine of the 13 dams (and some associated lock structures) primarily for the purposes of navigation, recreation, water quality, and flood control.

Topography in the region varies from steep ravines to rolling hills and flat land. The City of Kaukauna is located in the Eastern Ridges and Lowlands geographic province of Wisconsin. This province is known for its relatively level topography, fertile soil, and mild climate. Winters in the project area are cold and snowy, with average low temperatures of 10°F in January, the coldest month. Summers are relatively warm, with an average high temperature of 81°F in July, the hottest month. Average annual rainfall is approximately 31 inches. Most of the precipitation falls as rain during the growing season (late May to early September).

The Kaukauna Project is located in the City of Kaukauna, between the two hydropower developments that comprise the Badger-Rapide Croche Hydroelectric

<sup>&</sup>lt;sup>11</sup> Unless otherwise indicated, our information is taken from the application for license filed by Kaukauna on March 24, 2017, and responses to requests for additional information filed on August 23, 2017.

<sup>&</sup>lt;sup>12</sup> United States Geological Survey, *The National Map*, located at <u>https://viewer.nationalmap.gov/advanced-viewer/</u>. Last accessed June 26, 2018.

Project No. 2677 on the Lower Fox River.<sup>13</sup> The project is situated in a heavily industrialized, urban area.<sup>14</sup> Much of the river bed immediately below the project's dam consists of exposed bedrock. Most of the vegetation in the vicinity of the project is located within the Conservancy Zone, a 350-acre natural area owned by the City of Kaukauna and located within the river channel, downstream of the project's dam. The Conservancy Zone primarily contains forest and scrub-shrub vegetation.

## 3.2 SCOPE OF CUMULATIVE EFFECTS ANALYSIS

According to the Council on Environmental Quality's regulations for implementing the National Environmental Policy Act, a cumulative effect is the impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (federal or non-federal) or person undertakes such other actions (40 C.F.R. § 1508.7). Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time, including hydropower and other land and water development activities.

Based on our review of the license application, we have identified water quality and lake sturgeon as resources that could be cumulatively affected by continued operation of the Kaukauna Project in combination with other activities in the basin. These include agricultural and industrial uses, recreational activities, the historic introduction of nonnative invasive species, and the operation and maintenance of other hydroelectric developments and dams on the Lower Fox River.

<sup>&</sup>lt;sup>13</sup> The upstream Badger Development is located in the City of Kaukauna at the U.S. Army Corps of Engineers' (Corps) Kaukauna dam, at approximately RM 24, and the Rapide Croche Development is located in the Town of Buchanan at the Corps' Rapide Croche dam, at approximately RM 19. *See City of Kaukauna, Wisconsin*, 135 FERC ¶ 62,149 (2011).

<sup>&</sup>lt;sup>14</sup> A canal and lock system occurs parallel to the Lower Fox, and is adjacent to the project. The canal includes a series of five locks that were constructed in the 1850s to provide passage around the rapids at Kaukauna. The canal and lock system was constructed by private companies, and the Corps took control of the system in 1872. A heavily-industrialized island is located between the canal and the project. The locks were abandoned in the 1980s, but are currently being renovated for recreational use by the Fox River Navigational System Authority (Fox River Navigational System Authority, 2018).

In section 3.3.1.2, *Aquatic Resources- Environmental Effects*, we discuss the cumulative effects of licensing the project on water quality and lake sturgeon.

## 3.2.1 Geographic Scope

The geographic scope of the cumulative effects analysis defines the physical limits or boundaries of the proposed action's effect on the resources, and contributing effects from other hydropower and non-hydropower activities within the Lower Fox River Basin.

We have identified the Lower Fox River basin from Lake Winnebago to Green Bay as our geographic scope of analysis for water quality and lake sturgeon. We chose this geographic scope because the operation and maintenance of the Kaukauna Project, in combination with other dams and hydroelectric projects in the Lower Fox River Basin may affect water quality and habitat for lake sturgeon from Lake Winnebago to Green Bay. The project is one of seven federally licensed hydropower projects on the Lower Fox River (Figure 1). The Corps operates nine federal dams on the Lower Fox River, four of which have been developed for hydropower production (*i.e.*, Kimberly Project No. 10674, Little Chute Project No. 2588, and Badger-Rapide Croche Hydroelectric Project No. 2677 (including the Kaukauna and Rapide Croche dams)).<sup>15</sup> Operation and maintenance of the hydroelectric developments and the Corps dams may cumulatively affect water quality and lake sturgeon in the Lower Fox River. The large volumes of Lake Winnebago (almost 216 square miles) and Lake Michigan (22,400 square miles) would make further upstream and downstream cumulative effects unlikely.

## 3.2.2 Temporal Scope

The temporal scope of our cumulative effects analysis includes a discussion of past, present, and future actions and their effects on aquatic resources. Based on the potential new license term, the temporal scope looks 30 to 50 years into the future, concentrating on the effects on the resources from reasonably foreseeable future actions. The historical discussion is limited, by necessity, to the amount of available information. We identified the present resource conditions based on the license application, agency comments, and comprehensive plans.

## 3.3 PROPOSED ACTION AND ACTION ALTERNATIVES

In this section, we discuss the project-specific effects of the project alternatives on environmental resources. For each resource, we first describe the affected environment,

<sup>&</sup>lt;sup>15</sup> U.S. Army Corps of Engineers, *USACE Lower Fox River Dams – Current Condition*, located at: <u>https://www.lre.usace.army.mil/Missions/Civil-Works/Dam-Safety-Program/Lower-Fox-River-Dams/</u>. Last accessed on July 30, 2018.

which is the existing condition and baseline against which we measure project effects. We then discuss and analyze the site-specific environmental issues.

Only the resources that would be affected, or about which comments have been received, are addressed in detail in this EA. Based on this, we have determined that water quality, aquatic resources, terrestrial resources, threatened and endangered species, land use and recreation, and cultural resources may be affected by the proposed action and alternatives. We have not identified any substantive issues related to geology and soils, aesthetic resources, or socioeconomics associated with the proposed action; therefore, these resources are not addressed in the EA. We present our recommendations in section 5.1, *Comprehensive Development and Recommended Alternative*.

## 3.3.1 Aquatic Resources

## 3.3.1.1 Affected Environment

## Water Quantity

Under normal operating conditions, the Kaukauna Project forms a 19-acre impoundment at 629.0 feet msl. The Lower Fox River has a mean annual flow of about 4,364 cfs, as measured at the U.S. Geological Survey (USGS) gage no. 04084445 located in Appleton, Wisconsin, which is approximately 7 miles upstream of the project. The drainage area at Appleton, Wisconsin is 5,950 square miles, which is nearly equal to the drainage area of 5,980 square miles at the Kaukauna Project. Flows in the Lower Fox River exceed the maximum hydraulic capacity of the Kaukauna Project (3,000 cfs) approximately 60 percent of the time. The 90 percent and 10 percent exceedance flows for the Lower Fox River at the project are approximately 1,630 cfs and 8,496 cfs, respectively. Any flows greater than the project's hydraulic capacity are spilled over the dam, into the approximately 3,500-foot-long bypassed reach.

## Water Quality

The Lower Fox River is a eutrophic<sup>16</sup> river that reflects the nature of the watershed in the vicinity of the project, where agricultural activities and urban land are the dominant land use (approximately 50 percent and 35 percent, respectively) (Wisconsin DNR, 2012a). Discharges from regulated wastewater treatment facilities and runoff from agricultural land and urban land also contribute to excessive loadings of sediment, nutrients (nitrogen and phosphorus), and bacteria that degrade aquatic habitat (Wisconsin DNR, 2012a).

<sup>&</sup>lt;sup>16</sup> A eutrophic body of water is one that is enriched with dissolved nutrients, resulting in a high production of algae and a reduction of dissolved oxygen that is unfavorable to many aquatic animals.

Section 303(d) of the Clean Water Act requires that states develop a list of impaired waters, which includes those waters where current water quality does not meet numeric criteria in a water quality standard. According to Wisconsin DNR, the stretch of the Lower Fox River from De Pere Dam to Middle Appleton Dam that includes the project (See Figure 1) is polluted by phosphorus and impaired by low dissolved oxygen concentrations (Wisconsin DNR, 2018). Other sections of the Lower Fox River are also polluted by sediment, total suspended solids (TSS), and polychlorinated biphenyls (PCBs). To address these pollutants, Wisconsin DNR has developed total maximum daily loads of phosphorus and TSS for point and non-point sources in the Lower Fox River and Green Bay (Wisconsin DNR, 2012a).

The Lower Fox River is classified by the Wisconsin DNR for fish, aquatic life, and recreational use. The state of Wisconsin has established water quality standards for this classification to protect, maintain, and enhance surface waters, including: dissolved oxygen (DO) must be equal to or greater than 5 milligrams per liter (mg/L), temperature cannot exceed 89° F, and pH must be between 6.0 and 9.0.

From May through September 2006, the applicant conducted water quality surveys in study areas above and below the Kaukauna Project as part of the relicensing effort for the Badger-Rapide Croche Hydroelectric Project No. 2677. The data showed that DO levels were above the state water quality standards of 5 mg/l, and ranged from 6.8 to 14.0 mg/L. Water temperatures ranged from 54.5° F to 80.2° F and did not exceed the state standard of 89° F.

In September 2014, Kaukauna collected additional information on temperature, DO, pH, and secchi depth.<sup>17</sup> The 2014 data showed DO concentrations ranging from 9.1 to 10.9 mg/L, temperatures ranging from 60.8 to 63.5° F, and pH ranging from 9.2 to 9.3. These water quality measurements are generally consistent with the numerical values stipulated by the state of Wisconsin's standards, except for the pH measurements that are above 9.0, which could be attributed to the exposed limestone bedrock environment in the bypassed reach where the measurements were taken.

In the mid-1980s, the southern end of Green Bay and the Lower Fox River were established as one of 43 Great Lake Areas of Concern because of major environmental problems caused by toxic substances, including PCBs. Environmental problems were also attributed to excessive nutrients such as nitrogen and phosphorus, and sediment

<sup>&</sup>lt;sup>17</sup> Secchi depth is a measure of water transparency. To measure Secchi depth, an 8-inch disk with a black and white pattern is lowered into the water column until it is no longer visible from the surface and then the disk is raised until it is visible again. The depths at which the disk disappears and reappears are averaged and reported as the Secchi depth.

loads. Subsequently, a Lower Green Bay Remedial Action Plan<sup>18</sup> (Remedial Action Plan) was developed that outlines actions for cleaning up contaminated river sediments in Green Bay and the Lower Fox River. As part of the Remedial Action Plan, several federal, state, and tribal entities, including the FWS, EPA, and Wisconsin DNR collaborate to determine measures necessary to rehabilitate the Lower Fox River and the Green Bay area.

Based on the presence of PCBs and mercury found in previously-deposited sediments throughout the Lower Fox River, including near the Kaukauna Project, Wisconsin DNR and EPA issued a Superfund Record of Decision in 2002 for the portion of the Lower Fox River where the project is located (Wisconsin DNR and EPA, 2002). In the Record of Decision, Wisconsin DNR and EPA recommended "monitored natural recovery," which consists of a comprehensive monitoring program designed in part to monitor the levels of PCBs in various environmental compartments as the natural recovery processes work. Because a significant portion of the PCBs in the vicinity of the project had already been removed prior to the issuance of the Record of Decision, Wisconsin DNR and EPA determined that no significant deposits of contaminated sediment remained in the vicinity of the project. Accordingly, the agencies did not recommend sediment removal near the project.

#### Fishery Resources

The fish species composition in the vicinity of the project includes mostly warmwater fish species, such as carp, largemouth bass, longnose gar, channel catfish, and various minnow, sucker, and sunfish species. Some cool-water fish present include smallmouth bass, walleye, and northern pike.

The applicant conducted a fish survey in the spring (March and April) and summer (July) of 2015 to characterize the species composition and relative abundance of fish potentially affected by the project. The survey area was divided into three primary study reaches: (1) the Kaukauna Project impoundment; (2) the Conservancy Zone (a braided channel area immediately downstream of the Kaukauna Project impoundment); and (3) the upper impoundment of the Rapide Croche Development, located downstream of the Conservancy Zone.

During these surveys, the applicant collected a total of 1,628 fish representing 37 species. The combined catch was dominated numerically by gizzard shad (497), smallmouth bass (150), logperch (148), bluntnose minnow (131), common carp (88),

<sup>18</sup> Wisconsin Department of Natural Resources, *Remedial Action Plan Update for the Lower Green Bay and Fox River Area of Concern*, located at https://dnr.wi.gov/topic/greatlakes/documents/LGB-FR2013FinalRAPupdate.pdf. Last accessed July 11, 2018. emerald shiner (73), yellow perch (70), white sucker (62), largemouth bass (60), troutperch (44), and freshwater drum (33). Other species included game fish such as, walleye (2), black crappie (15), channel catfish (20), flathead catfish (9), and bluegill (20).

Length frequency data indicate that common sport fish are represented by various life stages in the project vicinity, including channel catfish (ranging from 357 to 836 millimeters), yellow perch (ranging from 50 to189 millimeters), smallmouth bass (ranging from 41 to 453 millimeters), and largemouth bass (ranging from 40 to 462 millimeters). Successful reproduction was also indicated by the presence of young-of-year size classes (*i.e.*, those measuring less than 100 millimeters) for yellow perch, smallmouth bass.

No federal or state threatened or endangered fish species were collected in the study area and most fish encountered during the surveys are common to the Lower Fox River drainage.

Lake sturgeon is the only species reported from the Lower Fox River that has been identified as a species of concern in Wisconsin. Wisconsin DNR manages a sturgeon fishery in Lake Winnebago, approximately 12 miles upstream from the Kaukauna project. No lake sturgeon were captured in the project's impoundment or the bypassed reach during surveys conducted in the spring and summer of 2015, but one lake sturgeon was captured downstream of the project in the upper impoundment of the Rapide Croche Development.

Kaukauna also surveyed the Conservancy Zone for mussels in 2015. The lower portion of the study area included the most suitable habitat for mussels, which consisted primarily of gravel and cobble with some sand present. Despite the presence of suitable habitat, no live or relic mussels were found during the survey.

## 3.3.1.2 Environmental Effects

## Project Operation

To protect fish and wildlife resources, Kaukauna proposes to continue operating the project in a run-of-river mode (i.e., with outflow from the project approximately equal to inflow to the impoundment) and proposes to maintain a target normal impoundment elevation at the crest of the overflow spillway at the dam (629.0 feet msl). Kaukauna also proposes to implement a minimum impoundment elevation of 628.5 feet msl, which corresponds to an elevation that is 0.5 foot less than the crest of the overflow spillway at the dam. Kaukauna states that a minimum impoundment elevation would "assure prudent run-of-river operation" and would allow Kaukauna the "flexibility to reasonably respond to changing river conditions in a run-of-river operation scenario." Separately, Kaukauna states that run-of-river operation could be temporarily modified as necessary to facilitate the removal or treatment of contaminated sediments in the Lower Fox River as part of the Remedial Action Plan. In addition, Kaukauna states it will be necessary to occasionally draw down the impoundment to repair the dam during the term of any new license issued for the project.

Kaukauna states that it will notify FERC and the Wisconsin DNR in advance of any temporary, planned modifications to normal project operation, and consult with Wisconsin DNR on the planned modifications to reduce project impacts on water quality. Kaukauna also states that it will implement any measures recommended by Wisconsin DNR during the planned modification to run-of-river operation to reduce project impacts on water quality. Kaukauna also states that it will notify FERC, Wisconsin DNR, and FWS following unplanned run-of-river deviations to allow Kaukauna to track deviations and assess any unanticipated adverse impact upon aquatic resources that result from persistent deviations. Kaukauna proposes to file a report with FERC and the Wisconsin DNR following any deviations from run-of-river operation or minimum headwater elevation, including: (1) an identification of the cause, severity, and duration of the incident and any observed or reported adverse environmental impacts resulting from the incident; (2) operation data necessary to determine compliance with license requirements; (3) a description of any corrective measures implemented at the time of occurrence and measures to ensure that similar incidents do not recur; and (4) comments or correspondence received from the Wisconsin DNR regarding the incident.

