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10 CFR 50
10 CFR 51
10 CFR 54

RS-15-221

July 31, 2015

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

LaSalle County Station, Units 1 and 2
Facility Operating License Nos. NPF-11 and NPF-18
NRC Docket Nos. 50-373 and 50-374

Subject: Revisions to LaSalle County Station, Units 1 and 2, License Renewal Application, Applicant's Environmental Report – Operating License Renewal Stage

References:

1. Letter from Michael P. Gallagher, Exelon Generation Company, LLC (Exelon Generation), to U.S. Nuclear Regulatory Commission (NRC) Document Control Desk, "Application for Renewed Operating Licenses," dated December 9, 2014.

2. Letter from David Drucker, NRC, to Michael P. Gallagher, Exelon Generation, "Request for Additional Information Regarding the LaSalle County Station, Units 1 and 2, License Renewal Application Environmental Review (TAC NOS. MF5567 AND MF5568)," dated May 22, 2015.

3. Letter from Michael P. Gallagher, Exelon Generation, to NRC Document Control Center, "Response to NRC Request for Additional Information, dated May 22, 2015, Regarding the LaSalle County Station, Units 1 and 2, License Renewal Application, Environmental Review," dated July 2, 2015

4. Letter from David Drucker, NRC, to Michael P. Gallagher, Exelon Generation, "Requests for Additional Information for the Review of the LaSalle County Station, Units 1 and 2, License Renewal Application," dated June 25, 2015

5. Letter from Michael P. Gallagher, Exelon Generation, to NRC Document Control Desk, "Response to NRC Request for Additional Information, dated June 25, 2015, Regarding the LaSalle County Station, Units 1 and 2, License Renewal Application Environmental Review," dated July 24, 2015.

In Reference 1, Exelon Generation Company, LLC (Exelon Generation) submitted the License Renewal Application (LRA) for the LaSalle County Station, Units 1 and 2 (LSCS), including Appendix E, which is the Applicant's Environmental Report – Operating License Renewal Stage (ER-LR).

In Reference 2, the NRC requested additional information to support the Staff's review of the LSCS ER-LR. One of the requests (HC-02) asked Exelon Generation to investigate whether three archaeological sites not discussed in the ER-LR would be located within the corrected LSCS property ownership boundaries.

In Reference 3, the response to NRC's request for additional information (RAI) HC-02 explained that, none of the three archaeological sites about which the NRC inquired in Reference 2 can be definitively located. However, Exelon Generation stated that the location of one of the three sites would be assumed to be within the LSCS property ownership boundaries.

In Reference 4, NRC requested additional information about the analysis in Section 4.13 of the LSCS ER-LR of environmental impacts from future transportation of high-burnup LSCS spent fuel. In part, Reference 4 asked for a reanalysis of impacts from future transportation of high-burnup LSCS spent fuel under incident-free and accident conditions using modified assumptions about certain shipment characteristics as well as route selection options not available at the time the ER-LR was initially prepared.

Reference 5 provided a summary of the results of Exelon Generation's reanalysis of spent fuel transportation impacts and indicated that Section 4.13 of the LSCS ER-LR would be updated in a later ER-LR revision. This letter provides that ER-LR revision.

The enclosure to this letter contains revised versions of pages in the LSCS ER-LR that incorporate changes and updates as follows:

Affected Sections	Purpose of Revisions
2.2; 3.1; 3.2; 3.5; 3.6; 3.7; 6.5	During its preparations for the NRC's LSCS license renewal environmental audit, which occurred in May 2015, Exelon realized that the 1977 LSCS Operating License ER (ER-OL) and subsequent documentation inaccurately depicted LSCS property ownership boundaries for the makeup and blowdown pipeline right-of-way near the Illinois River in the vicinity of the river screen house and blowdown discharge flume, as well as along the southern shore of the cooling pond. The revisions modify text, tables and figures that were erroneous because of the inaccurate depiction of ownership boundaries in the 1977 ER-OL or that were erroneous because of minor typographical errors.
3.2; 10.0	Reported and depicted acreages for land cover types have been updated using the 2011 National Land Cover Database.
3.4	The text has been modified to more accurately describe applicable state noise control standards, as well as current ambient noise sources and conditions in the vicinity of LSCS.
3.7.1.7; 10.0	The text has been revised to acknowledge the changed regulatory status of the American eel, which was listed in May 2015 by the Illinois Department of Natural Resources as threatened.

