
ML19031B926

Final Environmental Assessment
for the License Termination Plan for
La Crosse Boiling Water Reactor in
Vernon County, Wisconsin

LaCrosse*Solutions*, LLC.
Docket No. 50-409
License No. DPR-45

Completed: May 2019



Division of Fuel Cycle Safety, Safeguards, and Environmental Reviews
Office of Nuclear Material Safety & Safeguards
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

This page deliberately left blank.

CONTENTS

ABBREVIATIONS AND ACRONYMS	v
1.0 INTRODUCTION	1
1.1 Proposed Action	3
1.2 Purpose of and Need for the Proposed Action	3
1.3 Alternative to the Proposed Action	4
1.4 Scope of the Environmental Analysis	4
2.0 DECOMMISSIONING AND LICENSE TERMINATION	6
2.1 Brief History of the LACBWR License	6
2.2 Decommissioning and License Termination Activities	8
3.0 AFFECTED ENVIRONMENT	10
3.1 Site Description and Land Use	10
3.2 Geology and Soils	14
3.3 Water Resources	14
3.4 Meteorology and Air Quality	17
3.5 Ecological Resources	19
3.6 Protected Species and Habitats	21
3.7 Public and Occupational Health	27
3.8 Socioeconomics	29
3.9 Environmental Justice	30
3.10 Historic and Cultural Resources	31
3.11 Aesthetics	34
3.12 Noise	34
3.13 Waste Management	35
3.14 Transportation and Traffic	37
4.0 ENVIRONMENTAL IMPACTS	39
4.1 Water Resources	40
4.2 Greenhouse Gases and Climate Change	42
4.3 Protected Species and Habitat Impacts	43
4.4 Environmental Justice	49
4.5 Nonradioactive Waste Management	49
5.0 CUMULATIVE IMPACTS	50
6.0 AGENCIES CONSULTED AND COMMENTS RECEIVED	51
6.1 Wisconsin State Review	51
6.2 National Historic Preservation Act Section 106 Consultation	51
6.3 Endangered Species Act Section 7 Consultation	52
7.0 CONCLUSION	54
8.0 LIST OF PREPARERS	55
9.0 REFERENCES	56

ABBREVIATIONS AND ACRONYMS

AADT	annual average daily traffic
ADAMS	Agencywide Documents Access and Management System
ALARA	as low as is reasonably achievable
APE	Area of Potential Effect
BMP	best management practice
BWR	boiling water reactor
CFR	<i>Code of Federal Regulations</i>
CO ₂ e	carbon dioxide equivalent
DCGL	derived concentration guideline levels
DP	decommissioning plan
DPC	Dairyland Power Cooperative
EA	Environmental Assessment
EFH	essential fish habitat
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ESA	Endangered Species Acts
FES	Final Environmental Statement
FONSI	Finding of No Significant Impact
FR	<i>Federal Register</i>
FWS	U.S. Fish and Wildlife Service
G-3	Genoa Unit No. 3 (Fossil Station)
GCRP	U.S. Global Change Research Program
GEIS	Generic Environmental Impact Statement
GHG	greenhouse gases
ISFSI	Independent Spent Fuel Storage Installation
LACBWR	La Crosse Boiling Water Reactor
LLW	low level radiological waste
LS	LaCrosse <i>Solutions</i> , LLC
LTP	License Termination Plan
MBTA	Migratory Bird Treaty Act
MSA	Magnuson-Stevens Fishery Conservation and Management Act
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NRC	U.S. Nuclear Regulatory Commission
NRHP	National Register of Historic Places
ODCM	Offsite Dose Calculation Manual
PSDAR	Post-Shutdown Decommissioning Activities Report
REMP	Radiological Environmental Monitoring Program
SER	safety evaluation report
TEDE	Total Effective Dose Equivalent
THPO	Tribal Historic Preservation Officer
USGS	U.S. Geological Survey
WDHS	Wisconsin Department of Health Services
WDNR	Wisconsin Department of Natural Resources
WHS	Wisconsin Historical Society
WPDES	Wisconsin Pollutant Discharge Elimination System

1.0 INTRODUCTION

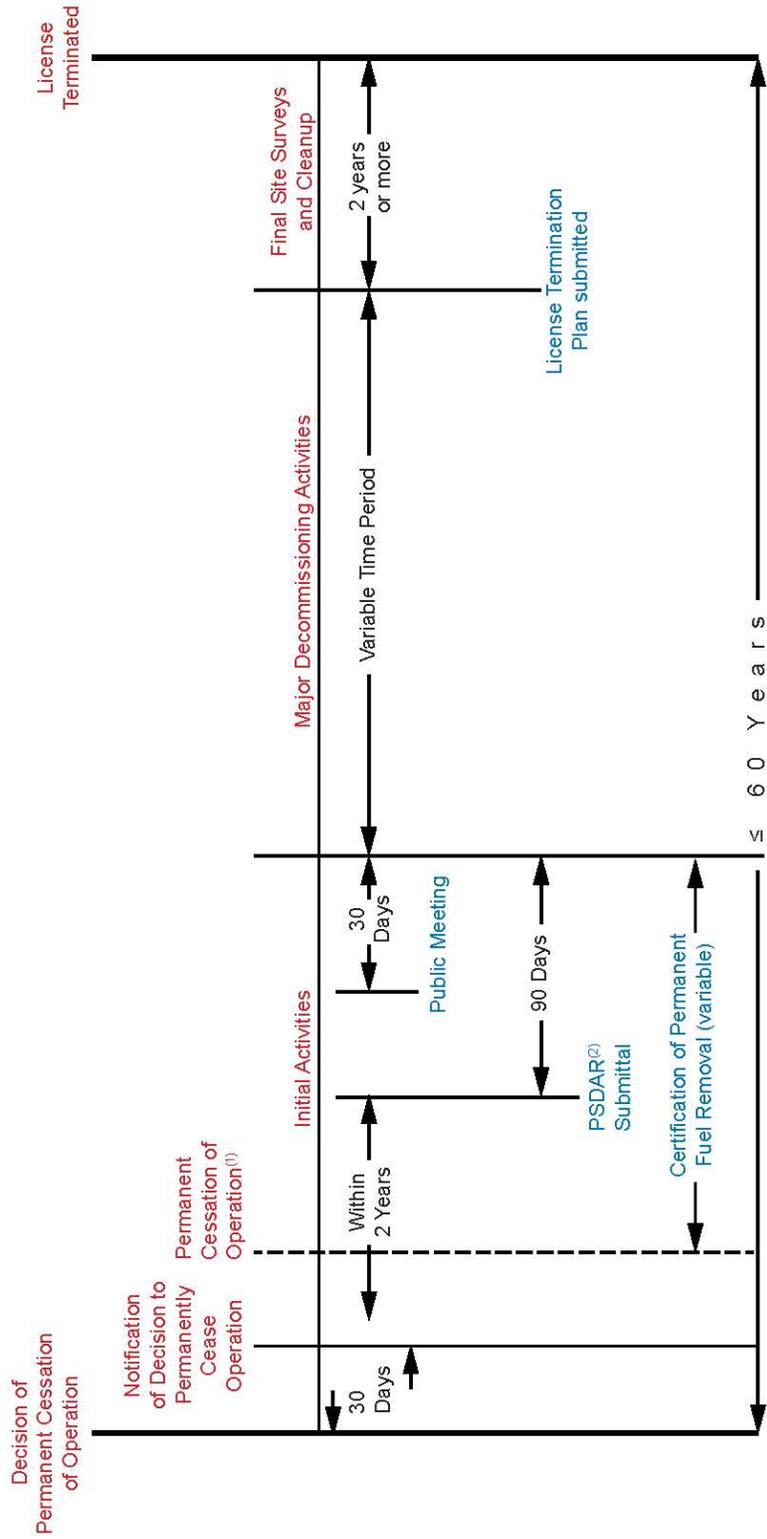
In June 2016, LaCrosseSolutions, LLC (LS) submitted a license amendment request to the U.S. Nuclear Regulatory Commission (NRC) to amend its possession-only license (DPR-45) for the La Crosse Boiling Water Reactor (LACBWR) (LS 2016a). The LACBWR, a commercial nuclear power plant in Vernon County, Wisconsin, is licensed by the NRC but has been permanently shut down since 1987.

LS's request, if granted, would add a license condition reflecting the NRC's approval of its License Termination Plan (LTP). LS is also requesting that the NRC amend the license to include a provision to allow LS to make certain changes to the NRC-approved LTP without prior NRC approval (LS 2016a). LS (2018a, b) provided supplemental information in response to NRC (2017a) requests for additional information, and submitted a revised LTP in May 2018 (LS 2018c) and November 2018 (2018h).

Submittal of the LTP is one of the final steps in the NRC's nuclear power reactor decommissioning process, which involves the safe removal of a facility from service and the reduction of residual radioactivity to a level that permits NRC license termination. Figure 1 provides a general timeline for the overall decommissioning process. Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.82, "Termination of license," provides the requirements for terminating power reactor licenses. 10 CFR 50.82(a)(9) specifies what must be included in a licensee's LTP when submitted to the NRC for review and approval. The LTP describes the process the licensee will use to meet the requirements for terminating the license and release the site for unrestricted use.

The NRC will terminate the license if it determines that the site meets the performance-based criteria for unrestricted site release, in accordance with 10 CFR 20.1402, "Radiological criteria for unrestricted use," and that the facility has been dismantled in accordance with the approved LTP. The portion of the site associated with the independent spent fuel storage installation (ISFSI) will remain under the NRC's regulatory jurisdiction. Although the terminology "license termination" is used throughout this EA, the 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities," license will continue in effect for the LACBWR ISFSI only. The LACBWR license will be considered terminated in all other aspects and will only apply to the site occupied by the LACBWR ISFSI.

The NRC staff has prepared this Environmental Assessment (EA) to evaluate and document the potential environmental impacts resulting from the NRC's approval of LS's license amendment request and the subsequent implementation of the LTP. The NRC staff is also performing a detailed safety analysis of LS's license amendment request. The results of the safety analysis will be documented in a separate Safety Evaluation Report (SER). The NRC decision whether to approve the license amendment request will be based on the results of the NRC staff's reviews documented in this EA and the SER.



(1) The cessation of operations may occur before, concurrent with, or following the certification to permanently cease operations.
 (2) The PSDAR may be submitted before permanent cessation of operations.

Decommissioning Timeline

(Adapted from NUREG-0586 Figure 1-1)

- = Licensee Decommissioning Activities
- = Regulatory Activities

Figure 1. General Timeline of the Decommissioning Process

1.1 Proposed Action

The proposed action is review and approval of the LACBWR LTP. In its license amendment request, LS requested amendment of the LACBWR license to add license conditions (1) reflecting the NRC staff's approval of the LTP and (2) providing criteria for when NRC approval is needed for subsequent LTP changes. If the NRC approves the LTP, the approval will be issued in the form of an amendment to the LACBWR license to add the requested license conditions.

1.2 Purpose of and Need for the Proposed Action

The purpose of and need for the proposed action is to allow for completion of decommissioning of the LACBWR site by LS, termination of the LACBWR license by the NRC, and the subsequent release of the LACBWR site for unrestricted use. The NRC regulation at 10 CFR 50.82 sets forth the process for the licensee to decommission its nuclear power plant, including submission of the LTP. The NRC will approve the LTP, provided that the LTP meets the criteria in 10 CFR 50.82(a)(10).

The LTP outlines the remaining decommissioning activities to be completed, such as building demolition and remediation, and license termination activities, such as soil scans and surveys and excavations. The NRC staff's review and approval of the LTP is the regulatory mechanism by which the NRC ensures that final decommissioning activities are appropriately completed. As part of the LTP review process, the NRC staff determines whether the procedures and activities for completing decommissioning (e.g., appropriate radiation release criteria and adequacy of the design of the final radiation survey) appear sufficient as described in the LTP.

LS intends to meet the radiological criteria for unrestricted use. The NRC's performance-based radiological criterion for unrestricted release of a licensed site, as specified by 10 CFR 20.1402, is:

A site will be considered acceptable for unrestricted use if the residual radioactivity that is distinguishable from background radiation results in a TEDE¹ to an average member of the critical group that does not exceed 25 [millirem] mrem (0.25 [milliSievert] mSv) per year, including that from groundwater sources of drinking water, and the residual radioactivity has been reduced to levels that are as low as reasonably achievable (ALARA). Determination of the levels which are ALARA must take into account consideration of any detriments, such as deaths from transportation accidents, expected to potentially result from decontamination and waste disposal.

LS has proposed derived concentration guideline levels (DCGLs) to meet the 10 CFR 20.1402 criteria. The NRC staff must determine whether additional planning,

Total Effective Dose Equivalent (TEDE) means the sum of the effective dose equivalent (for external exposures) and the committed effective dose equivalent (for internal exposures). *Dose equivalent* means the product of the absorbed dose in tissue, quality factor, and all other necessary modifying factors at the location of interest. The units of dose equivalent are the rem and sievert (Sv). (10 CFR 20.1003.)

investigation, or other activities by LS are necessary to support the NRC's decision approving the LTP. Once decommissioning has been completed, the NRC license has been terminated with the exception of the ISFSI site, and the site has been released for unrestricted use, the licensee can make the LACBWR site available for another use.

1.3 Alternative to the Proposed Action

As an alternative to the proposed action, the NRC staff considered the "no-action alternative." Under the no-action alternative, the NRC would not approve the LTP or the associated license amendment request, because regulatory requirements have not been met. Consequently, the LACBWR license would not be terminated, decommissioning and other onsite maintenance and operations activities involving the storage of spent nuclear fuel would continue, and the LACBWR site would not be released for unrestricted use. The NRC regulation at 10 CFR 50.82(a)(10) states that the Commission shall approve an LTP, by license amendment, if the LTP demonstrates that the remainder of the decommissioning activities will be performed in accordance with the NRC's regulations, will not be inimical to the common defense and security or to the health and safety of the public, and will not have a significant effect on the quality of the environment.

If the NRC was unable to approve the LTP because the regulatory requirements were not met, then LS would have to take the necessary actions to ensure the regulations are met. LS would need to take additional action to prepare an LTP that meets the requirements in 10 CFR 50.82(a)(1); the updated LTP would then need to be submitted to the NRC for approval prior to license termination.

1.4 Scope of the Environmental Analysis

To fulfill its obligations under the National Environmental Policy Act (NEPA), the NRC must evaluate the radiological and nonradiological environmental impacts associated with approval of the LTP and subsequent termination of the license. These evaluations involve an assessment of the impacts of remaining decommissioning and site restoration activities documented in the LTP and license termination activities (e.g., final site survey).

The NRC previously evaluated the potential environmental impacts of nuclear reactor decommissioning in NUREG-0586, Supplement 1, "Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities" (GEIS) (NRC 2002). The GEIS is used by the NRC staff to evaluate environmental impacts that would occur during the decommissioning of nuclear power reactors. The GEIS is considered "generic" in that it evaluates environmental impacts from decommissioning activities that are common to nuclear power reactor facilities. The GEIS addresses decommissioning of nuclear power reactors licensed by the NRC, including pressurized-water reactors, boiling-water reactors (BWRs), and multiple reactor stations. The generic analysis was based, in part, on experience with reactors that had already undergone or were undergoing decommissioning, which included LACBWR. Thus, the GEIS is applicable to the decommissioning of LACBWR.

The scope of the GEIS is based on decommissioning activities from the time that a licensee certifies that it has permanently ceased power operations until the license is terminated. The NRC staff concluded in the GEIS that the environmental impacts of decommissioning, including the license termination activities, can be determined generically for all nuclear power plants and will have SMALL impacts² in all but six environmental resource areas. The GEIS concluded that two of these six resource areas (i.e., threatened and endangered species and environmental justice) must always be evaluated on a site-specific basis in site-specific EAs, such as this EA for the LACBWR project. Depending on the site-specific circumstances, the following four additional resource areas are considered to be conditionally site-specific: offsite land use, historic and cultural resources, terrestrial ecology beyond the operation area, and aquatic ecology beyond the operational area (NRC 2002).

After the permanent shutdown of LACBWR, the Dairyland Power Cooperative (DPC) submitted a Decommissioning Plan (DP) for the NRC's review and approval³. As part of its review, the NRC prepared an SER and an EA to address the use of the SAFSTOR decommissioning option for the facility (NRC 1991). The DP EA did not address environmental justice or impacts to threatened and endangered species.

In Chapter 8 of its LTP (LS 2018c), LS indicated that all impacts from decommissioning were bounded by the Decommissioning GEIS and NUREG-0191, the Final Environmental Statement (FES) for operations at LACBWR. NUREG-0191 did not address environmental justice or threatened and endangered species (NRC 1980).

Therefore, this EA will focus on those issues not generically resolved by the GEIS—environmental justice and threatened and endangered species—as well as those impacts not addressed in the GEIS, FES for operations, or the DP EA—climate change, nonradiological waste, and contamination of groundwater from decommissioning activities.

In the GEIS, the staff determined that a decommissioning cost assessment is not a NEPA requirement but still included a decommissioning cost evaluation (without environmental significance levels) because accurate decommissioning cost estimates are necessary for safe and timely plant decommissioning. Licensees must submit decommissioning funding plans annually. Upon receipt of a decommissioning funding plan, the NRC reviews the estimates to determine if the licensee has demonstrated compliance with 10 CFR 50.82(a)(8)(v)-(vii), thus providing assurance that the licensee is maintaining the sufficient funds for decommissioning.

2 NRC staff use a standard of significance in the GEIS, described as either SMALL, MODERATE, or LARGE. "SMALL" impacts are defined as environmental impacts that are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource (NRC 2002).

3 Prior to the 1996 decommissioning rulemaking, reactor licensees had to submit a DP to the NRC for review and approval before they could begin decommissioning.

2.0 DECOMMISSIONING AND LICENSE TERMINATION

This section provides a brief history of LACBWR, an overview of the facility’s decommissioning process to date, and describes typical demolition and decommissioning activities.

2.1 Brief History of the LACBWR License

The LACBWR was a demonstration BWR that first went critical in 1967 and began operation in 1969. Allis-Chalmers, the original licensee, operated LACBWR until April 1987 when it was shut down for economic reasons. The NRC issued the DPC Provisional Operating License No. DPR-45 on August 28, 1973. The LACBWR permanently ceased operation in April 1987 and was defueled by June 1987 (NRC 1987a, 1987b). The NRC subsequently issued an amendment to the provisional license to create a possession-only license (NRC 1988). Figure 2 below provides an expected timeline of LACBWR activities after it was shut down and defueled.