In addition, Kaukauna proposes to develop an operation monitoring plan that "identifies the monitoring locations and protocol for a headwater gage and a method to determine flows released from the powerhouse, through the gates and over the ogee spillway."

#### **Our Analysis**

Continuing to operate the project in run-of-river mode would limit impoundment fluctuations associated with project operation. Operating the project in run-of-river mode would also continue to result in minimal to no adverse project effects on the flow regime of the Lower Fox River downstream of the tailrace, and minimal to no disruption to fishspawning habitat near the riverbanks in the downstream reach. Continuing to operate the project in run-of-river mode would also maintain the existing level of flows to the 3,500foot-long bypassed reach, and would continue to provide the existing aquatic environment that has been available since the project was constructed. Specifically, flows to the bypassed reach would continue when flows to the impoundment are greater than the hydraulic capacity of the project, including spill over the dam and through the spillway gates. These flows would mimic the seasonal variation of flow in the Lower Fox River. Establishing a minimum impoundment elevation of 628.5 feet msl would help ensure that the impoundment elevation does not fall more than 0.5 foot below the overflow spillway crest of 629.0 feet msl during normal project operation, and would provide Kaukauna with operational flexibility to adjust the impoundment elevation to as low as 628.5 feet msl to maintain compliance with run-of-river operation in the event of changing flow conditions in the Lower Fox River.

Lowering the impoundment to a minimum elevation that is 0.5 foot below the overflow spillway crest could adversely affect aquatic and semi-aquatic species that occur in and around the impoundment by dewatering 0.5 foot of habitat in the littoral zone (*i.e.*, near shore) and exposing fish spawning and nursery sites to desiccation, and fish eggs to increased predation. In addition, habitat available for benthic macroinvertebrates and other organisms occupying shallow near-shore areas could be temporarily exposed when the impoundment is lowered to an elevation of 628.5 feet msl. However, these adverse effects would be limited to 0.5 foot of littoral habitat in the impoundment and would not be expected to significantly affect the aquatic environment relative to the current operating regime, which does not specifically restrict impoundment fluctuations by any amount.

Kaukauna's proposal to develop an operation monitoring plan that identifies the monitoring locations and use of headwater gages, and provides a method for determining flow releases would help ensure that Kaukauna is accurately monitoring project inflow and outflow. However, the plan does not specify how Kaukauna would use the flow data that it collects, including whether Kaukauna would use the flow data to document its compliance with the operational provisions of any new license. To help ensure that the project is operated in a run-of-river mode and that outflow from the impoundment approximates inflow to the impoundment, the operation monitoring plan could be modified to include : (1) a provision for monitoring the impoundment elevation level, rather than monitoring inflows and outflows, to document compliance with run-of-river operation; (2) standard operating procedures to be implemented (a) outside of normal operating conditions, including during scheduled facility shutdowns, impoundment drawdowns, and impoundment refilling, and (b) during emergency conditions such as unscheduled facility shutdowns and maintenance, in order to minimize project effects on environmental resources; (3) notifying the Commission of deviations and reporting deviations to the Commission; and (4) maintaining a log of project operations.

Notifying FERC and resource agencies of modifications to normal project operation, and implementing measures recommended by Wisconsin DNR during a temporary, planned modification to run-of-river operation would help ensure that project effects on aquatic resources are minimized in the event of contingencies that affect normal project operation, such as maintenance events or emergencies that are beyond Kaukauna's control. Filing a report with FERC and resource agencies following deviations from run-of-river operation or the minimum headwater elevation would ensure that Kaukauna identifies the reason for the deviation, the duration and magnitude of the deviation, and any environmental effects of the deviation, and would ensure that Kaukauna provides documentation of consultation with Wisconsin DNR to the Commission. Specific provisions for notifying and reporting deviations could be included in the operation monitoring plan discussed above.

## Drawdown Management

Although Kaukauna is not currently planning to draw down the project impoundment during the term of any new license, Kaukauna states that future project maintenance could require impoundment drawdowns. Kaukauna proposes to develop an impoundment drawdown plan in consultation with Wisconsin DNR and FWS to mitigate the potential impacts of any drawdowns on aquatic resources. Kaukauna does not provide specific provisions to be included in the plan, but states that the plan would outline the process to be followed for any future maintenance activities that require a drawdown.

## Our Analysis

Establishing a standard process to be followed for any future maintenance activities that require a drawdown could help reduce the effects of impoundment drawdowns on aquatic habitat in the project vicinity. To protect aquatic habitat during impoundment drawdowns, an impoundment drawdown plan could include provisions for maintaining downstream flows at near natural flow levels during any impoundment drawdown and for refilling the impoundment following the drawdown. Minimizing the time that the impoundment is drawn down and the time that downstream flows are reduced would help maintain aquatic habitat in the impoundment and in the river downstream of the project. Further, impoundment refill procedures would help ensure that aquatic habitat would quickly be returned to normal conditions with minimal impacts to aquatic resources.

#### Woody Debris Management

Kaukauna proposes to develop a woody debris management plan in consultation with Wisconsin DNR and FWS. Kaukauna does not outline specific provisions to be included in the plan, but states that the plan would address the process and procedures for the proper disposal of woody debris collected at the project's facilities in a manner that allows for adequate project operation and protects aquatic resources in the Lower Fox River downstream of the project.

## Our Analysis

Woody debris that accumulates on the face of the project's 88-foot-wide trashrack, and along the length of the 3,842-foot-long dam needs to be removed and disposed of in

order to provide safe, efficient, and effective project operation. Debris that accumulates on the project's trashrack could reduce the effectiveness of the trashracks at protecting fish. For example, if the trashrack is covered with debris, fish may become entangled in the debris or the approach velocity at the trashracks could increase as intake water is constricted to a smaller area, which could result in a greater amount of fish impingement or entrainment, respectively. In addition, debris that accumulates along the spillway could present a safety hazard for whitewater boaters that are using the impoundment (see section 3.3.4, *Land Use and Recreation*, for additional discussion). To maintain the effectiveness of the proposed trashracks, the licensee would need to monitor the project intake for woody debris and remove accumulated debris from the face of the trashrack. Additional debris that accumulates in the forebay or on the spillways would also need to be removed in order to maintain efficient project operation.

At the same time, proper disposal of debris that is removed from the project intake area is important because organic debris sustains lower order trophic organisms, such as benthic macroinvertebrates, which in turn influences the productivity of higher order organisms, such as fish. Organic debris also provides habitat for macroinvertebrates and fish. Therefore, while removal of river-borne trash from the stream would be beneficial for project operations, it may be more appropriate to return organic debris to the river by passing it downstream of the dam. Passing large woody debris would provide habitat structures downstream of the dam and enhance the carrying capacity of the Lower Fox River for macroinvertebrates and fish by providing cover and velocity shelters.

A woody debris management plan could be used to minimize project effects on fish and recreation use, and ensure that desirable organic material is reintroduced to the river downstream of the dam, by including provisions that identify the frequency and methods for managing woody debris and trash at the project, including provisions for: (1) removing and sorting debris that collects on project structures; (2) passing organic debris (*i.e.*, leaves and wood) downstream of the project; and (3) removing and disposing of trash.

#### Water Quality

Kaukauna proposes to cooperate with Wisconsin DNR in the implementation of the Lower Green Bay Remedial Action Plan, by allowing Wisconsin DNR and other agencies involved with the implementation of the remedial plan access to the project area and to modify project operations as necessary to facilitate the removal or treatment of contaminated sediments in the Fox River.

In addition, Kaukauna proposes to install erosion and siltation controls during any ground disturbing activities within the project boundary to prevent or reduce erosion, sedimentation, and siltation caused by ground disturbing activities, and consequently to avoid or minimize adverse effects on water quality and aquatic resources.

## **Our Analysis**

Kaukauna is not proposing any operational changes that would alter the current project operation and maintenance activities; therefore, the existing water quality in the Lower Fox River would be unaffected by continued project operation.

Although PCBs occur in the sediments in the project vicinity as a result of past industrial discharges into the Lower Fox River, the proposed project operation (run-ofriver with no construction-related, sediment disturbing activities) would not affect the presence or distribution of these toxic substances. In addition, no significant deposits of contaminated sediment occur in the vicinity of the project and sediment removal was not recommended in the Wisconsin DNR's and EPA's 2002 Record of Decision. For these reasons, there is no project-specific need for Kaukauna to cooperate with Wisconsin DNR in the implementation of the Lower Green Bay Remedial Action Plan. Kaukauna could, nevertheless, voluntarily cooperate with the Wisconsin DNR and other resource agencies in efforts to clean-up the river's sediments in a manner that does not otherwise conflict with the terms of any license issued for the project.

Kaukauna has not proposed any specific ground-disturbing activities that would require erosion and siltation controls, but anticipates the need for maintenance activities that could lead to ground disturbance. Implementing erosion and siltation controls for ground-disturbing activities would reduce erosion, sedimentation, and siltation in the vicinity of the project that could otherwise adversely impact water quality by increasing turbidity and nutrient loading and adversely affect fish and aquatic invertebrates by, for example, smothering fish eggs and reducing the quality of aquatic habitat.

The Commission's standard terms and conditions for a hydropower license require the licensee to take reasonable measures to prevent soil erosion on lands adjacent to streams or other waters and stream sedimentation. These standard terms and conditions would be sufficient for routine maintenance activities that could result in erosion and sedimentation. However, any substantial alteration or addition to project facilities, land, or water must first be approved by the Commission before commencement of such activities. The Commission could at that time, consider the need for a separate erosion and sedimentation control plan in response to any substantial soil and sediment disturbing activities proposed during the term of any new license.

#### Fish Entrainment and Impingement

There are no designated downstream fish passage facilities at the project. Downstream fish passage occurs via spill over the project's dam or flow through the project's turbines. Kaukauna is not proposing any measures to reduce entrainment or impingement at the project.

#### Our Analysis

Fish entrainment studies conducted at 11 hydroelectric projects in Wisconsin indicate that several of the most common species that occur at the project (such as gizzard shad, freshwater drum, bluegill, channel catfish, rock bass, black crappie, smallmouth bass, and white bass) can be entrained at hydropower projects in Wisconsin (FERC, 1995). In addition, juvenile sturgeon that move downstream past the project may also be entrained. Peak entrainment rates likely occur in summer and fall for many species when young fish are most abundant and tend to be dispersing between habitats.

Although no site-specific project entrainment or turbine mortality studies have been conducted at the Kaukauna Project, based on the historical studies noted above and the 5-inch clear bar spacing at the trashrack, it is likely that small and young fish compose the majority of fish entrained at the Kaukauna Project. The survival of these small fish is expected to be relatively high because they are less prone to mechanical injury from turbine passage than larger fish. Turbine passage survival at hydroelectric projects with Kaplan turbines can be as high as 95 percent for small and moderate-sized fish and 88 percent for larger fish (EPRI, 1997).

With 5-inch clear spacing between trashrack bars, the project intake would physically exclude only the largest fish, including adult lake sturgeon. However, impingement of large fish on the trashracks is not anticipated to be a major issue due to their ability to avoid the influence of the trashrack. Large fish are capable of swimming at a "burst speed," which is defined as a short, intense swimming effort, generally sustainable for about 1 second or less (Bell, 1991). For instance, Murray (1974) calculated the burst speed of channel catfish to be 4.2 body lengths per second and smallmouth bass to be 6.8 body lengths per second. Therefore, it is likely that these larger fish would be able to avoid impingement on the trashrack, especially with regular cleaning of the trashrack.

Overall, there is no evidence or allegation of significant fish entrainment or impingement issues at the project. In addition, Kaukauna is not proposing any changes to project operation that would alter the level of fish entrainment and turbine mortality. Fish survey data also indicates that a diverse and abundant fish population exists at the project. While entrainment of smaller, younger fish is likely occurring, especially during the summer and fall seasons, the rate of survival for entrained fish is expected to be high based on known turbine passage survival rates.

#### Lake Sturgeon Stranding

In its license application, Kaukauna states that during pre-filing consultation a stakeholder identified a potential concern of lake sturgeon stranding in the Conservancy Zone following spawning. Kaukauna states that it does not believe the operation of the project causes stranding of sturgeon in the Conservancy Zone. Kaukauna states that sturgeon stranding would occur at a time of year when inflow exceeds the powerhouse
hydraulic capacity, and changes to flow do not occur at the powerhouse such that flow over the spillway is rapidly reduced.

## Our Analysis

Hydroelectric projects can potentially result in fish stranding when flows are diverted from the main channel of the river for project operation, and flows in the bypassed reach of the river are rapidly reduced. The diversion of flows for hydroelectric project operation can affect fish spawning and nursery areas in the bypassed reach.

Kaukauna is not required to release minimum flows to the bypassed reach under the current license and has not proposed to implement minimum flow releases as part of any new license that is issued for the project. Based on the presence of sturgeon in the downstream reach and the absence of minimum flow releases, project operation could potentially result in sturgeon stranding in the bypassed reach.

However, Wisconsin DNR states that sturgeon have been observed downstream of the spillway along the Fox River from April to June, but that no sturgeon stranding has been observed.<sup>19</sup> During surveys conducted in 2015, only a single lake sturgeon was detected in the bypassed reach and no sturgeon stranding was observed. Kaukauna is also not proposing to change project operation, including run-of-river operation. The impoundment would not be used to store water, and flows would be provided to the bypassed reach as spill over the dam when the project is not operating or when inflow to the impoundment is greater than the hydraulic capacity of the project. According to data collected from 1987 to 2015, flows in the Lower Fox River exceeded the 3,000-cfs maximum hydraulic capacity of the project and were spilled into the bypassed reach 80 percent of the time in April, 75 percent of the time in May, and 60 percent of the time in June. Based on the lack of evidence and allegations that sturgeon stranding is currently occurring at the project, and the fact that spillage has historically occurred in the bypassed reach the majority of the time that sturgeon are likely to be present in the bypassed reach, the project would not likely result in significant adverse effects to the lake sturgeon population in the Lower Fox River.

## Cumulative Effects

Based on our review of the license application and the Commission's January 20, 2010 environmental assessment for the Badger-Rapide Croche Hydroelectric Project No. 2677, we have identified water quality and lake sturgeon as resources that may be cumulatively affected by activities in the basin. These include agricultural and industrial uses, recreational activities, the historic introduction of non-native invasive species, and

<sup>&</sup>lt;sup>19</sup> See Kaukauna's August 23, 2010 response to Commission staff's May 25, 2017 additional information request, at Exhibit 1.

the construction, operation, and maintenance of other hydroelectric developments and dams on the Lower Fox River.

### Water Quality

Water quality in the Lower Fox River has been degraded by multiple point and non-point sources in the Lower Fox River basin over time, including the construction and operation of impoundments and hydroelectric facilities beginning in the 19<sup>th</sup> century, and from discharges related to industrial activities, regulated wastewater treatment facilities, and runoff from agricultural land and urban land.

#### Our Analysis

To address water quality issues in the Lower Fox River, Wisconsin DNR has developed total maximum daily loads of phosphorus and TSS to address excessive phosphorus and sediment loading from point and non-point sources in the Lower Fox River and Green Bay (Wisconsin DNR, 2012a). In addition, the Remedial Action Plan outlines actions for cleaning up contaminated river sediments in Green Bay and the Lower Fox River, including sediments containing PCBs. As part of the Remedial Action Plan, several federal, state, and tribal entities, including the FWS, EPA, and Wisconsin DNR collaborate to determine measures necessary to rehabilitate the Lower Fox River and the Green Bay area. According to the Wisconsin DNR, over 1 million cubic yards of PCB-contaminated sediment was removed from the Lower Fox River from 2015 to 2017, and dredging in the Lower Green Bay and Fox River will continue through 2019 (Wisconsin DNR, 2018). No significant deposits of contaminated sediment remain in the vicinity of the project.

The project has operated in run-of-river mode throughout the term of the existing license and Kaukauna is proposing to continue operating the project in run-of-river mode with a target normal impoundment elevation at the crest of the overflow spillway at the dam (629.0 feet msl). Operating the project in run-of-river mode would continue limiting impoundment fluctuations associated with project operation and minimizing the project's contribution to sediment loading in the Lower Fox River. Establishing a minimum impoundment elevation of 628.5 feet msl, as proposed by Kaukauna, would help ensure that the impoundment elevation does not fall more than 0.5 foot below the overflow spillway crest of 629.0 feet msl during normal project operation. Although some fluctuation would continue to occur between the crest elevation of 629.0 feet msl and 628.5 feet msl, the overall contribution of project operations to sedimentation would continue to be minimal.