Affected Sections	Purpose of Revisions
3.8.3	The text and tables have been revised to remove information about two archaeological sites not located within the corrected LSCS property ownership boundaries and to add information about one archaeological site that was revisited in response to an NRC staff request for additional information and found not to be definitively outside the LSCS property ownership boundary.
3.10.1	A transposition error has been corrected in this section's reporting of the highest maximum daily temperatures in the cooling pond discharge to the Illinois River during 2011 and 2012.
4.13; 5.2; 10.0	The text has been revised to incorporate the results of reanalyzing the impacts of transporting LSCS high-burnup spent nuclear fuel under incident-free and accident conditions using the TRAGIS highway route controlled quantity (HRCQ) option and TRAGIS state-specific distances and population densities in urban, suburban, and rural areas, which were not available options at the time the ER-LR was initially prepared. The changes include modifying the transportation analysis to assume shipments of LSCS high-burnup fuel would contain 0.5 metric ton of uranium per cask.

This letter and its enclosure contain no regulatory commitments.

If you have any questions, please contact Ms. Nancy Ranek, Environmental Lead, Exelon Generation License Renewal, at 610-765-5369.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on: 7-31-2015

Respectfully,

Michael P. Gallagher
Vice President - License Renewal Projects
Exelon Generation Company, LLC

Enclosure: LaSalle County Station Units 1 and 2, Revisions to License Renewal Application, Applicant's Environmental Report – Operating License Renewal Stage

cc: Regional Administrator - NRC Region III
NRC Project Manager (Environmental Review), NRR-DLR
NRC Project Manager (Safety Review), NRR-DLR
NRC Project Manager, NRR-DORL LaSalle County Station
NRC Senior Resident Inspector, LaSalle County Station
Illinois Emergency Management Agency - Division of Nuclear Safety

RS-15-221

ENCLOSURE

LaSalle County Station, Units 1 and 2

Revisions to License Renewal Application,

Applicant's Environmental Report – Operating License Renewal Stage

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Purpose and Description of Revisions

The following table identifies the locations and purposes of revisions to the LaSalle County Station (LSCS) Applicant's Environmental Report – Operating License Renewal Stage (ER-LR). Replacement pages showing revised text, tables and figures are also provided in this Enclosure. The replacement pages supersede the pages in the originally filed version of the LSCS ER-LR. The locations of revisions are indicated on each replacement page by vertical lines in the right-hand margin, and the date of this ER-LR revision (i.e., July 2015) has been placed in the lower right-hand corner of each replacement page. Readers should note, however, that in Section 10, insertion of new reference entries at alphabetically correct locations throughout the section shifted the entries on every page, regardless of whether or not a new entry was added to any given page. Accordingly, all pages in Section 10 are being replaced, but vertical lines appear in the right-hand margin only on the pages and at the locations where new reference entries occur.

ER-LR Page #	ER-LR Section #	Description of Revision	Purpose of Revision
Cover page	Not applicable	Added ER-LR revision number and changed document date to July 2015	To provide updated document information.
2-5	2.2	Revised Figure 2.2-1, LSCS Site Layout	To correct the location of LSCS property ownership boundaries.
2-6	2.2	Revised Figure 2.2-2, LSCS Plant Layout	To correct the location of LSCS property ownership boundaries.
3-2	3.1	In 2nd paragraph, 1st line on the page, changed LSCS total land area from 1,568 ha (3,875 ac) to 1,528 ha (3,776 ac)	To revise the total land area value within the corrected LSCS property ownership boundaries.
3-4	3.2	Revised Figure 3.1-2, 6 Mile (10 km) Radius Map	To correct the location of LSCS property ownership boundaries.
3-5	3.2	In 1st paragraph, 10th line on page, updated the reference citation for the National Land Cover Database (NLCD), to the 2011 version of the NLCD (i.e., NLCD 2012)	To clarify that land areas occupied by land use types within the corrected LSCS property ownership boundaries, as presented in Table 3.2-1, have been updated using the 2011 version of the NLCD.
3-5	3.2	In 4th paragraph, 2nd line on the page, changed the percentage of LSCS land area occupied by the cooling pond from 53% to 52%, and changed LSCS total land area from 1,568 ha (3,875 ac) to 1,528 ha (3,776 ac)	To revise the total land area value and land areas occupied by specific land use types within the corrected LSCS property ownership boundaries.
3-5	3.2	In 4th paragraph, 8th line on the page, corrected the acreage of LSCS land area occupied by the facilities and associated infrastructure from 60 ha (150 ac) to 65 ha (160 ac), and changed the acreage of	To revise the land areas occupied by specific land use types within the corrected LSCS property ownership boundaries.