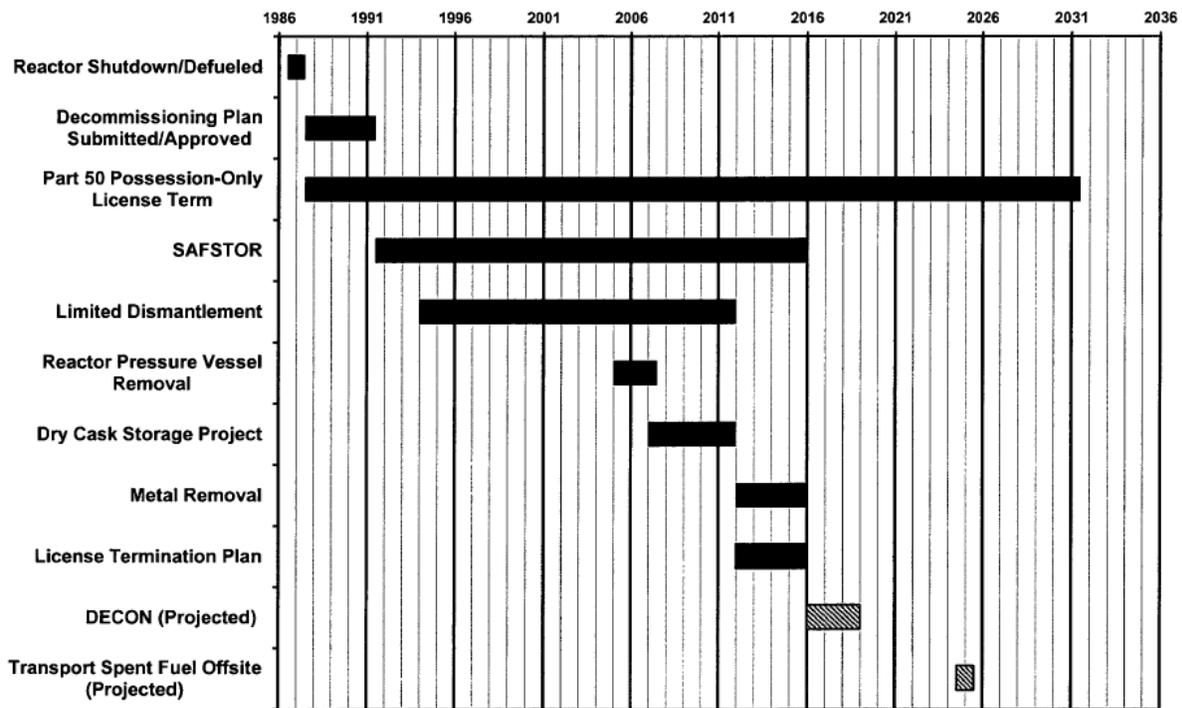


Figure 2. LACBWR Schedule (DPC 2012a)

The NRC issued an order to authorize decommissioning of LACBWR and approved the licensee's proposed DP for SAFSTOR in August 1991 (NRC 1991). DPC then placed LACBWR in SAFSTOR. See inset for definition of SAFSTOR. Limited dismantling activities were started in 1991, the reactor vessel was removed by 2008, and metal was removed between 2012 and 2016. In 2016, DECON activities began (LS 2012a). Because the NRC approved DPC's DP before August 28, 1996, pursuant to 10 CFR 50.82, the DP is considered the Post-Shutdown Decommissioning Activities Report (PSDAR) for LACBWR. A public meeting on the PSDAR was held in May 1998. The licensee's subsequent updates related to decommissioning have combined the DP and PSDAR into the "LACBWR Decommissioning Plan and Post-Shutdown Decommissioning Activities Report" (D-Plan/PSDAR). This document is also considered the Final Safety Analysis Report for LACBWR and is updated every 24 months in accordance with 10 CFR 50.71(e).

Spent nuclear fuel was transferred from wet storage to dry cask storage at an onsite ISFSI in September 2012 (LS 2018c). The ISFSI is described in more detail in Section 3.1.1.

In May 2016, the NRC approved the transfer of the license from DPC to LS (NRC 2016a). LS submitted a license amendment request, including the LTP, to the NRC in June 2016 (LS 2016a). At the same time, LS requested a partial site release of 35 hectares (ha) (88 acres [ac]) of non-impacted land from the Part 50 license (LS 2016b). The NRC held a public meeting in the vicinity of LACBWR on September 20, 2016, to discuss the LTP and partial site release reviews (NRC 2016b).

The Decommissioning GEIS (NRC 2002) defines three decommissioning options. Two apply at LACBWR:

SAFSTOR – *“The facility is placed in a safe, stable condition and maintained in that state (safe storage) until it is subsequently decontaminated and dismantled to levels that permit license termination. The determination of SAFSTOR includes those activities necessary for the final decontamination and dismantlement of the facility. During SAFSTOR, a facility is left intact, but the fuel has been removed from the reactor vessel, and radioactive liquids have been drained from systems and components and then processed.”*

DECON – *“An option for decommissioning in which the equipment, structures, and portions of a facility and site containing radioactive contaminants are removed or decontaminated to a level that permits termination of the license shortly after cessation of operations.”*

The NRC approved the partial site release in April 2017 (NRC 2017b). The LACBWR site footprint under NRC-jurisdiction is now 31 ha (75 ac) and includes the radiologically-restricted area.

The NRC will not terminate the LACBWR license until the licensee can demonstrate in its final radiation survey that the site meets the 10 CFR 20.1402 criteria for unrestricted release, and that the facility has been dismantled in accordance with the approved LTP. LS stated it expects to complete decommissioning, except for the ISFSI, by the second quarter of 2019 (LS 2018d).

*After the partial site release, the LACBWR footprint has been reduced to include only the areas identified as **radiologically impacted**—a term defined in 10 CFR 50.2 “Definitions”—to indicate the potential for residual radioactivity in excess of natural background radiation levels that was created by the routine operation and maintenance of the facility. **Non-impacted areas** are defined as those areas with no reasonable potential for residual radioactivity in excess of natural background or fallout levels.*

In June 2018, LS submitted an application to the NRC for review and approval to transfer the LACBWR license back to DPC (LS 2018d). LS is requesting that upon issuance of the license amendment providing for termination of the 10 CFR Part 50 license, except for the ISFSI, the license be transferred back to DPC. The NRC published a *Federal Register* (FR) Notice regarding the license transfer request in October 2018 (NRC 2018a).

2.2 Decommissioning and License Termination Activities



Figure 3. Reactor Pressure Vessel on Railroad Car (PNNL 2013)

Completed decommissioning activities as of 2016, as noted in the LTP, include removal of (1) the reactor pressure vessel (see Figure 3) and related components; (2) the turbine, generator, and auxiliary systems; and (3) various piping systems and components; as well as completion of the majority of asbestos abatement. Other completed decommissioning activities include abatement and disposal of lead and lead-containing material and asbestos-containing material (LS 2018c).

Remaining activities, as indicated in the LTP, include the demolition of the reactor building once it has been decontaminated, and demolition of several below ground portions of the turbine building. The open-air demolition of other buildings is yet to be completed, including the gas storage tank vault (an underground structure), waste treatment building, and the low specific activity storage building. (LS 2018c). After the piping and other components are removed from the building, the interior surfaces will be remediated to open air demolition criteria. If that criteria cannot be met, the material will be physically removed or the surface will be removed (e.g. by scabbling or air hammering). The aboveground portions of the building will then be demolished.

Below-ground structural concrete will either be left in place or removed (LS 2018c). In some cases, much of this work has already been completed (LS 2018b).

Mechanical hand tools, pneumatic breakers, excavators, scaffolding, and air hammers are among the various tools and equipment used for decommissioning and demolition activities at LACBWR. Soil remediation equipment can include shovels, back hoes, soil dredges, and vacuum trucks, among others (LS 2018c).

Decommissioning activities at the site are subject to other non-NRC Federal regulations and permits, such as water pollution control, handling and removal of asbestos and lead, and removal of underground storage tanks.

3.0 AFFECTED ENVIRONMENT

This section describes the current environmental conditions at the LACBWR site to provide a framework, or baseline, for the evaluation of the potential environmental impacts discussed in Section 4.0.

3.1 Site Description and Land Use

The LACBWR site is located on the eastern shore of the Mississippi River in Vernon County, Wisconsin. The site is 1 mile south of the Village of Genoa, Wisconsin and 19 miles south of La Crosse, Wisconsin. The site is accessed from the south by Highway 35. Figure 5 indicates the general location of the site.

3.1.1 Site Description

The LACBWR site was 66 ha (163 ac) prior to the 2017 partial site release (see Figure 6). Currently the LACBWR site is 31 ha (75 ac) (see Figure 7) and the reactor comprised only 0.6 ha (1.5 ac) of the site. The LACBWR site has been undergoing dismantling and decommissioning since 1994, and therefore the site conditions are continually evolving. Section 2.2 describes some of the activities that have already occurred and those that remain to be completed.

The only facilities and infrastructure that will remain in place after decommissioning are those that support the Genoa No. 3 (G-3) Fossil Station activities (e.g., crib house, switchyard, roadways, and security station) and the ISFSI.

The ISFSI is located 2,232 ft (680 m) south-southwest of the reactor building and currently stores five vertical concrete casks on a 32 ft by 48 ft (~10 m by 15 m) concrete storage pad. The pad is surrounded by a fence and supporting utility fixtures, as well as a security building that provides monitoring and support for the ISFSI. Spent fuel assemblies and fuel debris were placed into dry cask storage in September 2012 (LS 2018c). The ISFSI was generally licensed under the provisions of 10 CFR Part 72, Subpart K, “General License for Storage of Spent Fuel at Power Reactor Sites.”



Figure 4. Cask Storage at ISFSI (PNNL 2013)

Figure 5. General Location of LACBWR (Figure 8-1 from LS 2018c)



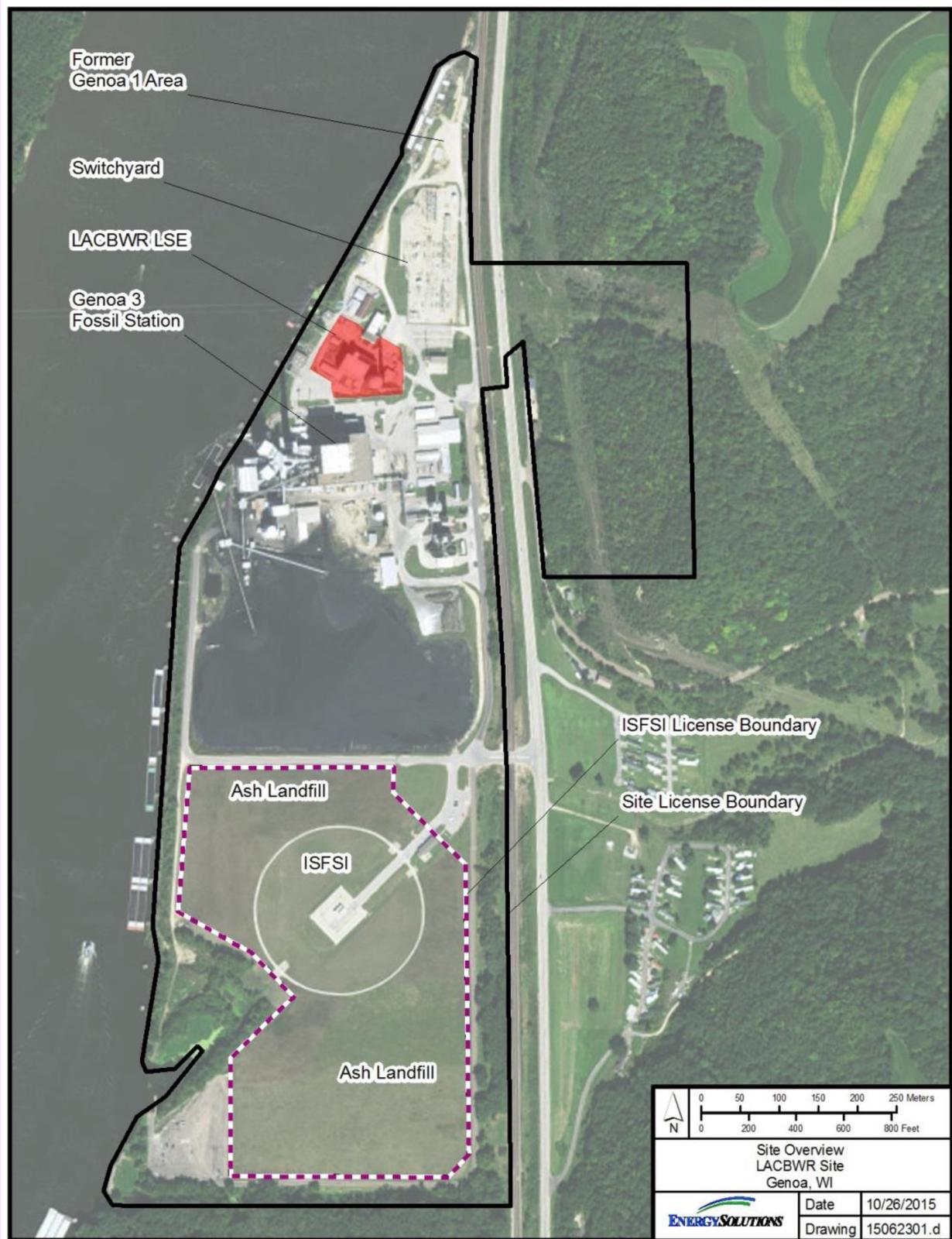


Figure 6. LACBWR Site at Time of LTP Submittal (LS 2018c Figure 8-2)

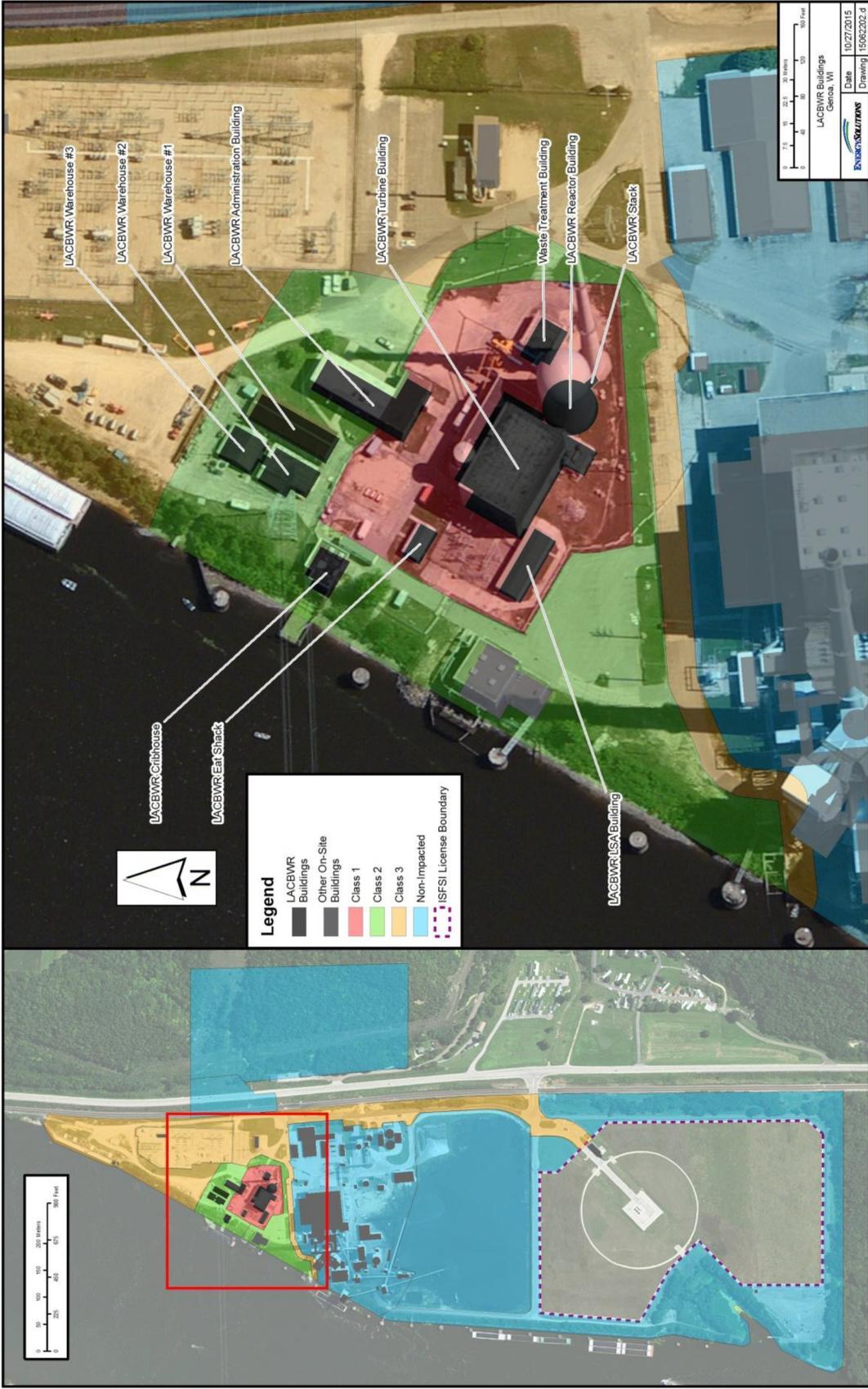


Figure 7. Impacted and Non-Impacted Areas (LS 2018c Figure 8-3)

Note: The blue areas have been released from the licensed area as part of the 2016 approval partial site release.

3.1.2 Land Use



Figure 8. Aerial View of LACBWR (Wikipedia)

The LACBWR site is bordered to the west and north by the Mississippi River, and by Highway 35 to the east. The western shore of the Mississippi River is within the state of Minnesota. The southern portion of the site is bordered by the Mississippi River National Wildlife and Fish Refuge's Pool 9 area. The Burlington Northern Santa Fe rail line runs along Highway 35 and carries commercial freight.

The area around the LACBWR site is mainly rural and undeveloped. The closest community is the village of Genoa, with a population less than 300. Genoa is located 1 mi (1.6 km) north of the site. There is a small mobile home park to the east of Highway 35 across from the site.

The Mississippi River, in the vicinity of the LACBWR site, is used for recreation, fishing, and commercial barge and ship traffic. There is a public boat landing on the River about 4,000 ft (1.2 km) south of the site. The surrounding area also includes the Upper Mississippi River National Wildlife and Fish Refuge. Portions of the Refuge are available for limited recreational activities, hunting, and fishing (LS 2018c). The Genoa National Fish Hatchery is located about 2 mi (3.2 km) south of LACBWR. The hatchery contains open air ponds and raceways and currently includes the Higgins Eye Pearlymussel, the Winged Mapleleaf Mussel, lake sturgeon, and coaster brook trout. (FWS 2017). To the north and less than one mile from the LACBWR site, there is a Lock and Dam (No. 8) on the River. Visitors are allowed to visit its observation platform from April to November (USACOE undated).

3.2 Geology and Soils

As described in NUREG-0191, the LACBWR site sits on material of the Cambrian and Quaternary age. To the east of the site are bluffs, which are Cambrian formations overlain by additional Cambrian and Ordovician formations. Approximately 27 acres of the site was formed from fill taken from River dredging (NRC 1991). According to LS, the site sits on 15 feet of hydraulic fill that overlays 100 - 130 feet of glacial outwash and fluvial deposits. Underneath those deposits are sandstones and shales of the upper Cambrian. (LS 2018c).

3.3 Water Resources

This section describes the use of and quality of surface water and ground water resources near the LACBWR site.

3.3.1 Surface Water

The LACBWR is located on the east bank of the Mississippi River in Vernon County. The river valley varies in width from La Crosse to Prairie du Chien, located 40 miles south. The Valley is

2.5 to 4.5 mi (~ 4 to 7.2 km) wide, narrowing for about 20 mi (32 km) below the site. The site location was originally comprised of wetlands and marshland. During construction, the site was graded using hydraulically dredged sands from the nearby river to form a flat surface.

LS intermittently uses water from the Mississippi River for its high pressure service water system at a withdrawal rate of 470 gallons per minute (gpm) (LS 2018c). River water was previously used for condensate cooling during operation of LACBWR, but following shutdown and fuel removal, this large volume of water was no longer being withdrawn from and discharged back to the River. Site discharge is located at the head of the Thief Slough, a side channel of the Mississippi River (LS 2018e).

Surface water is not used for municipal water supply for at least 40 mi (64 km) downstream. The nearest use of surface water for municipal drinking water supplies is about 195 mi (314 km) downstream at Davenport, Iowa, and for industrial purposes is about 15 mi (24 km) downstream at a steam-power plant in Lansing, Iowa (LS 2018c).