Separately, Kaukauna has not proposed any specific ground-disturbing activities that would require erosion and siltation controls. In the event that maintenance activities lead to ground disturbance, Kaukauna could implement erosion and siltation controls to reduce erosion, sedimentation, and siltation in the vicinity of the project. The Commission's standard terms and conditions for a hydropower license require a licensee to take reasonable measures to prevent soil erosion on lands adjacent to streams or other waters and stream sedimentation. These standard terms and conditions would be sufficient for routine maintenance activities that could result in erosion and sedimentation.

While PCBs occur in the sediments in the project vicinity as a result of past industrial discharges into the Lower Fox River, the proposed project operation (run-ofriver with no construction-related, sediment disturbing activities) would not affect the presence or distribution of these toxic substances.

Separately, project operation and maintenance is not known to contribute to phosphorus loading, and water quality surveys conducted in 2014 and 2015 showed DO concentrations ranging from 7.2 to 12.5 mg/L, all of which are above the state of Wisconsin's 5 mg/L standard.

Altogether, the project might contribute to sediment loading in the Lower Fox River Basin, but would not contribute to phosphorus loading or PCB contamination. Operating the project in run-of-river mode and taking reasonable measures to prevent soil erosion on lands adjacent to the Fox River during any future ground-disturbing activities, as proposed by Kaukauna and recommended by staff, would continue to minimize any adverse effects of the project on water quality in the Lower Fox River Basin. Therefore, there is no indication that the proposed project would significantly add to the cumulative effects on water quality that have occurred or that may occur in the future by any new activities in the basin.

### Lake Sturgeon

Development of the Lower Fox River has occurred since the 19<sup>th</sup> century. The Kaukauna Project is one of seven federally licensed hydropower projects on the Lower Fox River (Figure 1). The Corps operates nine federal dams on the Lower Fox River, four of which have been developed for hydropower production (*i.e.*, Kimberly Project No. 10674, Little Chute Project No. 2588, and Badger-Rapide Croche Hydroelectric Project No. 2677 (including the Kaukauna and Rapide Croche dams)).<sup>20</sup> These developments block movement of Lake Sturgeon from Green Bay for spawning in upstream areas of the Lower Fox River. In addition, sturgeon likely become entrained in the turbines at the hydropower developments along the Lower Fox River, and many that do so, likely experience mortality. As discussed above, water quality in the Lower Fox

<sup>&</sup>lt;sup>20</sup> U.S. Army Corps of Engineers, *USACE Lower Fox River Dams – Current Condition*, located at: <u>https://www.lre.usace.army.mil/Missions/Civil-Works/Dam-Safety-Program/Lower-Fox-River-Dams/</u>. Last accessed on July 30, 2018.

River has also been degraded by multiple point and non-point sources in the Lower Fox River basin over time, adversely affecting the aquatic habitat for lake sturgeon.

### Our Analysis

Lake sturgeon is the only species reported from the Lower Fox River that has been identified as a species of concern in Wisconsin. In October 2000, Wisconsin DNR published a Lake Sturgeon Management Plan based on the following key statewide lake sturgeon management issues: the decline in abundance over the last century, the absence of comprehensive biological and/or harvest information with which to manage populations at a statewide or watershed level, the negative effect that habitat loss, modification, or inaccessibility has had on populations, the maintenance of genetic diversity and long-term health of rehabilitated populations, the importance of protection from illegal harvest or incidental catch, the absence of a mechanism to ensure that genetic variability and other population characteristics are maintained in commercial or private industry activities, the existence of antiquated policies and management goals, and the essential involvement of the general public in an effective management program (Wisconsin DNR, 2000).

Wisconsin DNR manages a sturgeon fishery in Lake Winnebago, approximately 12 miles upstream from the Kaukauna project. Lake sturgeon can potentially travel downstream on the Lower Fox River from Lake Winnebago to Green Bay, including in the vicinity of the project.

Although lake sturgeon have not been observed in the impoundment, they could potentially occur in the impoundment while traveling downstream from Lake Winnebago and could be affected by project operation. However, with 5-inch clear spacing between trashrack bars, the project intake physically excludes adult sturgeon. As noted above, entrainment of smaller, juvenile sturgeon likely occurs at the project; however, due to their small size, many likely survive turbine passage. In addition and also as noted above, impingement of adult lake sturgeon on the trashracks is not anticipated to be a major issue at the project due to their strong swimming abilities.

Lake sturgeon have also been observed downstream of the spillway and tailrace. Continuing to operate the project in run-of-river mode, as proposed by Kaukauna, would result in minimal to no adverse project effects on the flow regime of the Lower Fox River downstream of the tailrace, and minimal to no disruption to fish-spawning habitat near the riverbanks in the downstream reach, including lake sturgeon spawning habitat. Also, as discussed above, based on the lack of evidence that sturgeon stranding is currently occurring at the project, and the high frequency of spillage to the bypassed reach in the April to June time period when sturgeon are most likely to be present, project operation would continue to not result in significant adverse effects to the lake sturgeon population in the Lower Fox River. In conclusion, the project would continue to serve as a barrier to upstream sturgeon movement, and entrain and kill some juvenile sturgeon. However, moving forward, the project would not significantly add to the cumulative effects on lake sturgeon that have been historically caused by the project and other activities in the basin or may be caused by other new activities in the basin in the future.

## 3.3.2 Terrestrial Resources

## 3.3.2.1 Affected Environment

The 350-acre Conservancy Zone consists of a group of islands and undeveloped upland habitat that is located primarily downstream of the dam, including approximately 36 acres of forest or scrub-shrub habitat. The forest canopy on the islands includes cottonwood, maples, oak, box elder, hickory, and several large willows. The understory and scrub-shrub vegetation on the islands in the Conservancy Zone is predominantly composed of dogwood, box elder, and willows (Kaukauna, 2007). Outside of the Conservancy Zone, land in the immediate project vicinity is industrial in nature and nearly devoid of vegetation except for isolated scrub-shrub vegetation located at formerly industrialized sites.

## Wetlands

According to the National Wetlands Inventory (FWS, 2018), terrestrial wetlands are located downstream of the dam in the Conservancy Zone. A total of 1.1 acres of forested and scrub-shrub wetlands are within the project boundary. Forested and scrub-shrub wetlands in Outagamie County include sedges, grasses, and water tolerant trees and shrubs such as box elder, red and silver maple, black willow, cottonwood, and flowering dogwood.

## Invasive plant species

Due to its disturbed and industrial nature, the Fox River Basin contains a variety of non-native invasive plant species. Glossy and common buckthorn, garlic mustard, Japanese honeysuckle, narrow leaf cattail, and purple loosestrife have all observed at the project. Eurasian milfoil, phragmites, and Japanese knotweed are also found within the region and have the potential to occur at the project (Kaukauna, 2007).

In 2009, the 1,000 Islands Environmental Center<sup>21</sup> created an invasive species management plan that sets short and long-term goals for locating, removing, and

<sup>&</sup>lt;sup>21</sup> The 1000 Islands was established in 1969 by the City of Kaukauna. The purpose of the Conservancy Zone is to preserve the land in a natural state for the benefit of all citizens, and to teach good conservation practices and preservation of natural

preventing populations of invasive plant species, as well as restoring native vegetation. Invasive plant species identified in the Conservancy Zone include common and glossy buckthorn, dames rocket, garlic mustard, honeysuckle, and moneywort.

### Wildlife

Wildlife habitat within the project vicinity is limited to the undeveloped islands located at and adjacent to the project. These habitats support a variety of resident and transient species. Wisconsin state threatened species occurring in the vicinity of the project are the big brown bat (*Eptesicus fuscus*), eastern pipistrelle (*Perimyotis subflavus*), great blue heron (*Ardea herodias*), great egret (*Ardea alba*), little brown myotis (*Myotis lucifugus*), northern myotis (*Myotis septentrionalis*), and wood turtle (*Glyptemys insculpta*).

Bald eagles are known to nest in the Conservancy Zone (1000 Islands Environmental Center, 2009b). The area immediately downstream of the project and within the Conservancy Zone complex contains important sites for roosting and foraging eagles throughout the year, especially during the winter months of November to March. Dozens of eagle use this area due to the opportunities for feeding and the availability of roosting trees.<sup>22</sup> The Conservancy Zone is also identified as a migratory bird concentration site in the Mississippi Flyway, and is estimated to support between 1,000 and 10,000 waterfowl and landbirds during the spring and fall migration seasons. During a relicensing survey conducted in September 2014, 36 species of birds were observed in the Conservancy Zone.

Mammal species present in the project area include eastern chipmunk, thirteenlined ground squirrel, several bat species (including big brown bat, silver-haired bat, and hoary bat), raccoon, and deer. Amphibians and reptiles using the area include northern leopard frog, green frog, painted turtle, snapping turtle, and northern water snake. In addition to bald eagles, bird species include shorebirds (including killdeer and spotted sandpiper), passerines (including warblers and sparrows), and water-birds, such as mallard, Canada goose, great blue heron, and American white pelican.

Developed areas in the project vicinity provide habitat for species that are adapted to living near human activity. Common urban birds, including robins, grackles, and swallows feed and nest near the dam and the powerhouse. Great blue and green herons

resources. The Conservancy Zone encompasses 350 acres. *See* <u>http://1000islandsenvironmentalcenter.org/about.html</u>.

<sup>&</sup>lt;sup>22</sup> Interview with Debbie Nowak, Conservancy Zone naturalist, on WLUK TV. December 6, 2017. Located at <u>http://fox11online.com/news/local/bald-eagle-nests-soar-to-record-number-across-wisconsin</u>.

fish in the shallow water near the dam, and cormorants use the deeper water. Typical urban mammals that occupy the area include eastern grey squirrel, raccoon, and deer.

### Invasive animal species

Non-native invasive animal species in the project vicinity include species that have spread throughout much of the Great Lakes region, such as zebra mussels, common carp, rusty crayfish, and white perch. These species have not been identified at the project, but have been documented just upstream.

# 3.3.2.2 Environmental Effects

## Project Operation

Kaukauna proposes to continue operating the project in a run-of-river mode (i.e., with outflow from the project approximately equal to inflow to the impoundment) and proposes to maintain a target normal impoundment elevation at the crest of the overflow spillway at the dam (629.0 feet msl). Kaukauna also proposes to establish a minimum impoundment elevation of 628.5 feet msl, which corresponds to an elevation that is 0.5 foot less than the crest of the overflow spillway. Kaukauna is not proposing any changes to project operation or ground-disturbing construction.

# Our Analysis

Operating the project as a run-of-river facility would continue to provide minimal to no disruption to riparian and wetland areas in the downstream reach relative to the flow regime of the Lower Fox River. Flow to wetland habitat in the bypassed reach would continue to be provided as spill over the dam and through the spillway gates when inflow to the impoundment is greater than the hydraulic capacity of the project. Run-of-river operation is not known to cause adverse effects on terrestrial resources in downstream reaches, and continued operation would continue to have no adverse effect.

Operating the project in run-of-river mode, with a minimum elevation of 628.5 feet msl would affect terrestrial resources bordering the impoundment. The only terrestrial habitat bordering the project impoundment is found on an island located just upstream of the spillway. This island is primarily forested by trees and shrubs, and is likely intermittently flooded at high flows. Establishing a minimum impoundment elevation of 628.5 feet msl could expose 0.5 foot of littoral habitat around the shoreline of the island between the overflow spillway crest elevation of 629.0 feet msl and the minimum impoundment elevation of 628.5 feet msl. However, the shallow riverbed around the island is composed of rock and would not provide favorable growing conditions for plants. Therefore, establishing a minimum impoundment elevation of 628.5 feet msl would not significantly affect terrestrial resources in the vicinity of the project.

### **Invasive Species**

Kaukauna is proposing to mitigate the spread of invasive species by developing an invasive species monitoring plan in consultation with Wisconsin DNR and FWS. Kaukauna does not outline specific provisions to be included in the plan, but states that the plan would be developed to coordinate any future monitoring at the project with the current monitoring requirements at the Badger-Rapide Croche Hydroelectric Project No. 2677, due to the location of the Badger Development and Rapide Croche Development upstream and downstream of the Kaukauna Project, respectively.

#### Our Analysis

Invasive exotic wetland plants like purple loosestrife and narrow-leaf cattail thrive in disturbed habitats (such as fluctuating water levels) and can outcompete native wetland and aquatic plants and dominate the species composition within a few years. These nonnative invasive species provide lower quality food value to wildlife than native forbs, grasses, and aquatic macrophytes, so infestation by these plants is harmful and can affect wildlife species diversity and survival. Due to other known populations of these plants in the local area, repeated colonization of the Kaukauna Project is likely to occur. Separately, zebra mussels, rusty crayfish, and other invasive animals tend to be highly adaptive to a variety of aquatic conditions.

Invasive plant species at the project are widespread and established, and have outcompeted native plants in all of the project's terrestrial habitats. Buckthorns are the dominant understory plants on the upland islands in the Conservancy Zone; purple loosestrife and narrow-leaf cattail are dominant on lower elevation and emergent islands in the Conservancy Zone; and garlic mustard is the dominant understory species in the riparian area. Continued operation of the project in a run-of-river mode would limit the extent of disturbances in the impoundment and downstream reach by minimizing water level fluctuations associated with project operation. However, natural fluctuations in the river elevation and fluctuations associated with the upstream Badger Development of the Badger-Rapide Croche Hydroelectric Project No. 2677<sup>23</sup> would continue to occur at the project impoundment, bypassed reach, and downstream reach, depending on flow conditions. Shallow water areas that are prone to garlic mustard and narrow-leaf cattail colonization would also still occur along the margins of the impoundment and around the islands in the Conservancy Zone. Recreation activities at the project, including boating and fishing, could also contribute to the spread of invasive species through seed transport and soil compaction.

<sup>&</sup>lt;sup>23</sup> The upstream Badger Development operates in a run-of-river mode by maintaining impoundment levels within a 1.5-foot operating band. *See City of Kaukauna, Wisconsin,* 135 FERC ¶ 62,149 (2011).

Kaukauna's proposal to develop an invasive species monitoring plan does not contain any details except that the plan would be developed in consultation with agencies and would be developed to coordinate any future monitoring at the project with the current monitoring requirements at the Badger-Rapide Croche Hydroelectric Project No. 2677. Although Kaukauna states that the plan would be developed to "mitigate the spread of invasive species," Kaukauna is not proposing any specific actions that would mitigate the spread of invasive species. In addition, because the project is already dominated by invasive species, solely monitoring for invasive species would not reduce the impact of invasive species on the local terrestrial habitat.

To mitigate the spread of invasive species and reduce the potential for new invasive species to become established on project land, the invasive species monitoring plan could be modified to include provisions for: (1) identifying target invasive species; (2) defining the treatment area(s) in the vicinity of the project; (3) describing the techniques to be used to control invasive species, including the frequency of treatments; (4) monitoring treatment areas to evaluate the success of invasive species control efforts; and (5) filing a report with the Commission following the monitoring period, including an analysis of whether additional invasive species control is necessary. With these provisions, the invasive species monitoring plan could help to protect native plant and animal communities from persistent invasive species, and improve habitat quality for fish and wildlife in disturbed areas in the project vicinity during the term of any new license issued for the project. Coordinating the implementation of the invasive species control plan with other invasive species plans in the project vicinity (including the invasive species monitoring and control plan for the Badger-Rapide Croche Hydroelectric Project No. 2677<sup>24</sup> and the invasive species management plan that is being implemented by the 1,000 Islands Environmental Center in the Conservancy Zone), would ensure the comprehensive treatment of invasive species in the project vicinity, thereby reducing the likelihood of further invasive species colonization and recolonization following treatment.

