

**LA CROSSE BOILING WATER REACTOR  
LICENSE TERMINATION PLAN  
CHAPTER 8, REVISION 1  
SUPPLEMENT TO THE ENVIRONMENTAL REPORT**

---

**TABLE OF CONTENTS**

|           |   |      |
|-----------|---|------|
| 8.        | Supplement to the Environmental Report.....                                 | 8-1  |
| 8.1.      | Introduction .....  | 8-1  |
| 8.1.1.    | Purpose.....  | 8-1  |
| 8.1.2.    | Background.....   | 8-1  |
| 8.2.      | Site Location and Description.....  | 8-2  |
| 8.2.1.    | Site Description After Unrestricted Release.....                            | 8-3  |
| 8.3.      | Remaining Dismantlement and Decommissioning Activities .....                | 8-5  |
| 8.4.      | Impacts to the Post-Shutdown Decommissioning Activities Report (PSDAR)..... | 8-5  |
| 8.5.      | La Crosse Boiling Water Reactor Environment Description.....                | 8-6  |
| 8.5.1.    | Geography and Demography .....  | 8-6  |
| 8.5.1.1.  | Site Location and Description.....  | 8-6  |
| 8.5.1.2.  | Population .....  | 8-6  |
| 8.5.1.3.  | Site Access, Land and Water Use.....  | 8-6  |
| 8.5.2.    | Climate.....  | 8-7  |
| 8.5.3.    | Topography, Geology and Seismology.....                                     | 8-7  |
| 8.5.3.1.  | Topography.....   | 8-7  |
| 8.5.3.2.  | Geology.....  | 8-8  |
| 8.5.3.3.  | Seismology.....   | 8-8  |
| 8.5.4.    | Hydrology and Hydrogeology .....  | 8-8  |
| 8.6.      | Environmental Effects of Decommissioning .....                              | 8-9  |
| 8.6.1.    | Summary .....   | 8-9  |
| 8.6.2.    | Radiological Effects of Decommissioning .....                               | 8-10 |
| 8.6.2.1.  | Occupational Radiation Exposure.....  | 8-10 |
| 8.6.2.2.  | Offsite Radiation Exposure and Monitoring.....                              | 8-12 |
| 8.6.2.3.  | Environmental Effects of Accidents and Decommissioning Events .....         | 8-12 |
| 8.6.2.4.  | Storage and Disposal of Low-Level Radioactive Waste .....                   | 8-13 |
| 8.6.2.5.  | Radiological Criteria for License Termination.....                          | 8-13 |
| 8.6.3.    | Non-radiological Effects of Decommissioning .....                           | 8-14 |
| 8.6.3.1.  | Onsite Land Use.....  | 8-14 |
| 8.6.3.2.  | Offsite Land Use (in the Vicinity) .....                                    | 8-14 |
| 8.6.3.3.  | Water Use.....  | 8-15 |
| 8.6.3.4.  | Water Quality.....  | 8-16 |
| 8.6.3.5.  | Air Quality .....   | 8-16 |
| 8.6.3.6.  | Aquatic Ecology.....  | 8-17 |
| 8.6.3.7.  | Terrestrial Ecology.....  | 8-18 |
| 8.6.3.8.  | Threatened or Endangered Species.....                                       | 8-19 |
| 8.6.3.9.  | Occupational Issues/Safety .....  | 8-20 |
| 8.6.3.10. | Cost.....   | 8-20 |
| 8.6.3.11. | Socioeconomic Impacts.....  | 8-21 |
| 8.6.3.12. | Environmental Justice .....   | 8-21 |
| 8.6.3.13. | Cultural, Historic, and Archeological Resources .....                       | 8-21 |
| 8.6.3.14. | Aesthetics .....  | 8-22 |
| 8.6.3.15. | Noise.....  | 8-22 |

---

|  |      |
|--|------|
| 8.6.3.16. Irretrievable Resources.....   | 8-23 |
| 8.6.3.17. Traffic and Transportation .....   | 8-23 |
| 8.6.3.18. Cumulative Impacts.....  | 8-24 |
| 8.7. Overview of Regulations Governing Decommissioning Activities and Site Release | 8-24 |
| 8.7.1. Federal Requirements .....  | 8-24 |
| 8.7.1.1. Nuclear Regulatory Commission.....  | 8-25 |
| 8.7.1.2. U.S. Environmental Protection Agency.....                                 | 8-25 |
| 8.7.2. Federal, State and Local Requirements .....                                 | 8-25 |
| 8.8. Conclusion.....   | 8-26 |
| 8.9. References .....  | 8-26 |

**LIST OF TABLES**

|           |   |      |
|-----------|---|------|
| Table 8-1 | Summary of the Environmental Impacts from Decommissioning<br>Nuclear Power Facilities ..... | 8-11 |
|-----------|---|------|

**LIST OF FIGURES**

|            |  |      |
|------------|--|------|
| Figure 8-1 | Site Regional Location.....                    | 8-28 |
| Figure 8-2 | Site Overview.....                             | 8-29 |
| Figure 8-3 | LACBWR Buildings.....                          | 8-30 |
| Figure 8-4 | Topographical Map.....                         | 8-31 |
| Figure 8-5 | Groundwater Sampling Wells – LACBWR Site ..... | 8-32 |

---

## LIST OF ACRONYMS AND ABBREVIATIONS

|                  |  |
|------------------|--|
| ACS              | American Community Survey                            |
| AEC              | Atomic Energy Commission                             |
| AMSL             | Above Mean Sea Level                                 |
| ALARA            | As Low As Reasonably Achievable                      |
| BGS              | Below Ground Surface                                 |
| BMP              | Best Management Practices                            |
| BWR              | Boiling Water Reactor                                |
| DOE              | Department of Energy                                 |
| DOT              | Department of Transportation                         |
| D-Plan/<br>PSDAR | Decommissioning Plan/Post Shutdown Activities Report |
| EPA              | Environmental Protection Agency                      |
| ER               | Environmental Report                                 |
| FESW             | Fuel Element Storage Well                            |
| FSS              | Final Status Survey                                  |
| G-1              | Genoa No. 1 Station                                  |
| G-3              | Genoa No. 3 Fossil Station                           |
| GEIS             | Generic Environmental Impact Statement               |
| GMU              | Geographic Management Unit                           |
| ISFSI            | Independent Spent Fuel Storage Installation          |
| LACBWR           | La Crosse Boiling Water Reactor                      |
| LSE              | LACBWR Site Enclosure                                |
| LTP              | License Termination Plan                             |
| MWe              | Megawatts Electric                                   |
| MWt              | Megawatts Thermal                                    |
| NPDES            | National Pollutant Discharge Elimination System      |
| NRC              | Nuclear Regulatory Commission                        |
| ODCM             | Off-Site Dose Calculation Manual                     |
| OSHA             | Occupational Safety and Health Administration        |
| PCB              | Polychlorinated Biphenyl                             |
| PSDAR            | Post-Shutdown Decommissioning Activities Report      |
| RWP              | Radiation Work Permit                                |

|         |  |
|---------|--|
| RCRA    | Resource Conservation and Recovery Act           |
| REMP    | Radiological Environmental Monitoring Program    |
| RPV     | Reactor Pressure Vessel                          |
| SAFSTOR | SAFe STORAge                                     |
| SSC     | Structures, Systems and Components               |
| TEDE    | Total Effective Dose Equivalent                  |
| TSCA    | Toxic Substance Control Act                      |
| USACE   | United States Army Corps of Engineers            |
| USEPA   | United States Environmental Protection Agency    |
| VCC     | Vertical Concrete Cask                           |
| WCS     | Waste Control Specialists                        |
| WDNR    | Wisconsin Department of Natural Resources        |
| WPDES   | Wisconsin Pollutant Discharge Elimination System |

## **8. Supplement to the Environmental Report**

### **8.1. Introduction**

In accordance with the requirements of 10 CFR 50.82 (a)(9)(ii)(A) and the guidance of *Regulatory Guide 1.179, Standard Format and Contents for License Termination Plans for Nuclear Power Reactors* (1), this chapter provides a supplement to the environmental report describing any new information or significant environmental change associated with the site-specific decommissioning and site closure activities performed at the La Crosse Boiling Water Reactor (LACBWR) site.

#### **8.1.1. Purpose**

This chapter supplements the 1972 Dairyland Power Cooperative (Dairyland) *Environmental Report, La Crosse Boiling Water Reactor* (ER) (2), which was revised on June 15, 1973 (3), by describing any new information or significant environmental changes associated with the site-specific decommissioning and license termination activities presented in this License Termination Plan (LTP). This supplement, including reference to LTP Chapter 3, provides a detailed description of the remaining decommissioning and site closure activities, the interaction between those activities and the environment, and the likely environmental impact of those activities.

The supplement discusses whether the activities and their impacts are bounded by the impacts predicted by the United States Nuclear Regulatory Commission (NRC) *NUREG-0191, Final Environmental Statement related to operation of La Cross Boiling Water Reactor, April 1980* (NUREG-0191) (4); *NUREG-0586, Supplement 1, "Generic Environmental Impact Statement (GEIS) on Decommissioning of Nuclear Facilities"*, November 2002 (5); and the Dairyland *LACBWR Decommissioning Plan and Post-Shutdown Decommissioning Activities Report (D-Plan/PSDAR)* (6). This chapter discusses decommissioning activities, with a focus on activities to be performed from time of submittal of this LTP until the completion of site restoration activities.

#### **8.1.2. Background**

LACBWR consists of a single Allis-Chalmers designed 50 megawatt electric (MWe) Boiling Water Reactor (BWR) constructed in 1967 as a demonstration reactor in conjunction with the U.S. Atomic Energy Commission (AEC). The plant was commissioned in November 1969. In 1973, the reactor and its fuel were transferred to Dairyland. It was operated by Dairyland until April 30, 1987, when it was shut down because of economic reasons due to its small size and electrical output. The plant was placed in SAFSTOR on August 7, 1991. An initial Site Characterization Survey for SAFSTOR was completed in October 1995.

Limited dismantlement activities were started in 1994, including the removal and off-site disposal of the Reactor Pressure Vessel (RPV) in May 2007. All of the spent nuclear fuel, consisting of 333 spent fuel assemblies, was transferred from the Fuel Element Storage Well (FESW) to dry cask storage at the on-site Independent Spent Fuel Storage Installation (ISFSI) by September 19, 2012. On March 12, 2014, Dairyland submitted a revision of the LACBWR D-

Plan/PSDAR to the NRC that accounts for the completion of the spent fuel transfer. Additional characterization was performed by EnergySolutions commencing on October 9, 2014 and concluding on August 6, 2015. The results of the site characterization surveys performed by EnergySolutions is documented in two separate reports, *LACBWR Radiological Characterization Survey Report for October and November 2014 Field Work (7)* and *LACBWR Radiological Characterization Survey Report for June thru August 2015 Field Work (8)*.