There are several Wisconsin Department of Natural Resources (WDNR) permits for nonradiological discharges from LACBWR site to the Mississippi River, including a Wisconsin Pollutant Discharge Elimination System (WPDES) permit, a stormwater general permit, and a wastewater permit (LS 2018c). LACBWR's WPDES permit includes surface water monitoring requirements such as prohibitions on use of additives, floating solids, visible foam and limitations on materials being released that could interfere with public rights in the water (LS 2018a). Further, LS implements best management practices to minimize impacts to the River from storm water runoff during decommissioning such as use of silt logs or fences, stabilization and erosion control measures (LS 2018a).

River water samples are collected from the River as part of the LACBWR Radiological Environmental Monitoring Program (REMP). Samples are collected from three locations (upstream, outfall, and downstream) in Spring and Fall. Results indicate several radioactive isotopes are present but are well below regulatory limits (LS 2018f).

During plant operations, circulating cooling water was discharged as normal releases. After reactor shutdown, normal releases continued as needed during decommissioning. Sediment samples are collected from the River as part of the REMF. Samples are collected upstream, at the outfall, and downstream twice a year. Radionuclide contamination accumulated in the river sediments in the outfall area of the discharge pipe. Since accumulation of radionuclides in the River is a result of permitted liquid effluents discharges, there is no requirement to perform additional sampling in the River for decommissioning. Wide variations in river sediment contamination over time were reflected in results from the biannual sampling of river sediments as reported in the annual REMF reports. In addition, results from a single 1994 sampling track performed by scuba divers ostensibly along the plume provided information on spatial variation that is at least relevant for that year (DPC 2009).

Accumulation of contaminants in the river sediments occurred immediately downstream of the outfall discharge pipe. The maximum sediment concentrations of 3.3 pCi/g of Cesium-137 (Cs-137) and 0.74 pCi/g of Cobalt-60 (Co-60) (0.12 and 0.027 Bq/g, respectively) during the period 2005 to 2017 were reported in the REMF reports. Biannual variations during this period covered three orders of magnitude with variations that could not be explained by radioactive

decay. The sampling location was described as at the discharge pipe outfall. For comparison, the range of results from the late 1980s for Cs-137 were 0.15 to 21.3 pCi/g (0.006 to 0.79 Bq/g), which accounting for decay, the maximum value would be 10.0 pCi/g (0.37 Bq/g) in 2018. The maximum sediment concentrations of Cs-137 and Co-60 from the 1994 scuba diver sampling event were 2.23 and 1.33 pCi/g (0.083 and 0.049 Bq/g), respectively, for a sample location approximately 80 feet (24 m) from the shore (DPC 2009). Accounting for decay, the corresponding sediment concentrations would be 1.3 pCi/g for Cs-137 and 0.6 pCi/g for Co-60 (0.048 and 0.02 Bq/g, respectively) in 2018. Based on the sampling track data of the scuba diver, the licensee indicated that a contaminated plume of river sediment covered an area of 95 ft long by 20 ft wide (29 m by 6 m). LS (2018a) stated that no additional characterization was performed on the contaminated river sediments in the outfall area.

Uncertainty makes present day impacts (i.e., concentrations) difficult to estimate. There is no regulatory requirement for characterization of offsite areas associated with normal releases. Nor is there a specified regulatory limit for contaminants in offsite sediment.

The NRC staff believes that the extent of the yearly variations in river sediment contamination levels could be controlled by (i) the timing of normal releases from the discharge pipe compared to the timing of river sediment biannual sampling event for the effluent reports, (ii) the sedimentation in the river bed changing in magnitude or mode between aggrading or degrading. For the former, sediment sampling immediately after normal discharge events may lead to elevated contamination, or sediment sampling just before a normal discharge event may lead to low sediment contamination. For the latter, an aggrading mode in the outfall area would link sediment contamination levels with radionuclides in the discharge releases during that year, and a degrading mode would point to erosion exposing old contamination. The NRC staff assumes the conservative approach of estimating the impact to the river sediment contamination based on maximum contamination found during any year because the uncertainty of (i) new contamination during decommissioning mixing with old contamination, and (ii) the timing of normal discharge events compared to the timing of sediment sampling. Therefore, based on the information in the paragraph above, the maximum concentration of Cs-137 would be 10.0 pCi/g (0.37 Bq/g) in 2018, which accounts for decay. Values for Co-60 would be approximately 0.1 pCi/g (0.0037 Bq/g) in 2018, which is a relatively smaller value compared to the change in Cs-137 because of Co-60's short half-life.

3.3.2 Groundwater

Groundwater at the site flows from the bluff (to the east of the site) towards the Mississippi River. The water table is shallow and flows towards the River. Groundwater at the site is found at depths ranging from 9 to 19 ft (2.7 to 5.8m) below ground surface based on the current set of active monitoring wells (LS 2018g). Deeper groundwater also probably flows west but then may turn and flow parallel to the River. The groundwater flow may be affected by the deeper, subsurface structures. Based on soil classifications, hydraulic conductivities for the shallow aquifer is approximately 313 and 429 ft/day (95.4 and 131 m/d) for the deep aquifer. Groundwater velocity ranges from 0.13 to 1.67 ft/day (0.04 to 0.51 m/d) in the shallow aquifer and 0.25 to 0.69 ft/day (0.076 to 0.21 m/d) in the deeper aquifer. The vertical gradient is

generally upwards, but can vary and can be affected by the Mississippi River. The vertical gradient locally may be downwards during high water in the River (LS 2018d).

Since 2012, water level and water chemistry measurements have been taken from six pairs of groundwater wells twice annually. Figure 9 shows the location of the groundwater monitoring wells. In each pair of wells installed in the shallow aquifer, one well was screened from 15 to 25 ft (4.6 to 7.6 m) depths and the second screened at 45 to 55 ft (14 to 17 m) depths. Samples are collected in the seasonal high water and low water levels (June and November, respectively) and undergo radiological analysis. The sample results did not show any radionuclides at activities above background (LS 2016c).

Ground water is the source of potable water at the LACBWR site and is pumped from wells screened at depths 116 and 129 ft (35.4 and 39.3 m) below the ground surface. LS will continue to use potable water to support decommissioning but has estimated the volume will be less than the volume used during operations. The FES for operations indicated 6×10^7 gallons ($2.3 \times 10^5 \text{ m}^3$) were taken from two wells at a rate of 120 gpm ($0.45 \text{ m}^3/\text{min}$) at 62 percent capacity (NRC 1980). The water will be processed onsite and discharged in accordance with the applicable state discharge permit (LS 2018c).

3.4 Meteorology and Air Quality

The climate in the vicinity of the LACBWR site is continental, comprised of cold winters and hot summers. The site is located in the bluffs of the Mississippi River Valley, with this geography influencing weather extremes due to airflow channeled through the valley. Northerly and southerly winds are predominant in the site vicinity due to geography, with monthly average wind speeds of 6 to 10 mph. Archived weather data for Genoa is provided through an active weather station maintained by USACE located at the Lock and Dam No. 8 site less than a mile north. Annual weather data for May 2014 to May 2015 show that temperatures ranged from 60°F to 90°F degrees in summer months (June through August) and 45°F to -5°F in winter months (December through February). The average temperature for the city of Genoa is 20°F in winter and 72°F in summer. Tornadoes in the site vicinity are uncommon. Rainfall averages 35.2 inches annually. Precipitation ranges from a monthly average of 3 to 5 inches in the spring and summer months to 1 to 3 inches in fall and winter.

The G-3 Fossil Station is an operational 350 MWe coal-fired power plant located onsite about 175 ft to the south of the LACBWR facilities. Vernon County is designated as in attainment of all National Ambient Air Quality Standards per 40 CFR Part 81 for all applicable National Ambient Air Quality Standards (NAAQS) (LS 2018a). The diesel generators are no longer present. LS will operate machinery and equipment per manufacturer specifications, which will help prevent additional emissions. As needed, water will be sprayed to suppress dust to mitigate fugitive dust emissions. LS states they comply with WDNR and Wisconsin Bureau of Air Management requirements. (LS 2018c).



Figure 9. Location of Monitoring Wells (LS 2018c)

Decommissioning activities include vehicle traffic, demolition of structures, and dismantlement and decontamination of systems, occurring over a period from 2007 until decommissioning is complete. Equipment, worker vehicles, and truck shipments emit criteria pollutants and greenhouse gases (GHGs). Structure demolition and dismantlement cause fugitive dust emissions. Emissions from decommissioning are localized and temporary.

Recent improvements regarding emissions and the science of climate change have enabled the U.S. Global Change Research Program (GCRP) to estimate regional climate change in the United States (GCRP 2014). The GCRP predicts increasing heat waves, heavy downpours, and flooding in the Midwest due to climate change (GCRP 2014). In the Midwestern United States, the projected change in temperature by mid-century—which encompasses the timeframe for decommissioning activities—is a regional annual average temperature increase of between 4° and 5°F. While the GCRP has not incrementally forecasted the change in precipitation by decade to align with the licensing action, rainfall in spring and winter is projected to increase by 10 to 20 percent during this century (GCRP 2014). Increases in both frequency and intensity of extreme precipitation are projected across the Midwestern United States (GCRP 2014).

3.5 Ecological Resources

3.5.1 Terrestrial Resources

The LACBWR site provides a range of terrestrial habitats, included forested areas, riparian zones, wetlands, and low-quality open space where trees and other vegetation have been cleared for industrial purposes (NRC 1980, LS 2018c). Bottomland forests on and adjacent to the site are dominated by white ash (*Fraxinus americana*), green ash (*F. pennsylvanica*), elms (*Ulmus* spp.), river birch (*Betula nigra*), and cottonwoods (*Populus* spp.) (NRC 1980). Oak forests, primarily comprised of red (*Quercus rubra*), white (*Q. alba*), and black (*Q. velutina*) oaks, occur on the hilly terrain in the eastern portion of the site (NRC 1980). During the construction of the LACBWR, 27 ac (11 ha) of riparian and low forested areas were filled with material dredged from the Mississippi River (LS 2018c). This shoreline habitat remains heavily modified (LS 2018c).

Birds and wildlife near LACBWR are likely tolerant of human activity given the decades of use as an industrial facility. In addition, many portions of the LACBWR site were cleared or filled for plant construction and remain as open areas or industrial facilities and roads. NRC (1980) describes common species that are known to occur on or near the site (see section 2.7).

The LACBWR site is located along the Mississippi Flyway, which is the migration corridor for 40 percent of North America's waterfowl and shorebirds (USGS 2015). The Mississippi Flyway is also an important migration corridor for raptors and neotropical songbirds. The flyway provides high quality habitat for breeding, nesting, foraging, and wintering. See Section 3.5.3 for a list of migratory birds that are likely to occur on or within the vicinity of the LACBWR site.

The Upper Mississippi River National Wildlife and Fish Refuge extends 261 river miles from the confluence of the Chippewa River in Wisconsin south to near Rock Island, Illinois, and part of

the refuge runs adjacent to the LACBWR site's southern boundary (FWS 2016, 2017). The refuge provides high quality habitat for fish, wildlife, plants, and migratory birds, including steep wooded bluffs, riverine habitats, bottomland forests, and wetlands. Due to the ecological importance of the refuge, it has been designated as a Wetland of International Importance and a Globally Important Bird Area (FWS 2016).

3.5.2 Aquatic Resources

The LACBWR is located adjacent to the Mississippi River, which is a 1,300 mi (2,092 km) waterway that supports a wide range of fish, invertebrates, plants, and planktonic species. As the Mississippi River flows and meanders, it erodes the outer bank and then deposits the sediment on the inner bank, which results in a diverse set of habitats such as extensive floodplains, deep backwaters, oxbow lakes, and another shallow-water habitats (Baker et al. 1991). These waterbody features often provide high-quality habitat for aquatic biota due to the structural complexity and low flows that support spawning, feeding, and refuge from large predators. The variety of low flow habitats, structural complexity along vegetated river banks, and fast-flowing channels support high biological richness with an abundance of fish and invertebrate species that occur within the Mississippi River. The U.S. Geological Survey (USGS 2015) estimated a total of 154 species of fish and 50 species of freshwater mussels within the Mississippi River. NRC (1980) describes common species that are known to occur on or near LACBWR (see section 2.7 and Tables 2.7-1 and 2.7-2) and McInerny (1980) describes fish collected at an impingement and study at LACBWR and G-3 Fossil Station (then referred to as Dairyland Power Cooperative power stations) from August 8, 1978 through June 30, 1980 (see Tables 6, 10, 11, and 12).

The Mississippi River has a long history of humans using the river as a mode of transportation, and subsequently modifying much of the high-quality, shallow-water habitats associated with a meandering river, such as floodplains, backwaters, and naturally vegetated river banks (Baker et al. 1991). For example, beginning in the 1800s, human modifications to allow for ship traffic along the Mississippi River and to minimize flooding events changed the relative abundance and types of habitats, access to fish migratory routes, flow patterns, and river channelization. Beginning in 1824, the U.S. government removed snags, such as trees or tree roots, from the river. Snags provide natural habitat for invertebrates that require a firm attachment site and places to hide for fish and other aquatic biota. On the other hand, revetments, which are built to prevent erosion and river meandering, have increased availability of hard-surface habitats, but decreased the availability of soft-surface river bank habitats (Baker et al. 1991; Brown et al. 2005). USGS (2015) estimated that 66 percent of the nearly 1,200,000 ac. [485,623 ha] of high quality floodplains along the Upper Mississippi River have been converted to crop and pastureland. Another threat to high quality habitats comes from the high rate of erosion, which can fill backwaters and floodplains with sediments, increase turbidity, and introduce excessive nutrients into the river (USGS 2015).

3.6 Protected Species and Habitats

The U.S. Fish and Wildlife Service (FWS) and the National Marine Fisheries Service (NMFS) jointly administer the Endangered Species Act of 1973 (ESA). The FWS manages the protection of, and recovery effort for, listed terrestrial and freshwater species, and NMFS manages the protection of and recovery effort for listed marine and anadromous species. This section discusses these species and species protected under the Migratory Bird Treaty Act of 1918 (MBTA).

3.6.1 Federally Listed Species

3.6.1.1 *Action Area*

The implementing regulations for section 7(a)(2) of the ESA define “action area” as all areas affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02). The action area effectively bounds the analysis of ESA-protected species and habitats because only species that occur within the action area may be affected by the Federal action.

For the purposes of the ESA analysis in this EA, the NRC staff considers the action area to be to include the 66.2-ha (163.5-acre) LACBWR site and the adjacent offsite area in which runoff may flow. The NRC staff expects all direct and indirect effects of the proposed action to be contained within these areas.

The NRC staff recognizes that while the action area is stationary, Federally listed species can move in and out of the action area. For instance, a flowering plant known to occur near, but outside, of the action area could appear within the action area over time if its seeds are carried into the action area by wind, water, or animals. Thus, in its analysis, the NRC staff considers not only those species known to occur directly within the action area, but those species that may passively or actively move into the action area. The staff then considers whether the life history of each species makes the species likely to move into the action area where it could be affected by the activities associated with license termination at LACBWR.

3.6.1.2 *Overview of Protected Species*

Figure 10 describes the Federally-listed species that have the potential to exist within the action area. The NRC staff compiled this table from the FWS’s Environmental Conservation Online System Information for Planning and Conservation system. Four Federally-listed species may occur in the action area (FWS 2018a). The NRC staff did not identify any proposed or candidate species or designated critical habitat within the action area (FWS 2018a).

The upper Mississippi River near the action area does not contain marine or anadromous fish species. Therefore, no Federally-listed species or habitats under NMFS’s jurisdiction occur within the action area.

Figure 10. Federally Threatened and Endangered Species with the Potential to Occur at the LACBWR Site or within the Vicinity

Common name	Scientific Name	Federal Status	State Status	Habitat on site or within vicinity
Higgins eye pearlymussel	<i>Lampsilis higginsii</i>	E		Habitat in the Mississippi River
Sheepnose Mussel	<i>Plethobasus cyphus</i>	E	E	Shallow areas in larger rivers and streams.
Northern Wild Monkshood	<i>Aconitum noveboracense</i>	T		Habitat on north-facing slopes
Northern Long-Eared Bat	<i>Myotis septentrionalis</i>	T		Potential roosting or foraging habitat in forested, wetland, and riparian areas

Source: <http://ecos.fws.gov/ecp0/reports/species-by-current-range-county?fips=55123>
 E – Endangered, P– Proposed, T – Threatened

The FWS listed the **Higgins eye pearlymussel** (*Lampsilis higginsii*) as Federally endangered in 1976 (41 FR 24062). The Higgins eye is a mussel that occurs in large, deep rivers with moderate currents. This freshwater mussel buries in sand or gravel river bottoms with its siphon extending into the water in order to filter out bacteria and other microorganisms for food. Like other unionids, the Higgins eye pearlymussel has an unusual life cycle. After fertilization, eggs live in special gill chambers of the females and develop into microscopic larvae called glochidia. Females brood the glochidia. When the glochidia are ready, the female expels the glochidia, which then must attach to a host fish's gills or fins to complete development by enclosing themselves in a cyst (encysting). They drop off the host fish as newly transformed juveniles.

In Wisconsin, Higgins eye pearlymussel occur in the Upper Mississippi River, the St. Croix River, and the Wisconsin River. Potential habitat with the Mississippi River and Thief Slough could occur adjacent to the LACBWR site. A 1978 mussel survey of the Thief Slough river area did not identify any Higgins eye pearlymussels, although suitable habitat was identified within the vicinity of LACBWR. In its 1980 FES, NRC (1980) noted that the Higgins eye pearlymussel occurs within the vicinity of the LACBWR site. In 1999, Helms and Associates performed a mussel survey near River Mile 677.5 and did not identify any Higgins eye pearlymussels (LS 2018a). Most recently, WDNR's Natural Heritage Inventory Databased reported observations of this species within the vicinity of the LACBWR site (WDNR 2017). Based on the availability of suitable habitat in the Mississippi River near the LACBWR intake and WDNR's Natural Heritage Inventory Database, the NRC staff determined that this species may occur within the action area.

The FWS listed the **sheepnose mussel** as Federally endangered on March 13, 2012 (77 FR 14914). Sheepnose mussels inhabit large rivers with gravel or mixed sand and gravel riverbeds (77 FR 14914). Further, in unpounded rivers, sheepnose mussels can be found in less than 0.6 m (2 ft) of water and in relatively fast currents. Adult mussels are benthic,

meaning that they live on the river bed partially or completely buried in the substrate. Sheepsnose mussels are suspension feeders and eat bacteria, algae, microscopic animals, and detritus (77 FR 14914). Similar to Higgins eye pearlymussel and other unionid mussels, eggs develop in the special gill chambers of the females until they are expelled and need to find a host fish to complete development. No surveys for the sheepsnose mussel have occurred within the action area since 1978 (LS 2018a, c). Based on the availability of suitable habitat in the Mississippi River near the LACBWR intake, the NRC staff determined that this species may occur within the action area.

The FWS listed **northern wild monkshood** (*Aconitum noveboracense*) in 1978 as a Federally threatened species (43 FR 17910). The northern wild monkshood has distinctive blue hood-shaped flowers that bloom between June and September. Flowers are approximately 1 in (2.5 cm) and pollinated by bees. This perennial plant generally grows on shaded to partially shaded cliffs, algal talus slopes, or on cool, streamside sites (FWS 2007). Habitat requirements also include cool soil conditions, cold air drainage, or cold groundwater flowage. No observations of northern monkshood have been reported on or near LACBWR, although no formal surveys for this species have occurred (LS 2018c). WDNR's Natural Heritage Inventory Database did not include any reported observations of this species within the action area (WDNR 2017). Based on its review of habitat requirements and lack of reported observations, the NRC staff determined that suitable habitat for this species does not occur within the action area (LS 2018c, FWS 2007, WDNR 2017).