# **3.3.3** Threatened and Endangered Species

## 3.3.3.1 Affected Environment

FWS's IPaC system indicates that the federally listed threatened northern longeared bat (NLEB) could occur in the project vicinity. The NLEB was listed as a federally threatened species under the ESA on May 4, 2015. Wisconsin has also designated the NLEB as a threatened species. In January 2016, the FWS finalized the 4(d) rule for this species, which focuses on preventing effects on bats in hibernacula associated with the

<sup>&</sup>lt;sup>24</sup> See City of Kaukauna, Wisconsin, 139 FERC ¶ 62,184 (2012).

spread of white-nose syndrome<sup>25</sup> and effects of tree removal on roosting bats or maternity colonies (FWS, 2016a). In the programmatic biological opinion for the 4(d) rule, FWS found that incidental take of NLEB is not prohibited unless the action: (1) affects an NLEB hibernaculum or could alter the entrance or the environment of a hibernaculum; (2) includes the removal of a known, occupied maternity roost tree or any trees within 150 feet of a known, occupied maternity roost tree during the pup season (June 1 – July 31);<sup>26</sup> or (3) includes the removal of any trees within 0.25 mile of an NLEB hibernaculum at any time of year (FWS, 2016c). The 4(d) rule provides flexibility to landowners, land managers, government agencies, and others as they conduct activities in areas that could be NLEB habitat.

Traditional ranges for the NLEB include most of the central and eastern U.S., as well as the southern and central provinces of Canada, coinciding with the greatest abundance of forested areas. The NLEB, whose habitat includes large tracts of mature, upland forests, typically feeds on moths, flies, and other insects. These bats are flexible in selecting roost sites, choosing roost trees that provide cavities and crevices, and trees with a diameter of 3 inches or greater at breast height.<sup>27</sup> Winter hibernation typically occurs in caves and areas around them and can be used for fall-swarming<sup>28</sup> and spring-staging.<sup>29</sup> No critical habitat has been designated for this species (FWS, 2016b).

<sup>26</sup> Pup season refers to the period when bats birth their young.

 $^{27}$  Diameter at breast height refers to the tree diameter as measured about 4 to 4.5 feet above the ground.

<sup>28</sup> Fall-swarming fills the time between summer and winter hibernation. The purpose of swarming behavior include introduction of juveniles to potential hibernacula, copulation, and gathering at stop-over sites on migratory pathways between summer and winter regions.

<sup>&</sup>lt;sup>25</sup> A hibernaculum is where a bat hibernates over the winter, such as in a cave. White-nose syndrome is a fungal infection that agitates hibernating bats, causing them to rouse prematurely and burn fat supplies. Mortality results from starvation or, in some cases, exposure.

 $<sup>^{29}</sup>$  Spring-staging is the time period between winter hibernation and migration to summer habitat. During this time, bats begin to gradually emerge from hibernation and exit the hibernacula to feed, but re-enter the same or alternative hibernacula to resume daily bouts of torpor (*i.e.*, a state of mental or physical inactivity).

The project is located within the white-nose syndrome buffer zone for this species (FWS, 2017).<sup>30</sup> Although there are no known hibernacula or maternity roosts in Outagamie County (Wisconsin DNR, 2016), the Conservancy Zone contains a forested canopy that could provide suitable roosting sites near the project. In addition, during an acoustic survey conducted in 2014 by the Wisconsin DNR's Wisconsin Bat Program, NLEB acoustic calls may have been recorded in the Conservancy Zone. However, the recordings were not conclusive and could have been either little brown bat or NLEB.

### **3.3.3.2** Environmental Effects

To avoid prohibited incidental take of NLEB, Kaukauna is proposing to avoid tree removal within the project boundary unless the tree poses a threat to human life or property, or the removal occurs outside of the NLEB pup season from (June 1 through July 31). Kaukauna also states that it will not initiate removal of any live bat species from structures within the project boundary prior to consulting with FWS. Kaukauna states that removal of any live bat species would be conducted in accordance with recommendations provided by FWS during consultation. In a July 17, 2017 email to Kaukauna, FWS concurred with the proposed measures for compliance with the requirements of the 4(d) rule for the NLEB.<sup>31</sup>

#### **Our Analysis**

Kaukauna has not proposed any ground disturbing activities or tree clearing activities that would affect NLEB summer roosting or foraging habitat. However, project maintenance activities during the term of any new license could require periodic tree removal that may affect NLEB habitat (*e.g.*, maintenance on the dam that abuts the Conservancy Zone).

Although there are no known hibernacula or maternity roosts in the project vicinity, no surveys have been conducted to verify the absence of maternity roost trees. Based on the fact that the Conservancy Zone contains a forested canopy that could provide suitable roosting sites near the project, and that NLEB may have been present

<sup>&</sup>lt;sup>30</sup> White-nose syndrome is a fungal infection that agitates hibernating bats, causing them to rouse prematurely and burn fat supplies. Mortality results from starvation or, in some cases, exposure. The white-nose syndrome buffer zone encompasses counties within 150 miles of a U.S. county or Canadian district in which white-nose syndrome or the fungus that causes white-nose syndrome is known to have infected bat hibernacula.

<sup>&</sup>lt;sup>31</sup> See Kaukauna's August 23, 2017 response to deficiency of license application and additional information request.

during the acoustic survey conducted in 2014, maternity roosts could potentially occur in the vicinity of the project and could potentially be affected by project maintenance.

Kaukauna's proposed measures restrict tree removal activities at the project and ensure that prohibited incidental take of NLEB will not occur during the term of any new license. With these measures in place, the project would not be likely to adversely affect NLEB. We intend to follow FWS's optional streamlined consultation framework that allows federal agencies to rely on the 4(d) rule to fulfill section 7(a)(2) consultation requirements for NLEB (FWS, 2016c).

## 3.3.4 Land Use and Recreation

# 3.3.4.1 Affected Environment

# Land Use

Outagamie County was almost completely forested prior to European settlement, but current forest cover is only 19 percent of the total land area. Approximately 45 percent of Outagamie County is agricultural land, and 18 percent wetlands. Aside from agricultural and natural areas, land within the county consists of urban, residential, industrial, or commercial development. The area immediately surrounding the Fox River has higher percentages of land dedicated to industry and development than the rest of Outagamie County. Land use in the immediate vicinity of the project consists mainly of current and former industrial sites, residential areas, and some forested areas, including the Conservancy Zone.

The current project boundary for the Kaukauna Project as established in the Commission's 1989 License Order encompasses approximately 50.25 acres, including the impoundment up to a contour elevation of 629.0 feet msl, the bypassed reach, tailrace, and land associated with the dam, powerhouse, transmission line, and appurtenant facilities.

# Statewide Recreation

The 2011 – 2016 Wisconsin State Comprehensive Outdoor Recreation Plan (SCORP) identifies outdoor recreation as central to the state's economic, environmental and community values. The SCORP identifies broad goals of using outdoor recreation to improve health, increase access to recreation on public lands, and drive economic development in Wisconsin. The SCORP recommends expanding public boating access; promoting awareness of existing recreation lands, facilities, and opportunities; and supporting efforts to increase access to outdoor recreation (Wisconsin DNR, 2012b).

### Local Recreation Opportunities

Recreational facilities within the vicinity of the Kaukauna Project include Central Park, Hydro Park, and Riverside Park near the upstream Badger Development, just upstream from the Kaukauna Project (Figure 3). Kaukauna owns and operates these parks. Central Park and Hydro Park provide walking paths and areas for passive recreation. Riverside Park provides a baseball field, picnic areas, and the City Boat Launch that provides recreational access to the upstream Badger Development impoundment. Kaukauna also owns Rapide Croche Park, which is located about four miles downstream from the Kaukauna Project and is operated and maintained by Kaukauna. Rapide Croche Park provides recreational access to the downstream Rapide Croche impoundment, which is more rural in nature than the parks upstream of the Kaukauna Project. In addition, a new fishing pier is being constructed downstream of the project on the north shore of the Lower Fox River, as part of the downstream Rapide-Croche Development.<sup>32</sup> All of these sites are part of the Badger-Rapide Croche Hydroelectric Project No. 2677.

The Conservancy Zone immediately downstream of the Kaukauna Project provides hiking, cross-country skiing, fishing, picnicking, and a nature center. It also provides a canoe launch to the downstream reach that will be upgraded for easier access within the next few years as part of the Badger-Rapide Croche Hydroelectric Project No. 2677. The Fox River Navigational System Authority is restoring the locks just north of the Kaukauna Project with the goal of providing boating access around the dams and rapids in this stretch of the Fox River (Fox River Heritage Parkway, 2018).

Outagamie County's comprehensive plan seeks to establish a county-wide system of parks, trails, and open space (Outagamie County, 2008). One of the recreational needs identified by the county is the need for more kayaking opportunities.

<sup>&</sup>lt;sup>32</sup> See City of Kaukauna, Wisconsin, 159 FERC ¶ 62,308 (2017).



Figure 3. Map of the Badger-Rapide Croche Hydroelectric Project No. 2677 project boundary showing the location of existing recreation facilities in the vicinity of the Kaukauna Project (Source: Kaukauna, 2008).

### Recreation Use at the Project

There are no formal recreation facilities at the project, but recreation use occurs within the project boundary and in the Conservancy Zone immediately downstream of the dam. From July 1, 2014 to June 30, 2015, Kaukauna conducted a recreation use study for a total of 139 survey days to determine the level of recreational use the project receives. The observation points for the survey were located on the shoreline of the impoundment, near the tailrace, and within the Conservancy Zone. The heaviest recreation use occurred within the Conservancy Zone. Based upon the results of the study, Kaukauna projected that the project received as many as 431 recreation user days in 2015. The most popular activities were: (1) nature walking, passive recreation (*e.g.* sitting, reading, children playing, sunbathing), and picnicking in the Conservancy Zone; (2) shoreline fishing around the impoundment; and (3) nature walking and shoreline fishing near the tailrace.

The 1.5-mile reach of the Lower Fox River from the upstream Badger Development to the Conservancy Zone provides a whitewater recreation opportunity (Figure 4). This whitewater stretch passes from the bypassed reach of the upstream Badger Development to the project impoundment (Segment I Reach), and then over the overflow spillway at the south-end of the project dam to the Conservancy Zone (Segment II Reach). Flow then passes from the Conservancy Zone to a take-out location in the bypassed reach of the project (Segment III Reach). Crossing the overflow spillway in a kayak is difficult and requires previous scouting and knowledge of the site and its varying water conditions. Conditions in the Segment II Reach can vary greatly depending on flows, with large areas of bedrock becoming exposed in some places at lower flows. Generally, crossing the overflow spillway requires a drop of at least two feet onto shallow water moving quickly over bedrock. In some areas, this shallow water extends for over ten feet before deeper pools are accessible. Other parts of the Segment II Reach may have deeper water depending on flows, but boaters may have to contend with fast moving water flowing over the overflow spillway to access the deeper areas. Fallen trees and woody debris can create navigational obstacles at the spillway and in the Conservancy Zone immediately after dropping over the spillway (American Whitewater, 2018). Accidents that occur in the Segment II Reach can result in difficult rescue operations, as boaters can be washed downstream and become stranded on one of the Conservancy Zone's islands. American Whitewater lists the entire stretch as Class II (novice) to IV (advanced) (American Whitewater, 2018), but the Fox River Heritage Parkway states that the rapids should only be attempted by highly experienced whitewater boaters (Fox River Heritage Parkway, 2018).

Enhancements to whitewater recreation in the vicinity of the project were required in the May 18, 2011 license order for the Badger-Rapide Croche Hydroelectric Project No. 2677,<sup>33</sup> including improvements to whitewater boater access in the bypassed reach of

<sup>&</sup>lt;sup>33</sup> See City of Kaukauna, Wisconsin, 135 FERC ¶ 62,149 (2011).

the upstream Badger Development and four annual whitewater releases over the spillway at the Badger Development. Kaukauna's December 29, 2016 recreation report for the Badger-Rapide Croche Hydroelectric Project No. 2677 reported that 18 paddlers were observed in the whitewater reach during scheduled release flows in 2015, and 19 paddlers were observed during scheduled release flows in 2016. Boating also occurs in the whitewater reach outside of the scheduled whitewater releases, especially during periods of high flow in the Lower Fox River.



Figure 4. Location of whitewater boating reaches in the vicinity of the Kaukauna Project (Google Earth, as modified by FERC staff).

### **3.3.4.2 Environmental Effects**

#### Recreation Use and Access

Kaukauna is not proposing to add formal recreation facilities to the project, but states that it will continue to cooperate with Outagamie County to address future recreation demands on a local and county-wide basis. Kaukauna also states that it will continue to maintain existing safety signage and warnings as required, including warnings for recreation users in the project boundary. To improve the safety of the project for boaters, Kaukauna is proposing to install boater safety exclusion cables in the forebay canal, upstream of the powerhouse intake.

In its January 16, 2018 comments, NPS states that the Lower Fox River in the project vicinity is a regionally significant whitewater recreation run, and that kayakers regularly paddle over the project overflow spillway to the Conservancy Zone. NPS recommends that Kaukauna provide kayakers with safe passage over the project overflow spillway. Specifically, NPS recommends that Kaukauna construct boater refuge areas to assist kayakers with safe passage. NPS suggests that the refuges be located along the overflow spillway and be constructed using rock-fill. NPS also recommends installing signs to identify the refuges and adding signs to the proposed boater exclusion cables to direct paddlers towards the recommended boater refuge areas. NPS recommends that Kaukauna develop additional access points for kayakers on the island immediately upstream of the project dam.

On March 6, 2018, Kaukauna responded to NPS's recommendations. Kaukauna states that, due to boater safety concerns, it does not condone passage over the overflow spillway under any conditions. Kaukauna states that informal, safe exits from the Lower Fox River already exist on the undeveloped island immediately upstream of the spillway, and that these safe exits can be used by whitewater boaters to avoid passing over the overflow spillway (Figure 5). The undeveloped island abuts the project impoundment, but is not within the project boundary above the elevation of 690 feet msl.<sup>34</sup> Kaukauna does not support the installation of boater refuge areas, as suggested by NPS, and states that placement of rock structures on the bed of the Lower Fox River could have unanticipated impacts that would need to be analyzed and addressed through a permitting process with the state of Wisconsin. Kaukauna also notes that easing the passage over the overflow spillway into the braided channels of the Conservancy Zone could increase

<sup>&</sup>lt;sup>34</sup> See Kaukauna's October 12, 2017 filing in response to comments submitted on Commission staff's June 20, 2017 scoping document. The undeveloped island is owned by Kaukauna and is open to the public, but is not part of the existing project boundary. Kaukauna states that the exit point on the south side of the island (South Channel Exit) is part of the Badger-Rapide Croche Hydroelectric Project No. 2677. The exit point on the north side (North Channel Exit) is an undeveloped small cove area.

kayaking in the Conservancy Zone and potentially cause cumulative effects to the environment. For example, Kaukauna states that increased kayaker access could cause nest abandonment and decreased foraging success for bald eagles in the Conservancy Zone.



Figure 5. Location of informal boater exit points (Source: Kaukauna's October 12, 2017 response to scoping comments).

### Our Analysis

The combination of surrounding private industrial land, inaccessible islands, and the long, low dam limit recreational access to the project. Recreational opportunities in the immediate project vicinity, however, are numerous. Given the abundance of recreational opportunities in the immediate project vicinity, additional recreation facilities do not appear to be necessary to meet recreation demand in the vicinity of the project.

However, the Kaukauna Project dam and overflow spillway present an obstacle for whitewater boaters as they progress along the stretch of whitewater located within the project boundary, and could be safety hazards for boaters depending on the individual boater's experience, flow levels, and debris loading at the project. Passing over the project's overflow spillway requires first-hand knowledge of the area and a level of experience that enables the boater to navigate potentially hazardous circumstances, including being trapped by debris at the spillway, getting stuck on the spillway during low flows, overturning the boat while passing over the overflow spillway to the downstream reach, and striking bedrock and debris at the base of the overflow spillway and in the Conservancy Zone. Any injury resulting from passage over the overflow spillway could be exacerbated by difficult rescue operations associated with strong currents and island terrain in the Conservancy Zone.