As stated in the D-Plan/PSDAR, “Review of post-operating license stage environmental impacts was documented in a supplement to the Environmental Report for LACBWR dated December 1987. LACBWR decommissioning and dismantlement activities have resulted in no significant environmental impact not previously evaluated in the NRC's Environmental Assessment in support of the August 7, 1991, Decommissioning Order or NUREG-0191 related to operation of LACBWR, dated April 21, 1980.” This review included the evaluation of impacts against those noted in the ER and NUREG-0586. The reference BWR facility in NUREG-0586 was the 1,155 MWe WNP-2 BWR operated by Washington Public Power Supply System (plant now known as Columbia Generating Station, owned and operated by Energy Northwest). As LACBWR is a much smaller reactor compared to WNP-2, its impacts fall within the envelope of the generic environmental assessment. NUREG-0586 also provided information about the decommissioning impact of a small 58.2 megawatt thermal (MWt) BWR demonstration reactor located in Elk River, Minnesota, which was dismantled between 1971 and 1974. It was noted that this decommissioning was completed safely with little risk to workers and the public. The Elk River facility was another Allis-Chalmers reactor, a superheated test BWR, which achieved license termination in 1974 (9).

The latest D-Plan/PSDAR document (issued in March 2014) concluded the following:

“The environmental impact of all completed or planned LACBWR decommissioning and dismantlement activities is SMALL as determined by the GEIS. LACBWR decommissioning is specifically evaluated in the GEIS. As stated in the GEIS, licensees can rely on information in this Supplement as a basis for meeting the requirements in 10 CFR 50.83(a)(6)(ii). Site-specific potential environmental impacts not determined in the GEIS are:

- Offsite land use activities
- Aquatic ecology as to activities beyond the operational area
- Terrestrial ecology as to activities beyond the operational area
- Threatened and endangered species
- Socioeconomic
- Environmental justice”

## **8.2. Site Location and Description**

LACBWR is located in southwestern Wisconsin, in Vernon County, on the east shore of the Mississippi River, about 1 mile south of the Village of Genoa, WI and approximately 19 miles south of the city of La Crosse, WI. The Site Regional Location graphic (Figure 8-1) shows the site location, including nearby prominent features such as highways, rivers and lakes. The map coordinates for LACBWR are longitude 91°, 13', 53.35" West and latitude 43°, 33', 36.22"

North. The site is at mile 678.6 on the Mississippi River above the mouth of the Ohio River. The Reactor Building is approximately 300 feet from the Mississippi River and 475 feet west of the cargo-carrying-only rail road. The Reactor Building stands on filled land at an elevation of 639 feet Above Mean Sea Level (AMSL), or 19 feet above the normal elevation of the Mississippi River. The covered land consisted of the river edge and low forest areas which were filled with sand material dredged from the Mississippi River.

The licensed site comprises a total of 163.5 acres which is owned by Dairyland, with the actual LACBWR plant comprising only 1.5 acres. The site is accessed by a road on the south side of the plant off of Highway 35. Other prominent site features include:

- the land north of the LACBWR plant, which includes the site switchyard and the site of the former Genoa No. 1 Station (G-1) coal (and later oil) fueled power plant (removed in 1989),
- the land area directly south of LACBWR, which contains an operational 350 MWe fossil generating station (Genoa No. 3 Fossil Station [G-3]), located approximately 175 feet from the LACBWR plant,
- the land area south of G-3, where the ISFSI is located, and
- the parcel of land to the east of Highway 35, across from LACBWR.

The Site Overview (Figure 8-2) illustrates the boundary of the licensed site.

The site is bordered on the north by the Mississippi River and a narrow strip of land between the Mississippi River and Highway 35. The U.S. Lock & Dam No. 8, managed by the U.S. Army Corps of Engineers (USACE) Rock Island District, is located approximately 0.6 miles upstream. The site is bordered on the west by the Mississippi River and bordered on the east by Highway 35. A Burlington Northern-Santa Fe rail line, located between the site and Highway 35, carries commercial freight along the eastern portion of the site. Passenger trains currently do not use this rail line. The site is bordered to the south by a segment of the Upper Mississippi River National Wildlife & Fish Refuge Pool 9 area. Further south, approximately 2.4 miles from LACBWR, is the Genoa National Fish Hatchery, which raises endangered mussels, brook trout and sturgeon. On the southwestern corner of the site, approximately 0.75 miles south of the LACBWR plant, there is a public boat launching ramp with a parking lot.

### **8.2.1. Site Description After Unrestricted Release**

This section provides a summary of the final condition of the site at the conclusion of decommissioning and site closure activities. The “End-State” for LACBWR decommissioning is defined as the configuration of the remaining below ground backfilled buildings, structures and piping and open land areas at the time of license termination meeting the requirements of 10 CFR 20.1402.

The decommissioning of the Class 1 areas of the plant (the on-site radiologically contaminated buildings, structures and components) will include the demolition, removal and disposal of structures. The major sub-grade structures that will be backfilled and remain at license termination are the basements of the Reactor Building and Waste Gas Tank Vault (WGTV) located below the 636 foot elevation (3 feet below grade). The Waste Treatment Building (WTB), Turbine Building (including the Turbine Sump and Turbine Pit), the Piping and

Ventilation Tunnel, Reactor/Generator Plant, and the Chimney Foundation will all be removed in their entirety. All systems will be removed from basements located below the 636 foot elevation leaving only concrete walls and floors in the “End-State.” This approach will apply to the following buildings and structures:

- Reactor Building,
- Waste Treatment Building,
- Ventilation Stack,
- Pipe and Ventilation Tunnels,
- Waste Gas Tank Vault,
- Turbine Building and Turbine Office Building,
- Low Specific Activity (LSA) Storage Building, and
- Maintenance Eat Shack.

The debris generated from demolition and removal operations will be segregated for recycling or disposal.

Figure 8-3 shows the key LACBWR buildings at the site. All on-site LACBWR buildings, structures and components, other than the LACBWR Administration Building and Crib House, will be demolished and removed to a depth of at least 3 feet below grade. None of the buildings and structures associated with G-3 are expected to be radiologically impacted such that they require remedial actions; therefore, no remediation is planned and these structures, including the G-3 Crib House, will remain intact and functional for G-3 power operations. Any contaminated structures at depths greater than 3 foot below grade will be assessed for radiological impact and potential removal. Further information on the approach to the various buildings is provided in the LTP Chapter 3.

The below grade structures to remain in the “End State” such as basement foundations will be filled with suitable clean soil, sand and/or other suitable media, as allowable under Wisconsin Department of Natural Resources (WDNR) regulations. The restored areas on the site will be backfilled, returned to grade, seeded and appropriate erosion controls will be established.

The structures outside of the “LACBWR Site Enclosure” (LSE) are not expected to be dismantled and will remain on site. These include:

- LACBWR Crib House, including fire protection piping systems,
- Outfall diffuser discharge piping, extending 110 feet into the Mississippi River,
- G-3 Coal Plant and all associated buildings, warehouses and support structures, including the coal barge washing station to the north of the plant and all associated sanitary sewer and water systems and piping,
- Electrical Switchyard, and,
- Paved roadways and the Burlington Northern-Santa Fe rail line and spur into the LACBWR plant area.

After all demolition and remediation activities are complete, a Final Status Survey (FSS) process as described in Chapter 5 of this LTP, will be performed to demonstrate that LACBWR and the surrounding open land areas within its licensed boundaries, with the exception of the ISFSI facility, comply with the radiological criteria for unrestricted use specified in 10 CFR 20.1402. As part of the decommissioning process, all spent nuclear fuel was loaded into dry storage casks and transferred to the ISFSI. It is expected that this spent fuel will remain in dry storage within the ISFSI until it is transferred to the Department of Energy (DOE).

Isolation and control measures will be implemented following the conclusion of radiological remediation activities. These activities will be completed prior to starting the FSS process. The control measures will be implemented to ensure the final radiological conditions are not compromised by the potential for re-contamination as result of access by personnel or equipment. Open land areas, access roads and boundaries will be posted with signs restricting access. Isolation and control measures will remain in effect throughout FSS activities and until there is no risk of re-contamination from decommissioning. These measures are not required in survey areas that have been released from the license.

Several services such as sanitary sewer services and electrical service will remain in operation to support the ISFSI monitoring and security operations. There are three potable wells on site supporting the adjacent G-3 fossil station which will remain in place.

### **8.3. Remaining Dismantlement and Decommissioning Activities**

To date, several key dismantlement and decommissioning activities have occurred, including the removal of the following components:

- RPV and associated reactor components (e.g. fuel shrouds, control rods, steam separators, incore monitor guide tubes, etc.),
- FESW stored components such as fuel shrouds, control rods, and start-up sources, and
- Various system piping and components associated with the Forced Circulation system, the RPV, and primary systems such as the Control Rod Drive Mechanisms, Decay Heat, Primary Purification, Seal Injection and Main Steam.
- Various Turbine and auxiliary systems.

Chapter 3 of this LTP provides detailed descriptions of the dismantlement, decontamination and remediation activities currently being performed and the remaining activities to be executed to achieve the “End-State” condition.

### **8.4. Impacts to the Post-Shutdown Decommissioning Activities Report (PSDAR)**

As previously noted, the D-Plan/PSDAR, amended in March 2014, described the planned decommissioning operations at the site and concluded that the potential environmental impacts associated with decommissioning the site have already been postulated in, and will be bounded by the previously issued environmental impact statements, specifically:

- NUREG-0191, and
- NUREG-0586.

Chapter 3 of the LTP identifies the dismantlement and decontamination activities that are scheduled to be completed prior to the unrestricted release of the site (excluding the ISFSI footprint). The identified activities are not significantly different from those originally discussed in the D-Plan/PSDAR. Although additional details regarding major decommissioning activities will be defined during decommissioning planning efforts, no significant impacts beyond those identified in the D-Plan/PSDAR have been identified. Subsequent sections in this chapter provide additional evaluation and information regarding the environmental effects of decommissioning.

## **8.5. La Crosse Boiling Water Reactor Environment Description**

### **8.5.1. Geography and Demography**

#### **8.5.1.1. Site Location and Description**

The site location and description were discussed in section 8.2. The 163.5 acre site is located in Vernon County, Wisconsin, in the Mississippi River Valley, with the Reactor Building located 300 feet from the east bank of the Mississippi River. Twenty-seven acres of the site were formed by filling in river edge and low forest areas with material dredged from the Mississippi River. The site is relatively flat with the reactor facilities standing at elevations ranging from 636 to 642 feet AMSL bounded by the railroad tracks to the east and the riprap on the shore of the Mississippi River to the west. The geology consists primarily of fill materials (fine sands and silts) underlain by fine to medium sands with some soils containing higher percentages of coarse sands and gravels. Bedrock is encountered at approximately 130 feet below ground surface (10).

#### **8.5.1.2. Population**

The U.S. Census Bureau, *American Community Survey* (ACS) report (11) provides the most reliable census data for nearby Wisconsin villages and cities and Vernon County. The estimated total population in 2013 was 258 for the Village of Genoa, located 1 mile north of LACBWR; 744 for Stoddard, located 7 miles N of the plant; 51,522 for La Crosse, the largest Wisconsin city near the plant, located 17 miles N; and 30,329 for Vernon County. There are also numerous small towns west of the plant across the Mississippi River, including Reno township, MN (population 397), located 3 miles northwest, and New Albin, IA (population 513), located 5 miles southwest.