The FWS listed the **Northern long-eared bat** (*Myotis septentrionalis*) as Federally threatened throughout its range on April 2, 2015 (80 FR 17973). This medium-sized bat roosts and forages in upland forests in the cavities and crevices of trees during the summer months. During the winter, the northern long-eared bat hibernates in caves and mines. The biggest threat to this species is a disease, white-nose syndrome. Potential habitat could occur on the LACBWR site: older trees may have peeling bark that could provide roosting habitat and forested hill sides, small ponds, and streams may provide foraging habitat for this species (WDNR 2016). However, no mist net surveys for bat or surveys for potential roosting or foraging habitat have occurred onsite (LS2018a, c). Based on the potential for suitable roosting or foraging habitat in forested, wetland, and riparian portions of the action area, the NRC staff determined that this species may occur within the action area.

3.6.2 State-listed Species

Figure 11 describes the State-listed species that have the potential to exist on or within the vicinity of the LACBWR. The NRC staff compiled this table from WDNR's Natural Heritage Inventory data (WDNR 2017), LS's description of ecological resources in its LTP (LS 2018a, c), and other ecological descriptions of the LACBWR site and vicinity (NRC 1980).

Figure 11. State-listed Threatened and Endangered Species with the Potential to Occur in the Action Area

Common name	Scientific Name	Federal Status	State Status	Habitat
Fish				
Black buffalo	<i>Ictiobus niger</i>	-	T	Rivers with strong currents, sloughs, backwaters, and impoundments
Blue sucker	<i>Cycleptus elongatus</i>	-	T	Large, deep rivers with moderate to strong currents, typically near gravel or cobble covered riverbeds
Bluntnose darter	<i>Etheostoma cholorosoma</i>	-	E	Oxbow, ponds, sloughs and pools and lakes over mud, clay, mixed sand and mud substrates
Goldeye	<i>Hiodon alosoides</i>	-	E	Large rivers with turbid waters, or connected lake ponds and marshes
Paddlefish	<i>Polyodon spathula</i>	-	T	Large rivers and associated lakes
Pallid shiner	<i>Hybopsis amnis</i>	-	E	Large lowland rivers with slower currents and associated sloughs and impoundments over sand or mud substrates
River redhorse	<i>Moxostoma carinatum</i>	-	T	Large rivers with moderate to swift currents and associated impoundments and pools
Shoal Chub	<i>Macrhybopsis hyostoma</i>	-	T	Fast, moderate depth waters in rivers with broad sand flats
Skipjack Herring	<i>Alosa chrysochloris</i>	-	E	Open waters, larger rivers, lakes, and channels below dams
Mussels				
Fawnsfoot	<i>Truncilla donaciformis</i>	-	T	Large rivers or the lower reaches of medium-sized streams
Higgins Eye Pearlymussel	<i>Lampsilis higginsii</i>	E	E	Deep waters in moderate flowing freshwater rivers

Wartyback	<i>Quadrula nodulata</i>	-	T	Large rivers within sand, mud, or fine gravel substrates
-----------	--------------------------	---	---	--

Turtles

Wood Turtle	<i>Glyptemys insculpta</i>	-	T	Rivers and streams with adjacent riparian wetlands and upland deciduous forests
-------------	----------------------------	---	---	---

Birds and Bats

Cerulean Warbler	<i>Setophaga cerulea</i>	-	T	Lowland deciduous forests with American elm, cottonwood, and green ash and upland blocks of mature dry-mesic to mesic forests
------------------	--------------------------	---	---	---

Northern Long-Eared Bat	<i>Myotis septentrionalis</i>	T	T	Upland forests in the cavities and crevices of trees for summer roosting; hilly forested areas, stream, or small ponds for foraging
-------------------------	-------------------------------	---	---	---

Peregrine Falcon	<i>Falco peregrinus</i>	-	E	Rock ledges on the sides of steep bluffs and ledges of buildings
------------------	-------------------------	---	---	--

Plants

Northern Wild Monkshood	<i>Aconitum noveboracense</i>	T	T	Shaded to partially shaded cliffs, algific talus slopes, or on cool, streamside sites
-------------------------	-------------------------------	---	---	---

Sources: WDNR 2017, FWS 2018a, NRC 1980
 E – Endangered, T – Threatened

The peregrine falcon (*Falco peregrinus*) is the only terrestrial State-listed species known to occur at the site (LS 2018a). This species weighs just over two pounds with a wing span of approximately 3 feet (ft), and is similar in size to a crow (FWS 2006). Peregrine falcons use a variety of habitats, including cliff sides or tall ledges for breeding as well as lake edges and other open areas for foraging. In 1997, a peregrine falcon nest box, which was installed on the stack at the G-3 Fossil Station, which is located approximately 450 feet from LACBWR (LS 2018a). A total of 62 chicks have successfully fledged from the nest box, with at least one fledgling nearly every year from 1998 through 2017 (LS 2018a).

Blue sucker (*Cycleptus elongatus*) is the only aquatic State-listed species known to occur at the site (McInerney 1980; LS 2018). This species grows to approximately 2 ft with an elongated silver body with blue to blue black sides and back (WDNR 2018). Blue suckers prefer deep rivers with moderate to strong currents. This fish eats insects, insect larvae, crustaceans, plant material and algae off the river bed. From August 8, 1978 through June 30, 1980, McInerney (1980) collected ten young-of-the-year during an impingement and study at LACBWR and the G-3 Fossil Station (then referred to as DPC power stations). Since that time, no impingement or entrainment studies have occurred at the LACBWR (LS 2018a).

3.6.3 Migratory Birds

The FWS administers the MBTA, which prohibits anyone from taking native migratory birds or their eggs, feathers, or nests. Regulations under the MBTA define a “take” differently than the ESA (16 U.S.C. 1532(19)) and define “take” as “to pursue, hunt, shoot, wound, kill, trap, capture, or collect or attempt to” carry out these activities (50 CFR 10.12). Unlike a “take” under the ESA regulations (50 CFR 17.3), a “take” under the MBTA does not include significant habitat alteration or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, such as breeding, feeding, or sheltering.

The MBTA protects a total of 1,007 migratory bird species (75 FR 9282). The FWS (2018b) indicated that 5 migratory birds of conservation concern may occur on or near the action area (see Figure 12). LS (2018a) indicated that turkey vultures previously visited the site, but have since been displaced by the removal of perching structures at LACBWR. Turkey vultures may occur within the vicinity, especially at the G-3 Fossil Station that includes tall structures for perching (LS 2018a).

Near the proposed site, migratory birds rely on riparian, forested, grassland, and wetland habitats as important areas for foraging, resting, and avoiding predators and for breeding for some species. Based on the limited amount of continuous habitat and the amount of ongoing human activity near the LACBWR plant, the portion of the site where license termination and decommissioning activities would take place likely provides low-quality habitat for migratory birds. However, portions of the licensed LACBWR site contain high-quality habitat for migratory birds, including areas with forests, riparian buffers along the Mississippi River and streams, and wetland habitats. Most of these high quality habitat were released prior to receiving the LTP application (see Figures 6 and 7). In addition, the Upper Mississippi River Wildlife and Fish Refuge, which is adjacent to the site, also provides high quality habitat for migratory birds.

Figure 12. Migratory Birds of Conservation Concern that may Occur near the Project Area

Scientific Name	Common Name	Occurrence in Project Area
<i>Haliaeetus leucocephalus</i>	bald eagle	Year-round
<i>Tringa flavipes</i>	lesser yellowlegs	spring
<i>Melanerpes erythrocephalus</i>	red-headed woodpecker	Fall-Winter
<i>Euphagus carolinus</i>	rusty blackbird	Spring and Fall
<i>Calidris pusilla</i>	semipalmated sandpiper	Spring

Source: FWS 2018b

3.6.4 Bald Eagles

The bald eagle (*Haliaeetus leucocephalus*) is protected under the Bald and Golden Eagle Protection Act. This Federal act prohibits anyone from taking or disturbing bald eagles or golden eagles (*Aquila chrysaetos*), including their nests or eggs, without a FWS-issued permit. Suitable habitat for the bald eagle occurs within and adjacent to the LACBWR site (FWS 2018b). Breeding, nesting, and wintering habitat for bald eagles occur in forested areas along large bodies of water, such as the Mississippi River (FWS 2018b). The NRC (1980) staff noted two pairs of nesting bald eagles on the west side of the Mississippi River within 1 to 2 mi (1.6 to 3.2 km) from the LACBWR site.

3.6.5 Essential Fish Habitat

Magnuson–Stevens Fishery Conservation and Management Act, as amended (MSA) requires Federal agencies to consult with NMFS on actions that may adversely affect essential fish habitat (EFH). The NMFS has not designated any EFH under the MSA within affected water bodies in the vicinity of the proposed site (NMFS 2017). Because no habitats are designated, no EFH would be affected by the proposed action. Therefore, this section does not discuss species with essential fish habitat.

3.7 Public and Occupational Health

The intent of decommissioning is to reduce radiological contamination at the site to meet the NRC requirements for unrestricted use. Potential human health hazards associated with decommissioning and license termination activities at LACBWR range from potential exposure to very low levels of radioactivity in soils to elevated levels of radioactivity within the remaining facility and support structures and systems (e.g., remaining lines and sumps).

All facilities that the NRC licenses must adhere to its radiation protection standards (10 CFR Part 20) to protect workers and the public against potential health risks from exposure to radioactive material used, generated, and released from the licensed facility. In the GEIS, the NRC determined that the radiological impacts to public and occupational health would remain within regulatory limits.

LS will conduct decommissioning activities under the provisions of its Radiation Protection Program and Radioactive Waste Program. In addition to those programs, LS will use the Radioactive Effluent Control Program and the Offsite Dose Calculation Manual (ODCM) to control and monitor radioactive effluents to meet the requirements in 10 CFR 50.36a, 10 CFR Part 20 and Appendix I of 10 CFR Part 50 related to doses to members of the public. (LS 2018c).

3.7.1 Existing Radiological Conditions

In accordance with 10 CFR Part 20, LS has a REMP which is part of the ODCM and requires annual reports to the NRC on results of environmental sampling and monitoring activities. In addition, LS has been monitoring and providing reports to the NRC on the ISFSI as required in 72.44(d).

A preoperational REMP was conducted at the LACBWR site from April 1965 to April 1966 to establish a baseline for monitoring the fluctuations of radioactivity in the environment before LACBWR began operating (NRC 1980). The REMP continued when operation of the reactor began in 1969 and continued until the plant ceased operation in 1987. The operational REMP measured radiation and radioactive materials released from LACBWR. During operation of LACBWR, the REMP monitored exposure pathways such as direct radiation, airborne exposure pathway, water exposure pathway, aquatic exposure pathway and the ingestion exposure pathway. The REMP has been modified as the offsite radiological impacts from LACBWR have been reduced. For example, in 2014, LS discontinued fish sampling, monitoring of main stack air, offsite particulate air, direct radiation monitoring around the plant, but continues to monitor direct radiation around the ISFSI. The modified REMP will continue throughout the course of decommissioning, and will continue while the ISFSI remains in operation. The results of the REMP are included in an annual report titled *Radioactive Environmental Monitoring Report and Radioactive Effluent Release Report* (e.g., DPC 2014, LS 2017, 2018f).

3.7.2 Occupational Dose

When LACBWR permanently shut down in 1987, the plant went into SAFSTOR. Active decontamination and dismantlement activities were started in 1994 and the reactor vessel was removed in 2007 and shipped to the Barnwell Waste Management Facility in South Carolina. From 1988 through 2014, there was a collective dose of 184 rem at LACBWR with the highest dose in 2007 (37 rem) when the reactor pressure vessel was removed (NRC 2016b). The GEIS estimated that the cumulative dose for BWRs over the entire decommissioning process and using the SAFSTOR option is 3.5 person-Sv (350 person-rem). The GEIS made the generic determination that the radiological impacts of decommissioning, including license termination activities, are SMALL since the expected doses will remain within regulatory limits. (NRC 2002). The occupational dose at LACBWR is expected to be lower than the GEIS's estimate, therefore the GEIS analysis is bounding. During the remainder of the decommissioning process, LS will continue to use the various protection programs and ALARA goals to ensure worker protection in accordance with 10 CFR Part 20 (LS 2018c).

3.7.3 Public Dose

LS continues to monitor and estimate doses to the public. Until the termination of the license, the licensee must meet the requirements of 10 CFR 50.36(a) for effluent releases after permanent cessation of operation. Licensees are also required to keep releases of radioactive materials to unrestricted areas at ALARA levels. Licensees must also comply with the U.S. Environmental Protection Agency's (EPA) standards in 40 CFR Part 190,

“Environmental radiation protection standards for nuclear power operations” (NRC 2002). During the remainder of the decommissioning process, LS will continue to use the various protection programs and ALARA goals to ensure public protection in accordance with 10 CFR Part 20 and 10 CFR Part 50, Appendix I (LS 2018c).

In the GEIS, the NRC determined that the levels of radionuclide emissions were lower for facilities undergoing decommissioning compared to operating facilities. Collective doses to public members were lower than 0.01 person-Sv (1 person-rem) per year within 80 km (50 mi) of the facilities. The maximally exposed individual was estimated to receive a dose of less than 0.01 mSv/yr (1 mrem/yr) which is well within the regulatory limit of 10 CFR Part 20 (NRC 2002).

LS is proposing DCGLs as acceptable levels of residual radioactivity that can be left at the LACBWR site to comply with the unrestricted use criteria specified in 10 CFR 1402. As part of the NRC decision on whether to approve the LTP, the NRC will evaluate the adequacy of the DCGLs to provide protection for members of the public after termination of the license. In addition, because the proposed DCGLs exceed soil concentration values established in the Memorandum of Understanding the NRC has with the EPA, the NRC is consulting with the EPA (NRC 2017c). In March, 2018, the EPA responded that in its view if LS is unable to meet the Table 1, “Consultation Triggers for Residential and Commercial/Industrial Soil Contamination” soil values for industrial use, the NRC should consider a more restricted land use—such as recreational or waste management—along with appropriate institutional controls (EPA 2018). Once LS completes decommissioning, if the residual activity is greater than the EPA’s standards, the EPA can decide if it will require further action by the licensee. However, the NRC would still be able to terminate the license if the NRC release criteria are met.

3.8 Socioeconomics

This section describes current socioeconomic factors that have the potential to be directly or indirectly affected by the proposed LTP at LACBWR. LACBWR and the communities that support it can be described as a dynamic socioeconomic system. The communities supply the people, goods, and services required to conduct decommissioning activities. Decommissioning activities, in turn, supply wages and benefits for people and dollar expenditures for goods and services. The measure of a community’s ability to support the proposed LTP depends on its ability to respond to changing environmental, social, economic, and demographic conditions.

There are approximately 75-100 workers at the LACBWR site for the decommissioning phase. LS estimates the workforce at LACBWR will be reduced to about 25 personnel following decommissioning work to support ISFSI operation (LS 2018a).

According to Appendix J of the Decommissioning GEIS, population changes greater than 3 percent could have detectable socioeconomic effects in local communities. The reduction in the LACBWR workforce from 100 to 25 represents a change of less than 1 percent in the Vernon County, Wisconsin population of 29,773 (USCB 2018).

Potential socioeconomic impacts during decommissioning include increased demand for short-term housing, public services, and increased traffic due to temporary fluctuations in the size of the workforce required to implement the LTP at LACBWR. Any changes in employment and tax payments caused by the proposed LTP could have a direct and indirect impact on community services and housing demand, as well as traffic volumes in the communities around the LACBWR site.

In general, there are two ways in which decommissioning activities may have a social and economic impact on a community and its surrounding area: 1) through expenditures in the community by the facility workforce and direct purchases of goods and services necessary for facility operation; and 2) the effects on local government tax revenues and services (NRC 2002).

The greatest impact has already occurred to the cities and towns surrounding LACBWR when it shut down, permanently in 1987. The LACBWR workforce diminished, along with reduced expenditures for goods and services in local communities. Similarly, tax revenues used to fund community infrastructure, services and education were greatly reduced. Similarly, tax revenues used to fund community infrastructure, services, and education were greatly reduced. Table J-4 of the GEIS noted that the site-specific impact on local public services were SMALL (housing, transportation, public utilities, social services, tourism and recreation) and SMALL to MODERATE (education, transportation, and public safety), or MODERATE to LARGE (social services) based on inquiries to local governments. (NRC 2002). These were evaluated for the SAFSTOR option for LACBWR, as discussed above, and are therefore bounding for the DECON option.

3.9 Environmental Justice

The environmental justice impact analysis evaluates the potential for disproportionately high and adverse human health and environmental effects on minority and low-income populations that could result from activities associated with the proposed LTP at LACBWR. Such effects may include human health, biological, cultural, economic, or social impacts. Minority and low-income populations are subsets of the general public residing in the vicinity of LACBWR, and all are exposed to the same health and environmental effects generated from activities at LACBWR.

3.9.1 Minority Populations in the Vicinity of LACBWR

According to the 2010 Census, 1.6 percent of the total population (approximately 990 individuals) residing within a 4-mi radius of LACBWR identified themselves as minority (MCDC 2018). The largest minority populations were people of two or more races (0.6 percent) and Hispanic, Latino, or Spanish origin of any race and American Indian and Alaska Native, both comprising 0.4 percent of the total population. According to the U.S. Census Bureau's 2010 Census, about 3 percent of the Vernon County population identified themselves as minorities, with persons of Hispanic, Latino, or Spanish origin of any race comprising the largest minority population (1.3 percent) (USCB 2018). According to the U.S. Census Bureau's 2015 American Community Survey 5 Year Estimates, the minority population of Vernon County, as a

percentage of the total population, had increased to about 3.5 percent, with persons of Hispanic, Latino, or Spanish origin of any race increasing to 1.5 percent (USCB 2018).

3.9.2 Low-income Populations in the Vicinity of the LACBWR

According to the U.S. Census Bureau's 2011–2015 American Community Survey 5-Year Estimates, approximately 15 families and 100 individuals (5.3 and 10.5 percent, respectively) residing within a 4-mi radius of the LACBWR were identified as living below the Federal poverty threshold (MCDC 2018). The 2015 Federal poverty threshold was \$24,257 for a family of four (USCB 2018).

According to the U.S. Census Bureau's 2011–2015 American Community Survey 5-Year Estimates, the median household income for Wisconsin was \$53,357, while 8.6 percent of families and 13 percent of the state population were found to be living below the Federal poverty threshold. Vernon County had a lower median household income average (\$47,675) and a higher percentage of families (9.7 percent) and persons (16 percent) living below the poverty level, respectively (USCB 2018).

3.10 Historic and Cultural Resources

This section discusses the cultural background and the known historic and cultural resources found on and in the vicinity of the LACBWR. The discussion is based on information provided in the NRC's 1980 FES for operations and information gained from the Wisconsin Historical Society (WHS).

The direct area of potential effect (APE) for this proposed action is the approximate 31-ha (75-ac) radiologically restricted area. The indirect APE is the previous site boundary, 66 ha (163 ac), and includes the ISFSI. This determination is made irrespective of land ownership or control.

3.10.1 Cultural Background

Native American Tribes are believed to have arrived in Wisconsin over 10,000 years ago. Between 500 BC to around AD 1300, earthen burial mounds were introduced marking the Woodland Tradition (WHS 2019b). The Woodland period saw more permanent settlements and changes in burial practices (NRC 2015). Archeologists have defined a culture referred to as "effigy mound" that appeared in Wisconsin. The effigy mounds were built in the shape of birds, animals, spirit animals, people, or abstract shapes. The dead were buried in small pits or laid on prepared surfaces and then mounds were built over them. (WHS 2019b).