A safe exit from the Lower Fox River is currently available on the shoreline of the project impoundment. Pursuant to its license for the Badger-Rapide Croche Hydroelectric Project No. 2677, Kaukauna provides access to the project impoundment area via the Elm Street access site (see Figure 4). The Elm Street access site includes an accessible path from the impoundment to nearby Elm Street, picnic tables, impoundment fishing access, a lifeguard ring on a throw rope, two trash cans, on-street parking with lighting, and a kiosk. Although boating access is not specifically discussed in the recreation plan for the Badger-Rapide Croche Hydroelectric Project No. 2677, take-out areas for hand-carry boats are available at the eastern end of the site where the bedrock shelf dips into the Kaukauna impoundment.<sup>35</sup>

Kaukauna and NPS have indicated that the North and South Channel Exits also provide a place for boaters to exit the Lower Fox River immediately upstream of the spillway. Although the North and South Channel Exits and South Channel Exit could potentially provide additional safe exits from the whitewater reach, there is no evidence that additional exits are needed. As discussed, the Elm Street access site already exists at the far end of the south channel. The Elm Street access site provides a suitable place for exiting the Lower Fox River before the spillway. In addition, the North and South Channel Exits are located on an undeveloped island that is part of the Conservancy Zone.

<sup>&</sup>lt;sup>35</sup> See City of Kaukauna, Wisconsin, 143 FERC ¶ 62,129 (2013).

The proposed exits would require the construction of trails through the forest on the undeveloped island to ensure that boaters can safely access Elm Street. These trails could degrade the upland and wetland habitat on the undeveloped island. In contrast, the existing Elm Street access site, which is located directly across the channel from the South Channel Exit, already provides an accessible path back to Elm Street.

Boaters that access the Lower Fox River at the bypassed reach of the upstream Badger Development could use either the north or south channels to get to the project impoundment (Figure 5). Boaters that utilize the north channel enter the impoundment directly above the forebay canal, upstream of the powerhouse intake. Kaukauna's proposal to install boater exclusion cables would increase safety for boaters in project water by providing a barrier to the forebay canal and the powerhouse intake. Installing signs on the cables would increase safety by directing boaters to a safe exit, as suggested by NPS. In addition, providing signage that directs boaters to the Elm Street access site would increase safety by ensuring that the exit point is clearly marked. Signs could be placed on the shore of the north and south channels to indicate the direction to the takeout. A buoy could also be placed in the impoundment at the end of the north channel to direct boaters away from the intake and towards the Elm Street access point.<sup>36</sup> Another buoy placed immediately downstream of the Elm Street access point could help identify the exit area, thereby eliminating any confusion as to where the boat exit is located.

Providing passage routes over the project overflow spillway and constructing boater refuge areas at the overflow spillway could create safety concerns and have adverse effects on environmental resources in the Conservancy Zone. Although Kaukauna does not prohibit whitewater boaters from passing over the overflow spillway, it also does not condone passage at the overflow spillway and has expressed safety concerns related to overflow spillway passage. There are numerous potential hazards associated with overflow spillway passage, as discussed above. Additional boater access to the Conservancy Zone could also have an adverse effect on wildlife in the area, including bald eagle nesting and foraging, depending on the level of future recreation use. Finally, as discussed below, the Elm Street access site can be used as a boater refuge area for boaters that are using the bypassed reach of the Badger Development, the north and south channels, and the project impoundment.

### Project Boundary

Kaukauna proposes to remove approximately 25.3 acres of land and water from the existing project boundary downstream of the dam and powerhouse, including a

<sup>&</sup>lt;sup>36</sup> The buoy could indicate that boaters should turn away from the forebay and keep close to the undeveloped island until reaching the Elm Street access point about 1,000 feet to the south.

significant section of the bypassed reach and tailrace area that it states is no longer serving a project purpose.

# Our Analysis

The 25.3 acres of land and water is located entirely within the bypassed reach and tailrace area, and is not used for project operation and maintenance, or the protection of environmental resources. Removal of this land would create a new project boundary that would cover the area needed for project operation and maintenance, and would eliminate land and water that are not needed for project purposes.

# 3.3.5 Cultural Resources

# 3.3.5.1 Affected Environment

# Area of Potential Effect

Under section 106 of the NHPA of 1966, as amended, the Commission must take into account whether any historic properties within the proposed project's APE could be affected by the issuance of a license for the project. The Advisory Council on Historic Preservation defines an APE as the geographic area or areas in which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist (36 C.F.R. § 800.16(d)).

In its application, Kaukauna proposes an APE that encompasses all lands enclosed within the project boundary; attached or associated buildings and structures extending beyond the project boundary, which contribute to the National Register of Historic Places eligibility; and lands or properties outside the project boundary, where the project may cause changes in the character or use of Historic Properties. On October 3, 2016 Kaukauna sought concurrence from the Wisconsin SHPO regarding the APE and the potential effect of the project on cultural resources. On November 17, 2016, the Wisconsin SHPO replied to Kaukauna's letter by indicating that it agreed with Kaukauna's findings.<sup>37</sup>

# **Regional History**

Kaukauna is one of the oldest communities in the state of Wisconsin. Before the arrival of European explorers in the early 1600s, the Fox River Valley was home to Fox, Menominee, and Winnebago Indians, more or less settled people who depended on hunting, fishing, gathering, and agriculture for sustenance. French exploration began in early 1634, when Jean Nicolet came to Green Bay, and the period that followed saw the

<sup>&</sup>lt;sup>37</sup> See Kaukauna's March 24, 2017 license application, Volume 4, Section 3 at 217.

arrival of increasing numbers of European explorers, missionaries, and fur traders. Diseases such as smallpox and intertribal warfare brought nearly total destruction of the Indian cultures over the next two centuries.

The French dominated the fur trade and substantially controlled associated waterways until their defeat by the British in 1763. For the next 50 years, the British followed in the footsteps of the French in exploiting the fur trade. After the War of 1812, Americans assumed ownership of the area, operating forts at Green Bay, Portage, and Prairie du Chien. This change in political control, coupled with westward movement of the American frontier, led to accelerated settlement.

In the 1830s, a series of treaties, including the Treaty of the Cedars, opened the Fox River Valley to settlement through U.S. government territorial land offices. In 1832, the Winnebago ceded tribal lands south of what is now the Oshkosh area. Relocation to Minnesota, South Dakota, and Nebraska followed, but significant numbers of Winnebago Indians later returned to southern Wisconsin. Following cession in 1836 of lands located in the Fox River area, the Menominee Indians were granted a reservation consisting of 12 townships within what had been their traditional range in Menominee County, Wisconsin. Other recent arrivals from the east, including the Oneida, were also granted reservations in the area.

Europeans began settling towns near the present-day location of the Kaukauna Project in the early-to-mid nineteenth century. From the 1820s on, settlers from New England and other areas of the northeastern U.S. arrived in significant numbers, joining local Indian and French-speaking populations. Prevalent economic activities among early settlers from Europe and the eastern U.S. included wheat farming, flour and grist milling, logging, and sawmilling. Commercial activity was helped considerably by the availability of water-based transportation and power. Small towns soon developed into commercial centers featuring woolen mills, creameries, wood products, quarries, breweries, grain mills, and sawmills.

Following the successful completion of the Erie Canal in 1825, interest in linking the Fox and Wisconsin Rivers to the Mississippi River for commercial navigation purposes began to grow among business leaders and politicians. The system was conceived as a series of locks and dams on the Fox River, a canal to connect the Fox and Wisconsin Rivers near Portage, Wisconsin, and a series of locks and dams on the Lower Wisconsin River to provide a navigable channel. By 1860, the lock and dam system, known as the Fox-Wisconsin Improvement Project, was partially complete and steamboats could travel the entire length of the Fox-Wisconsin waterway. As part of this project, five locks and a canal were constructed to provide passage around the rapids and 50-foot elevation drop at Kaukauna.

To support canal-building activities in the 1850s, a small north side business district developed in the area that is currently occupied by the City of Kaukauna. In

1885, the village of Ledyard joined with the north side business district to form the City of Kaukauna. The development of the railroad in the area in the 1880s coincided with the creation of new water power canals to supply the business industry in the region. The overall success of the Fox-Wisconsin Improvement Project was ultimately curtailed due to competition from the expanding railroad system and the fact that the streambed of the Lower Wisconsin River is ill-suited to pass large craft. Paper became the dominant industry at this time, and it is still present in the City of Kaukauna today. Five municipal hydroelectric generating plants gave the City of Kaukauna its nickname, the "Electric City."

Intensive development in the vicinity of the Kaukauna Project first occurred in the nineteenth century as transportation routes on both land and water were improved and as hydroelectric power technology advanced. Wisconsin's first water-powered grist mill was built in the City of Kaukauna in 1816, and the first of many water-powered paper mills was established there in 1873.

With a power plant placed in operation at Appleton, Wisconsin in 1882, hydroelectric power production has had a longer history in the Lower Fox River area than anywhere else in the country. Construction on the Kaukauna project started in 1939 and incorporated the Outagamie Mill Complex from the 1890s. The first generating unit was completed in 1940, but the project did not become fully functional until 1942 because of a shortage of materials for the second generator unit due to World War II (Kaukauna, 2018).

The locks located on the Lower Fox River continued to operate until the 1980s, when all but three were shut down by the federal government. The lock system is culturally significant because it was built for passage of steamboats rather than towed vessels, and is manually operated with a system of gears and valves.

In 2004, ownership of the lock system from Lake Winnebago to Green Bay was transferred from the Corps to the Fox River Navigational System Authority, which is in the process of rehabilitating the lock system for recreational boating. However, the Rapide Croche lock located downstream of the Kaukauna Project has been sealed since 1988 to prevent the upstream passage of invasive species. The five locks that are immediately adjacent to the project are undergoing renovation, but are still closed as of the 2018 summer boating season (Fox River Navigational System Authority, 2018).

#### **Historic Properties**

Four historic properties that are eligible for or listed on the National Register are located outside of the APE, but within two miles of the Kaukauna Project. The Badger Hydroelectric Historic District and the Rapide Croche Lock and Dam Historic District are both eligible for the National Register. The Kaukauna Locks Historic District and the Little Chute Locks and Canal Historic District are both listed on the National Register. In addition to these nearby sites, the Kaukauna project itself is eligible for listing. The powerhouse and intake, (c. 1940-1942), tailrace (c. 1940), and the dam (c. 1941) are contributing structures. The facilities warrant listing for their association to the history of power development in Kaukauna, and for their architectural significance as an example of a typical hydroelectric plant constructed during the prewar period that encompasses the period between the turn of the century and World War II. The Kaukauna Utilities City Plant Hydroelectric District was created in 2016 and is comprised of the powerhouse and intake, tailrace, dam, and appurtenant project facilities.

Kaukauna also conducted a Phase I archeological survey as part of its relicensing. The survey examined two known prehistoric sites that overlap with the project boundary. The first site is a prehistoric campsite/village that has been largely destroyed by commercial and residential development in the project vicinity. On March 21, 2016, the Wisconsin SHPO concurred with Kaukauna's conclusion that no further archaeological investigations are required on this site. The second site consists of a Menominee village and cemetery. The portion of this site that is located immediately adjacent to the project boundary appears to be filled-in river bed and there is extensive industrial development upon the site. On March 21, 2016, the Wisconsin SHPO concurred with Kaukauna's conclusion that no further archaeological investigations are required on this site. The survey also found poured concrete remains (*e.g.*, foundations, pillars, bridge supports) that are likely from the L. Lindauer Pulp Mill that was constructed around 1890. The remains of the pulp mill do not contain features that are likely to qualify for the National Register.

### 3.3.5.2 Environmental Effects

### Historic Properties

The statewide Programmatic Agreement (PA) that was executed by Commission staff and the Wisconsin SHPO on December 16, 1993 (FERC, *et al.*, 1993) requires that every hydroelectric project in Wisconsin develop an HPMP to avoid, lessen, or mitigate adverse effects on both identified and unidentified historic properties within the APE.

To address any potential adverse effects on historic properties, Kaukauna proposes to implement a proposed HPMP that it filed as part of its license application. The proposed HPMP includes provisions to: (1) avoid the alteration of any National Registereligible properties; (2) use in-kind replacement materials for project facilities during maintenance; (3) consult with the Wisconsin SHPO and Commission on measures to be implemented to protect historic properties should any alterations to historic properties become necessary; (4) notify the Wisconsin SHPO of any emergency repairs; (5) treat and dispose of any human remains and grave-associated artifacts that may be inadvertently discovered at the project in a manner that is consistent with the Advisory Council on Historic Preservation's Policy Statement Regarding Treatment of Human Remains and Funerary Objects (Advisory Council on Historic Preservation, 2007); (6) develop and implement a traditional cultural properties treatment plan should any traditional cultural properties be identified; and (7) cease any ground-disturbing activities in the event that any previously unknown historic properties are discovered as a result of ground disturbance, and develop and implement actions in consultation with the Wisconsin SHPO to take into account the effects of the undertaking on the property.

### Our Analysis

Kaukauna proposes to continue operating the project as a run-of-river facility, with minimal impoundment fluctuation, and has not proposed any changes to project facilities or project operation that would disturb additional areas in the project vicinity or otherwise affect cultural resources outside of the project boundary, including the Badger Hydroelectric Historic District, the Rapide Croche Lock and Dam Historic District, the Kaukauna Locks Historic District, and the Little Chute Locks and Canal Historic District.

Without protection measures in place, continued operation and maintenance of the Kaukauna Project could have adverse effects on the Kaukauna Utilities City Plant Hydroelectric District in the event repairs are needed to maintain the structure and function of the aging dam, powerhouse and intake, or tailrace, or to fix structural damage that occurs in the course of project operation. Because the Kaukauna Utilities City Plant Hydroelectric District is eligible for listing on the National Register, and relicensing the Kaukauna Project could have an adverse effect on the dam, powerhouse, and tailrace, it would be beneficial to implement the statewide PA during any new license term.

As required by the PA, Kaukauna distributed the proposed HPMP to 24 interested parties, including the Wisconsin SHPO. In a June 15, 2016 form, the Wisconsin SHPO approved the proposed HPMP and determined that continued operation of the project would have no adverse effect on historic properties.<sup>38</sup>

The proposed HPMP filed with the license application outlines procedures and requirements necessary to protect the dam, powerhouse and intake, and tailrace from adverse effects, including effects associated with project maintenance and repairs that could otherwise diminish the integrity of the design and materials of the structures. The proposed HPMP also ensures that any previously undiscovered archaeological resources in the APE are not adversely affected by the project. Implementing the proposed HPMP

<sup>&</sup>lt;sup>38</sup> See Kaukauna's March 24, 2017 license application, Exhibit E, at Appendix E-26, Historic Properties Management Plan, Appendix D.

would ensure that continued operation and maintenance of the project would have no adverse effect on historic properties within the APE.

## 4.0 DEVELOPMENTAL ANALYSIS

In this section, we look at the project's use of the Lower Fox River for hydropower purposes to see what effects various environmental measures would have on the project's costs and power generation. Under the Commission's approach to evaluating the economics of a hydropower project, as articulated in *Mead Corp.*,<sup>39</sup> the Commission compares the current project cost to an estimate of the cost of obtaining the same amount of energy and capacity using a likely alternative source of power for the region (cost of alternative power). In keeping with Commission policy as described in *Mead Corp.*, our economic analysis is based on current electric power cost conditions and does not consider future escalation of fuel prices in valuing the hydropower project's power benefits.

For each of the licensing alternatives, our analysis includes an estimate of: (1) the cost of individual measures considered in the EA for the protection, mitigation, and enhancement of environmental resources affected by the project; (2) the cost of alternative power; (3) the total project cost (*i.e.*, operation, maintenance, and environmental measures); and (4) the difference between the cost of alternative power and total project cost is positive, the project helps to produce power for less than the cost of alternative power. If the difference between the cost of alternative power and total project cost is negative, then the project helps to produce power for more than the cost of alternative power. This estimate helps to support an informed decision concerning what is in the public interest with respect to a proposed license. However, project economics is only one of many public interest factors the Commission considers in determining whether, and under what conditions, to issue a license.

## 4.1 POWER AND ECONOMIC BENEFITS OF THE PROJECT

Table 1 summarizes the assumptions and economic information we use in our analysis for the project. This information was provided by Kaukauna in its license application or estimated by staff. We find that the values provided by Kaukauna are reasonable for the purposes of our analysis. Cost items common to all alternatives include: taxes and insurance costs, net investment, estimated future capital investment

<sup>&</sup>lt;sup>39</sup> See *Mead Corporation, Publishing Paper Division*, 72 FERC ¶ 61,027 (1995). In most cases, electricity from hydropower would displace some form of fossil-fueled generation, in which fuel cost is the largest component of the cost of electricity production.

required to maintain and extend the life of facilities, relicensing costs, normal operation and maintenance cost, and Commission fees.