#### **8.5.1.3. Site Access, Land and Water Use**

The LACBWR property is located in the far western portion of Vernon County on the east bank of the Mississippi River. Although the site area is 163.5 acres, it is relatively isolated as it is bounded by the Mississippi River to the west, a rail line to the east, USACE property to the north, and a wildlife and fish refuge to the south. The site includes G-3, a coal-fired 379 MWe electric power station completed in 1969, which is also owned and operated by Dairyland (12). This station is located to the south, adjacent to the LACBWR facilities. The closest town is Genoa, located approximately 1 mile to the northeast of the site. An elementary school is located within the town. There are no residences within 2,000 feet of any LACBWR structure.

The area of the Mississippi River adjacent to the site is used for recreational purposes (boating and fresh water fishing) and commercial barge and ship traffic (e.g. barges of coal are delivered to the G-3 station located south of the LACBWR plant). There is a public boat landing on the site, located approximately 4,000 feet south of the plant. There is a portion (Pool 9) of the Upper Mississippi River National Wildlife & Fish Refuge just south of the site which has limited access for hunting, fishing and recreational activities (13). Further south are public land areas and the Genoa National Fish Hatchery. Lock and Dam No. 8, located on the Mississippi River at mile 679.2, is approximately 0.6 miles north of the site. The dam is a 110 feet wide, 600 feet long lock and dam structure owned and operated by the USACE (14). This facility also allows public access to an observation platform, open from dawn to dusk during the months of April through November. The State of Wisconsin also maintains a highway wayside off State Highway 35 approximately ½ mile north of the LACBWR site, across from Lock and Dam No. 8.

### **8.5.2. Climate**

The climate at the La Crosse region of Wisconsin and at the LACBWR site is typical of a continental climate with cold winters and hot summers and extremes influenced because of the river valley location of the site. The USACE maintains an active weather station at the nearby Lock and Dam No. 8 site with archived weather information for the Genoa, WI area. A review of the information for the past year (May 2014 to May 2015) indicated temperatures ranging from 60 to 90° F during the months of June through August 2014 and 45 to -5° F during the winter months of December 2014 to February 2015. City data compiled for Genoa shows that the average temperature is approximately 20° F in the winter months and reaches 72° F in the summer season (15).

The average annual rainfall is 35.2 inches. Monthly precipitation averages in the Genoa, WI area range from 3 to 5 inches per month in the spring and summer seasons and from 1 to 3 inches per month for the remainder of the year.

The bluffs of the Mississippi River Valley channel the winds at the LACBWR site. Predominant winds at the site where the valley runs north-south are from the north and the south. The monthly average wind speeds are typically 6 to 10 mph. The Genoa, WI area has rarely experienced tornados. On April 30, 1954, a category F4 (maximum wind speeds 207-260 mph) tornado occurred 27.4 miles away from the Genoa village center. On June 5, 1980, a category F3 (maximum wind speeds 158-216 mph) tornado that occurred 6.6 miles away from the village center injured one person and caused between \$500,000 and \$5,000,000 in damages.

### **8.5.3. Topography, Geology and Seismology**

#### **8.5.3.1. Topography**

The site is located within the Mississippi River Valley, where the valley is deeply cut into highly dissected uplands. From La Crosse to Prairie du Chien, approximately 40 miles south, the valley varies between 2½ and 4½ miles in width. The valley walls rise sharply 500 to 600 feet from river level. The LACBWR site is located between two valleys on either side of the bluff east of Highway 35. Figure 8-4 provides a Topography Map of the site.

Prior to construction of the LACBWR facility, the site location consisted of marshes and low-lying wetlands. The property grade was then increased through the deposition of hydraulically dredged sands from the Mississippi River. During grade manipulation and site preparation prior to construction, the area was graded to a relatively flat ground surface. The resulting grade for the LACBWR site is generally flat with grade level at approximately 639 feet AMSL from the access road along the eastern boundary of the site to the riprap along the river shore.

#### 8.5.3.2. Geology

LACBWR is located on the east bank of the Mississippi River in the Wisconsin Driftless section of the Central Lowland Physiographic Province (16). The site is located on the southwest flank of the Wisconsin Dome and the western flank of the Wisconsin Arch. The sedimentary strata or bedrock in this region dips less than 20 feet per mile to the southwest.

Generally, the local geology is described as approximately 15 feet of hydraulic fill overlying 100 to 130 feet of glacial outwash and fluvial deposits on the east flood plain of the Mississippi River Valley. These unconsolidated deposits are underlain by flat lying sandstone and shales of the Dreshbach Group (Upper Cambrian). The Dreshbach Group is then underlain by dense Precambrian crystalline rocks encountered at approximately 650 feet below ground surface (BGS). At the subject site, the bedrock surface is encountered at an elevation of approximately 509 feet AMSL near the Reactor Building and slopes to approximately 501 feet AMSL near the river shoreline.

#### 8.5.3.3. Seismology

Many faults have been mapped in the site region. None of these faults are considered to be capable in accordance with 10 CFR 100, Appendix A. Per the NRC, “There are no geologic conditions in the site vicinity that represent hazard to the facility. Numerous faults are mapped in the site region, but investigations of all of these faults during the course of validating several nuclear power plant sites in the region, in addition to studies for the LACBWR, have not found any evidence of capable faulting. Additionally, the area is one of relatively low seismicity. Therefore, capable faulting does not need to be considered in the analysis of this site” (17).

Seismic activity (magnitudes ranging from 3.5 to 5.4) that has been recorded between 1975 and 2008 all occurred over 180 miles from the site and did not impact the plant site or operations.

### **8.5.4. Hydrology and Hydrogeology**

Hydrology and hydrogeological information was primarily obtained from Reference 10. Groundwater beneath the site is first encountered at depths ranging from approximately 15 to 25 feet BGS and the water table aquifer is in strong hydraulic communication with the adjacent Mississippi River. Therefore, changes in the water table elevation are dependent on the stage of the Mississippi River. Groundwater in the shallow deposits and fill material likely flows towards the west and discharges into the Mississippi River. The deeper groundwater is also likely to flow towards the west but then may turn and flow parallel to the river. Based on a review of the groundwater elevation measurements collected during routine sampling in support of the G-3 fossil station, it appears that there is a slight downward vertical gradient. However, there are some periods where the gradients are reversed and this is likely due to high river stages and flooding.

Hydraulic conductivity is influenced by the soil structure and grain size distribution. Because of the shallow sands that were hydraulically dredged, deposited, and compacted on site, the internal structure of the shallow soils would not likely influence groundwater flow direction. However, the native sands underlying the hydraulic fill would likely provide sufficient structure that the anisotropy of the aquifer would be more permeable and have a higher hydraulic conductivity in the horizontal direction than in the vertical direction. This decreases the vertical transport within these layers.

The velocity of groundwater flow is directly related to both the hydraulic conductivity and the gradient. The gradient of the water table is influenced by the topography and with the flat areas across the site it is likely that the water table has a very low gradient. Therefore, it is likely that the groundwater velocity across the site is also relatively slow (i.e., in the inches and feet/day range) even though the hydraulic conductivity could support faster flow.

## **8.6. Environmental Effects of Decommissioning**

### **8.6.1. Summary**

The evaluation of the environmental effects (or impacts) of the decommissioning of LACBWR follows the approach and methodology outlined and described in NUREG-0586. This approach includes identification of environmental issues as either generic or site-specific. If the issue is considered to be generic, it is assigned a significance level of either “Small,” “Moderate,” or “Large.” If identified as generic, the environmental impact is considered to be bounded by the evaluation in NUREG-0586 which concludes that the overall impact significance is “Small.”

For those environmental issues or decommissioning activities that require site-specific evaluation, a standard approach is followed. It is summarized as follows:

- 1) The issue or activity is summarized, including a summary of the impacts as reported in NUREG-0191 and D-Plan/PSDAR. Note that many decommissioning activities are not identified in these documents.
- 2) Applicable regulations, permits, limits or other regulatory requirements are identified.
- 3) Potential impacts from decommissioning activities relating to the environmental issue are described.
- 4) An evaluation is performed. This includes analysis and professional judgment to estimate or determine whether the activity is likely to make a noticeable impact on the environment considering the available information. If an impact is likely, existing and additional mitigation measures that can be taken are evaluated. If an impact cannot be avoided, a determination is made as to whether the impact is likely to seriously damage the resource or attribute.
- 5) A conclusion is reached.

A conclusion is derived from the evaluation steps summarized above. The conclusion identifies the level of significance of the impacts. Site-specific issues are not bounded by the NUREG-0586 evaluation. Note that the environmental impacts of the operating G-3 coal power plant and the former G-1 coal/oil fueled power plant was not considered in this review.

Table 8-1 was used as the basis for the site specific environmental impact assessment for LACBWR. It is excerpted from Table 6.1 of NUREG-0586. The first step in this process is to screen the issues to identify site-specific issues. Decommissioning activities specific to LACBWR are then reviewed and the activities that may require site-specific evaluation are identified. The screening identified the following potential areas for additional site-specific evaluation:

- Offsite land use activities: changes in demographics and zoning that have occurred in the past 35 years, since the FES was issued.
- Aquatic ecology affected by activities beyond the operational area; changes in designation of sensitive areas.
- Terrestrial Ecology affected by activities beyond the operational area; changes in designation of sensitive areas.
- Threatened and endangered species: changes in local flora and fauna and designation of threatened and endangered species that have occurred in the past 35 years.
- Environmental Justice: changes in demographics and socioeconomic status in the past 35 years.
- Cultural and Historic Resource impacts beyond the operational areas; changes in local historic landmark designations and other cultural resources.

## **8.6.2. Radiological Effects of Decommissioning**

### **8.6.2.1. Occupational Radiation Exposure**

During decommissioning, Solutions will continue to implement a Radiation Protection Program in accordance with the license specifications and the requirements of 10 CFR 20. The objectives of the Radiation Protection Program are to control radiation hazards, avoid accidental radiation exposures and maintain occupational worker exposures to less than the administrative limit of 2,000 mrem/yr Total Effective Dose Equivalent (TEDE). Dose to workers and the public must also be maintained As Low As Reasonably Achievable (ALARA). The LACBWR work control program and procedures will ensure that work specifications, designs, work packages and Radiation Work Permits (RWP) involving potential radiation exposure or handling of radioactive materials incorporate effective radiological controls.

In August 1987, Dairyland placed LACBWR in a SAFSTOR condition (a period of safe storage of the stabilized and defueled facility). LACBWR remained in a fully SAFSTOR condition until 1994 with the commencement of incremental decommissioning activities. This period of time allowed for the decay of most short-lived radionuclides, which subsequently reduced radiation levels at the facility. This delay, combined with the effective implementation of the Radiation Protection Program and ALARA measures, minimized the actual and projected radiation dose exposure during the decommissioning of LACBWR to date. It is anticipated that the most significant contributors to occupational dose from remaining dismantlement activities will be the removal and packaging of remaining Reactor Building Structures, Systems, and Components (SSCs).