During the Mississippian era, there were major changes in settlement, subsistence patterns, and social structures. In Southern Wisconsin, the Mississippian culture was blended with the Woodland Tradition to create the Oneota tradition. The Oneota culture is noted by permanent villages, hunting and gathering as well as cultivation of maize. Burial traditions varied from the burial mounds of the Woodland tradition to the non-mounded, village cemeteries. (NRC 2015).

The end of the Mississippian culture is characterized by social, political, and demographic changes caused by contact with Europeans. During the first quarter of the nineteenth century more settlers began to arrive and the white population continued to grow. In 1825, the U.S. Government invited Tribes from the Upper Mississippi to meet at Prairie du Chien and worked out a general treaty of peace and established boundaries between the white settlers and Native Americans. Many Tribes were forced or pressured to cede their land. Competition for resources led to sporadic wars between tribes and settlers. The Black Hawk War of 1832 was initiated due to the Sauk and Fox tribes being forced to cede their land claims. (WDHS 2019a).

Most American Indians had been placed on reservations by 1871. The U.S. government had created schools for Native Americans to force assimilation, such as the Menominee Boarding School at Keshena or the Lac du Flambeau Boarding School at Lac du Flambeau. (WDHS 2019a).

3.10.2 Historic and Cultural Resources

The National Historic Preservation Act of 1966, as amended (NHPA), requires Federal agencies to consider the effects of their undertakings on historic properties, and the remaining decommissioning activities and license termination activities are an undertaking that could potentially affect historic properties. As stated in the NHPA, historic properties are any prehistoric or historic district, site, building, structure, or object included in, or eligible for, inclusion in the National Register of Historic Places (NRHP).

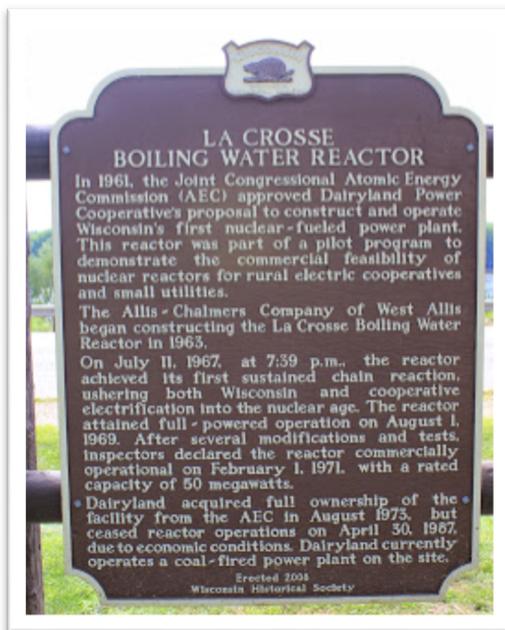


Figure 13. LACBWR Wisconsin Historical Marker (Source: Wisconsin Historical Society)

The National Register of Historic Places lists several properties in Vernon County, Wisconsin, however, there are no historic properties located at LACBWR. The closest site is the Goose Island Archeological site near Stoddard, Wisconsin, approximately seven miles away from LACBWR, which was added in 1980 to the National Register (LS 2018c). NUREG-0191 (NRC 1980) also references three Wisconsin historical markers placed along Highway 35 in Vernon County. The markers note the Mississippi River locks system, the Battle of Bad Axe, and the LACBWR facility itself (See Figure 13).

In accordance with the provisions of the NHPA, the NRC is required to make a reasonable effort to identify historic properties included in, or eligible for, inclusion in the NRHP in the APE.

In the NRC's FES for operation of the LACBWR, the NRC concluded that there were no historic properties to be affected by the operation of the LACBWR. The WHS provided comments on the FES confirming there were no sites on the

NRHP that would be adversely affected by the operation of LACBWR, nor were any sites known in the project area that were eligible for inclusion on the NRHP (NRC 1980).

For this project, the NRC sent letters to 14 federally recognized Tribes and the WHS to ask for information about potential resources (NRC 2017d, 2018b). The NRC received one response, from the Miami Tribe of Oklahoma, who stated that the site was within the aboriginal homelands of the Miami Tribe but that they were “not currently aware of existing documentation directly linking a specific Miami cultural or historic site to the project site.” (Hunter 2018).

Based on this previous finding in the 1980 FES and no new information from Tribes or the WHS, the NRC submitted a determination to the WHS that no historic properties would be affected by this project (NRC 2018e). The WHS concurred with that finding but also indicated that a Native American mound group (River Road mounds VE-00111) may overlap with the area to be decommissioned (WHS 2019a).

The WHS, in a letter to the NRC in 1974, related to the FES for operations, had noted that there were several groups of mounds in the general vicinity of the LACBWR, but that they were not aware if the sites still existed or if other sites were located within the project area since no comprehensive survey had ever been completed. There was no additional information on those sites in the FES. Based on the new information provided by the WHS, the River Road mounds were first recorded in 1912. A survey in 2012 reported heavy disturbance from the fossil fuel plant, road cut, fill, and other developments. This confirms the observations from a previous 2006 visit which indicated disturbance from access roads and areas of steep slopes. No surface indications of the mounds remain. According to the WHS, the mounds are recognized as an “uncatalogued burial site” under Wisconsin’s Burial Sites Preservation law (Wis. Stat. § 157.70).

A small part of the mound area, as defined by the WHS, does overlap with the APE for this project. The NRC has determined that although the defined mound area overlaps with the direct APE, the overlap occurs in areas where land disturbing activities are not expected to occur. NRC confirmed with the licensee that they have not encountered any human or burial artifacts during any activities.

The WHS identified the following Wisconsin State requirements that may apply to the licensee’s proposed activities. Prior to doing any work in an uncatalogued burial site, the landowner is required to submit a formal “Request to Disturb” and obtain an authorization from the State prior to commencing any work within the boundaries of the uncatalogued burial site; a qualified archaeologist (§157.70 [1] [i] and HS 2 [6] [a]) must be present to monitor the work. It is the responsibility of the licensee to obtain an authorization under Wisconsin Statute §157.70. Wisconsin law also requires landowners to stop work if human remains or burial objects are found during excavation. In addition to any State requirements, the licensee has a procedure in place that requires them to contact the NRC immediately if remains are found during land disturbing activities (NRC 2019b).

The NRC sent letters to 20 federally recognized Tribes informing them of the information from the WHS and indicating our determinations (NRC 2019a, c). The NRC received six responses, one indicating the area was not within its area of interest, two indicating it had no information or comment about the project site at this time, and two requesting copies of any signed authorizations or surveys (LaRonge 2019, St John 2019, Whipple 2019, Quackenbush 2019, Hunter 2019). More information about communication with Tribes can be found in Section 6.1 of this EA. The NRC's finding under Section 106 of the NHPA is that no historic sites will be affected, which the WHS concurred. Based on portions of the site being filled with dredged material, significant land disturbance from the original construction of the site, the licensee having procedures in place in the event human remains are found, and State requirements for conducting activities within burial sites, and the fact that no surface features remain, license termination activities and the remaining decommissioning activities would not have a significant impact on the burial mounds.

3.11 Aesthetics

There are temporary (e.g., noise and dust) and permanent (viewsheds) aesthetic impacts as a result of decommissioning. Licensees are expected to use best management practices to control dust and noise. The removal of structures is generally considered beneficial to aesthetics (NRC 2002).

The LACBWR site is located on the eastern shore of the Mississippi River. After decommissioning is complete, only a few structures will remain (e.g., ISFSI). Operation of the G-3 Fossil Station will continue so the industrial utility of the site will remain. Boaters who might have used LACBWR as a marker, will still be able to use the G-3 facility for that purpose. LS stated recreational use might be another possible use of the site in the future (LS 2018c).

3.12 Noise

In the GEIS, the NRC staff made the generic conclusion that for all facilities, the potential noise impacts from decommissioning including license termination activities are SMALL. Noise will be generated primarily from demolition activities and heavy equipment. License termination activities (e.g. site radiological surveys and scans) would not generate any noise. Most work is completed during daylight hours and during the work week (LS 2018c). Truck and rail shipments would also generate noise. The Decommissioning GEIS (Table 4-5) predicts rail traffic could generate up to 68 dBA one mile away. The nearest residences are within one mile of the LACBWR, located to the east and northeast (LS 2018c). Based on the predicted noise levels from dismantling and rail shipments, as noted in the GEIS, the nearest residence could hear rail traffic and machinery at LACBWR. However, those activities are intermittent and temporary and residents living near the rail line would be used to the noise generated from the rail traffic.

3.13 Waste Management

Decommissioning generates large volumes of waste, both radioactive and nonradioactive (e.g., hazardous, municipal, and demolition), primarily from the dismantling of buildings and equipment. Decommissioning activities at the LACBWR site are subject to non-NRC Federal and State of Wisconsin regulations, permits, licenses, notifications, and approvals, including those for hazardous waste generation and disposition, handling and removal of asbestos, handling and removal of lead-containing materials, and removal of underground storage tanks. Chapter 2 (Site Characterization) of the LTP provides a description of historical spills and other events at the LACBWR site that may have contaminated site structures or soils with radiological or chemical constituents. Chapter 2 of the LTP also describes numerous studies, analyses, and other efforts to characterize the site in detail to determine the extent of radiological and nonradiological contamination and estimate the quantities of wastes for disposal onsite (e.g., clean concrete) or offsite (e.g., municipal waste or low-level radiological waste (LLW)).

In total, LS projects approximately 11,000 m³ (394,000 ft³) of radioactive wastes and approximately 13,700 m³ (483,000 ft³) of nonradioactive wastes (primarily clean debris and recyclable metal) to be generated as a result of past and ongoing decommissioning activities (LS 2018c, Table 3-3). Radioactive and nonradioactive wastes are discussed in separate sections below.

3.13.1 Radioactive Waste

The types of LLW generated from LACBWR decommissioning include, but are not limited to, contaminated equipment, systems, structures, tools, protective clothing, asbestos-containing materials, resins and filters, and bulk debris (concrete, metal, etc.) (LS 2018c). The disposition of spent nuclear fuel is discussed in the latter portion of this section.

The GEIS estimated the volume of land required for radioactive waste disposal as an irretrievable and irreversible impact. In the GEIS (Table 4-7), it was estimated that for SAFSTOR, 18,000 m³ (636,000 ft³) of land would be needed for disposal of LLW from BWRs based on information from previously decommissioned facilities (NRC 2002). LS projects approximately 11,000 m³ (394,000 ft³) of LLW would be generated from decommissioning LACBWR. This estimate includes legacy waste – demolition debris – that has been stored within the LACBWR site. LS is shipping most of its LLW waste via railcar to the EnergySolutions site in Clive, Utah site. (LS 2018c).

The licensee is required to meet the requirements of 10 CFR 50.36(a) for effluent releases after permanent cessation of operation. Licensees are also required to keep releases of radioactive materials to unrestricted areas at ALARA levels. Licensees must also comply with EPA's standards in 40 CFR Part 190, "Environmental radiation protection standards for nuclear power operations." (NRC 2002).

In 2012, LS completed the transfer of spent fuel from the spent fuel pool to the onsite ISFSI (DPC 2012b). The ISFSI holds 5 vertical concrete casks (LS 2018c). Following decommissioning, the ISFSI will continue to operate and remain under the possession-only license until such time as a deep geologic repository becomes available to accept spent fuel or until other spent fuel disposal arrangements become available.

3.13.2 Nonradioactive Waste

The nonradioactive waste generated primarily consists of debris and scrap metal. While the GEIS discussed the types of nonradioactive wastes that might be generated during decommissioning and the various regulations for its disposal, the GEIS did not estimate quantities of nonradioactive waste (NRC 2002). LS estimates approximately 10,200 m³ (361,000 ft³) of the waste is “clean” debris and asphalt. Scrap metal, estimated to be 3,500 m³ (122,000 ft³), is being recycled. (LS 2018c). Figure 14 provides the projections of nonradioactive waste generated from LACBWR decommissioning.

LACBWR has generated universal wastes (e.g., fluorescent bulbs and mercury-containing items), polychlorinated biphenyls wastes, used oil, and hazardous wastes during operations and decommissioning. Some wastes have been shipped for disposal at approved facilities in accordance with federal and state regulations, while other wastes are being stored onsite while awaiting shipment to an approved facility. (LS 2018c).

Figure 14. Projected Approximate Nonradioactive, Nonhazardous Waste Volumes (LS 2018c, Table 3-3)

Waste Type	Disposal	Waste Volume (m ³)	Waste Volume (ft ³)
Clean backfill	Landfill	7,500	264,000
Clean Asphalt	Landfill	2,700	97,000
Scrap Metal and Rebar	Recycled	3,500	122,000
Total		13,700	483,000

3.14 Transportation and Traffic

The GEIS addressed impacts to transporting equipment and materials offsite. Materials discussed in the GEIS include LLW, hazardous and nonhazardous wastes, and mixed waste. Radiological impacts include exposures to the public and workers along the transportation route. Nonradiological impacts include increased traffic, wear and tear on the roadways, and traffic accidents.

The primary route to the LACBWR site is via Highway 35 that runs north-south along the Mississippi River in western Wisconsin. The annual average daily traffic (AADT) for Highway 35 in the vicinity of LACBWR is 4500, up from 4000 in 2013 (WDOT 2018). The number of workers for decommissioning ranges from 25 to 100 (LS 2018a). LS estimates that there are approximately 40 staff for the ISFSI (LS 2018c). These LACBWR workers would be in addition to the commuters for the G-3 Fossil Station.

LS transports its LLW (Class A) offsite via truck to the Seven Rivers Intermodal Facility in Winona, Minnesota. The trucks travel north from the site on Highway 35, west on Highway 14 into Minnesota, and then continue north. The intermodal containers are loaded onto Union Pacific railcars. From there, they are transported to EnergySolutions in Clive, Utah. LS indicated that it will transport seven vehicles (trucks with trailers) to and from the site, five days a week until all the waste is transported offsite (LS 2018a). In the REMP reports for 2013 through 2016, about 25 shipments were made each year to Clive, Utah and/or Oak Ridge, Tennessee (LS 2014, 2015, 2016d, 2017a). In 2017, LS made 918 rail and truck shipments of solid waste to Utah (LS 2018f), which is less than 3 shipments per day. There are no estimates of number of shipments for nonradiological waste offsite. LS intends to take backfill material (estimate of 200 loads) from a non-impacted area located to the east of the G-3 coal pile. LS estimates that another 250 truckloads of backfill will be brought onsite from a borrow pit, located in Genoa, Wisconsin (LS 2018a).

Regarding transportation accidents, the GEIS states that, historically, the accident rate for activities at nuclear facilities has been lower than the national average for similar activities, attributed to the nuclear industry emphasis on training and procedures (NRC 2002). The GEIS assumed most decommissioning waste would be transported by truck. However, at LACBWR, most waste will be transported by rail for disposal (LS 2018a). The Decommissioning GEIS estimates that shipment of LLW by rail rather than by truck would reduce radiological impacts significantly (NRC 2002). The GEIS concluded that the radiological impacts from transportation, based on compliance with applicable regulations, would not be detectable or destabilizing. NRC expects that LS will comply with all regulations and requirements for transport of waste and materials.

The GEIS states that transportation impacts include increases in traffic density, wear and tear on roadways and railways, and transportation accidents. While this analysis was primarily based on material leaving the site, those impacts would also apply to truck traffic bringing material (such as clean backfill soils) to the site (NRC 2002). Assuming the maximum

commuting workforce, trucks carrying backfill material, and LLW shipments all occurred at the same time, this would represent an almost 16 percent increase in vehicular traffic over the current AADT, which would likely be noticeable. Impacts are considered destabilizing if increased traffic causes a decrease in the level of service or measurable deterioration of affected roads can be directly tied to the activities at the plant (NRC 2002). At this time, the NRC has no reason to conclude the level of service has decreased or the transportation infrastructure on Highway 35 has declined from license termination and decommissioning activities.

4.0 ENVIRONMENTAL IMPACTS

This section of the EA evaluates the environmental impacts from the remaining decommissioning activities and license termination activities described in Section 2.2.

The GEIS addresses decommissioning of nuclear power reactors licensed by the NRC, including LACBWR, and evaluates environmental impacts from decommissioning activities common to a number of nuclear power facilities. In the GEIS, the NRC staff concludes that the environmental impacts of decommissioning, including license termination activities, can be determined generically for all nuclear power plants and will have SMALL impacts for most resource areas. The GEIS included information gained from the LACBWR decommissioning experience up to 2002 (NRC 2002). Figure 15 summarizes the impact considerations for those resource areas at LACBWR that are generically resolved and bounded by the GEIS analysis.

The analysis in this Section, however, focuses on the following resource areas: climate change, water resources, protected species and habitats, environmental justice, and nonradiological waste. Climate change and nonradiological waste were not evaluated in the Decommissioning GEIS, the FES for operations, nor the DP EA. Protected species and habitats and environmental justice were not generically resolved in the GEIS and therefore require a site-specific analysis. The River and ground water at the LACBWR site was contaminated with tritium as a result of demolition activities, which was not addressed in the GEIS and therefore requires a site-specific analysis.

Figure 15. Environmental Resource Areas Bounded by the Decommissioning GEIS

Environmental Resource	Impact Consideration
Land Use	The NRC staff expects no impacts associated with these issues beyond those discussed in the GEIS, which concluded that the impact level for these issues is SMALL. There are no activities occurring offsite.
Air Quality	The NRC staff expects no impacts associated with air quality beyond those discussed in the GEIS, which concluded that the impact level for this issue is SMALL.
Ecological Resources	The NRC staff expects no impacts associated with these resources beyond those discussed in the GEIS, which concluded that the impact level for these issues is SMALL.
Public and Occupational Health	The NRC staff expects no impacts associated with these resources beyond those discussed in the GEIS, which concluded that the impact level for these issues is SMALL.
Socioeconomics	The NRC staff expects no impacts associated with these resources beyond those discussed in the GEIS, which concluded that the impact level for these issues is SMALL. Many of the impacts from the facility ceasing operation and entering decommissioning have already occurred.
Historic and Cultural Resources	The NRC staff expects no impacts beyond those discussed in the GEIS, which concluded that the impact level for these issues is SMALL (onsite). Based on portions of the site being filled with dredged material, significant land disturbance from the original construction of the site, the licensee having procedures in place in the event human remains are found, and State requirements for conducting activities within burial sites, and the fact that no surface features of the mounds remain, the

Environmental Resource	Impact Consideration
Aesthetics	effect of the license termination activities and remaining decommissioning activities on the mounds would not be significant. No decommissioning activities will be occurring offsite.
Noise	The NRC staff expects no aesthetics impacts beyond those discussed in the GEIS, which concluded that the impact level for these issues is SMALL.
Transportation	The NRC staff expects no impacts associated with noise beyond those discussed in the GEIS, which concluded that the impact level for these issues is SMALL.
LLW Disposal	Although the number of shipments per day are estimated to be greater than those considered in the Decommissioning GEIS, the NRC staff does not expect impacts associated with transportation to be destabilizing or beyond those discussed in the GEIS, which concluded that the impact level for this issue is SMALL.
LLW Disposal	The GEIS addressed LLW disposal impacts in the context of irretrievable resources and concluded that the land disposal requirements for LLW would be SMALL. The NRC staff expects no impacts associated with low-level radioactive waste disposal beyond those discussed in the GEIS.

4.1 Water Resources

Section 3.3 provides information about surface and ground water at the LACBWR site. Runoff and wastewater streams are still discharged into the Mississippi River, regulated by state permits. Ground water is used for potable water and will continue to be used although at rates much less than during LACBWR operations.