Parameters	Values (2018 dollars) <sup>a</sup>	Sources
Period of analysis	30 years	Staff
Term of financing	20 years	Staff
Escalation rate	0 percent	Staff
Dependable Capacity	2.1 MW	Kaukauna
Alternative energy value	\$28.25/MWh <sup>b</sup>	Staff
Capacity Value	\$195/ kilowatt-year <sup>b</sup>	Staff
Energy and Capacity Value	\$42.04/MWh <sup>b</sup>	Staff
Payments in lieu of taxes	\$56,496	Kaukauna
Insurance and administration costs	\$46,805	Kaukauna
Interest rate	5.3 percent	Kaukauna
Discount rate	5.3 percent <sup>c</sup>	Staff
Net remaining investment	\$2,824,490 <sup>d</sup>	Kaukauna
Depreciation	\$59,959	Kaukauna
Annual operation and maintenance cost	\$250,452	Kaukauna

Table 1. Parameters for the economic analysis of the Kaukauna Project (Source: Kaukauna and Staff).

- <sup>a</sup> Values provided by Kaukauna in 2016 dollars were converted to 2018 dollars using the United States Department of Labor Consumer Price Index.
- <sup>b</sup> Source: Energy Information Administration using rates obtained from Annual Energy Outlook 2017 at <u>http://www.eia.gov/outlooks/aeo/index.cfm</u>.
- <sup>c</sup> Assumed by staff to be the same as the interest rate.
- <sup>d</sup>Based on Kaukauna's remaining undepreciated net investment and cost to develop the license application for the project.

# 4.2 COMPARISON OF ALTERNATIVES

Table 2 summarizes the installed capacity, annual generation, annual cost of alternative power, annual project cost, and difference between the cost of alternative power and project cost for each of the alternatives considered in this EA: no-action, Kaukauna's proposal, and the staff alternative.

	No Action	Kaukauna's Proposal	Staff Alternative
Installed capacity (MW)	4.8	4.8	4.8
Annual generation (MWh)	29,704	29,704	29,704
Annual cost of alternative power (\$ and \$/MWh)	1,248,756 42.04	1,248,756 42.04	1,248,756 42.04
Annual project cost (\$ and \$/MWh)	491,304 16.54	541,207ª 18.22	541,801 18.24
Difference between the cost of alternative power and project cost (\$ and \$/MWh)	757,452 25.50	707,549 23.82	706,955 23.80

Table 2. Summary of the annual cost of alternative power and annual project cost for the three alternatives for the Kaukauna Project.

<sup>a</sup> The annual project cost under Kaukauna's proposal does not include the costs of implementing measures recommended by Wisconsin DNR during temporary, planned modifications to run-of-river operation because those measures lack the specificity needed to estimate their cost.

## 4.2.1 No-Action Alternative

Under the no-action alternative, the project would continue to operate as it does now. The project would have an installed capacity of 4.8 MW, and generate an average of 29,704 MWh of electricity annually. The average annual cost of alternative power would be \$1,248,756, or about \$42.04/MWh. The average annual project cost would be \$491,304, or about \$16.54/MWh. Overall, the project would produce power at a cost of about \$25.50/MWh, which is \$757,452 less than the cost of alternative power.

# 4.2.2 Kaukauna's Proposal

Table 3 lists all environmental measures, and the estimated cost of each, considered for the Kaukauna Project. Under Kaukauna's proposal, the Kaukauna Project would have an installed capacity of 4.8 MW, and generate an average of 29,704 MWh of electricity annually. The average annual cost of alternative power would be \$1,248,756, or about \$42.04/MWh. The average annual project cost would be \$541,207, or about \$18.22/MWh. Overall, the project would produce power at a cost that is about \$23.82/MWh, which is \$707,549 less than the cost of alternative power.

# 4.2.3 Staff Alternative

The staff alternative is based on Kaukauna's proposal with staff modifications and additional measures. The staff alternative would have an installed capacity of 4.8 MW and an average annual generation of 29,704 MWh. The average annual cost of alternative power would be \$1,248,756, or about \$42.04/MWh. The average annual project cost would be \$541,801, or about \$18.24/MWh. Overall, the project would produce power at a cost that is about \$23.80/MWh, which is about \$706,955 less than the cost of alternative power.

# 4.3 COST OF ENVIRONMENTAL MEASURES

Table 3. Cost of environmental mitigation and enhancement measures considered in assessing the effects of operating the Kaukauna Project (Source: Kaukauna and Staff).

Enhancement/Mitigation Measures	Entity	Capital cost	Annual cost <sup>a</sup>	Levelized annual cost <sup>b</sup>
General				
Continue to operate the project in a run-of-river mode and maintain a target normal impoundment elevation at the crest of the overflow spillway at the dam (629.0 feet msl).	Kaukauna, Staff	\$0	\$0	\$0
Notify FERC and the Wisconsin DNR in advance of temporary, planned modifications to run-of- river operation, and consult with Wisconsin DNR to reduce project impacts on water quality.	Kaukauna, Staff	\$0	\$0	\$0
Implement any measures that are recommended by Wisconsin DNR during consultation on temporary, planned modifications to run-of- river operation.	Kaukauna	Unknown – proposal lacks specificity needed to estimate a cost.	Unknown – proposal lacks specificity needed to estimate a cost.	Unknown – proposal lacks specificity needed to estimate a cost.
Notify FERC, Wisconsin DNR, and FWS following unplanned run-of- river deviations to allow Kaukauna to track deviations and assess any unanticipated adverse impact upon aquatic resources that result from persistent deviations.	Kaukauna, Staff	\$0	\$0	\$0
Establish a minimum impoundment elevation of 628.5 feet msl (0.5 foot less than the crest elevation of the overflow spillway) to provide Kaukauna with the flexibility to respond to changing river conditions.	Kaukauna, Staff	\$0	\$0°	\$0

Enhancement/Mitigation Measures	Entity	Capital cost	Annual cost <sup>a</sup>	Levelized annual cost <sup>b</sup>
Wicubul C5		cost	cost	annuar cost
File a report with FERC and the Wisconsin DNR following any deviations from run-of-river operation or minimum headwater elevation.	Kaukauna, Staff	\$0	\$6,360	\$6,360
Develop an operation monitoring plan that identifies the monitoring locations and protocol for a headwater gage, and identifies a method for determining flows released from the powerhouse, through the spillway gates, and over the spillway.	Kaukauna	\$5,000 <sup>d</sup>	\$O <sup>d</sup>	\$340
Develop an operation monitoring plan as proposed by Kaukauna, with the following provisions: (1) monitoring run-of-river operation and impoundment elevation levels to document compliance with the operational conditions of any new license; (2) standard operating procedures to be implemented (a) outside of normal operating conditions, including during scheduled facility shutdowns, impoundment drawdowns, and impoundment refilling, and (b) during emergency conditions such as unscheduled facility shutdowns and maintenance, in order to minimize project effects on environmental resources; (3) notifying the Commission of deviations and reporting deviations to the Commission; and (4) maintaining a log of project operations.	Staff	\$5,000	\$0	\$340

Enhancement/Mitigation Measures	Entity	Capital cost	Annual cost <sup>a</sup>	Levelized annual cost <sup>b</sup>
Aquatic Resources				
Develop an impoundment drawdown plan that includes provisions for mitigating the effects of any future drawdowns of the impoundment on aquatic resources.	Kaukauna	\$5,000 <sup>d</sup>	\$0 <sup>d</sup>	\$340
Develop an impoundment drawdown plan as proposed by Kaukauna, but include the provisions of the plan in the staff- recommended operation monitoring plan, including provisions for maintaining downstream flows at near natural flow levels during any impoundment drawdown and for refilling the impoundment following the drawdown.	Staff	\$5,000	\$0	\$340
Develop a woody debris management plan that includes provisions for mitigating the effect of removing debris from the trashracks on downstream habitat.	Kaukauna	\$5,000 <sup>d</sup>	\$10,600	\$10,940
Develop a woody debris management as proposed by Kaukauna, with the following additional provisions that identify the frequency and methods for managing woody debris and trash at the project, including the frequency and methods for: (1) removing and sorting debris that collects on project structures; (2) passing organic debris downstream of the project; and (3) removing and disposing of trash.	Staff	\$5,000	\$10,600	\$10,940

Enhancement/Mitigation Measures	Entity	Capital cost	Annual cost <sup>a</sup>	Levelized annual cost <sup>b</sup>
Cooperate with Wisconsin DNR on the implementation of the Lower Green Bay Remedial Action Plan to facilitate the management of contaminated sediment in the Lower Fox River by providing reasonable access to the project area for agencies involved with the implementation of the Remedial Action Plan and temporarily modifying run-of-river operation as needed during the removal or treatment of contaminated sediments.	Kaukauna, Staff	\$0	\$1,060	\$1,060
Install erosion and siltation controls during any ground-disturbing activities within the project boundary to reduce impacts on water quality and aquatic resources.	Kaukauna, Staff	\$0	\$6,360	\$6,360
<b>Terrestrial Resources</b>				
Develop an invasive species monitoring plan that includes provisions for monitoring and mitigating the spread of invasive species.	Kaukauna	\$4,000 <sup>d</sup>	\$1,000 <sup>d</sup>	\$1,270 <sup>d</sup>
Develop an invasive species monitoring plan as proposed by Kaukauna, with additional provisions for controlling invasive species and reducing the effects of invasive species on wildlife habitat in the vicinity of the project.	Staff	\$6,000	\$1,000	\$1,400

Enhancement/Mitigation Measures	Entity	Capital cost	Annual cost <sup>a</sup>	Levelized annual cost <sup>b</sup>
Threatened and Endangered Species				
Implement measures to protect the federally threatened NLEB, including: (1) avoid tree removal at the project unless the tree poses a threat to human life or property, or removal occurs outside of the pup season (June 1 through July 31); and (2) only remove live bats from structures within the project boundary following consultation with FWS and in accordance with FWS recommendations.	Kaukauna, Staff	\$0	\$0	\$0
<b>Recreation Resources</b>				
Install boater safety exclusion cables in the forebay canal, upstream of the powerhouse intake.	Kaukauna, Staff	\$31,800	\$10,600	\$12,740
Install signage on the boater safety exclusion cables in the forebay canal to indicate the direction and approximate distance to the Elm Street access point.	Staff	\$1,000	\$100	\$170
Continue to maintain existing safety signage and warnings as required, including warnings for recreationists in the area of the project boundary.	Kaukauna, Staff	\$0	\$0 <sup>e</sup>	\$0
Construct boater refuge areas to assist kayakers with safe passage over the overflow spillway.	NPS	\$20,000 <sup>f</sup>	\$500	\$1,850
Install signs to identify NPS's recommended boater refuge areas.	NPS	\$1,000	\$100	\$170
Enhancement/Mitigation Measures	Entity	Capital cost	Annual cost <sup>a</sup>	Levelized annual cost <sup>b</sup>
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Develop north and south channel access points on an undeveloped island for boaters to exit the Lower Fox River.	NPS	\$2,000	\$500	\$630
To help ensure safe access points are available for boaters to exit the Lower Fox River before reaching the project spillway, install signs indicating the direction and approximate distance to the existing Elm Street access point that is part of the Badger-Rapide Croche Hydroelectric Project No. 2677.	Staff	\$2,000	\$300	\$430
Land Use				
Remove 25.3 acres of land and water from the existing project boundary downstream of the dam and powerhouse, including a significant section of the bypassed reach and tailrace area.	Kaukauna, Staff	\$0	\$0	\$0
Cultural Resources				
Implement a proposed HPMP that is consistent with the statewide PA to protect historic properties within the project's APE.	Kaukauna, Staff	\$0 <sup>g</sup>	\$10,600	\$10,600

<sup>a</sup> Annual costs typically include project operation and maintenance costs and any other costs that occur on a yearly basis.

- <sup>b</sup> All capital and annual costs are converted to equal annual costs over a 30-year period to give a uniform basis for comparing all costs.
- <sup>c</sup> We assume no cost for this measure based on its consistency with existing project operation in which the project operates in a run of river mode with minimal fluctuation of the impoundment water surface elevation. Establishing a minimum elevation of 628.5 feet msl clarifies how Kaukauna would minimize fluctuations of the impoundment while it continues to operate the project in a run-of-river mode.

- <sup>d</sup> Kaukauna's estimated capital and annual costs for these measures (\$100,000 total capital cost and \$41,000 total annual cost in 2016 dollars) are significantly higher than expected and do not appear to be accurate; therefore, staff revised these costs to more accurately reflect capital and annual expenses based on the costs of similar measures at other hydropower projects.
- <sup>e</sup> Kaukauna estimated that this measure would cost \$2,000 annually, in 2016 dollars. However, since Kaukauna is implementing this measure under the existing license, we assume that this cost is already included in the overall annual operation and maintenance cost for the project shown in Table 1.
- f Staff estimated that the cost of placing rip-rap in the impoundment and securing it to the river bed would cost about \$5,000 per refuge, for a total cost of \$20,000 for the four refuges proposed by NPS.
- <sup>g</sup> Kaukauna estimated that this measure would have a capital cost of \$40,000, in 2016 dollars. However, since Kaukauna developed an HPMP that it filed with its license application, we assume that this cost is already included in the license application cost, which is included the project's net remaining investment shown in Table 1.

# 5.0 CONCLUSION AND RECOMMENDATIONS

## 5.1 COMPREHENSIVE DEVELOPMENT AND RECOMMENDED ALTERNATIVE

Sections 4(e) and 10(a)(1) of the FPA require the Commission to give equal consideration to the power development purposes and to the purposes of energy conservation; the protection, mitigation of damage to, and enhancement of fish and wildlife; the protection of recreational opportunities; and the preservation of other aspects of environmental quality. Any license issued shall be such as in the Commission's judgment will be best adapted to a comprehensive plan for improving or developing a waterway or waterways for all beneficial public uses. This section contains the basis for, and a summary of, our recommendations for relicensing the project. We weigh the costs and benefits of our recommended alternative against other proposed measures.

Based on our independent review of agency and public comments filed on the project and our review of the environmental and economic effects of the proposed project and project alternatives, we selected the staff alternative as the preferred alternative. We recommend this alternative because: (1) issuing a major license for the project would allow Kaukauna to continue to operate its project as a dependable source of electrical energy; (2) the 4.8 MW of electric capacity comes from a renewable resource that does not contribute to atmospheric pollution; (3) the public benefits of the staff alternative would exceed those of the no-action alternative; and (4) the proposed and recommended measures would protect and enhance fish and wildlife resources and improve public recreation opportunities at the project.

In the following section, we make recommendations as to which environmental measures proposed by Kaukauna or recommended by agencies or other entities should be included in any license issued for the project. In addition to Kaukauna's proposed environmental measures listed below, we recommend additional staff-recommended environmental measures to be included in any license issued for the project.

# 5.1.1 Measures Proposed by Kaukauna

Based on our environmental analysis of Kaukauna's proposal in section 3.0, *Environmental Analysis*, and the costs presented in section 4.0, *Developmental Analysis*, we conclude that the following environmental measures proposed by Kaukauna would protect or enhance environmental resources and would be worth the cost. Therefore, we recommend including these measures in any license issued for the project.