ER-LR Page #	ER-LR Section #	Description of Revision	Purpose of Revision
		LSCS land area occupied by undeveloped acreage from 101 ha (250 ac) to 142 ha (350 ac)	
3-7	3.2	Revised Figure 3.2-1, Land Use 6-Mile Map	To correct the location of LSCS property ownership boundaries and update areas depicted for land cover types to be consistent with the 2011 NLCD.
3-8	3.2	Revised Figure 3.2-2, Land Use - Site	To correct the location of LSCS property ownership boundaries and update areas depicted for land use types to be consistent with the 2011 NLCD.
3-11	3.2	Revised Table 3.2-1, Land Use in the 10-km (6-mi) Radius of LSCS	To revise the values for land areas occupied by specific land cover types within the corrected LSCS property ownership boundaries.
3-18	3.4	Revised Section 3.4, Noise	To more accurately describe applicable state noise control standards as well as current ambient noise sources in the vicinity of LSCS.
3-24	3.5	Revised Figure 3.5-2, Agricultural Soil Characterization Map	To correct the location of LSCS property ownership boundaries.
3-32	3.6	Revised Figure 3.6-1, Surface Water and Groundwater Well Locations at LSCS	To correct the location of LSCS property ownership boundaries.
3-35	3.6	Revised Figure 3.6-2, Groundwater Flow Map	To correct the location of property LSCS ownership boundaries.
3-48	3.6	Revised Table 3.6-3, Wells within a 1-mi (1.6-km) Radius of LSCS, by changing the entry in the “Well Depth” column for row “8” in the “Well Id” column from “235 (7700)” to “235 (770) “	To correct a typographical error.
3-50	3.7	In 1st paragraph, 1st line on page, changed LSCS total land area from 1,568 ha (3,875 ac) to 1,528 ha (3,776 ac)	To revise the total land area values within the corrected LSCS property ownership boundaries.
3-61	3.7.1.7	Revised Section 3.7.1.7, Special Status Aquatic Species	To acknowledge the changed regulatory status of the American eel, which was listed as threatened in May 2015 by the Illinois Department of Natural

ER-LR Page #	ER-LR Section #	Description of Revision	Purpose of Revision
			Resources.
3-71	3.8.3	In 3rd full paragraph, 9th, 10th and 11th lines, deleted information about archaeological sites LS00533 and LS00252, and added information about archaeological site LS00527	To remove information about two archaeological sites that are not located within the corrected LSCS property ownership boundaries, and to add information about one archaeological site that was revisited in response to an NRC staff request for additional information and found not to be definitively outside the LSCS property ownership boundary.
3-71	3.8.3	In last partial paragraph, 2nd, 4th and 5th lines, corrected text	To align the text with changes made elsewhere in section 3.8.3 regarding the locations of archaeological sites relative to the corrected LSCS property ownership boundaries.
3-72	3.8.3	Revised Table 3.8-2, Archaeological Sites Located Within the LSCS Property	To remove two archaeological sites that are not located within the corrected LSCS property ownership boundaries, and to add one archaeological site that is on or very near the LSCS property ownership boundary and was not previously listed in Table 3.8-2. The location of the latter site was revisited in response to an NRC staff request for additional information, and it has been added to Table 3.8-2 because available information is not sufficient to establish that its location is definitively outside the LSCS property boundary.
3-79	3.10.1	In 5th paragraph, 4th line on page, reversed the temperature values reported for 2011 and 2012	To correct a transposition error in this section's reporting of the highest maximum daily temperatures in the cooling pond discharge to the Illinois River during 2011 and 2012.
4-50 to 4-53	4.13	Revised Section 4.13, Impacts Common to All Alternatives: Uranium Fuel Cycle	To incorporate the results of reanalyzing the impacts of transporting LSCS high-burnup

ER-LR Page #	ER-LR Section #	Description of Revision	Purpose of Revision
			spent nuclear fuel under incident-free and accident conditions using the TRAGIS highway route controlled quantity (HRCQ) option and TRAGIS state-specific distances and population densities in urban, suburban, and rural areas, which were not available options at the time the ER-LR was initially prepared. The changes include modifying the transportation analysis to assume shipments of LSCS high-burnup spent fuel would contain 0.5 metric tons of uranium per cask.
5-4	5.2	In 2nd paragraph, 8th to 11th lines, revised the description of impacts from transporting LSCS high-burnup spent fuel.	To align the text in Section 5.2 to the revisions made in Section 4.13.
6-10	6.5	In 1st paragraph, 1st line on page, changed LSCS total land area from 1,568 ha (3,875 ac) to 1,528 ha (3,776 ac)	To revise the total land area values within the corrected LSCS property ownership boundaries.
10-1 to 10-18	10.0	Revised Section 10.0, References	To insert new references associated with revisions in Sections 3.2, 3.7.1.7, and 4.13 into the list of references at alphabetically correct locations.