**Table 8-1 Summary of the Environmental Impacts from Decommissioning Nuclear Power Facilities**

| Section  | Environmental Issue                                  | NUREG-0586 (GEIS) | Impact Significance |
|----------|--|-------------------|---------------------|
| 8.6.2    | Radiological   |                   |                     |
|          | Activities resulting in occupational dose to workers | Yes               | Small               |
|          | Activities resulting in dose to the public           | Yes               | Small               |
|          | Radiological Accidents                               | Yes               | Small               |
| 8.6.3.1  | Onsite land use activities                           | Yes               | Small               |
| 8.6.3.2  | Offsite land use activities                          | No                | Site-specific       |
| 8.6.3.3  | Water Use  | Yes               | Small               |
| 8.6.3.4  | Water Quality  |                   |                     |
|          | Surface water  | Yes               | Small               |
|          | Ground water   | Yes               | Small               |
| 8.6.3.5  | Air Quality  | Yes               | Small               |
| 8.6.3.6  | Aquatic Ecology                                      |                   |                     |
|          | Activities within the operational area               | Yes               | Small               |
|          | Activities beyond the operational area               | No                | Site-specific       |
| 8.6.3.7  | Terrestrial Ecology                                  |                   |                     |
|          | Activities within the operational area               | Yes               | Small               |
|          | Activities beyond the operational area               | No                | Site-specific       |
| 8.6.3.8  | Threatened and Endangered Species                    | No                | Site-specific       |
| 8.6.3.9  | Occupational Issues                                  | Yes               | Small               |
| 8.6.3.11 | Socioeconomic  | Yes               | Small               |
| 8.6.3.12 | Environmental Justice                                | No                | Site-specific       |
| 8.6.3.13 | Cultural and Historic Resource Impacts               |                   |                     |
|          | Activities within the operational area               | Yes               | Small               |
|          | Activities beyond the operational area               | No                | Site-specific       |
| 8.6.3.14 | Aesthetics   | Yes               | Small               |
| 8.6.3.15 | Noise  | Yes               | Small               |
| 8.6.3.16 | Irretrievable Resources                              | Yes               | Small               |
| 8.6.3.17 | Traffic and Transportation                           | Yes               | Small               |

NUREG-0586 estimated that 1,874 Rem will be needed to decommission a single unit BWR. The current occupational expended and dose expected to complete the decommissioning is estimated to be 130.3 Rem, which is well below the NUREG-0586 estimate. As the occupational dose for the decommissioning will meet the regulatory standards of 10 CFR 20, it is therefore bounded by NUREG-0586 and the impact is considered as “Small.”

---

#### 8.6.2.2. Offsite Radiation Exposure and Monitoring

Dairyland implemented a regulatory compliant Radiological Environmental Monitoring Program (REMP) at LACBWR which provided annual reports with assessments of the radiological environment in and around the environs of the site. The REMP program provides assurance that the radioactive gaseous (airborne) and liquid effluent releases during plant operations and decommissioning activities do not exceed the concentration limits of 10 CFR 20, the dose limits of 10 CFR 50, Appendix I, or the fuel cycle dose limits of 40 CFR 190. Solutions will continue to adhere to these limits throughout the course of the decommissioning. Consequently, the public dose from decommissioning is bounded by the criteria in NUREG-0586 and the impact is considered as “Small.”

The only authorized effluent release pathway for the discharge of treated and filtered radioactive liquid waste from the LACBWR site to the Mississippi River is through the “seal well/diffuser piping” which is a part of the G-3 circulating water discharge system. Currently, the liquid waste collection system pumps are not operable. The only liquid effluent discharges at LACBWR are through the East Turbine building sump using an air operated pump. The air operated pump discharges to the inlet of the liquid waste monitor, which is still operable. Continued application of the current and future Radiation Protection and REMP at LACBWR ensures public protection in accordance with 10 CFR 20 and 10 CFR 50, Appendix I. REMP reports for LACBWR to date conclude that the public exposure as a result of decommissioning activities is bounded by the evaluation in NUREG-0586, which concludes the impact is minimal.

The gaseous pathway (which includes noble gas and particulate) analysis is subject to the meteorological conditions during the time of the release. Due to plant shutdown and cessation of noble gas, the gaseous pathway consists of airborne particulate only and presents a minor release or exposure pathway. Routine air samples are collected to determine the dose due to radioactive gaseous releases.

#### 8.6.2.3. Environmental Effects of Accidents and Decommissioning Events

Decommissioning accident analysis is integral to the licensing design basis for LACBWR and this analysis has continued during shutdown and decommissioning. Post-fuel accident analysis conducted and provided in regular updates to the D-Plan/PSDAR, within section “Plant Post-Fuel Accident Analysis” have noted that “with consideration for the current stage of LACBWR decommissioning and with spent nuclear fuel now stored in the ISFSI, this analysis confirms that the minimal radioactive material resulting from LACBWR operation and remaining on the LACBWR site is insufficient for any potential event to result in exceeding dose limits or otherwise involving a significant adverse effect on public health and safety.”

The decommissioning of radioactively contaminated SSCs will involve the highest dose rates and contamination levels remaining at LACBWR. Worker safety is addressed in the Radiation Protection and Safety and Health Programs for LACBWR which rely on ALARA principles. The safety of the public is principally related to potential hazards associated with an airborne release of radioactive materials during decommissioning operations.

During decommissioning, Solutions will perform decontamination and dismantlement of SSCs in addition to maintenance, waste management, and surveillance activities. The accidents discussed in NUREG-0586 associated with immediate dismantling would also be applicable during the

decommissioning of LACBWR. Consequently, the potential decommissioning accidents at LACBWR are bounded by the accident evaluation presented in NUREG-0586. However, the potential consequences associated with those accidents would be less at LACBWR due to the reduction of the total radionuclide inventory at LACBWR from:

- Decontamination efforts made before decommissioning,
- Prior radioactive waste shipments, and
- Radioactive decay.

Operational accidents during decommissioning could result from equipment failure, human error, and service conditions. With the spent nuclear fuel removed from the LACBWR site and stored in the ISFSI, operational accidents during decommissioning can be categorized as follows:

- Radioactive waste transportation accidents,
- Explosions and/or fires associated with explosive and/or combustible materials,
- Loss of contamination control,
- Natural phenomena, and
- Human caused events external to LACBWR.

The public dose consequences reported in NUREG-0586 for onsite, non-fuel related radiological accidents during decommissioning ranged from 0.02 to 0.96 rem. An analysis of potential public dose consequences from accidents during LACBWR decommissioning was provided in the D-Plan/PSDAR and resulted in dose ranging from 0.027 to 0.065 rem. The NUREG-0586 accident analysis is therefore bounding for the decommissioning of LACBWR.

#### 8.6.2.4. Storage and Disposal of Low-Level Radioactive Waste

The decommissioning of LACBWR has, and will continue to require the disposal of large volumes of low level radioactive waste, including contaminated equipment, tools, clothing and bulk debris materials such as concrete, metal and asphalt. Materials that cannot be free released are, and will continue to be dispositioned as low level radioactive waste. Through the proper implementation of the Waste Management Program and associated procedures, Solutions ensures the appropriate segregation, classification, processing, packaging, shipment and control of solid and liquid radioactive wastes.

The majority of the Class A low level radioactive waste from LACBWR will be shipped to the EnergySolutions disposal site in Clive, Utah. Waste will be loaded into appropriate containers and trucked to a rail trans-load facility in Winona, MN where the waste container will be transferred to a rail car. Rail and truck shipments are made in accordance with Department of Transportation (DOT) regulations. If Class B/C waste is identified, it will be shipped to the Waste Control Specialist (WCS) facility in Andrews, Texas.

#### 8.6.2.5. Radiological Criteria for License Termination

Following the completion of decontamination, dismantlement and remediation activities, radiological surveys will be performed to demonstrate that the dose from residual radioactivity remaining in backfilled structure basements, any remaining piping and soils at LACBWR

(excluding the ISFSI) meets the unrestricted use criteria specified in 10 CFR 20.1402. After the radiological conditions are demonstrated to be below the unrestricted use criteria, the 10 CFR 50 license will be terminated, with the exception of the area around the ISFSI. LTP Chapter 5 and Chapter 6 provide the methodology for demonstrating compliance with the unrestricted use criteria.

### **8.6.3. Non-radiological Effects of Decommissioning**

#### **8.6.3.1. Onsite Land Use**

The environmental impact associated with onsite land uses has been determined by the NRC, within section 4.3.1 of NUREG-0586 to be generically considered as a “Small” impact.

The LACBWR decommissioning project is located and executed within the boundary of the existing LACBWR licensed property previously used for power generation; all work is expected to be conducted within the LSE footprint. Some onsite roads have been refurbished. No barge slips are being constructed. The existing rail line supported the operation of the facility. Containers will be unloaded and loaded onsite. Onsite activities such as vehicle parking and equipment/container laydown, storage, staging and waste loading are and continue to occur in a manner similar to when the facility was operational.

Several structures such as the Switchyard, Administration Building, Crib House as well as all roadways and rail lines, will remain at license termination. Subsurface basement structures, including piping and tunnels, below the 636 foot elevation will be radiologically assessed and remediated, as necessary. All other systems and components as well as all structures above the 636 foot elevation will be removed during the decommissioning process and disposed of as a waste stream.

No significant environmental changes associated with the site-specific decommissioning activities are anticipated. In addition to NRC requirements, decommissioning activities will also comply with applicable United States Environmental Protection Agency (USEPA) and WDNR regulatory requirements.

In accordance with the guidance presented in NUREG-0586, the potential impacts to land use onsite are considered as “Small.”

#### **8.6.3.2. Offsite Land Use (in the Vicinity)**

Only areas within the existing site licensed boundary will be used to support decommissioning and license termination activities (such as temporary storage and staging areas for remediation and demolition equipment, waste containers, etc.). Of the 163.5 acre site, about 1.5 acres are located within the fence-enclosed LSE, where most work is expected to be conducted. Appropriate isolation and control measures will be instituted to prevent the spread of contamination from the LSE area to the adjacent LACBWR property as well as offsite areas. These measures will also be monitored to ensure their effectiveness. Thus, no environmental impacts associated with the use of offsite lands are anticipated from the decommissioning activities at LACBWR.

Land in the vicinity of the LACBWR site is predominantly rural and undeveloped. Of the area within a five-mile radius, approximately one third is water and bottomlands included in the

Upper Mississippi River National Wildlife & Fish Refuge. WDNR has designated the La Crosse-Bad Axe River Basin Watershed as a Geographic Management Unit (GMU) and Vernon County has established a *Land & Water Resource Management Plan* (18), addressing land use, water quality and protection of the environment within this GMU. The community of Genoa is located within the Bad Axe River Watershed. Approximately 36% of the La Crosse-Bad Axe basin land use is agricultural and over 50% of the land is forested. There is an increasing shift of some of the agricultural land to recreational land use, similar to other parts of rural Wisconsin.