To protect or enhance aquatic habitat, fish and wildlife habitat, recreation, and cultural resources at the project, Kaukauna proposes to:

- Continue to operate the project in a run-of-river mode and maintain a target normal impoundment elevation at the crest of the overflow spillway at the dam (629.0 feet msl) to protect fish and wildlife resources;
- Notify FERC and the Wisconsin DNR in advance of temporary, planned modifications to run-of-river operation, and consult with Wisconsin DNR to reduce project impacts on water quality;
- Notify FERC, Wisconsin DNR, and FWS following unplanned run-of-river deviations to allow Kaukauna to track deviations and assess any unanticipated adverse impact upon aquatic resources that result from persistent deviations;
- Establish a minimum impoundment elevation of 628.5 feet msl (0.5 foot less than the overflow spillway crest elevation) to provide Kaukauna with the flexibility to respond to changing river conditions;
- File a report with FERC and the Wisconsin DNR following any deviations from run-of-river operation or minimum headwater elevation, including: (1) an identification of the cause, severity, and duration of the incident and any observed or reported adverse environmental impacts resulting from the incident; (2) operation data necessary to determine compliance with license requirements; (3) a description of any corrective measures implemented at the time of occurrence and measures to ensure that similar incidents do not recur; and (4) comments or correspondence received from the Wisconsin DNR regarding the incident;
- Develop an impoundment drawdown plan that includes provisions for mitigating the effects of any future drawdowns of the impoundment on aquatic resources;

- Develop a woody debris management plan that includes provisions for mitigating the effect of removing debris from the trashracks on downstream habitat;
- Cooperate with Wisconsin DNR on the implementation of the Lower Green Bay Remedial Action Plan to facilitate the management of contaminated sediment in the Lower Fox River by providing reasonable access to the project area for agencies involved with the implementation of the Remedial Action Plan and temporarily modifying run-of-river operation as needed during the removal or treatment of contaminated sediments;
- Develop an operation monitoring plan that identifies the monitoring locations and protocol for a headwater gage, and identifies a method for determining flows released from the powerhouse, through the spillway gates, and over the spillway;
- Install erosion and siltation controls during any ground disturbing activities within the project boundary to reduce impacts on water quality and aquatic resources;
- Develop an invasive species monitoring plan that includes provisions for monitoring and mitigating the spread of invasive species;
- Implement measures to protect the federally threatened northern long-eared bat, including: (1) avoid tree removal at the project unless the tree poses a threat to human life or property, or removal occurs outside of the pup season (June 1 through July 31); and (2) only remove live bats from structures within the project boundary following consultation with FWS and in accordance with FWS recommendations;
- Install boater safety exclusion cables in the forebay canal, upstream of the powerhouse intake;
- Continue to maintain existing safety signage and warnings as required, including warnings for recreationists in the area of the project boundary;
- Remove 25.3 acres of land and water from the existing project boundary downstream of the dam and powerhouse, including a significant section of the bypassed reach and tailrace area; and
- Implement a proposed HPMP that is consistent with the statewide PA to protect historic properties within the project's APE.

## 5.1.2 Additional Measures Recommended by Staff

In addition to Kaukauna's proposed measures listed above, we recommend including the following measures in any license that may be issued for the Kaukauna Project:

- Develop an operation monitoring plan as proposed by Kaukauna, with the following additional provisions: (1) monitoring run-of-river operation and impoundment elevation levels to document compliance with the operational conditions of any new license; (2) standard operating procedures to be implemented (a) outside of normal operating conditions, including during scheduled facility shutdowns, impoundment drawdowns, and impoundment refilling, and (b) during emergency conditions such as unscheduled facility shutdowns and maintenance, in order to minimize project effects on environmental resources; (3) notifying the Commission of deviations and reporting deviations to the Commission; and (4) maintaining a log of project operations;
- Develop an impoundment drawdown plan as proposed by Kaukauna, but include the provisions of the plan in the staff-recommended operation monitoring plan, and include provisions for maintaining downstream flows at near natural flow levels during any impoundment drawdown and for refilling the impoundment following the drawdown;
- Develop a woody debris management plan as proposed by Kaukauna, with additional provisions that identify the frequency and methods for managing woody debris and trash at the project, including the frequency and methods for: (1) removing and sorting debris that collects on project structures; (2) passing organic debris downstream of the project; and (3) removing and disposing of trash;
- Develop an invasive species monitoring plan as proposed by Kaukauna, with the following additional provisions for controlling invasive species and reducing the effects of invasive species on wildlife habitat in the vicinity of the project: (1) identifying target invasive species; (2) defining the treatment area(s) in the vicinity of the project; (3) describing the techniques to be used to control invasive species; (4) monitoring treatment area(s) for invasive species on an annual basis for three consecutive years following invasive species treatment; and (5) filing a report with the Commission following the monitoring period, including an analysis of whether additional invasive species control is necessary;
- To help ensure safe access points are available for boaters to exit the Lower Fox River before reaching the project spillway, install signs indicating the direction and approximate distance to the existing Elm Street access point that is part of the Badger-Rapide Croche Hydroelectric Project No. 2677; and

• Install signage on the boater safety exclusion cables in the forebay canal to indicate the direction and approximate distance to the Elm Street access point.

Below, we discuss the basis for our additional staff-recommended measures.

## Project Operation

Kaukauna proposes to continue operating the project in a run-of-river mode (i.e., with outflow from the project approximately equal to inflow to the impoundment) and proposes to maintain a target normal impoundment elevation at the crest of the overflow spillway at the dam (629.0 feet msl). Kaukauna also proposes to implement a minimum impoundment elevation of 628.5 feet msl, which corresponds to an elevation that is 0.5 foot less than the crest of the overflow spillway. Continuing to operate the project in run-of-river mode would limit impoundment fluctuations associated with project operation, and would continue to result in minimal to no adverse project effects on the flow regime of the Lower Fox River downstream of the tailrace. Separately, establishing a minimum impoundment elevation of 628.5 feet msl would help ensure that the impoundment elevation in the full impoundment elevation while operating the project in instantaneous run-of-river mode. Accordingly, staff recommends that Kaukauna continue operating the project in a run-of-river mode, and implement a minimum impoundment elevation of 628.5 feet msl.

Below, we discuss Kaukauna's proposals to monitor compliance with run-of-river operation, including its proposal to develop an operation monitoring plan and an impoundment drawdown plan, and to establish procedures for reporting deviations from run-of-river operation.

## Compliance with Run-of-River Operation

Kaukauna states that run-of-river operation could be temporarily modified as necessary to facilitate the removal or treatment of contaminated sediments in the Lower Fox River as part of the Remedial Action Plan. In addition, Kaukauna states it will be necessary to occasionally draw down the impoundment to repair the dam during the term of any new license issued for the project.

## **Operation Monitoring**

Kaukauna proposes to develop an operation monitoring plan that "identifies the monitoring locations and protocol for a headwater gage and a method to determine flows released from the powerhouse, through the gates and over the ogee spillway."

Kaukauna's proposal to develop an operation monitoring plan would help ensure that Kaukauna is accurately monitoring project inflow and outflow.<sup>40</sup> However, the plan does not include specific provisions, or explain how Kaukauna would use the flow data that it collects, including whether Kaukauna would use the data to document its compliance with the operational provisions of any new license. To help ensure that the project is operated in a run-of-river mode and that outflow from the impoundment approximates inflow to the impoundment, staff recommends modifying the operation monitoring plan to include: (1) a provision for monitoring the impoundment elevation level, rather than monitoring inflows and outflows, to document compliance with run-ofriver operation; (2) standard operating procedures to be implemented (a) outside of normal operating conditions, including during scheduled facility shutdowns, impoundment drawdowns, and impoundment refilling, and (b) during emergency conditions such as unscheduled facility shutdowns and maintenance, in order to minimize project effects on environmental resources; (3) notifying the Commission of deviations and reporting deviations to the Commission; and (4) maintaining a log of project operations. We conclude that the benefits of the staff-recommended operation monitoring plan would be worth the estimated levelized annual cost of \$340.

### Impoundment Drawdowns

Kaukauna proposes to develop an impoundment drawdown plan in consultation with Wisconsin DNR and FWS to mitigate the potential impacts of any drawdowns on aquatic resources. However, Kaukauna does not provide specific provisions to be included in the plan. Staff recommends modifying the proposed impoundment drawdown plan to include provisions for maintaining downstream flows at near natural flow levels during any impoundment drawdown and for refilling the impoundment following the drawdown.

Drawing down the impoundment could adversely affect aquatic and semi-aquatic resources in the impoundment. Littoral zone habitats could be dewatered, and as a consequence some fish spawning and nursery sites could be dewatered, fish eggs could be desiccated and made more vulnerable to predation. Habitat available for benthic macroinvertebrates and other organisms occupying shallow near-shore areas may be adversely affected during an impoundment drawdown. A drawdown plan would allow Kaukauna to schedule drawdowns for maintenance and repairs at times that would be least disruptive to aquatic resources. In addition, minimizing the time that the

<sup>&</sup>lt;sup>40</sup> With regard to Kaukauna's proposal to identify the monitoring locations of a headwater gage, the Commission's standard terms and conditions for a hydropower license require the licensee to maintain gages and stream-gaging stations for the purpose of determining the stage and flow of the stream on which the project is located, the amount of water held in and withdrawn from the project, and the effective head on the turbines.

impoundment is drawn down and the time that downstream flows are reduced would help maintain aquatic habitat in the impoundment and in the river downstream of the project. Further, impoundment refill procedures would help ensure that aquatic habitat would quickly be returned to normal conditions with minimal impacts to aquatic resources. Accordingly, staff recommends developing standard operating procedures for impoundment drawdowns, to be implemented during the term of any new license issued for the project.

We conclude that the benefits of the staff-recommended operating procedures for impoundment drawdowns would be worth the estimated levelized annual cost of \$340. For administrative efficiency, staff recommends including these operating procedures in the staff-recommended operation monitoring plan described above, instead of including these provisions in a separate impoundment drawdown plan.

## **Deviation from Normal Operating Conditions**

Kaukauna proposes to notify FERC and the Wisconsin DNR in advance of temporary, planned modifications to normal project operation, and to consult with Wisconsin DNR on the planned modifications to reduce project impacts on water quality. Kaukauna also proposes to implement any measures recommended by Wisconsin DNR during a temporary, planned modification to run-of-river operation to reduce project impacts on water quality. Kaukauna also states that it will notify FERC, Wisconsin DNR, and FWS following unplanned run-of-river deviations to allow Kaukauna to track deviations and assess any unanticipated adverse impact upon aquatic resources that result from persistent deviations. Kaukauna proposes to file a report with FERC and the Wisconsin DNR following any deviations from run-of-river operation or minimum headwater elevation, including: (1) an identification of the cause, severity, and duration of the incident and any observed or reported adverse environmental impacts resulting from the incident; (2) operation data necessary to determine compliance with license requirements; (3) a description of any corrective measures implemented at the time of occurrence and measures to ensure that similar incidents do not recur; and (4) comments or correspondence received from the Wisconsin DNR regarding the incident.

Kaukauna's proposal to notify FERC and the resources agencies of temporary, planned modifications from normal project operation, and to file a report with FERC and the Wisconsin DNR following any deviations from run-of-river operation, would help ensure that Kaukauna identifies the reason for the deviation, the duration and magnitude of the deviation, and any environmental effects of the deviation, and would ensure that Kaukauna provides documentation of consultation with Wisconsin DNR to the Commission.<sup>41</sup> We conclude that the benefits of the notification and reporting

<sup>&</sup>lt;sup>41</sup> The Commission's standard terms and conditions for a hydropower license provide that licensees can modify project operation when needed during an emergency,

procedures for deviations would be worth the estimated levelized annual cost of \$6,360. For administrative efficiency, staff recommends including the provisions for notifying and reporting planned and unplanned deviations in the staff-recommended operation monitoring plan discussed above.

We do not recommend Kaukauna's proposal to implement any measures that could be recommended by Wisconsin DNR during a temporary, planned modification to run-of-river operation. The staff-recommended operation monitoring plan would include standard operating procedures that would be implemented during scheduled facility shutdowns, impoundment drawdowns, and impoundment refilling. In addition, the Commission's standard terms and conditions for a hydropower license provide that licensees can make minor modifications to project operation if such changes do not result in a decrease in efficiency of the project, a material increase in project cost, an adverse environmental impact, or the impairment of the general scheme of development. To the extent additional measures need to be implemented during a planned modification to normal project operation, Kaukauna would need to file the measures with the Commission for approval prior to the occurrence of the planned deviation.

### Woody Debris Management

Kaukauna proposes to develop a woody debris management plan in consultation with Wisconsin DNR and FWS. Kaukauna does not outline specific provisions to be included in the plan, but states that the plan would address the process and procedures for the proper disposal of woody debris collected at the project's facilities in a manner that allows for adequate project operation and protects aquatic resources in the Lower Fox River downstream of the project.

Woody debris that accumulates on the face of the project's 88-foot-wide trashrack could reduce the effectiveness of the trashracks at protecting fish. Fish may become entangled in the debris or the approach velocity at the trashracks could increase as intake water is constricted to a smaller area, which could result in a greater amount of fish impingement or entrainment, respectively. In addition, debris that accumulates along the 3,842-foot-long dam could present a safety hazard for whitewater boaters that are using the impoundment. To maintain the effectiveness of the proposed trashracks, the licensee would need to remove accumulated debris from the face of the trashrack.

Proper disposal of debris that is removed from the project intake area is important because organic debris sustains lower order trophic organisms, such as benthic macroinvertebrates, which in turn influences the productivity of higher order organisms,

including the protection of navigation, life, health, or property, without prior approval from the Commission. However, any such modifications are subject to alteration as the Commission may direct.

such as fish. Organic debris also provides habitat for macroinvertebrates and fish. Therefore, while removal of river-borne trash from the stream would be beneficial for project operations, it may be more appropriate to return organic debris to the river by passing it downstream of the dam. Passing large woody debris would provide habitat structures downstream of the dam and enhance the carrying capacity of the Lower Fox River for macroinvertebrates and fish by providing cover and velocity shelters.

A woody debris management plan could be used to minimize project effects on aquatic organisms and recreation use, and ensure that desirable organic material is reintroduced to the river downstream of the dam, by including provisions that identify the frequency and methods for managing woody debris and trash at the project, including provisions for: (1) removing and sorting debris that collects on project structures; (2) passing organic debris downstream of the project; and (3) removing and disposing of trash. Staff concludes that benefits of a woody debris management plan would be worth the estimated levelized annual cost of \$10,940.

### **Invasive Species Mitigation**

Invasive plant species are widespread and established at the project, and have outcompeted native plants in the wetland and upland areas in the project vicinity. Kaukauna proposes to mitigate the spread of invasive species by developing an invasive species monitoring plan in consultation with Wisconsin DNR and FWS. Kaukauna does not outline specific provisions to be included in the plan, but states that the plan would be developed to coordinate any future monitoring at the project with the current monitoring requirements at the Badger-Rapide Croche Hydroelectric Project No. 2677.

Invasive exotic wetland plants thrive in disturbed habitats, and can degrade wildlife habitat by outcompeting native forbs, grasses, and aquatic macrophytes, and providing a lower quality food value than native plants. Continued operation of the project in a run-of-river mode would limit the extent of disturbances in the impoundment and downstream reach by minimizing water level fluctuations associated with project operation. However, natural fluctuations in the river elevation and fluctuations associated with the upstream Badger Development of the Badger-Rapide Croche Hydroelectric Project No. 2677<sup>42</sup> would continue to occur at the project impoundment, bypassed reach, and downstream reach, depending on flow conditions. Shallow water areas would also occur along the margins of the impoundment and around the islands in the Conservancy Zone, which would provide favorable conditions for invasive plant

<sup>&</sup>lt;sup>42</sup> The upstream Badger Development operates in a run-of-river mode by maintaining impoundment levels within a 1.5-foot operating band. *See City of Kaukauna, Wisconsin,* 135 FERC ¶ 62,149 (2011).

species. Recreation activities at the project, including boating and fishing, could also contribute to the spread of invasive species through seed transport and soil compaction.

Kaukauna's proposal for an invasive species monitoring plan does not contain any details on that plan except that it would be developed in consultation with agencies and the invasive species monitoring and control plan for the Badger-Rapide Croche Hydroelectric Project No. 2677. Although Kaukauna states that the plan would be developed to "mitigate the spread of invasive species," Kaukauna is not proposing any specific actions that would mitigate the spread of invasive species. As the project area is already dominated by invasive species, solely monitoring for invasive species would not reduce the impact of non-native invasive species on the local terrestrial habitat.

To mitigate the spread of invasive species and reduce the potential for new invasive species to become established on project land, the invasive species monitoring plan could be modified to include provisions for: (1) identifying target species; (2) defining the treatment area(s) in the vicinity of the project; (3) describing the techniques to be used to control invasive species, including the frequency of treatments; (4) monitoring treatment areas to evaluate the success of invasive species control efforts; and (5) filing a report with the Commission following the monitoring period, including an analysis of whether additional invasive species control is necessary. Coordination with other invasive species plans in the project vicinity, including the invasive species monitoring and control plan for the Badger-Rapide Croche Hydroelectric Project No. 2677 and the invasive species management plan for the Conservancy Zone, would control invasive species over a larger area and thereby reduce chances for recolonization from adjoining management units. Development and implementation of such a plan would help to protect native plant communities and maintain habitat quality for fish and wildlife through the period of any new license that may be issued for the project. We conclude that the benefits of the invasive species monitoring plan would be worth the estimated levelized annual cost of \$1,400.