During decommissioning and license termination activities, there have been two events which allowed radioactive material to reach the Mississippi River and groundwater. In February 2017, LS notified the NRC that a containment berm of a tank had overflowed. The water traveled over the asphalt surface to the storm sewer and then eventually discharged to the Mississippi River. The Cs-137 concentrations ranged from $1.1E^{-06}$ uCi/ml to $2.86 E^{-06}$ uCi/ml, which exceed 10 CFR Part 20 Table 2 effluent limits for water but do not exceed the NRC's reporting requirements (20 times Table 2 limits). (LS 2017b).

In December 2017, LS discovered tritium contamination in the ground water. Elevated concentrations of tritium were detected in samples collected from groundwater monitoring well MW-203A in December 2017, and later in well MW-202A and its replacement well MW-202AR. LS stated that dust generated from demolition activities within the reactor building, containing tritium, passed through the ventilation system. The dust landed on the ice and snow melt on frozen ground. LS believes that subsequent snow melt and rain events carried the contaminated dust through surface water flow to a sump where the contamination entered the groundwater. The sump was at the eastern end of the demolished Turbine Building, which abutted the Reactor Building. A portion of the tritium reached monitoring wells MW-203A located approximately 60 ft downgradient and MW-202A/202AR approximately 215 ft downgradient. The extent and maximum concentration of the tritium plume was not characterized, other than the measurements at the two existing wells. No other radionuclides have been detected in the groundwater well samples (LS 2018b).

During the December 2017 routine sampling event, LS detected elevated levels of tritium (or H-3) at MW-203A of 13,000 pCi/L. Previous sampling results were typically non-detects or background levels in the hundreds of pCi/L, therefore LS started a program that called for additional sampling to be undertaken. Additional groundwater samples were collected in February 2018 and indicated tritium exceeded the EPA's derived drinking water standard (maximum contaminant level or MCL) for tritium – 20,000 pCi/L – at 24,200 pCi/L at MW-203A. Tritium was also found at MW-202A at 13,200 pCi/L, which is downgradient from MW-203A (LS 2018g). Samples were also collected in April, June, July, August, and September 2018. Since February 2018, the concentrations have decreased below the MCL for tritium (LS 2018g). LS also sampled ice and snow melt affected by the exhaust and found tritium at approximately 237,000 pCi/L, which is reflective of the surface water contamination prior to entering the subsurface.

LS notified WDNR and NRC of its findings and took corrective actions to eliminate the source of the contamination. In March 2018, WDNR informed LS of actions that needed to be taken to address the tritium contamination. LS submitted a Site Investigation Plan (LS 2018e). In July 2018, LS began a dye tracer test to confirm the site groundwater conceptual model (LS 2018b), specifically, to provide support for the transport pathway. LS stated that the tritium contamination remained in the shallow aquifer and followed the groundwater flow direction horizontally westward towards the Mississippi River. The tracer test results confirmed that the transport pathway remained in upper part of the shallow aquifer and flowed generally westward to at least the first monitoring well (MW-203A), though the latest data set (LS 2018g) exhibited a double peak and increasing tracer concentrations in the last measurement set. Neither tracer material nor elevated tritium were detected in wells MW-202B or MW-203B, which are screened deeper in the shallow aquifer. In November 2018, two sets of simulations were documented, one set on calibration to the tracer test results and one on the prediction of maximum tritium concentrations in the groundwater (LS 2018b, g). For the first set, the groundwater model was calibrated to tracer results from the closest well, MW-203A. For the second set, the calibrated groundwater model was used to estimate the maximum tritium concentration in the groundwater based measured tritium concentrations from the more distant well, MW-202AR. Based on the model, the maximum concentration of tritium in the groundwater was estimated to be 60,000 pCi/L and the concentration reaching the River to be 10,500 pCi/L tritium.

Uncertainty in the model estimates of tritium concentrations arises because LS did not explain the discrepancy between the conceptual site model and the double peak results of the tracer test, nor provide analysis indicating that wells MW-203A and MW-202AR lie in the centerline of the groundwater plume. The NRC staff notes, however, that mixing of contaminated groundwater with the much larger volumetric flux of the River (typically 20,000 to 80,000 ft³/sec varying with the season) leads to dilution in the River of at least a couple orders of magnitude; even if only a small fraction of the River flow is considered in the mixing ratio. Large dilution of contaminated groundwater entering the River means that concentration of tritium in the River would be far below the EPA's drinking water standard.

Therefore, the NRC staff expects that (i) the impacts to groundwater as a result of this leak are temporary, localized, and appeared to be approaching background levels by September 2018, and (ii) concentrations in the river were likely well below the EPA's drinking water standard. In

addition, LS has committed to providing bottled water to workers until WDNR indicates the dye study can be terminated (LS 2018b).

The State of Wisconsin also has programs to protect groundwater quality, monitoring, and maintaining groundwater monitoring methods. The EPA, through its regulatory authority under the Comprehensive Environmental Response, Compensation, and Liability Act could require further investigation and/or remediation to ensure the groundwater quality meets its standards. Dose contribution from tritium in the soil and groundwater on site will be included in the Final Status Survey to ensure the site meets 25 mrem/yr limit for unrestricted release. Therefore, the NRC does not expect significant impacts to water resources as a result of remaining decommissioning and license termination activities.

4.2 Greenhouse Gases and Climate Change

In CLI-09-21 (NRC 2009), the Commission provided guidance to the NRC staff on addressing GHG issues in environmental reviews. That guidance directed the NRC staff to “include consideration of carbon dioxide and other greenhouse gas emissions in its environmental reviews for major licensing actions under the National Environmental Policy Act.” This Commission decision was issued after the GEIS was finalized in 2002, and as such, these topics were not addressed in the GEIS.

As discussed in Section 3.4 of this EA, equipment, worker vehicles, and truck shipments associated with decommissioning activities will emit GHGs. The NRC developed a generic GHG footprint for the lifecycle of a reference 1,000-MWe light-water reactor with an 80 percent capacity factor, including decommissioning (NRC 2014). The generic GHG footprint can be scaled for the number of units and electrical capacity. The LACBWR is much smaller in size (50 MWe) and therefore the estimates from the generic footprint will be conservatively high for the proposed action. For decommissioning over a 10 year period, 19,000 MT carbon dioxide equivalents (CO₂e) are expected from decommissioning equipment and another 8,000 MT CO₂e are expected from the decommissioning workforce (NRC 2014). LS began DECON in 2016 and expects to complete decommissioning in 2019 so the 10-year estimate is bounding for LACBWR. This amounts to 2,700 MT CO₂e annually, an amount that is far below the EPA’s threshold of 25,000 MT per year of CO₂e, which requires facilities to report GHG emissions to EPA annually in accordance with 40 CFR Part 98. Given that GHG emissions during decommissioning would be localized and temporary and well below the GHG-reporting threshold, the NRC staff concludes that GHG impacts associated with decommissioning would be minimal.

Even though GHG emission estimates from decommissioning are far below the GHG reporting threshold, the licensee could consider measures that would reduce GHG emissions. These could include use of low-GHG-emitting vehicles and other policies to reduce GHG emissions from vehicle use (e.g., anti-idling policies, vanpooling, or carpooling). Maintenance of on-road construction vehicles and off-road construction equipment would also minimize daily GHG emissions.

As discussed in Section 3.4 of this EA, climate-change impacts for the Midwest include increasing temperatures and increases in the frequency and intensity of extreme precipitation. Increases of 4 to 5°F in the annual average temperature are projected for the Midwest (GCRP 2014). Increased precipitation intensity can result in increased surface runoff and reduced water quality (GCRP 2014). In a higher temperature environment, the formation of ozone due to emissions of nitrogen oxides from onsite equipment may increase. However, air emissions due to decommissioning activities are localized and temporary and unlikely to contribute measurably to ozone formation. The thermal impact to the Mississippi River from LACBWR is no longer present given that operations have ceased, therefore increasing river water temperatures resulting from increasing air temperatures would not be exacerbated by decommissioning activities.

4.3 Protected Species and Habitat Impacts

Section 3.6 provides an overview of the protected species and habitats that have the potential to exist within the action area. In that section, the NRC concluded that four species had the potential to occur at the LACBWR site or within the vicinity (see Figure 4). Figure 16 summarizes the NRC’s effect determinations for the four Federally-listed species, followed by a discussion of impact determinations for each species.

Figure 16. Effect Determinations for Federally Listed Species

Species	Common Name	Federal Status	Effect Determination
Mussel			
<i>Lampsilis higginsii</i>	Higgins eye pearly mussel	E	may affect, but is not likely to adversely affect
<i>Plethobasus cyphus</i>	sheepnose mussel	E	may affect, but is not likely to adversely affect
Bat			
<i>Myotis septentrionalis</i>	northern long-eared bat	T	may affect, but is not likely to adversely affect
Plant			
<i>Aconitum noveboracense</i>	northern wild monkshood	T	no effect

Key: E = endangered, T = threatened

4.3.1 General Impacts

Ongoing decommissioning activities include the demolition or dismantlement of buildings and other structures. License termination activities include radiological surveys, soil sampling, and soil removal. The majority of these activities would occur within previously disturbed areas that have been used for industrial purposes for the past several decades. Based on this history, it would be unlikely that any Federally listed species occur within these areas. Radiological surveys, soil sampling, and soil removal could occur within a small tract of wetlands and a small

tract of forest that could provide habitat for some Federally listed species. Given the small size of these patches of habitat and because they are adjacent to industrial facilities, these areas provide low-quality habitat for plants, birds, and wildlife. In addition, any effects from radiological surveys, soil sampling, and soil removal would be discountable because the activities would be limited to a few times per year and ground disturbance would be limited to small, discrete areas.

Noise from demolition or other decommissioning activities could disturb and temporarily displace birds and wildlife. In response to such disturbances, birds and wildlife could move out of the immediate area and find adequate, similar habitat within the vicinity. Once decommissioning activities are complete, birds and wildlife could return to the area. Some of the disturbed areas could eventually be re-seeded and re-contoured, which may provide higher quality habitat than the currently existing industrial buildings. These activities would have a beneficial effect.

Bird and bat collisions with demolition equipment and the existing facilities could result in increased mortality caused by the presence of tall structures and artificial night lighting. Migratory songbirds would be most likely to collide with artificially lighted structures or cranes because of their propensity to migrate at night, their low flight altitudes, and their tendency to be trapped and disoriented by artificial light (Ogden 1996; NRC 2013). LS has not conducted any bird or bat collision surveys; however it is not aware of any bird or bat collisions (LS 2017a). The NRC reviewed bird collisions with plant structures at nuclear power plants and determined that collision rates were negligible sources of bird mortality with plants that have cooling towers 100 ft (30 m) in height (NRC 2013). Given that the existing buildings at the LACBWR site are lower than 100 ft (30 m), bird and bat collisions would likely be discountable. Additional details regarding the Federally listed birds and bats within the action area are provided in the next section.

Radionuclides may be released from nuclear power plants into the environment via a number of pathways. Releases into terrestrial environments often result from deposition of small amounts of radioactive particulates released from power plant vents during normal operations. Radionuclides may also be released into the aquatic environment from the liquid effluent discharge line. Radionuclides that enter shallow groundwater can be taken up by terrestrial plant species, including both upland species and wetland species, where wetlands receive groundwater discharge. Terrestrial biota may be exposed to ionizing radiation from radionuclides through direct contact with water or other media, inhalation, or ingestion of food, water, or soil.

The NRC (2013) addressed the potential for both radioactive contaminants associated with plant operations generically in NUREG-1437, "Generic Environmental Impact Statement (GEIS) for License Renewal of Nuclear Plants" (NRC 2013). The GEIS determined that examined dose exposure rates for terrestrial and aquatic animals and plants at 15 power plant sites based on reported radionuclide concentrations in water, sediment, and soils at each site. The NRC staff determined that exposure to radionuclides would be of SMALL significance for terrestrial and aquatic organisms for all nuclear power plants because exposure would be well below U.S.

Environmental Protection Agency and U.S. Department of Energy guidelines developed to protect biota. The NRC defines “SMALL” to mean that environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource (10 CFR 51, Appendix B to Subpart A, Table B–1, “Summary of Findings on NEPA Issues for License Renewal of Nuclear Power Plants”). Such an effect level would equate to “insignificant” in Endangered Species Act terminology—in other words, the effects would never reach the scale where a take would occur and, based on best judgment, a person would not be able to meaningfully measure, detect, or evaluate such effects.

4.3.2 Impact Determinations for Federally Listed Species

Higgins eye pearlymussel and sheepsnose mussel

No direct physical disturbances to potential mussel beds are expected because no in-water work is expected (LS 2018c). However, direct mortality could occur from operation of the service water system, which would withdraw and discharge water from the intake structure on the Mississippi River. Withdrawing water can result in impingement and entrainment. Impingement is the entrapment of an individual on the outer part of an intake structure or against a screening device during periods of water withdrawal (40 CFR 125.83). Impingement is not expected for this species since adults attach to the river bed and would not be swimming near the intake structure. Entrainment is the incorporation of all life stages of fish or shellfish with intake water flow entering and passing through a cooling-water intake structure and into a circulating water system (40 CFR 125.83). Organisms susceptible to entrainment are generally of smaller size than those susceptible to impingement and may include eggs, sperm, and larval stages of shellfish. Entrainment of larval Higgins eye pearlymussels or sheepsnose mussels would be minimal because larvae spend most of the time attached to female adults or other host fish (FWS 2012), reducing the chances they would be drifting in water near the intake. In addition, the withdrawal rate during decommissioning (470 gpm) is a small fraction of the withdrawal rate during operations (LS 2018a), further reducing the likelihood that larvae become entrained.

Demolition, remediation, and other activities could increase the amount of pollutants and sediments that runs off into nearby aquatic habitats, such as the Mississippi River, tributaries, streams, or wetlands. Higgins eye pearlymussels and sheepsnose mussels are particularly susceptible to increases in sedimentation and water quality degradation because these species bury within the riverbed while keeping their siphons just above the riverbed in order to filter microorganisms for food. Therefore, increased sedimentation could clog siphons or inadvertently bury mussels. Increased runoff could degrade water quality by increasing turbidity or introducing various chemicals or other pollutants. However, impacts to the Mississippi River and its tributaries are expected to be minimal because non-radiological water discharges such as stormwater runoff are, and would continue to be regulated under WDNR permits, such as LACBWR’s WDNR Tier II Industrial Storm Water General Permit, LACBWR’s WPDES permit, and WDNR Wastewater Permit. The permits include requirements to minimize runoff into the Mississippi River through the implementation of a storm water pollution prevention program and a spill prevention, countermeasure plan (LS 2018a). In addition, LS (2018a, c) would implement appropriate soil erosion and sediment control best management practices (BMPs) to minimize

the transport of suspended sediments and other pollutants, and it would monitor erosion coming from remediation or demolition areas. Therefore, increased erosion or runoff associated with the proposed action would result in insignificant or discountable effects to the Higgins eye pearlymussel and the sheepnose mussel.

Given that no direct physical disturbances to mussel beds are expected, entrainment would be minimal, and increased sedimentation and introduction of pollutants would be insignificant based on BMPs to control erosion and runoff, and the NRC staff concludes that the proposed action **may affect, but is not likely to adversely affect**, the Higgins eye pearlymussel and the sheepnose mussel.

Northern wild monkshood

In Section 3.5.1, the NRC staff determined that northern wild monkshood is not likely to occur within the action area based on the lack of suitable habitat for this species (LS 2018c, FWS 2007, WDNR 2017). Therefore, the NRC staff concludes that the proposed action would have **no effect** on this species.

Northern long-eared bat

No direct impacts to the northern long-eared bat habitat, such as disturbing roost trees or ground disturbing activities within foraging habitats, are expected. The northern long-eared bat could experience injury or direct mortality from collisions within facility structures or decommissioning equipment. LS (2018c) is not aware of any known bat collisions at LACBWR, although no formal studies regarding bird or bat collisions have occurred. The NRC staff finds it unlikely that the northern long-eared bat individuals could experience injury or mortality resulting from collisions given this species is not likely to inhabit the non-forested developed portions of the site that contain collision hazards, and if this species occurs within the action area, it would only occur in the action area for a portion of the year (e.g. spring through early fall). If a Federally-listed species were to collide with the facility or decommissioning equipment, such a collision could result in a “take,” as defined by the ESA, and ESA consultation would occur.

Noise from demolition or other decommissioning activities could disturb and temporarily displace bats. While most decommissioning and demolition activities would be confined to previously disturbed areas of the LACBWR site, activities could cause some temporary disturbances to this species if activities are audible in roosting or foraging habitats in nearby forested, wetland, or riparian areas. If individuals did avoid these areas due to noise disturbances, similar habitat would be available within the vicinity and bats could return once the decommissioning activities are completed. Therefore, the NRC staff determined that decommissioning activities would result in insignificant or discountable effects to the northern long-eared bat.

Given that collisions with facilities or decommissioning equipment would be unlikely, direct impacts from disturbing roost trees and foraging habitats is not expected, and that impacts from other decommissioning activities (e.g. noise disturbances) would result in insignificant or discountable effects, the NRC staff concludes that the proposed action **may affect, but is not likely to adversely affect**, the northern long-eared bat.

4.3.3 Species and Habitats under the National Marine Fisheries Service's Jurisdiction

As discussed in Section 3.6, no species or habitats under the NMFS's jurisdiction occur within the action area. Thus, the NRC staff concludes that the proposed action would have no effect on Federally listed species or habitats under the NMFS's jurisdiction.

In addition, the NMFS has not designated essential fish habitat pursuant to the MSA, in the Upper Mississippi River. Thus, the NRC staff concludes that the proposed action would have no effect on essential fish habitat.

4.3.4 ESA Cumulative Effects

The ESA regulations at 50 CFR 402.12(f)(4) direct Federal agencies to consider cumulative effects as part of the proposed action effects analysis. Under the ESA, cumulative effects are defined as "those effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation" (50 CFR 402.02). Unlike the definition of cumulative impacts NEPA, cumulative effects under the ESA do not include past actions or other Federal actions requiring separate ESA section 7 consultation. When formulating biological opinions under formal ESA section 7 consultation, the FWS and the NMFS (1998) consider cumulative effects when determining the likelihood of jeopardy or adverse modification. Therefore, consideration of cumulative effects under the ESA is necessary only if listed species will be adversely affected by the proposed action (FWS 2014).

Given that the NRC staff concluded earlier in this section that the proposed action would not adversely affect any listed-species, this analysis is not applicable.

4.3.5 State-listed Species and Migratory Birds

Section 3.2 describes the State-listed and migratory birds that have the potential to occur on or near the LACBWR site. License termination activities would include demolition of buildings, radiological surveys, soil sampling, and soil removal. The majority of these activities would occur within previously disturbed areas that have been used for industrial purposes for the past several decades (LS 2018c). Based on this history, most birds and wildlife near the action area would be relatively tolerant of human activity. Radiological surveys, soil sampling, and soil removal would primarily occur within lower quality habitat for State-listed species and migratory birds. In addition, any effects from radiological surveys, soil sampling, and soil removal would be negligible because the activities would be limited to a few times per year and ground disturbance would be limited to small, discrete areas. LS (2018c) would use dust suppression methods on roadways and surfaces being dismantled to minimize the impact from dust. Further, most of the undisturbed, high quality habitat was already released from the NRC license and thus would not be included in the LACBWR decommissioning activities described in the LTP (NRC 2017b).

Noise from demolition or other decommissioning activities could disturb and temporarily displace birds and wildlife. In response to such disturbances, birds and wildlife could move out of the immediate area and find adequate, similar habitat within the vicinity. Once

decommissioning activities are complete, birds and wildlife could return to the area. Some of the disturbed areas would eventually be re-seeded and re-contoured as necessary, which may provide higher quality habitat than the currently existing industrial buildings, and therefore, would be a beneficial effect.