The closest municipality to the LACBWR site is the village of Genoa, approximately 1 mile north of the site, across from the north-south running Highway 35. This small rural community with a population of 258 consists of various residences, farms, and a few retail businesses in the valley below the eastern bluff.

Decommissioning activities are not being performed in any land areas adjacent to the site or near the Refuge at the southern boundary of the site. Also, public access to the boat launch at the southern end of the site will be minimally impacted during decommissioning by rail and truck traffic entering or leaving the site. Consequently, the offsite land areas are not affected by the decommissioning activities and the potential impacts to land use offsite are considered “Small.”

#### 8.6.3.3. Water Use

LACBWR is located on the shores of the Mississippi River. The Mississippi River and its Thief Slough tributary extends along the LACBWR site for 3,000 feet from north to south. The predominant water usage during the operation of LACBWR was the use of water from the Mississippi River as condensate cooling water. With the plant shut down and fuel removed from the reactor, river water is not currently being used as a cooling medium for reactor or fuel systems. River water only supplies the High Pressure service water system, and the river intake (470 gpm) is well below that for which the requirements of CWA Section 316(b) apply. Water pulled from onsite wells will support decommissioning tasks and this water will continue to be processed onsite and discharged in accordance with the site’s state discharge permits.

For a distance of 40 miles downstream of the site, virtually all municipal water supplies for towns and cities along the Mississippi River are obtained from ground water. The nearest use of river water for industrial purposes, excluding the adjacent G-3 fossil plant, is the coal-fired plant in Lansing, Iowa, about 15 miles downstream of the site. There are no other known users of river water for industrial purposes between the LACBWR site and Prairie du Chien, WI, 40 miles downstream.

The LACBWR site has its own potable water supply, provided through a single groundwater well at the site. The locations of all wells (active and abandoned) are illustrated in Figure 8-5. Potable water use during decommissioning operations is not expected to be significantly greater than the potable water use during plant power operations. Sanitary wastes are collected in a solids holding tank and pumped off by a local state permitted sanitary waste hauler. This includes a sanitary holding tank that services the Administration Building and a sanitary holding tank that services the LSE Turbine Building. Storm water runoff is diverted directly to the Mississippi River at outfalls. Release areas are periodically monitored for oil sheen and discoloration. Roof drains are either discharged to the ground area surrounding the facility through downspouts or through the normal effluent release pathway after processing through an oil separator

located inside the LSE. Consequently, in accordance with NUREG-0586, the potential impacts to water use are considered “Small.”

#### 8.6.3.4. Water Quality

This section evaluates potential project effects on those portions of the natural environment related to surface water and groundwater. Surface water generally refers to streams, rivers, ponds, reservoirs and lakes. At LACBWR, the nearby bodies of water are the Mississippi River to the west and the Refuge wetlands to the south.

The environmental impact evaluation associated with surface and groundwater quality in section 4.3.3 of NUREG-0586 has been determined to be generally applicable to LACBWR with a “Small” impact.

At LACBWR, all non-radiological water discharges to the Mississippi River are controlled under its WDNR permits. Water management programs and practices have been implemented at LACBWR which meet the Genoa site’s WDNR Wisconsin Pollutant Discharge Elimination System (WPDES) as well as LACBWR’s WDNR Tier II Industrial Storm Water General Permit and WDNR Wastewater Permit. In addition, impacts to the Mississippi River will be greatly reduced through implementation of appropriate Best Management Practices (BMP) for soil erosion and sedimentation control during decommissioning operations. During decommissioning, storm water run-off from active impacted areas undergoing remediation or demolition will be monitored and controlled if necessary.

Radiological impacts are minimized through adherence to Off-site Dose Calculation Manual (ODCM) limits and assessed through the REMP and the groundwater monitoring program. Potential onsite groundwater impacts are monitored by the routine sampling of 10 permanent onsite monitoring wells at LACBWR. Representative groundwater samples are obtained twice per year for radiological analysis purposes when groundwater conditions are at low and high elevations. The plant’s network of down gradient wells (five paired wells: MW-200A/B; MW-201 A/B; MW-202A/B; MW-203A/B; and MW-204A/B) are situated around the key LACBWR buildings in appropriate locations and quantity to intercept and detect contamination from LACBWR former process areas and potential release points.

As the water from the Mississippi is no longer used to cool operating plant systems at LACBWR, the thermal impact to the Mississippi River has been eliminated.

No adverse impacts on surface water and groundwater are expected from the implementation of decommissioning activities. Consequently, the potential impacts to surface and groundwater quality are bounded by NUREG-0586 and considered “Small.”

#### 8.6.3.5. Air Quality

The environmental impact evaluation associated with air quality in section 4.3.4 of NUREG-0586 has been determined to be generally applicable to LACBWR with a “Small” impact.

LACBWR complies with all applicable Federal and State air quality regulations, including the requirements of the WDNR and the Wisconsin Bureau of Air Management, and will implement BMP to minimize fugitive dust during demolition and decommissioning activities. Air emission

sources such as the plant's diesel generators are no longer in service and have been removed from the facility.

Fugitive dust will be generated from various decommissioning activities, including the demolition of concrete building structures and the excavation of soil. Careful planning and controlled demolition and dismantlement techniques, with appropriate assessments by Solutions Radiation Protection, Environmental, and Safety and Health staff, will be conducted to ensure excessive or harmful dust emissions are not generated. As necessary, measures such as dust suppression by misting water will be used to mitigate dust emissions.

Demolition equipment will be operated and maintained in accordance with manufacturer's specifications which will prevent excessive exhaust emissions from defective equipment. Appropriate Health and Safety assessments and controls will also be established during expected extended periods of operation to ensure that personnel and the environment are not adversely impacted by exhaust emissions.

No adverse impacts on air quality are expected from the implementation of decommissioning activities. Consequently, the potential impacts to air quality are bounded by NUREG-0586 and considered "Small."

#### 8.6.3.6. Aquatic Ecology

The environmental impact evaluation associated with aquatic ecology in section 4.3.5 of NUREG-0586 has been determined to be generally applicable to LACBWR with a "Small" impact.

The aquatic habitat at LACBWR includes the area from the intake structure integral to the Crib House at the shoreline to the diffuser structure that extends out into the Mississippi River approximately 110 feet from the shoreline. Habitats associated with this area were previously disturbed during the initial construction of the facility. However, the implementation of decommissioning activities is not expected to disturb existing aquatic habitats, their flora and fauna in the Mississippi River and also nearby River tributaries, streams and wetlands. The removal of the diffuser structure, which shares a line with the G-3 fossil station, is not planned.

Plans for the demolition of structures at LACBWR do not include the removal of waste or equipment by barge. Consequently, there is no impact to the shoreline from this type of activity.

Solutions will continue to maintain WDNR permits and decommissioning operations will be performed within applicable limits. Protection of the nearby Refuge wetlands and habitats is, and will continue to be a priority when planning onsite dismantlement or waste management operations, and isolation, controls, and other protective measures will be used to minimize erosion and degradation of the nearby ecological habitats.

Various fresh water fish species, macro-invertebrate populations, and vegetation exist within these aquatic environments. A 1980 study indicated that the population of fish near the site included 53 species and 19 families (19).

Exotic species can threaten native species and ecosystems due to aggressive growth, reproduction or survival rate, and diseases or parasites they may transmit to native species. While there are some known aquatic invasive species (e.g. zebra mussel, curly-leaf pondweed, rusty crayfish, etc.) in Vernon County, these have been noted in sloughs and lakes other than the

ones in the vicinity of the LACBWR site (20). The operation and decommissioning activities conducted at LACBWR have not resulted in the introduction of any aquatic invasive species to the site.

A study of the impingement and entrainment of the fishes, such as bluegill (*Lepomis macrochirus*), freshwater drum (*Aplodinotus grunniens*), gizzard shad (*Dorosoma cepedianum*) and channel catfish (*Ictalurus punctatus*), within the Upper Mississippi River National Wildlife & Fish Refuge Pool 9 navigation areas from the operation of LACBWR and G-3 was previously performed in 1980. It was determined that the impact was most likely insignificant. The subsequent shutdown of LACBWR and reduced intake operations, limited to supporting the G-3 fossil station, has further reduced this impact. Decommissioning operations are not expected to require any operations resulting in any impingement and entrainment impacts to fish. No construction, demolition, material and waste staging or transfer operations will be performed in aquatic areas beyond the site boundary.

The potential impacts to the aquatic ecology within the site boundary are bounded by NUREG-0586 and considered to be “Small.”

The potential impacts to the aquatic ecology beyond the site boundary have also been evaluated and considered to be “Small.”

#### 8.6.3.7. Terrestrial Ecology

The environmental impact evaluation of terrestrial ecology in section 4.3.6 of NUREG-0586 has been determined to be generally applicable to LACBWR with a “Small” impact.

No known terrestrial exotic or invasive species have been noted to occur within the decommissioning project area. To minimize the introduction of exotic or invasive species, appropriate BMPs are, and will continue to be followed.

The land around LACBWR was initially disturbed by the construction of the facility, including the formation of about 27 acres by filling river edge and low forest areas with material dredged from the Mississippi River. Therefore, the site shoreline no longer resembles the shoreline prevalent in surrounding areas. Given the extensive land disturbance, construction and years of operations associated with G-1 and G-3 as well as LACBWR, the terrain has not supported onsite habitats for many plant and animal species, including endangered or invasive species. In addition, with the short-term nature of the work associated with decommissioning and the fact that the direct heavy construction and demolition project area is separated from the Refuge area to the south, no direct impacts to any off-site sensitive species are anticipated. Since the planned demolition activities do not include the removal of waste or equipment by barge, there is also no anticipated impact to the shoreline.

Best Management Practices and site procedures require prompt cleanup and remediation of oil spills resulting from equipment operation.

The potential impacts to terrestrial ecology are bounded by NUREG-0586 and considered “Small.”

The potential impacts to the terrestrial ecology beyond the site boundary have also been evaluated and considered to be “Small.”

8.6.3.8. Threatened or Endangered Species

The potential impacts to “Threatened” or “Endangered” species are bounded by NUREG-0586 and considered “Small.”

A review of the U.S. Fish and Wildlife Service listing, the *Federally-Listed Threatened, Endangered, Proposed, and Candidate Species’ County Distribution* (21) concluded that only two species are designated as “Threatened” or “Endangered” within Vernon County, the county which LACBWR resides in:

- A mussel species, Higgins eye pearlymussel (*Lampsilis higginsii*), with habitat in the Mississippi River: Endangered.
- A plant species, Northern monkshood (*Aconitum noveboracense*), with habitat in north-facing slopes: Threatened.