#### Recreation Use

There are no formal recreation facilities at the project, but recreation use occurs within the project boundary and in the Conservancy Zone immediately downstream of the dam. Whitewater boating occurs at the project during scheduled releases and other times when there are high flows. A 1.5-mile whitewater stretch passes from the bypassed reach of the upstream Badger Development to the project impoundment, and then over the overflow spillway at the south-end of the project dam to the Conservancy Zone. Passing over the project's overflow spillway requires first-hand knowledge of the area and a level of experience that enables the boater to navigate potentially hazardous circumstances, including being trapped by debris at the spillway, getting stuck on the spillway during low flows, overturning the boat while passing over the spillway to the downstream reach, and striking bedrock and debris at the base of the spillway and in the Conservancy Zone. Any injury resulting from passage over the spillway could be exacerbated by difficult

rescue operations associated with strong currents and island terrain in the Conservancy Zone.

To improve the safety of the project for boaters, Kaukauna is proposing to install boater safety exclusion cables in the forebay canal, upstream of the powerhouse intake. Kaukauna states that it will continue to maintain existing safety signage and warnings as required, including warnings for recreation users in the project boundary.

Kaukauna's proposal to install boater exclusion cables would increase safety for boaters in project water by providing a barrier to the forebay canal and the powerhouse intake. Due to the safety hazards associated with whitewater boating at the project, we recommend installing signs on the cables. Signage on the boater exclusion cables would inform boaters of the danger of the powerhouse intakes and direct them to a safe exit at the existing Elm Street access site. We conclude that safety signs on the exclusion cables would be worth the estimated levelized annual cost of \$170.

Due to the safety hazards associated with whitewater boating at the project, we also recommend installing signs at the following locations to direct boaters to the existing Elm Street access site and away from the spillway: (1) on the shoreline of the south channel; (2) on the shoreline of the north channel; (3) on a buoy located in the impoundment at the end of the north channel; and (4) on a buoy located immediately downstream of the Elm Street access point. We conclude that installing these signs would be worth the levelized annual cost of \$430.

## 5.1.3 Measures Not Recommended

Some of the measures recommended by the NPS would not contribute to the best comprehensive use of Lower Fox River water resources, do not exhibit sufficient nexus to the project environmental effects, or would not result in benefits to non-power resources that would be worth their cost. The following discussion includes the basis for staff's conclusion not to recommend such measures.

## Whitewater Recreation Improvements

NPS states that the Lower Fox River in the project vicinity is a regionally significant whitewater recreation run, and that kayakers regularly paddle over the project overflow spillway to the Conservancy Zone. NPS recommends that Kaukauna provide kayakers with safe passage over the project overflow spillway. Specifically, NPS recommends that Kaukauna construct four boater refuges to provide rest areas and access over the ogee wall. NPS also recommends that Kaukauna improve two informal access areas (referred to as the North and South Channel Exits) to provide kayakers with additional exit areas from the Lower Fox River upstream of the spillway. In addition, NPS recommends the placement of signs on the boater refuge areas and the boater exclusion cables to guide paddlers to the refuges.

Providing passage routes over the project overflow spillway and constructing boater refuge areas at the overflow spillway could create safety concerns and have adverse effects on environmental resources in the Conservancy Zone. Although Kaukauna does not prohibit whitewater boaters from passing over the overflow spillway, it also does not condone passage at the overflow spillway and has expressed safety concerns related to overflow spillway passage. There are numerous potential hazards associated with overflow spillway passage, as discussed above. Additional boater access to the Conservancy Zone could also have an adverse effect on wildlife in the area, including bald eagle nesting and foraging, depending on the level of future recreation use. Finally, as discussed below, the Elm Street access site can be used as a boater refuge area for boaters that are using the bypassed reach of the Badger Development, the north and south channels, and the project impoundment. Therefore, there is no basis for recommending a license condition requiring Kaukauna to provide kayakers with safe passage over the project overflow spillway or to construct four boater refuges to provide rest areas.

Although NPS's recommendation to develop additional access points at the North and South Channel Exits could provide additional safe exits from the whitewater reach, there is no evidence that these additional exits are needed. A safe exit from the Lower Fox River is already available on the shoreline of the project impoundment. Pursuant to its license for the Badger-Rapide Croche Hydroelectric Project No. 2677, Kaukauna provides access to the project impoundment via the Elm Street access site. The Elm Street access site provides a suitable place for boaters to exit the Lower Fox River before reaching the spillway. In contrast, the North and South Channel Exits are located on an undeveloped island that is part of the Conservancy Zone. Ensuring safe access to Elm Street from the North and South Channel Exits would require the construction of trails through upland and wetland habitat on the undeveloped island, which would degrade the value of the Conservancy Zone for wildlife relative to existing conditions. The Elm Street access site, which is located directly across from the South Channel Exit, already provides an accessible exit path to Elm Street and would not require further improvement to provide a safe exit. Based on the availability of the Elm Street access site as a safe exit area for boaters, we have no basis for recommending the development of additional access points at the North and South Channel Exits.

### 5.1.4 Conclusion

Based on our review of the agency and public comments filed on the project and our independent analysis pursuant to sections 4(e), 10(a)(1), and 10(a)(2) of the FPA, we conclude that licensing the Kaukauna Project, as proposed by Kaukauna with the additional staff-recommended measures, would be best adapted to a plan for improving the Lower Fox River Basin.

## 5.2 UNAVOIDABLE ADVERSE IMPACTS

Future ground-disturbing activities at the Kaukauna project could result in minor, short-term erosion and sedimentation, but such activities would be minimized by implementation of control measures consistent with the standard terms and conditions of any new hydropower license issued for the project. Other unavoidable adverse effects would include some entrainment mortality that would result with continued operation of the Kaukauna Project. However, there is no indication that any losses due to entrainment have had significant effect on fishery resources within the project area.

# 5.3 SUMMARY OF SECTION 10(J) RECOMMENDATIONS

Under the provisions of section 10(j) of the FPA, each hydroelectric license issued by the Commission shall include conditions based on recommendations provided by federal and state fish and wildlife agencies for the protection, mitigation, or enhancement of fish and wildlife resources affected by the project.

Section 10(j) of the FPA states that whenever the Commission finds that any fish and wildlife agency recommendation is inconsistent with the purposes and the requirements of the FPA or other applicable law, the Commission and the agency shall attempt to resolve any such inconsistency, giving due weight to the recommendations, expertise, and statutory responsibilities of the agency.

In response to our November 21, 2017, notice accepting the application to relicense the project and soliciting motions to intervene, protests, comments, recommendations, preliminary terms and conditions, and preliminary fishway prescriptions, neither Wisconsin DNR nor Interior filed section 10(j) recommendations.

## 5.4 CONSISTENCY WITH COMPREHENSIVE PLANS

Section 10(a)(2)(A) of the FPA, 16 U.S.C., § 803(a)(2)(A), requires the Commission to consider the extent to which a project is consistent with federal or state comprehensive plans for improving, developing, or conserving a waterway or waterways affected by the project. We reviewed the following 9 comprehensive plans that are applicable to the Kaukauna Project. No inconsistencies were found.

- National Park Service. The Nationwide Rivers Inventory. U.S. Department of the Interior, Washington, D.C. 1993.
- U.S. Fish and Wildlife Service. Canadian Wildlife Service. 1986. North American Waterfowl Management Plan. Department of the Interior. Environment Canada. May 1986.
- U.S. Fish and Wildlife Service. n.d. Fisheries USA: The Recreational Fisheries Policy of the U.S. Fish and Wildlife Service. Washington, D.C.
- U.S. Fish and Wildlife Service. 1993. Upper Mississippi River & Great Lakes Region Joint Venture Implementation Plan: A component of the North American Waterfowl Management Plan. March 1993.
- Wisconsin Department of Natural Resources. 1988. Lower Green Bay Remedial Action Plan for the Lower Fox River and Lower Green Bay Area of Concern. Madison, Wisconsin. February 1988.
- Wisconsin Department of Natural Resources. 1991. Wisconsin water quality management program: Lower Fox River Basin water quality management plan. Madison, Wisconsin. October 1991.
- Wisconsin Department of Natural Resources. 1992. Wisconsin water quality assessment report to Congress. Madison, Wisconsin. April 1992.
- Wisconsin Department of Natural Resources. 1995. Wisconsin's Biodiversity as a Management Issue. Madison, Wisconsin. May 1995.
- Wisconsin Department of Natural Resources. Wisconsin Statewide Comprehensive Outdoor Recreation Plan (SCORP): 1991-1996. Madison, Wisconsin. October 1991.

## 6.0 FINDING OF NO SIGNIFICANT IMPACT

If the Kaukauna Project is issued a new license as proposed with the additional staff-recommended measures, the project would continue to operate while providing enhancements to aquatic and terrestrial resources, improvements to recreation facilities, and protection of cultural and historic resources in the project area.

Based on our independent analysis, we find that the issuance of a license for the Kaukauna Project, with additional staff-recommended environmental measures, would not constitute a major federal action significantly affecting the quality of the human environment.

## 7.0 LITERATURE CITED

1000 Islands Environmental Center.

http://www.1000islandsenvironmentalcenter.org/about.html. Accessed June 18, 2018.

- Advisory Council on Historic Preservation. (2007). Policy Statement Regarding Treatment of Burial Sites, Human Remains, and Funerary Objects. <u>http://www.achp.gov/docs/hrpolicy0207.pdf</u>. Accessed July 11, 2018.
- American Whitewater. National River Database, Wisconsin. <u>https://www.americanwhitewater.org/content/River/detail/id/3685/</u>. Accessed June 18, 2018.
- Bell, M. 1991. Fisheries handbook of engineering requirements and biological criteria. U.S. Army Corps of Engineers Fish Passage Development and Evaluation Program, North Pacific Division. Portland, OR.
- Electric Power Research Institute (EPRI). 1997. Turbine entrainment and survival database field tests. Prepared by Alden Research Laboratory, Inc., Holden, Massachusetts. EPRI Report No. TR-108630. October 1997.
- Federal Energy Regulatory Commission (FERC). 1995. Preliminary assessment of fish entrainment at hydropower projects, a report on studies and protective measures, volumes 1 and 2 (appendices). FERC Office of Hydropower Licensing, Washington, D.C. Paper No. DPR-10. June 1995 (volume 1) and December 1994 (volume 2).
- Federal Energy Regulatory Commission. 2010. Environmental Assessment for New Hydropower License: Badger-Rapide Croche Hydroelectric Project No. 2677-019. FERC Office of Energy Projects, Washington, D.C.
- Federal Energy Regulatory Commission, Advisory Council on Historic Preservation, Wisconsin State Historic Preservation Officer, and Michigan State Historic Preservation Officer. 1993. Programmatic agreement among the Federal Energy Regulatory Commission, the Advisory Council on Historic Preservation, the Wisconsin State Historic Preservation Officer, and the Michigan State Historic Preservation Officer for managing historic properties that may be affected by new and amended licenses issuing for the continued operation of existing hydroelectric projects in the State of Wisconsin and the adjacent portions of the State of Michigan. December 30, 1993.
- Fox River Heritage Parkway, 2018. Fox Locks. <u>http://www.heritageparkway.org/</u>. Accessed July 6, 2018.

- Fox River Navigational System Authority. 2018. Fox Locks. <u>http://www.foxlocks.org/</u>. Accessed July 6, 2018.
- City of Kaukauna, Wisconsin (Kaukauna). 2007. Badger-Rapide Croche Hydroelectric Project (FERC No. 2677) Final License Application.
- \_\_\_\_\_. 2008. Response to FERC request for additional information. Badger-Rapide Croche Hydroelectric Project, FERC No. 2677. Filed April 4, 2008.
- \_\_\_\_\_. 2017. Kaukauna Hydro Project No. 1510 Final License Application.
- \_\_\_\_\_. 2018. Kaukauna City Dam. <u>https://www.kaukaunautilities.com/about/power-supply/kaukauna-city-dam/</u>. Accessed July 6, 2018.
- Murray, D.E. 1974. A review of literature dealing with the swimming speeds of fishes of the Lake Erie vicinity. The Ohio State University Center for Lake Erie Area Research, Columbus, Ohio. Available at: <u>http://www.ohioseagrant.osu.edu/\_documents/publications/CTR/CTR-157.pdf</u>. Accessed July 4, 2018.
- North American Electric Reliability Corporation (NERC). December 13, 2017. 2017 Long-Term Reliability Assessment; April 2018.
- Outagamie County. 2008. Comprehensive Plan. <u>http://www.outagamie.org/government/departments-a-e/development-and-land-services/comprehensive-plan</u>. Accessed July 5, 2018.
- U.S. Fish and Wildlife Service (FWS). 2015. Northern Long-Eared Bat. [Online] URL: http:// https://www.fws.gov/midwest/endangered/mammals/nleb/nlebFactSheet.html . (Accessed June 14, 2018).
- . 2016a. Endangered and Threatened Wildlife and Plants; 4(d) Rule for the Northern Long-Eared Bat. 81 Fed. Reg. 9, 1900-1922 (January 14, 2016).
- . 2016b. Endangered and Threatened Wildlife and Plants; Determination that designation of critical habitat is not prudent for the Northern Long-Eared Bat. 81 Fed. Reg. 81, 24707-24714 (April 27, 2016).
- \_\_\_\_\_. 2016c. Programmatic biological opinion on final 4(d) rule for the northern longeared bat and activities excepted from take prohibitions. U.S. Fish and Wildlife Service, Midwest Regional Office.

- \_\_\_\_\_. 2017b. Northern Long-Eared Bat Final 4(d) Rule, White-Nose Syndrome Zone around WNS/Pd Positive Counties/Districts. Created July 2, 2018. Available at <u>http://www.fws.gov/Midwest/endangered/mammals/nleb/pdf/WNSZone.pdf</u>. Accessed March 14, 2018.
- \_\_\_\_\_. 2018. National Wetlands Inventory. Available at <u>https://www.fws.gov/wetlands/data/mapper.html</u>. Accessed June 14, 2018.
- Wisconsin Department of Natural Resources (Wisconsin DNR). 2000. Wisconsin's Lake Sturgeon Management Program. <u>https://dnr.wi.gov/topic/fishing/documents/sturgeon/lsturmplan\_eversion.pdf</u>. Accessed July 31, 2018.
- 2012a. Total Maximum Daily Load and Watershed Management Plan for Total Phosphorous and Total Suspended Solids in the Lower Fox River Basin and Lower Green Bay.
  <u>https://dnr.wi.gov/topic/TMDLs/documents/lowerfox/LowerFoxRiverTMDLRepo</u> rt2012.pdf. Accessed May, 9, 2018.
- \_\_\_\_\_. 2012b. Wisconsin State Comprehensive Outdoor Recreation Plan (SCORP): 2011- 2016. Madison, Wisconsin. Available at <u>https://dnr.wi.gov/topic/parks/planning/scorp/pdfs/WI\_SCORP\_2011\_16.pdf</u>. Accessed May 29, 2018.
- . 2016. Northern Long-eared Bat: Counties with documented hibernacula and maternity roosts as of March 14, 2016. Available at <a href="https://dnr.wi.gov/topic/EndangeredResources/documents/NLEBMap.pdf">https://dnr.wi.gov/topic/EndangeredResources/documents/NLEBMap.pdf</a>. Accessed June 19, 2018.
- \_\_\_\_\_. 2018. Wisconsin Water Quality Report to Congress. Available at <u>http://dnr.wi.gov/water/wsSWIMSDocument.ashx?documentSeqNo=158866891</u>. Accessed July 31, 2018.
  - \_\_\_. Watersheds; Lower Fox River basin. https://dnr.wi.gov/topic/Watersheds/basins/lowerfox/. Accessed May, 2, 2018.
- Wisconsin DNR and EPA (U.S. Environmental Protection Agency). 2002. Record of decision, Operable Unit 1 and Operable Unit 2, Lower Fox River and Green Bay, Wisconsin. December 2002.

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