Bird collisions with demolition equipment and the existing facilities could result in mortality caused by the presence of tall structures and artificial night lighting. Migratory songbirds would be most likely to collide with artificially lighted structures or cranes because of their propensity to migrate at night, their low flight altitudes, and their tendency to be trapped and disoriented by artificial light (Ogden 1996; NRC 2013). The NRC staff reviewed bird collisions with plant structures at nuclear power plants in NUREG-1437 and determined that collision rates were negligible sources of bird mortality with plants that have cooling towers 100 ft (30 m) in height (NRC 2013). The risk of collisions at LACBWR is even lower given that the existing buildings at the LACBWR site are lower than 100 ft (30 m) cooling towers. In addition, LS has conducted minimal nighttime dismantlement activities, which has limited the number of hours nighttime artificial lighting is present within the action area (LS 2018a). The amount of nighttime artificial lighting has decreased since the plant was shut down and continues to decrease as decommissioning continues (LS 2018a). Given that the existing buildings at the LACBWR site are lower than the 100 ft (30 m) cooling towers considered in NUREG-1437 and that nighttime artificial lighting is minimal, bird collisions would likely be very unlikely to occur.

Demolition, remediation, and other activities could increase the amount of pollutants and sediments that runoffs into nearby aquatic habitats, such as the Mississippi River (including the Upper Mississippi River National Wildlife and Fish Refuge), tributaries, streams, or wetlands. As described above, impacts to the Mississippi River and its tributaries are expected to be minimal because non-radiological water discharges such as stormwater runoff are, and would continue to be regulated under WDNR permits, such as LACBWR's WDNR Tier II Industrial Storm Water General Permit, LACBWR's WPDES permit, and WDNR Wastewater Permit. The permits include requirements to minimizing runoff into the Mississippi River through the implementation of a storm water pollution prevention program and a spill prevention, countermeasure plan (LS 2018c). In addition, LS (2018a,c) would implement appropriate soil erosion and sediment control BMPs to minimize the transport of suspended sediments and other pollutants, and it would monitor erosion coming from remediation or demolition areas. Therefore, increased erosion or runoff associated with the proposed action would result in minor effects to State-listed species.

Withdrawing water can result in impingement and entrainment. As described above, the withdrawal rate during decommissioning (470 gpm) is a small fraction of the withdrawal rate during operations (LS 2018c). The NRC (2013) staff reviewed impingement and entrainment at nuclear power plants with closed-cycle cooling and determined that the effects from impingement and entrainment are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource. Given that the withdrawal rate is small fraction of the withdrawal rate an operating plant, impingement and entrainment would likely be minimal.

Given that decommissioning and license termination activities would largely be limited to previously disturbed areas, fauna within the area are likely tolerant of human activity given the

decades of industrial activity that has occurred on the site, any noise disturbances would be temporary, bird collisions would likely be negligible, impingement and entrainment would be minimal given the relatively low withdrawal rates, erosion and runoff would be minimized through required BMPs, and disturbed areas would eventually be re-seeded and re-contoured as necessary, the NRC staff concludes that the impacts to State-listed species and migratory birds would be SMALL.

4.4 Environmental Justice

Minority and low-income populations (see Section 3.9) are subsets of the general public residing in the vicinity of LACBWR, and all are exposed to the same health and environmental effects generated from activities at LACBWR. Potential impacts to minority and low-income populations would consist of environmental and socioeconomic effects (e.g., noise, dust, traffic, employment, and housing impacts) and radiological effects. Radiation doses during decommissioning are expected to remain well below regulatory limits.

The LTP states that only areas within the existing site license boundary would be used for decommissioning activities (LS 2018c). Noise and dust impacts would be limited to onsite activities. Minority and low-income populations residing along site access roads could experience increased vehicle traffic during shift changes. Increased demand for inexpensive rental housing during major decommissioning activities could disproportionately affect low-income populations. According to 2011–2015 American Community Survey 5-Year Estimates, there were approximately 120 and 2,000 vacant housing units in the Village of Genoa and Vernon County, respectively (USCB 2018). The estimated maximum workforce for decommissioning and structural demolition is 75–100 personnel (LS 2018a).

Based on this information and the analysis of human health and environmental impacts presented in this EA, the proposed LTP would not have disproportionately high and adverse human health and environmental effects on minority and low-income populations residing in the vicinity of LACBWR.

4.5 Nonradioactive Waste Management

As described in Section 3.12.2, the management and disposal of nonradioactive hazardous and nonhazardous materials and wastes at LACBWR is ongoing as a result of decommissioning. Any hazardous materials remaining at the site or generated after the site is released from operating reactor licensing would continue to be subject to the same regulatory requirements for hazardous waste generation, handling, and disposal while the ISFSI continues to operate. Based on the availability of ample disposal capacity for nonhazardous and hazardous wastes that are not radioactive, the NRC does not expect a noticeable impact on landfill or other disposal facility capacity from the decommissioning of LACBWR. The NRC expects that LS will continue to adhere to applicable local, State, and Federal requirements regarding nonradioactive waste generation, handling, and disposal.

5.0 CUMULATIVE IMPACTS

The NRC staff evaluated whether cumulative environmental impacts could result from the incremental impact of the proposed action when added to past, present, or reasonably foreseeable future actions in the area. Decommissioning and demolition activities have been ongoing since 1994 as described in Section 2.2. In 2017, the NRC approved a partial site release, reducing the NRC-licensed area (NRC 2017a). Current and reasonably foreseeable future actions at the site include continued operation of the ISFSI and the ongoing operation of the G-3 fossil Station, ash landfills, and barge washing and therefore it is expected the site will remain as an industrial-use property (LS 2018c).

The ISFSI will continue to operate after decommissioning of LACBWR is complete and will remain until other disposal options become available (offsite interim storage or permanent repository). However, the ISFSI is a passive system that does not have any moving parts and requires minimum maintenance or management. ISFSI operation includes minimal security and basic utility services, which are already present. Doses to the public and workers are expected to remain within regulatory limits.

The Mississippi River provides an important waterway for the transportation of a variety of goods via barges and ships. Boat traffic can have a negative impact on aquatic biota habitats within the Mississippi River by degrading water quality through the introduction of various emissions, exhaust, and accidental fuel spillages. In addition, waves produced by the propulsion system and boat movement can increase turbidity through sediment resuspension. Lastly, aquatic and terrestrial biota may be disturbed by noises and human activity, and therefore, avoid the area. (WDNR 2000).



Figure 17. Coal Barge at Barge Dock Area at LACBWR Site (Source: PNNL 2013)

The co-located 379-MW G-3 Fossil Station will remain in operation. Coal-fired facilities generate air emissions, hazardous and solid wastes, and requires land for storage of coal. Rail and barge service will continue to support operations at the G-3 facility (LS 2018c). Dairyland, the operator, recycles the majority of the coal ash, using it as a concrete additive (DPC Undated).

The NRC staff has assessed the potential incremental impacts of the proposed action to the current and reasonably foreseeable activities discussed above and has determined that there would be no significant cumulative impacts because there would only be minimal incremental impacts from the proposed action described in Section 4 above and minor overlapping impacts with other projects described in this Section.

6.0 AGENCIES CONSULTED AND COMMENTS RECEIVED

6.1 Wisconsin State Review

The NRC submitted the draft EA to the State Liaison Officer at the Wisconsin Department of Health Services (WDHS) for their review and comment on December 19, 2018 (NRC 2018d). The State Liaison Officer responded on January 29, 2019, with no comments (WDHS 2019b).

6.2 National Historic Preservation Act Section 106 Consultation

In an effort to identify potential cultural and historic resources, the NRC staff contacted 14 Federally recognized Native American Tribe with ancestral ties to the project area, requesting information about historic and traditional cultural properties (NRC 2017d, 2018b).

- Lower Sioux Indian Community of Minnesota Tribe
- Upper Sioux Indian Community of Minnesota Tribe
- Winnebago Tribe of Nebraska
- Flandreau Santee Sioux Tribe of South Dakota
- Miami Tribe of Oklahoma
- Sisseton-Wahpeton Oyate of the Lake Treverse Reservation
- Chippewa Tribe of Wisconsin
- Spirit Lake Tribe of Fort Totten
- Kickapoo Tribe of Oklahoma
- Fort Belknap Community of Fort Belknap Reservation of Montana
- Menominee Indian Tribe
- Ho-Chunk
- Prairie Island Community Tribe of Minnesota
- Santee Sioux Tribe of Nebraska

The Miami Tribe of Oklahoma responded, indicating the site was within the aboriginal lands of the tribe and requested that if any remains or cultural items were discovered that the Tribal Historic Preservation Officer (THPO) be contacted (Hunter 2018).

The NRC (2018c) also requested information from the WHS about any potential resources at the site but did not receive a response.

The NRC did not identify any potential historic or cultural resources. Therefore, the NRC submitted, along with a copy of the Draft EA, its determination of *no historic properties affected* to the WHS (NRC 2018e). On February 4, 2019, the WHS responded that they concurred with the NRC's finding (WHS 2019a). However, their letter also noted the presence of a Native American mound group that may overlap with the decommissioning reactor (See Section 3.10). The WHS also noted that there were additional Federally-recognized Tribes within Wisconsin in addition to the ones the NRC had already contacted. Therefore, the NRC sent letters to 20 tribes—the 14 tribes listed above and 6 newly identified Wisconsin tribes, informing them of the information from WHS about the burial mound group and the NRC's conclusions regarding historic and cultural properties (NRC 2019a,c). The six additional tribes from Wisconsin were:

- Bad River Band of Lake Superior Chippewa Indians
- Forest County Potawatomi Community
- Lac Courte Oreilles Band of Lake Superior Chippewa Indians
- Oneida Tribe of Wisconsin
- Stockbridge-Munsee Community Band of the Mohican Indians
- Sokaogon Chippewa Community.

The NRC received a response from the Forest County Potawatomi Community that the project area falls outside their current area of interest and therefore they have no wish to consult on this project (LaRonge 2019). The Santee Sioux Nation Nebraska responded they had no information regarding this project (Whipple 2019). The Lower Sioux Indian Community said they would reach out if concerns or questions arise (St John 2019). The Ho-Chunk Nation responded and requested copies of WHS-required permits and copies of any archaeological work completed. The Ho-Chunk THPO also stated that if there are any inadvertent finds involving cultural resources during the process that the licensee stop work and contact the necessary agencies (Quackenbush 2019). The Miami Tribe requested copies of any archeological surveys performed at the sites and reiterated that if human remains or cultural items are discovered that their Tribe be contacted immediately (Hunter 2019). The NRC provided information from WHS to the Miami Tribe THPO (Hunter 2019). LS's procedure requires them to contact the NRC if remains are encountered during land-disturbing activities. The NRC would then contact the appropriate stakeholders.

6.3 Endangered Species Act Section 7 Consultation

Federal agencies may fulfill their obligations to consult with the Services under ESA section 7 in conjunction with the interagency cooperation procedures required by other statutes, including NEPA (50 CFR 402.06(a)). In such cases, the Federal agency should include the results of the ESA section 7 consultation in the NEPA document (50 CFR 402.06(b)). The NRC considers this EA and associated correspondence with the FWS (2018a, b) to fulfill its obligations under ESA section 7.

Upon receipt of LS's application, the NRC staff considered whether any Federally- listed or proposed species or designated or proposed critical habitats may be present in the action area (as defined at 50 CFR 402.02) for the proposed action. The NRC staff request a list of ESA-protected species and critical habitats within the vicinity of the facility from the FWS in accordance with the ESA section 7 regulations at 50 CFR 402.12(c). The FWS provided the list of Federally-listed species in its letter dated April 26, 2018 (FWS 2018a). The NRC staff used this list as a starting point for its analysis of effects to Federally listed species and critical habitat, which appears in Sections 3.5.1 and 4.3 of this EA. Based on this analysis, the NRC staff concludes that the proposed agency action would have no effect on critical habitat or on northern wild monkshood (*Aconitum noveboracense*). In addition, the NRC staff determined that the proposed action could have insignificant or discountable effects on Higgins eye pearlymussel (*Lampsilis higginsii*), sheepnose mussel (*Plethobasus cyphus*), and northern long-eared bat (*Myotis septentrionalis*), and therefore, the proposed action **may effect but is not likely to adversely affect** these species. Because this EA constitutes the NRC staff's

biological assessment, the NRC staff submitted a copy of the draft EA to the FWS for review in accordance with 50 CFR 402.12(j) (NRC 2018f). The FWS concurred with the NRC's ESA findings by letter, dated January 30, 2019 (FWS 2019).

7.0 CONCLUSION

The NRC has prepared this EA as part of the NRC's review of LS's license amendment request to approve and incorporate the LTP into the possession-only license for LACBWR, and to allow the licensee to make certain changes in the future to the LTP without prior NRC approval.

The Decommissioning GEIS generically addressed many of the potential environmental impacts of decommissioning at LACBWR. During its review of the LACBWR LTP, the NRC concluded that the impacts for most resource areas—land use, water resources, air quality, ecology, socioeconomics, historic and cultural resources, aesthetics, noise, transportation, and waste management—were still bounded by the GEIS. Therefore, the NRC does not expect impacts associated with these issues beyond those discussed in the GEIS, which concluded that the impact level for these issues was SMALL.

The NRC evaluated the potential environmental impacts of the remaining decommissioning and license termination activities on groundwater, climate change, environmental justice, and waste management and did not identify any significant impacts. For protected species, the NRC determined that there may be potential to affect, but not likely to adversely affect, some of the listed species.

On the basis of this EA, the NRC has concluded that there are no significant environmental impacts and a FONSI is appropriate. The FONSI will be published in the *Federal Register*.

8.0 LIST OF PREPARERS

This EA was prepared by the Environmental Review Branch in the Division of Fuel Cycle Safety, Safeguards, and Environmental Review in the Office of Nuclear Material Safety and Safeguards with support from the staff of the Office of Nuclear Reactor Regulation.

Eva Eckert Hickey, Health Physicist Contractor, Office of New Reactors, public and occupational health

Randy Fedors, Senior Hydrogeologist, Office of Nuclear Material safety and safeguards, water resources

Stacey Imboden, Senior Project Manager, Office of Nuclear Material Safety and Safeguards, land use, water resources, air quality, socioeconomics, environmental justice, transportation and traffic

Michelle Rome Moser, Biologist, Office of Nuclear Reactor Regulation, ecology and protected species and habitats, ESA Section 7 consultation

Christine Pineda, Project Manager, Office of Nuclear Material Safety and Safeguards, waste management

Jessie Muir Quintero, Project Manager, Office of Nuclear Material Safety and Safeguards, land use, noise, aesthetics, historic and cultural resources, and NHPA Section 106 consultation

9.0 REFERENCES

References used in the preparation of this EA are publicly available – either online or through the NRC’s Agencywide Documents Access and Management System (ADAMS) at <http://www.nrc.gov/reading-rm/adams.html>. To begin a search in ADAMS, select “[Begin WBA Search](#).” The ADAMS accession number is provided for references in ADAMS.

[10 CFR Part 20](#). *Code of Federal Regulations*, Title 10, *Energy*, Part 20, “Standards for Protection Against Radiation.”

[10 CFR Part 50](#). *Code of Federal Regulations*, Title 10, *Energy*, Part 50, “Domestic Licensing of Production and Utilization Facilities.”

[10 CFR Part 72](#). *Code of Federal Regulations*, Title 10, *Energy*, Part 72, “Licensing Requirements for the Independent Storage of Spent Nuclear Fuel, High-Level Radioactive Waste, and Reactor-Related Greater Than Class C Waste.”

[36 CFR Part 800](#). *Code of Federal Regulations*, Title 36, *Parks, Forests, and Public Property*, Part 800, “Protection of Historic Properties.”

[40 CFR Part 81](#). *Code of Federal Regulations*, Title 40, *Protection of Environment*, Part 81, “Designation of Areas for Air Quality Planning Purposes.”

[40 CFR Part 98](#). *Code of Federal Regulations*, Title 40, *Protection of Environment*, Part 98, “Mandatory Greenhouse Gas Reporting.”

[40 CFR Part 190](#). *Code of Federal Regulations*, Title 40, *Protection of the Environment*, Part 190, “Environmental Radiation Protection Standards for Nuclear Power Operations.”

[50 CFR Part 10](#). *Code of Federal Regulations*, Title 50, *Wildlife and Fisheries*, Part 10, “General Provisions.”

[50 CFR Part 17](#). *Code of Federal Regulations*, Title 50, *Wildlife and Fisheries*, Part 17, “Endangered and Threatened Wildlife and Plants.”

[50 CFR Part 402](#). *Code of Federal Regulations*, Title 50, *Wildlife and Fisheries*, Part 402, “Interagency Cooperation – Endangered Species Act of 1973, as amended.”

41 FR 24062. “Endangered Status for 159 Taxa of Animals.” *Federal Register*, U.S. Department of the Interior, Fish and Wildlife Service. June 14, 1976.

43 FR 17910. “Final Determination that Eleven Plant Taxa are Endangered and Two Plant Taxa are Threatened Species.” *Federal Register*, U.S. Department of the Interior, Fish and Wildlife Service. April 26, 1978.

75 FR 9282. U.S. Fish and Wildlife Service. “General Provisions; Revised List of Migratory Birds [Final rule].” *Federal Register*, March 1, 2010.

77 FR 14914. U.S. Fish and Wildlife Service. “Endangered and Threatened Wildlife and Plants: Determination of Endangered Status for the Sheepnose and Spectaclecase Mussels Throughout Their Range.” *Federal Register* 77(49):14914-14949. March 13, 2012.

80 FR 17973. U.S. Fish and Wildlife Service. “Endangered and Threatened Wildlife and Plants; Threatened Species Status for the Northern Long-Eared Bat with 4(d) Rule.” *Federal Register* 80(63): 17974-18033. April 2, 2015.

- Baker JA, Killgore KJ, Kasul RL. 1991. Aquatic habitats and fish communities in the lower Mississippi River. *Reviews in Aquatic Science* 3: 313-356.
- Bald and Golden Eagle Protection Act of 1940, as amended. 16 U.S.C. §668–668c.
- Brown AV, Brown KB, Jackson DC, Pierson WK. 2005. The lower Mississippi River and its tributaries. In Benke AC, Cushing CE, eds. *Rivers of North America*. New York, Academic Press.
- DPC. 2009. LACBWR Initial Site Characterization Survey for SAFSTOR. October 1995, Revised December 2009. ADAMS Accession No. ML18345A082.
- DPC. 2012a. Dairyland Power Cooperative La Crosse Boiling Water Reactor Possession-Only License, Decommissioning Plan Revision November 2012. November 29, 2012. ADAMS Accession No. ML12354A076.
- DPC. 2012b. Dairyland Power Cooperative La Crosse Boiling Water Reactor Possession-Only License DPR-45 Registration of Spent Fuel Dry Storage Cask in Use. September 19, 2012. ADAMS Accession No. ML12290A027.
- DPC. 2014. Dairyland Power Cooperative La Crosse Boiling Water Reactor Offsite Dose Calculation Manual, Revision 15. Date August 26, 2014. ADAMS Accession No. ML15056A700.
- DPC. Undated. Genoa Site: Dairyland Power Cooperative, Genoa, Wisconsin. Accessible at: http://www.dairynet.com/energy_resources/genoa.pdf. Accessed on July 20, 2018.
- Endangered Species Act, as amended. 16 U.S.C. § 1531 *et seq.*
- EPA. 2018. Letter from Schatzi Fitz-James, EPA, to NRC regarding MOU consultation. March 13, 2018. ADAMS Accession No. ML18303A311.
- FWS. 2006. Peregrine Falcon (*Falco peregrinus*). May 2006. Available at: <https://www.fws.gov/endangered/esa-library/pdf/Peregrinefactsheet.pdf> (accessed on 25 April 2018).
- FWS. 2007. Threatened and Endangered Species Fact Sheet: Northern Monkshood *Aconitum noveboracense*. Fort Snelling, Minnesota. November 2007. Available at: <https://www.fws.gov/midwest/endangered/plants/pdf/acnofctsht.pdf> (accessed on 22 February 2017).
- FWS. 2012. Fact Sheet: Higgins' Eye Pearlymussel *Lampsilis higginsii*. Revised August 2012. Available at <https://www.fws.gov/midwest/endangered/clams/pdf/HigginsEyeFactSheet2012.pdf> (accessed on 25 April 2018)
- FWS. 2014. "Guidance for Preparing a Biological Assessment." 6 p. Available at <http://www.fws.gov/midwest/endangered/section7/pdf/BAGuidance.pdf> (accessed February 27, 2017).
- FWS. 2016. Upper Mississippi River, National Wildlife and Fish Refuge, Illinois, Iowa, Minnesota, and Wisconsin. About the Refuge. Last updated December 13, 2016. Available at: https://www.fws.gov/refuge/Upper_Mississippi_River/about.html (accessed on 23 February 2017).