No adverse impacts to aquatic species have been noted during plant operations. In general, due to the siting and operation of the LACBWR facility, as well as the previous G-1 facility, and the existing G-3 fossil station, the majority of the licensed site, situated between the Mississippi River to the west and the rail line and Highway 35 to the east, is developed and does not support terrestrial or aquatic habitats which may be inhabited by threatened or endangered species. The presence of the Higgins eye pearlymussel in mussel beds in the vicinity of LACBWR has not been noted. A mussel survey of the Thief Slough river area was conducted in 1978 (as documented in NUREG-0191) and another in 1999 (22), and no Higgins eye pearlymussels were found during either survey.

Likewise, the Northern monkshood has not been noted on or in the vicinity of LACBWR. The Wisconsin Department of Agriculture, Trade & Consumer Protection’s *Endangered Species Habitat Program* (23) has noted that the Northern monkshood’s habitat is leached sandstone and limestone cliffs over creeks and streams and the plant is present in the Whitestown and Stark townships within Vernon County. This habitat is not present within or near the LACBWR site for this plant species to be impacted by decommissioning operations.

The Peregrine Falcon (*Falco peregrinus*) were put on the Wisconsin Endangered and Threatened Species list in 1975 and starting in 1993, Dairyland supported recovery efforts with installation of falcon nesting boxes at its facilities, including at the G-3 stack, to support chick hatching and protection (24). Overall, Peregrine Falcon restoration program efforts resulted in the bird being delisted in 1999 (25); however, Dairyland has continued to maintain the G-3 nesting site and hatching efforts. Since the G-3 facility will still continue operations and the LACBWR decommissioning will not interfere with G-3 operations or its stack, there is no impact to the falcon recovery effort and population.

Dairyland Power Corporation requested that the Wisconsin Department of Natural Resources (DNR) review the impacts of the activities associated with the proposed decommissioning project at LaCrosse. The Bureau of Natural Heritage Conservation, DNR, performed an Endangered Resources Review for the project, which is documented in an October 6, 2016, letter (26). The Bureau identified 23 terrestrial and aquatic species considered to be endangered, threated, or of special concern, which *could* reside in the area surrounding the decommissioning project. The Bureau determined that there was no impact to these species and no actions were required or recommended, based on the conclusions that either there was a lack of suitable

habitat present at the site or that the habitat (e.g., the Mississippi River) would not be impacted by the proposed project activities. In the case of the Peregrine Falcon, the Bureau concluded that no impacts are expected as the nesting box is adjacent to the project area, as the nesting box is mounted on the stack for Genoa-3 and faces away from the demolition activities.

#### 8.6.3.9. Occupational Issues/Safety

Occupational issues/safety has been evaluated to be bounded by NUREG-0586 and the impact is considered “Small.”

The environmental impact evaluation associated with occupational issues in section 4.3.10 of NUREG-0586 has been determined to be generally applicable to LACBWR with a “Small” impact. While decommissioning involves increased industrial activities and safety focus, similar programs addressing worker safety were implemented during the operation of the facility and also during repair and refueling outages. The occupational issues and safety impacts assessed are those related to human health and safety, including impacts from physical, chemical, ergonomic, and biological hazards. Radiological impacts were discussed in section 8.6.2.

Solutions is committed to decommissioning LACBWR safely through the application of contractor health and safety programs to effectively control hazards in the work environment and prevent occupational injuries and illnesses. Contractor health and safety programs will comply with federal and state regulations including Wisconsin Department of Labor and the United States Occupational Health and Safety Administration (OSHA) requirements.

Typical contractor safety practices and communications will include actions such as the following:

- Safety training as a part of the site access program for all employees and sub-contractors.
- Safety emphasis as the first topic of discussion at meetings.
- Providing all workers with a Health and Safety booklet.
- Worker training and required certifications review prior to assignment to tasks requiring specific worker qualifications. Certain specialty subcontractors are mobilized, as necessary, such as heavy equipment demolition firms.
- Obtaining and reviewing Safety Data Sheets for chemicals bought onsite.
- Involving Health and Safety staff in reviewing and approving decommissioning work packages and participating in pre-job walkdowns, work condition assessments and reviews.
- Issuing periodic safety messages to communicate awareness of significant safety issues and lessons learned.
- Holding safety stand-downs whenever serious safety events occur to communicate and reinforce safety events and lessons learned site-wide.

#### 8.6.3.10. Cost

A detailed discussion of the site decommissioning project costs is presented in Chapter 7 of this LTP.

8.6.3.11. Socioeconomic Impacts

LACBWR was shut down in 1987 as the small size of the plant did not make it economically efficient to operate. By 1994, some incremental decommissioning planning and activities began with some projects associated with the removal of the RPV in 2007 and other metallic radioactive components over the past 7 years. A small ISFSI facility holding 5 casks was completed by 2012. Staff size at the plant has gradually been reduced as operations ceased, with periodic spikes in workforce hiring to support specific project needs (e.g. 40 personnel staffing the ISFSI project) (27).

More active decommissioning and structural demolition is anticipated in the 2016-2017 timeframe. Some of the labor tasks require specialized skills and equipment which will be obtained from outside Wisconsin; however, some of the workforce will be comprised of craft personnel from the local and regional areas surrounding the site. Overall, the decommissioning activities will have a short-term positive economic impact on the local community due to the increased use of the local craft workforce and opportunities for local businesses to support the project and workers with supplies and services.

Therefore, the socioeconomic impact is evaluated to be bounded by NUREG-0586 and the impact is considered “Small.”

8.6.3.12. Environmental Justice

The percentages of low-income and minority groups within the Village of Genoa as well as Vernon County are quite low, approximately 3%, and lower than those in large cities (e.g. La Crosse) and more populated Wisconsin counties further from the LACBWR site (28) (29). No impact to the greater population, including special groups, is expected.

Decommissioning activities will cause slight increases in truck traffic to and from LACBWR to transport equipment and debris. The truck traffic will use existing main street routes, primarily Highway 35 traversing north-south by the site. There will be no environmental justice impact relative to rail and truck transportation as a result of decommissioning.

There is no reason to believe that low-income and minority populations will be adversely impacted by the decommissioning project. Per NUREG-0586 and this evaluation, the potential site specific impact is considered “Small.”

8.6.3.13. Cultural, Historic, and Archeological Resources

A review of the National Park Service *National Register of Historic Places* (30) through May 2015 and the Wisconsin Historical Society (31) through May 2015 identified only a few historical sites in Vernon County and no structures in the village of Genoa or within 5 miles of the plant. The closest historical site with pre-historical structural remnants is the Goose Island Archeological Site near Stoddard, WI. located approximately 7 miles north of the LACBWR site, which was certified by the National Park Service in 1980 (32).

Also, as indicated in NUREG-0191, the State of Wisconsin has placed three historical markers along Highway 35 in Vernon County. One is about a half mile north of LACBWR, overlooking the USACE Lock and Dam No. 8. It describes the origin of the present system of locks on the Upper Mississippi. The second, about 7.5 miles south of the plant, highlights the Battle of Bad

Axe. The third was adjacent to LACBWR and commemorates the plant itself as Wisconsin's first nuclear generating plant. In 2009, crews erected a new, updated Wisconsin state historical marker at the wayside across Highway 35 from the site (33). This new location resolved security concerns associated with having a public-access marker on Dairyland property.

Dairyland sent an unused control rod to the Wisconsin Historical Museum in Madison, WI which presents the control rod and a replica fuel assembly (34); however, there is no objective to save or categorize any part of the LACBWR plant as a historical site.

Because LSRP intends to size-reduce large components prior to removal from a building and because the waste will be loaded into containers for removal from site via truck, disturbance to the land will be minimized. The route employed by LACBWR for disposal of large components utilizes existing roadways and the existing Seven Rivers/Union Pacific rail spur/lines (none requiring modification) for transport. As no modifications to this route are required, no offsite land disturbances or associated impacts result. Use of this transportation route avoids using other routes that may require modifications or new roadways, barge slips, or rail spurs/lines, resulting in offsite land disturbances and potential associated impacts.

Land that was disturbed for projects beyond the nuclear operational areas (e.g. associated with the construction and demolition of the G-1 fossil station and the construction of the G-3 fossil station) were performed in accordance with applicable permits and included appropriate soil erosion controls and stormwater pollution prevention plans.

Based on the historical information presented in NUREG-0191 and the current approach for the transportation of system components and waste, the decommissioning will have no significant impact on cultural, historic, and archeological resources. Consequently, as bounded by NUREG-0586 and based upon this evaluation, the potential impacts to Cultural, Historic, and Archaeological Resources are considered "Small."

#### 8.6.3.14. Aesthetics

The environmental impact evaluation associated with aesthetics in section 4.3.15 of NUREG-0586 has been determined to be generally applicable to LACBWR with a "Small" impact.

The impact of decommissioning on site aesthetics (e.g. visual skyline) is limited in terms of land disturbance and duration. These impacts are temporary and will cease when decommissioning is completed. Once all of the major plant structures and buildings east of the Mississippi River are removed, the aesthetics will improve slightly by providing a more open view of the Mississippi River. The final determination on usage of the decommissioned property will be made upon completion of the decommissioning.

Therefore, the environmental impact associated with aesthetics is evaluated to be bounded by NUREG-0586 and the impact is considered "Small."

#### 8.6.3.15. Noise

The environmental impact evaluation associated with noise in section 4.3.16 of NUREG-0586 has been determined to be generally applicable to LACBWR with a "Small" impact.

LACBWR is located on the shore of the Mississippi River, 300 feet from the river bank, and 475 feet west of the rail road line. USACE land and Lock and Dam No. 8 are located on the

north side and a portion of the Upper Mississippi River National Wildlife & Fish Refuge on the south side. There are no residences within 1,000 feet of the station structures and no schools or hospitals within 1 mile. The nearest community, the village of Genoa, Wisconsin is located approximately 1 mile to the north of the plant.

Noise generation will primarily result from demolition activities involving heavy construction equipment. Noise associated with decommissioning and shipment of waste is intermittent and temporary and will occur primarily during daylight hours. Once the decommissioning is complete, noise levels in the vicinity of the LACBWR site will be reduced to levels below those experienced during the operation of the facility.

Due to the distance of the station from sensitive receptors, there will be limited temporary impacts on noise levels during decommissioning and demolition activities. No noise ordinances or limitations are imposed by the Village of Genoa. LACBWR agrees to comply with any future noise limitations that the Village of Genoa may impose.

Therefore, the environmental impact associated with noise is evaluated to be bounded by NUREG-0586 and the impact is considered “Small.”

#### 8.6.3.16. Irretrievable Resources

The environmental impact evaluation associated with irretrievable resources in section 4.3.18 of NUREG-0586 has been determined to be generally applicable to LACBWR with a “Small” impact.

During the demolition and structural dismantlement of the station, recycling and asset recovery efforts will be made. Some metals from the site are anticipated to be released as clean scrap. Low level radioactive waste has been and will continue to be shipped to the EnergySolutions disposal site in Clive, Utah. This facility has sufficient space for the disposal of this waste. In addition, any Class B/C waste that is generated will be shipped to the WCS facility in Andrews, Texas.

As stated in NUREG-0586, irretrievable resources that would occur during the decommissioning process are the materials used to decontaminate the facility (e.g., rags, solvents, gases, and tools), and fuel used for construction machinery and for transportation of materials to and from the site. These resource commitments are considered to be minor and are neither detectable nor destabilizing.

Therefore, the environmental impact associated with irretrievable resources is evaluated to be bounded by NUREG-0586 and the impact is considered “Small.”

#### 8.6.3.17. Traffic and Transportation

The environmental impact evaluation associated with transportation issues in section 4.3.17 of NUREG-0586 has been determined to be generally applicable to LACBWR with a “Small” impact.

As indicated in LTP section 8.6.3.13, transportation of waste will be via road and rail, and no radioactive shipments will be executed via barge traffic. Existing barge traffic on the Thief Slough branch and the Mississippi River support the operating G-3 fossil station and are not associated with LACBWR decommissioning operations. Non-radiological impacts of

transportation include increased traffic and wear and tear on roadways. Although the number of shipments is greater during decommissioning than during the operation of the facility, the increase in traffic on the roads travelled is small, and thus it is anticipated that there will be no significant effect on traffic flow or road wear.

Therefore, the environmental impact associated with transportation is evaluated to be bounded by NUREG-0586 and the impact is considered as “Small.”

#### 8.6.3.18. Cumulative Impacts

Cumulative impact is defined the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions. The cumulative impacts were assessed by first determining the resources affected by LACBWR decommissioning. These include surface water and groundwater, air quality, aquatic ecology, terrestrial ecology. Irretrievable resources were also evaluated from the perspective of cumulative impact.

Past, proposed and future foreseeable actions include construction, operation and decommissioning of coal-fired power plants and recreational use of the land as access to the Mississippi river for boating. The individual impacts of the LACBWR decommissioning on the resources listed above were all determined to be minor. The past, present and future site activities are not projected to significantly accumulate environmental impacts that would in total, over time, exceed the minor impact of the individual activities on the affected resources. The major irretrievable resource attributable to LACBWR decommissioning was the use of land for disposal of low level radioactive waste. No future activities will involve radioactive waste disposal and will therefore have no cumulative effect.

In summary, the cumulative impact to site resources is projected to be minor.

### 8.7. Overview of Regulations Governing Decommissioning Activities and Site Release

#### 8.7.1. Federal Requirements

Decommissioning activities that are subject to federal regulations include:

- Handling, packaging, and shipment of radioactive waste,
- Worker radiation protection,
- Public radiation protection,
- License termination and final site release,
- Worker health and safety,
- Liquid and gaseous effluent releases,
- Hazardous waste generation/disposition,
- Handling and removal of asbestos,
- Characterization and removal of Polychlorinated Biphenyls (PCBs), and Handling and removal of lead paint.

---

#### 8.7.1.1. Nuclear Regulatory Commission

The majority of radiological activities fall under Title 10 of the Code of Federal Regulation and are administered by the NRC. Applicable Title 10 regulations include:

- Part 20 – Radiation protection.
- Part 50 – Decommissioning activities.
- Part 51 – Environmental protection.
- Part 61 – Disposal of radioactive waste.
- Part 71 – Packaging and transportation of radioactive waste (regulations in 49 CFR Parts 171 through 174 also apply).
- Part 73 – Physical Protection of Plants and Materials.

#### 8.7.1.2. U.S. Environmental Protection Agency

The Environmental Protection Agency (EPA) regulations outlined in Title 40 of the Code of Federal Regulations apply as follows:

- Part 61 – Asbestos Handling and Removal
- Parts 122 to 125 – National Pollutant Discharge Elimination System (NPDES)
- Part 141 – Safe Drinking Water Standards
- Part 190 – Radiation Protection Standards for Nuclear Power Operations
- Parts 260 to 272 – Resource Conservation and Recovery Act (RCRA)
- Part 280 – Underground Storage Tanks
- Part 761 – Toxic Substance Control Act (TSCA) for Polychlorinated Biphenyls (PCBs)
- Part 129-132 – Clean Water Act

#### **8.7.2. Federal, State and Local Requirements**

Permits and approvals from or notifications to state and local agencies are required for safety and environmental protection purposes. Decommissioning activities and related site operations that fall under Federal, State and local jurisdiction include, but are not limited to the following:

- Wisconsin Department of Natural Resources (WDNR)
- Wisconsin Department of Health Services, Division of Public Health, Bureau of Environmental and Occupational Health, Radiation Protection Section
- Village of Genoa
- Occupational Safety and Health Administration (OSHA)

This information provided above is a general overview of the applicable regulations and not intended to be all-inclusive.

## **8.8. Conclusion**

As previously evaluated in the D-Plan/PSDAR, the non-radiological environmental impacts from decommissioning LACBWR are temporary and not significant. The potential issues identified as “site-specific” in NUREG-0586 have been evaluated and there is no significant impact. The potential environmental impacts associated with decommissioning LACBWR have already been predicted in and will be bounded by the previously issued environmental impact assessments (NUREG-0191, NUREG-0586, and D-Plan/PSDAR). Therefore, there are no new or significant environmental changes associated with decommissioning.

## **8.9. References**

1. U.S. Nuclear Regulatory Commission Regulatory Guide 1.179, Standard Format and Content of License Termination Plans for Nuclear Power Reactors, Revision 1 - June 2011.
2. Dairyland Power Company, DPC-ED-3, Environmental Report - Lacrosse Boiling Water Reactor - September 1972.
3. Dairyland Power Cooperative, Environmental Report, La Crosse Boiling Water Reactor, Supplement Report – June 15, 1973.
4. U.S. Nuclear Regulatory Commission NUREG-0191, Final Environmental Statement related to Operation of the La Crosse Boiling Water Reactor by Dairyland Power Cooperative - April 1980.
5. U.S. Nuclear Regulatory Commission NUREG-0586, Generic Environmental Impact Statement (GEIS) on Decommissioning of Nuclear Facilities, Supplement 1, Volume 1 – November 2002.
6. Dairyland Power Cooperative, LACBWR Decommissioning Plan and Post Shutdown Decommissioning Activities Report (D-Plan/PSDAR), Revision – March 2014.
7. EnergySolutions GG-EO-313196-RS-RP-001, LACBWR Radiological Characterization Survey Report for October and November 2014 Field Work – November 2015.
8. EnergySolutions LC-RS-PN-164017-001, LACBWR Radiological Characterization Survey Report for June thru August 2015 Field Work – November 2015.
9. Atomic Power Review, “Atomic Journal” – September 24, 2011.
10. Haley & Aldrich, Hydrogeological Conceptual Site Model, File No. 38705-001 – August 30, 2012.
11. U.S. Census Bureau, 2008-2012 American Community Survey. (5-year data sets) - <https://www.census.gov/programs-surveys/acs/news/data-releases.2012.html>.
12. Dairyland Power Cooperative - [http://www.dairynet.com/energy\\_resources/genoa.php](http://www.dairynet.com/energy_resources/genoa.php).
13. U.S. Fish & Wildlife Service - [http://www.fws.gov/refuge/Upper\\_Mississippi\\_River/](http://www.fws.gov/refuge/Upper_Mississippi_River/).
14. U.S. Army Corps of Engineers - <http://www.mvp.usace.army.mil/Missions/Navigation/LocksDams/LockDam8.aspx>.
15. <http://www.city-data.com/city/Genoa-Wisconsin.html>.

16. Dame & Moore, Geotechnical Investigation of Geology, Seismology and Liquefaction Potential, La Crosse Boiling Water Reactor (LACBWR) near Genoa, Vernon County, Wisconsin for Gulf United Nuclear Fuels Corporation – October 1973.
17. Dairyland Power Cooperative, LaCrosse Boiling Water Reactor (LACBWR) Decommissioning Plan, revised November 2003.
18. Vernon County, Land & Water Resource Management Plan – February 2009.
19. McInterny, Michael. C., Impingement and Entrainment of Fishes at Dairyland Power Cooperative’s Genoa Site, Thesis, submitted to University of Wisconsin-La Crosse – December 1980.
20. Wisconsin Department of Natural Resources, Aquatic Invasive Species – Vernon County - <http://dnr.wi.gov/lakes/invasives>.
21. U.S. Fish and Wildlife Service, Federally-Listed Threatened, Endangered, Proposed and Candidate Species’ County Distribution, April 2015 - <http://www.fws.gov/midwest/endangered/lists/wisc-city.html>.
22. Helms and Associates. Mussel Survey for a Proposed Fleeting Site Mississippi River - Pool 9 (River Mile 677.5) Near Genoa, Wisconsin. November 1999.
23. Wisconsin Department of Agriculture, Trade & Consumer Protection, Endangered Species Habitat Program - [http://datcp.wi.gov/Farms/Endangered\\_Species/index.aspx](http://datcp.wi.gov/Farms/Endangered_Species/index.aspx).
24. Dairyland Power Cooperative, Peregrine Falcon Restoration Program - [http://www.dairynet.com/environmental/falcon\\_program.php](http://www.dairynet.com/environmental/falcon_program.php).
25. Wisconsin Department of Natural Resources, Peregrine Falcon - <http://dnr.wi.gov/eek/critter/bird/falcon.htm>.
26. Wisconsin Department of Natural Resources. Endangered Resources Review (ERR Log #16-648) Proposed Dairyland LACBWR Plant Demolition, Vernon County, WI. October 6, 2016.
27. Hubbuch, Chris, A nuclear option: After 25 years, Genoa reactor’s waste gets new home, La Crosse Tribune – July 15, 2012.
28. Village of Genoa, Vernon County, WI Public Records - [http://www.open-public-records.com/wisconsin/genoa\\_data.htm](http://www.open-public-records.com/wisconsin/genoa_data.htm).
29. U.S. Census Bureau, Vernon County, Wisconsin - <http://www.census.gov/>.
30. National Park Service, National Register of Historic Places - <http://www.nps.gov/nr/>.
31. Wisconsin Historical Society - <http://www.wisconsinhistory.org/>.
32. National Park Service, National Registry of Historic Places, Goose Island Archeological Site Ve-502 - <http://nrhp.focus.nps.gov/natregsearchresult.do>.
33. Dairyland Power Cooperative, Power for Generations, Genoa Site Update – December 2009.
34. Wisconsin Historical Society, Nuclear Fuel Assembly - <http://www.wisconsinhistory.org>.