- FWS. 2017. Genoa National Fish Hatchery, FWS Fisheries, Midwest Region. Available at < <https://www.fws.gov/midwest/genoa/about.html>> (accessed May 9, 2018).
- FWS. 2018a. Letter from FWS to NRC. Subject: La Crosse Boiling Water Reactor Environmental Assessment for License Termination. List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project. April 26, 2018. ADAMS Accession No. ML18120A056.
- FWS. 2018b. IPaC Resource List for La Crosse Boiling Water Reactor Environmental Assessment for License Termination. April 26, 2018. ADAMS Accession No. ML18120A059.
- FWS. 2019. Letter from FWS to NRC. Subject: Request for Consultation under Section 7 of the Endangered Species Act for the La Crosse Boiling Water Reactor License Termination Plan (Docket Number: 50-409). January 30, 2019. ADAMS Accession No. ML19031B157.
- FWS and NMFS. 1998. *Endangered Species Consultation Handbook: Procedures for Conducting Consultation and Conference Activities Under Section 7 of the Endangered Species Act*. March 1998. 315 p. Available at <http://www.fws.gov/endangered/esa-library/pdf/esa_section7_handbook.pdf> (accessed 12 September 2016).
- GCRP. 2014. *Climate Change Impacts in the United States: The Third National Climate Assessment*. J.M. Melillo, T.C. Richmond, and G.W. Yohe (editors). U.S. Global Change Research Program. ADAMS Accession No. ML14129A233.
- Hunter. 2018. Letter from Ms. Diane Hunter, THPO for Miami Tribe of Oklahoma, to Ms. Jessie Quintero, NRC, dated July 16, 2018, regarding “License Termination Plan for La Crosse Boiling Water Reactor (Docket Number 50-409) – Comments of the Miami Tribe of Oklahoma. ADAMS Accession No. ML18198A055.
- Magnuson-Stevens Fishery Conservation and Management Act, as amended.
16 U.S.C. § 1801, *et seq.*
- Hunter. 2019. Letter from Ms. Diane Hunter, THPO for Miami Tribe of Oklahoma, to Ms. Quintero, NRC, dated April 23, 2019, regarding, “La Crosse Boiling Water Reactor in Vernon County, Wisconsin – Comments of the Miami Tribe of Oklahoma.” ADAMS Accession No. ML19115A048
- MCDC (Missouri Census Data Center). 2018. “Circular Area Profiles (CAPS),” 2010 Census Summary File 1, Aggregated Census Race and Hispanic or Latino data and 2011-2015 American Community Survey (ACS) Poverty Status data, Summary of aggregated Census data in a 4-mile (6-kilometer) radius around LACBWR (Latitude = 43.5601, Longitude = -91.2315). Accessed April 2018. Available at <http://mcdc.missouri.edu/websas/caps10c.html>.
- LaRonge. 2019. Email Response from Michael LaRonge, THPO of Forest County Potawatomi Community regarding LACBWR License Termination Plan. April 1, 2019. ADAMS Accession No. ML19105A018.
- LS. 2013. Radioactive Effluent Report and Radiological Environmental Monitoring Report for the La Crosse Boiling Water Reactor (2013). February 26, 2014. ADAMS Accession NO. ML14063A470.

- LS. 2015. La Crosse Boiling Water Reactor - Radioactive Effluent Report and Radiological Environmental Monitoring Report (2014). February 26, 2015. ADAMS Accession No. ML15056A699.
- LS. 2016a. License Amendment Request for the License Termination Plan and License Termination Plan. June 27, 2016. ADAMS Package Accession No. ML16200A095.
- LS. 2016b. La Crosse Boiling Water Reactor Request for Partial Site Release. June 27, 2016. ADAMS Accession No. ML16181A068.
- LS. 2016c. Notification of Amended Decommissioning Plan and Post-Shutdown Decommissioning Activities Report (D-Plan/PSDAR) for La Crosse Boiling Water Reactor (LACBWR). June 27, 2016. ADAMS Accession No. ML16181A117.
- LS. 2016d. La Crosse Boiling Water Reactor – Annual Radioactive Effluent Report and Radiological Environmental Monitoring Report (2015). March 1, 2016. ADAMS Accession No. ML16067A121.
- LS. 2017a. La Crosse Boiling Water Reactor (LACBWR) Annual Radioactive Environmental Monitoring Report and Radioactive Effluent Release Report (2016). February 16, 2017. ADAMS Accession No. ML17048A469.
- LS. 2017b. Reportable Event Notification 022242017 – Inadvertent Release of Contaminated Water. February 24, 2017. Accessible at <https://www.nrc.gov/reading-rm/doc-collections/event-status/event/2017/20170227en.html>.
- LS. 2018a. La Crosse Boiling Water Reactor License Termination Plan Request for Additional Information Responses. May 31, 2018. ADAMS Accession No. ML18169A271.
- LS. 2018b. La Crosse Boiling Water Reactor License Termination Plan Request for Additional Information. November 15, 2018. ADAMS Accession No. ML18331A023.
- LS. 2018c. La Crosse Boiling Water Reactor License Termination Plan Revision 1. May 31, 2018. ADAMS Package Accession No. ML18169A235.
- LS. 2018d. Application for Order Approving License Transfer and Conforming Administrative License Amendments. June 27, 2018. ADAMS Accession No. ML18184A444.
- LS. 2018e. Site Investigation Work Plan submitted to Wisconsin Department of Natural Resources LC-2018-0039. May 24, 2018. ADAMS Accession No. ML18150A568.
- LS. 2018f. La Crosse Boiling Water Reactor (LACBWR) Annual Radioactive Environmental Monitoring Report and Radioactive Effluent Release Report (2017). February 22, 2018. ADAMS Accession No. ML18057A047.
- LS. 2018g. Draft Site Investigation Report LaCrosse Boiling Water Reactor, Genoa, Wisconsin. November 2018. ADAMS Accession No. ML18331A029.
- LS. 2018h. La Crosse Boiling Water Reactor License Termination Plan Revision 1. November 15, 2018. ADAMS Accession No. ML18331A023.
- McInerny, MC. 1980. Impingement and Entrainment of Fishes at Dairyland Power Cooperative's Genoa Site. Masters Thesis. Submitted to University of Wisconsin, La Crosse. December, 1980. ADAMS Accession No. (USE # FROM RAI RESPONSE).
- Migratory Bird Treaty Act of 1918, as amended. 16 U.S.C. § 703 et seq.
- National Environmental Policy Act of 1969, as amended. 42 U.S.C. § 4321, et seq.

- National Historic Preservation Act of 1966, as amended. 16 U.S.C. § 470, *et seq.*
- NMFS. 2017. *Essential Fish Habitat Mapper v3.0*. Available at <http://www.habitat.noaa.gov/protection/efh/habitatmapper.html> (accessed 23 February 2017).
- NRC. 1980. NUREG-0191 Final Environmental Statement related to Operation of the LACBWR. April 21, 1980. ADAMS Accession No. ML17038A257.
- NRC. 1987a. Dairyland Power Cooperative, License Amendment Request. May 22, 1987. ADAMS Accession No. ML17080A422.
- NRC. 1987b. LACBWR Amendment to Decommissioning Technical Specifications. June 19, 21987. ADAMS Accession No ML17080A420.
- NRC. 1988. Issuance of Amendment 63 for Dairyland Power Cooperative (Possession-Only License). August 18, 1988. ADAMS Accession No. ML17080A421.
- NRC. 1991. NRC Order to Authorize Decommissioning of La Crosse Boiling Water Reactor. SER and EA/FONSI. August 7, 1991. ADAMS Accession No. ML17080A454.
- NRC. 2002. NUREG-0586, Supplement 1, Vol. 1 - *Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities*. U.S. Nuclear Regulatory Commission. November 2002. Available at: <http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr0586/>.
- NRC. 2009. Memorandum and Order (CLI-09-21) In the Matter of Duke Energy Carolinas, LLC, and Tennessee Valley Authority. (Combined License Application for Williams States Lee III Nuclear Station, Units 1 and 2 and Bellefonte Nuclear Power Plant, Units 3 and 4), November 3, 2009. Docket Nos. 52-014-COL, 52-015-COL, 52- 018-COL, 52-019-COL. Accession No. ML093070689.
- NRC. 2013. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants*. Revision 1. Washington, DC: NRC. NUREG–1437, Volumes 1, 2, and 3. June 2013. 1,535 p. ADAMS No. ML13107A023.
- NRC. 2014. *Interim Staff Guidance on Environmental Issues Associated with New Reactors, COL/ESP–ISG–026*. Washington, D.C. ADAMS Accession No. ML14100A157.
- NRC. 2015. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants Supplement 55 Regarding Braidwood Station, Units 1 and 2*. Washington, DC. NRC. NUREG-1437, Supplement 55. November 2015. Accessible at: <https://www.nrc.gov/docs/ML1531/ML15314A814.pdf>.
- NRC. 2016a. Order Approving Transfer of the License for the La Crosse Boiling Water Reactor from the Dairyland Power Cooperative to La Crosse Solutions, LLC and Conforming Administrative License Amendment. May 20, 2016. ADAMS Accession Package No. ML16123A049.
- NRC. 2016b. Memorandum re: Summary of the September 20, 2016 Public Meeting with Dairyland Power Cooperative and La Crosse Solutions Regarding the License Termination Plan and Partial Site Release for the La Crosse Boiling Water Reactor. October 17, 2016. ADAMS Accession No. ML16286A050.
- NRC. 2016c. NUREG-0713, Volume 36: *Occupational Radiation Exposure at Commercial Nuclear Power Reactors and Other Facilities 2014: Forty-Seventh Annual Report*. April 2016. Available at: <https://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr0713/v36/>

- NRC. 2017a. Letter to John Sauger, EnergySolutions, regarding “La Crosse Boiling Water Reactor – Request for Additional Information Regarding the La Crosse Solutions License Termination Plan and Associated Conforming License Amendment (CAC NO. L53134).” August 4, 2017. ADAMS Accession No. ML17178A252.
- NRC. 2017b. Letter to John Sauger, EnergySolutions, regarding “La Crosse Boiling Water Reactor – Approval of Partial Site Release for Possession-Only License No. DPR-45 (CAC NO. L53136). Dated April 12, 2017. ADAMS Accession No. ML16250A200.
- NRC. 2017c. Letter to Dana Stalcup, EPA, regarding “Consultation on the Decommissioning of the La Crosse Boiling Water Reactor in Genoa, Wisconsin. December 17, 2017. ADAMS Accession No. ML17047A604.
- NRC. 2017d. Letter to Mr. Wilfred Cleveland, Ho-Chunk Nation, regarding “Section 106 Consultation of the National Historic Preservation Act Regarding the License Termination Plan for the Lacrosse Boiling Water Reactors (License Number DPR-45).” March 17, 2017. ADAMS Accession No. ML17053A160.
- NRC. 2018a. La Crosse Boiling Water Reactor – Initial Federal Register notice Regarding the La Crosse Solutions License Transfer Application and Associated Conforming Administrative License Amendments to Transfer License to the Dairyland Power Cooperative. October 3, 2018. ADAMS Accession No. ML18247A211.
- NRC. 2018a. Initial *Federal Register* Notice Regarding the Lacrosse Solutions License Transfer Application and Associated Conforming Administrative License Amendments to Transfer License to Dairyland Power Cooperative. October 3, 2018. ADAMS Accession No. ML18247A211.
- NRC. 2018b. Letters to Multiple Tribes regarding, “Section 106 Consultation of the National Historic Preservation Act Regarding the License Termination Plan for the LaCrosse Boiling Water Reactor (Docket Number 50-409).” June 19, 2018. ADAMS Package Accession No. ML18159A312.
- NRC. 2018c. Letter to Mr. Jim Draeger, Wisconsin Historic Society, regarding “Notification and Request for Consultation Regarding the LaCrosse Boiling Water Reactor License Termination Plan (Docket Number 50-409).” June 25, 2018. ADAMS Accession No. ML17067A467.
- NRC. 2018d. Email to Mr. P. Schmidt, Wisconsin Department of Health Services, conveying Draft Environmental Assessment for the LACBWR License Termination Plan for Review and Comment. December 19, 2018. ADAMS Accession No. ML18354B000.
- NRC. 2018e. Letter to Mr. J. Draeger, Wisconsin State Historical Society, regarding “Request for Concurrence on Determination of No Historic Properties Affected Regarding the La Crosse Boiling Water Reactor License Termination Plan. December 19, 2018. ADAMS Accession No. ML18351A216.
- NRC. 2018f. Letter to Mr. P. Fasbender, FWS, regarding “ Request for Concurrence on Endangered Species Act Findings related to La Crosse Boiling Water Reactor License Termination Plan. December 19, 2018. ADAMS Accession No. ML18351A255.
- NRC. 2019a. Letter to Multiple Native American Tribes regarding LACBWR License Termination Plan. March 25, 2019. ADAMS Package Accession No. ML18351A255.
- NRC. 2019b. Email to Gerard P. Van Noordennen, LS, regarding Next Steps for Addressing the Wisconsin SHPO Comments on the LACBWR LTP. March 5, 2019. ADAMS Accession No. ML19064B328.

- NRC. 2019c. Emails to Multiple Native American Tribes conveying courtesy copy of March 25, 2019 letter regarding LACBWR License Termination Plan. April 1, 2019. ADAMS Accession No. ML19105A022.
- Ogden, LJ. 1996. *Collision Course: The Hazards of Lighted Structures and Windows to Migrating Birds. Fatal Light Awareness Program (FLAP)*. Paper 3. Available at <http://digitalcommons.unl.edu/flap/3?utm_source=digitalcommons.unl.edu%2Fflap%2F3&utm_medium=PDF&utm_campaign=PDFCoverPages> (accessed 12 September 2016).
- PNNL. 2013. Preliminary Evaluation of Removing Used Nuclear Fuel from Shutdown Sites. September 30, 2013. Available at: https://www.pnnl.gov/main/publications/external/technical_reports/PNNL-22676rev1.pdf.
- Quackenbush. 2019. Email Response from William Quackenbush, THPO of the Ho-Chunk Nation regarding LACBWR License Termination Plan. April 3, 2019. ADAMS Accession No. ML19105A019.
- St. John. 2019. Email from Cheyanne St John, THPO, to Jessie Quintero, NRC, regarding request for comment on NRC determination re: La Crosse Boiling Water Reactor in Vernon County, Wisconsin. April 02, 2019. ADAMS Accession No. ML19121A593.
- USACOE. Undated. US Army Corps of Engineers St. Paul District. Lock & Dam 8 website. Available at <<http://www.mvp.usace.army.mil/Missions/Navigation/Locks-Dams/Lock-Dam-8/>> (accessed May 11, 2018).
- USCB. 2018. American FactFinder, Table DP-1, “Profile of General Population and Housing Characteristics: 2010, 2010 Census Summary File 1” for Vernon County, Wisconsin; American FactFinder, Table DP05, “ACS Demographic and Housing Estimates, 2011–2015 American Community Survey 5-Year Estimates” for Vernon County, Wisconsin; and Table DP03 – “Selected Economic Characteristics, 2011–2015 American Community Survey 5-Year Estimates” for Wisconsin and Vernon County, and Table B25004 – “Vacancy Status, 2011-2015 American Community Survey 5-Year Estimates” for Vernon County and the Village of Genoa, Wisconsin. Accessed April 2018. Available at <https://factfinder.census.gov/faces/nav/jsf/pages/searchresults.xhtml?refresh=t>. “Poverty Thresholds for 2015 by Size of Family and Number of Related Children Under 18 Years.” Available at <http://www.census.gov/hhes/www/poverty/data/threshld/index.html>.
- USGS. 2015. Upper Midwest Environmental Science Center, About the Upper Mississippi River System. Last Updated on November 3, 2015. Accessed at: https://www.umesc.usgs.gov/umesc_about/about_umrs.html on February 23, 2017.
- Wisconsin Administrative Code Chapter 29. *Wild Animals and Plants*. Accessed at <<http://docs.legis.wi.gov/statutes/statutes/29>> on February 27, 2017.
- Wisconsin Administrative Code Chapter 157. *Disposition of Human Remains*. §157.70, “Burial sites preservation.” Accessible at: <https://docs.legis.wisconsin.gov/2001/statutes/statutes/157/III/70>.
- WDHS. 2019a. American Indians in Wisconsin: History. Wisconsin Department of Health Services webpage. Accessed on March 4, 2019 at: <https://www.dhs.wisconsin.gov/minority-health/population/amind-pophistory.htm>.

- WDHS. 2019b. Email from Peter Schmidt, Wisconsin Department of Health Services, conveying no comment on the LACBWR LTP Draft EA. January 29, 2019. ADAMS Accession No. ML19031B159.
- WDNR. 2000. The Effects of Motorized Watercraft on Aquatic Ecosystems. Monona, WI. March 17, 2000. Available at: <http://dnr.wi.gov/topic/ShorelandZoning/documents/201301041052.pdf> (accessed on February 27, 2017).
- WDNR. 2016. Northern Long-eared Bat (*Myotis septentrionalis*). Last Updated November 11, 2016. Accessed at: <http://dnr.wi.gov/topic/EndangeredResources/Animals.asp?mode=detail&SpecCode=AMACC01150> (accessed on 27 February 2017).
- WDNR. 2017. Natural Heritage Inventory Data, Township Tool, Data for Township 13N, Range 07W. Last Updated July 18, 2017. Accessed at: <http://dnr.wi.gov/topic/NHI/Data.asp?tool=township&mode=detail> on 27 April 2018.
- WDNR. 2018. Blue Sucker (*Cyprinus elongates*). Last updated March 9, 2018. Available at: <https://dnr.wi.gov/topic/EndangeredResources/Animals.asp?mode=detail&SpecCode=AFCJC04010> (accessed on 2 May 2018).
- WDOT. 2018. AADT Count 2016 for Highway 35. Wisconsin Department of Transportation. Accessed at: <https://trust.dot.state.wi.us/roadrunner/>. November 21, 2018. ADAMS Accession No. ML18325A060.
- WHS. 2019a. Response from Wisconsin Historical Society to NRC. February 4, 2019. ADAMS Accession No. ML19043A773.
- WHS. 2019b. Effigy Mounds Culture. Wisconsin Historical Society webpage. Accessed on March 4, 2019 at: https://www.wisconsinhistory.org/turningpoints/tp-004/?action=more_essay.
- Whipple. 2019. Email Response from Duane Whipple, THPO of Santee Sioux Nation, Nebraska regarding LACBWR License Termination Plan. April 1, 2019. ADAMS Accession No. ML19105A020.