**Figure 8-1 Site Regional Location**



Figure 8-2 Site Overview

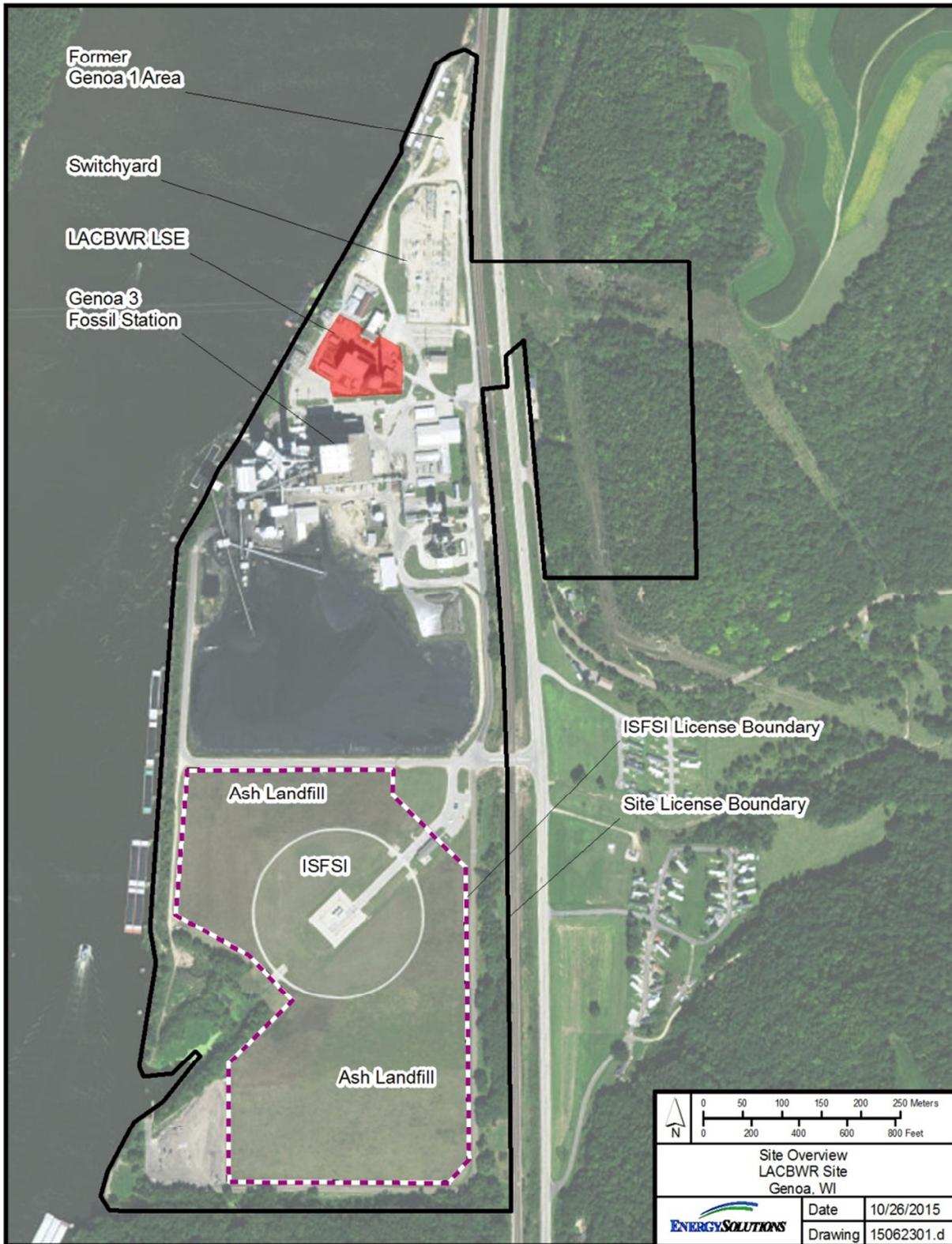


Figure 8-3 LACBWR Buildings

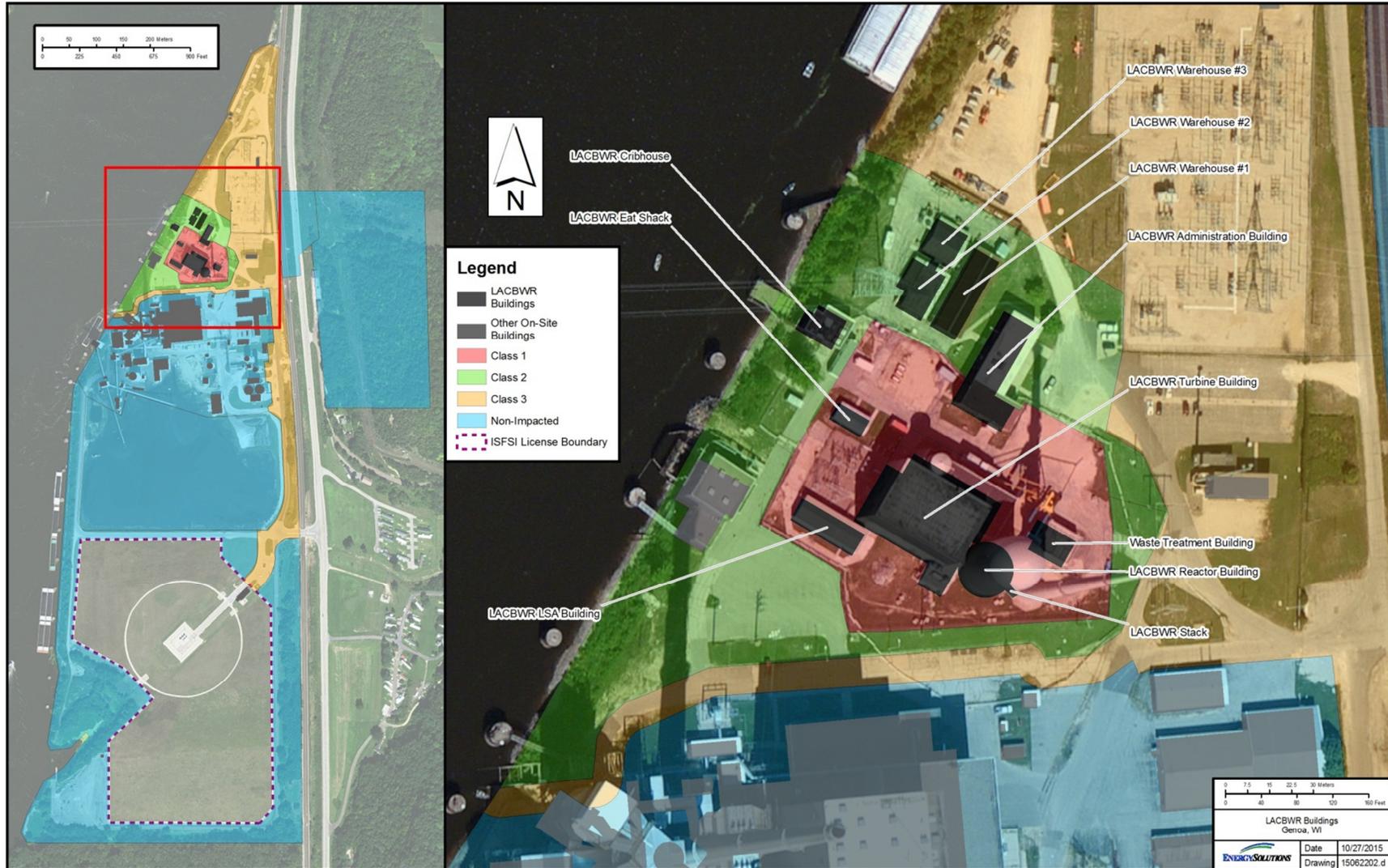
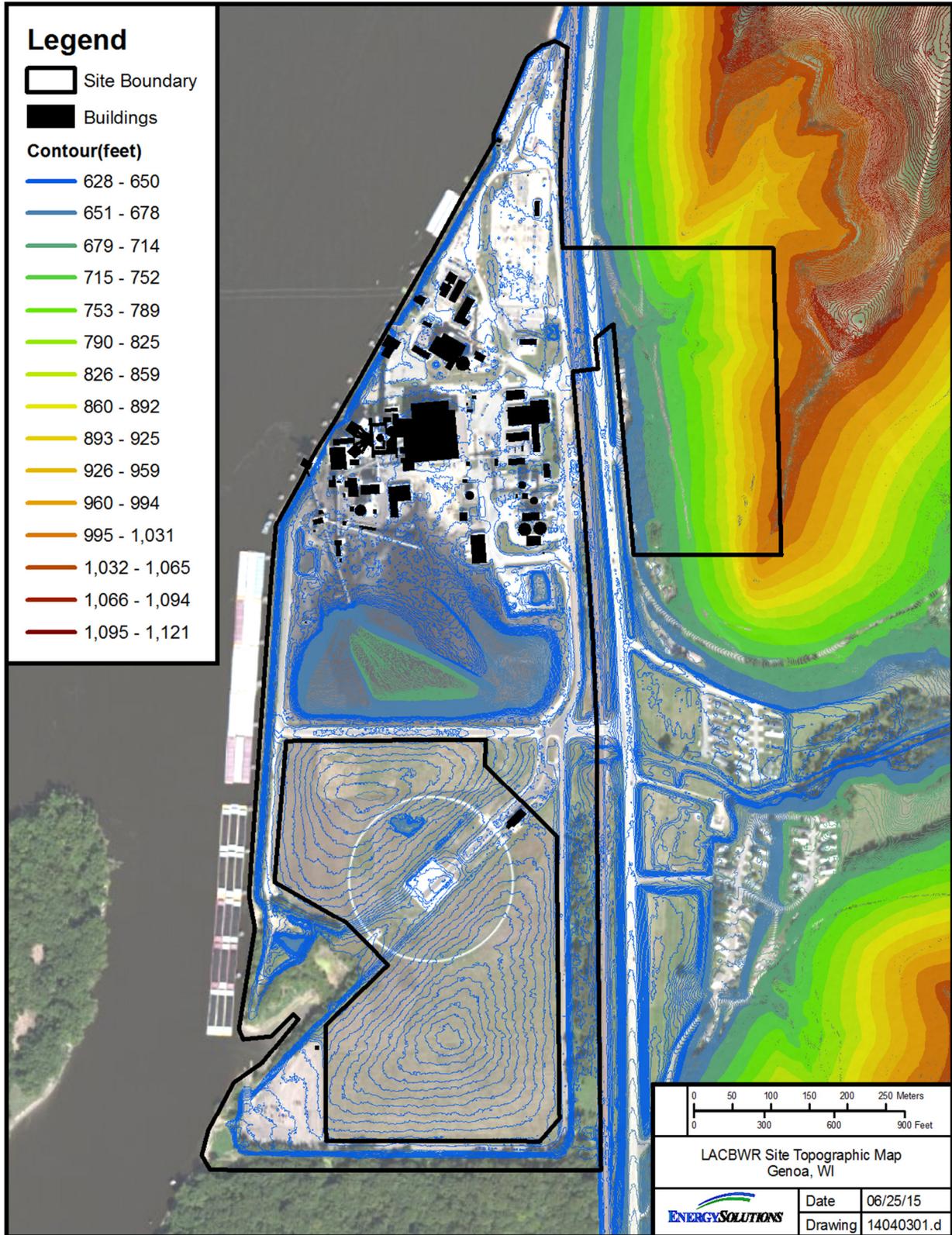


Figure 8-4 Topographical Map



**Figure 8-5 Groundwater Sampling Wells – LACBWR Site**