REPLACEMENT PAGES FOR
LaSalle County Station ER-LR

REMOVE Page Number(s) in Original ER-LR	INSERT Replacement Page Number(s)
Cover Page	Cover Page
2-5	2-5
2-6	2-6
3-2	3-2
3-4	3-4
3-5	3-5
3-7	3-7
3-8	3-8
3-11	3-11
3-18	3-18
3-24	3-24
3-32	3-32
3-35	3-35
3-48	3-48
3-50	3-50
3-61	3-61
3-71	3-71
3-72	3-72
3-79	3-79
4-50, 4-51, 4-52, 4-53	4-50, 4-51, 4-52-a, 4-52-b, 4-52-c, 4-52-d, 4-53
5-4	5-4
6-10	6-10
10-1 through 10-18	10-1 through 10-20

NOTE: The replacement pages listed in the table, above, are provided as the last 47 (unnumbered) pages in this Enclosure to RS-15-221.

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Applicant's Environmental Report – Operating License Renewal Stage LaSalle County Station

Unit 1
License No. NPF-11

Unit 2
License No. NPF-18

Exelon Generation Company, LLC

Revision 1
July 2015

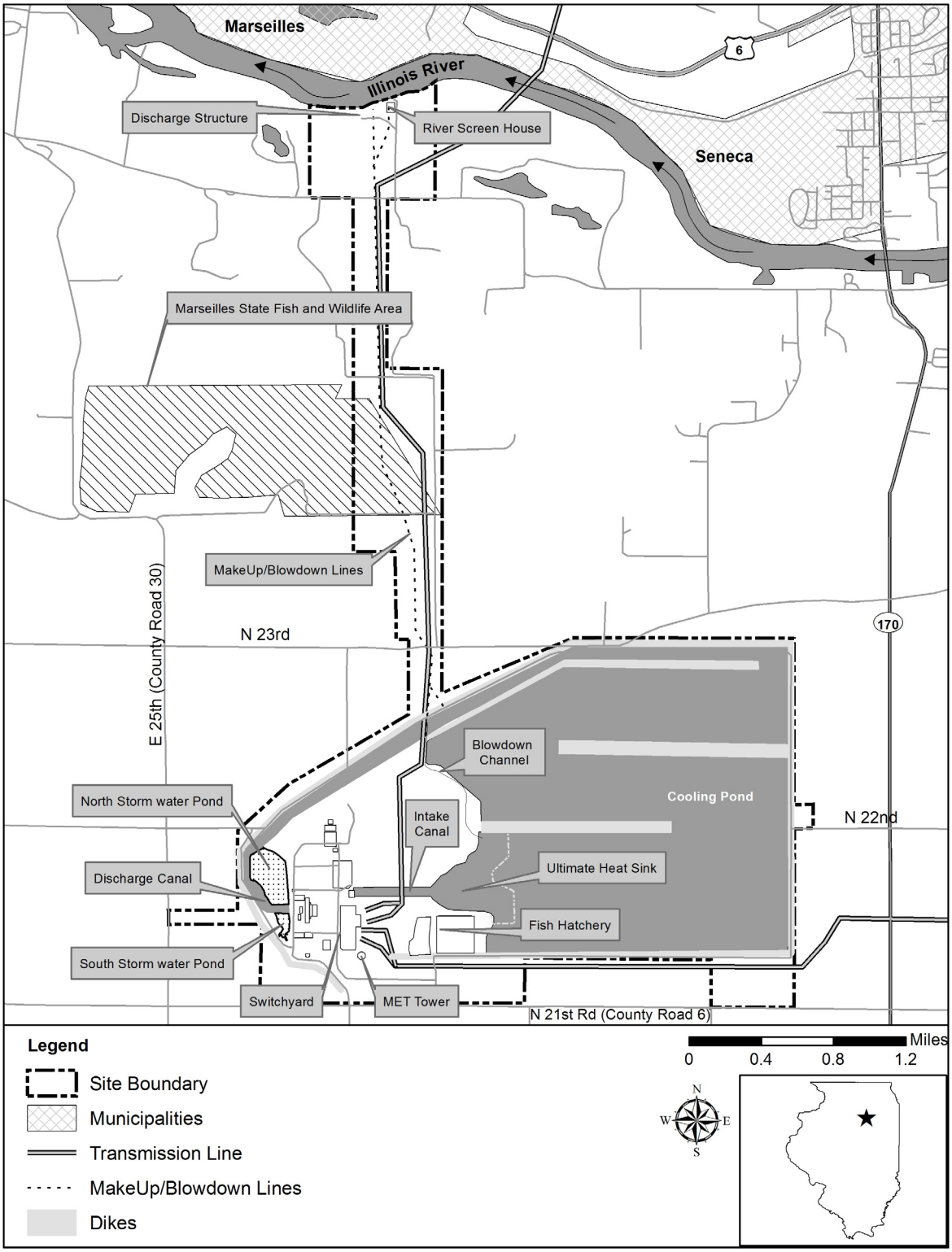

Figure 2.2-1 LSCS Site Layout

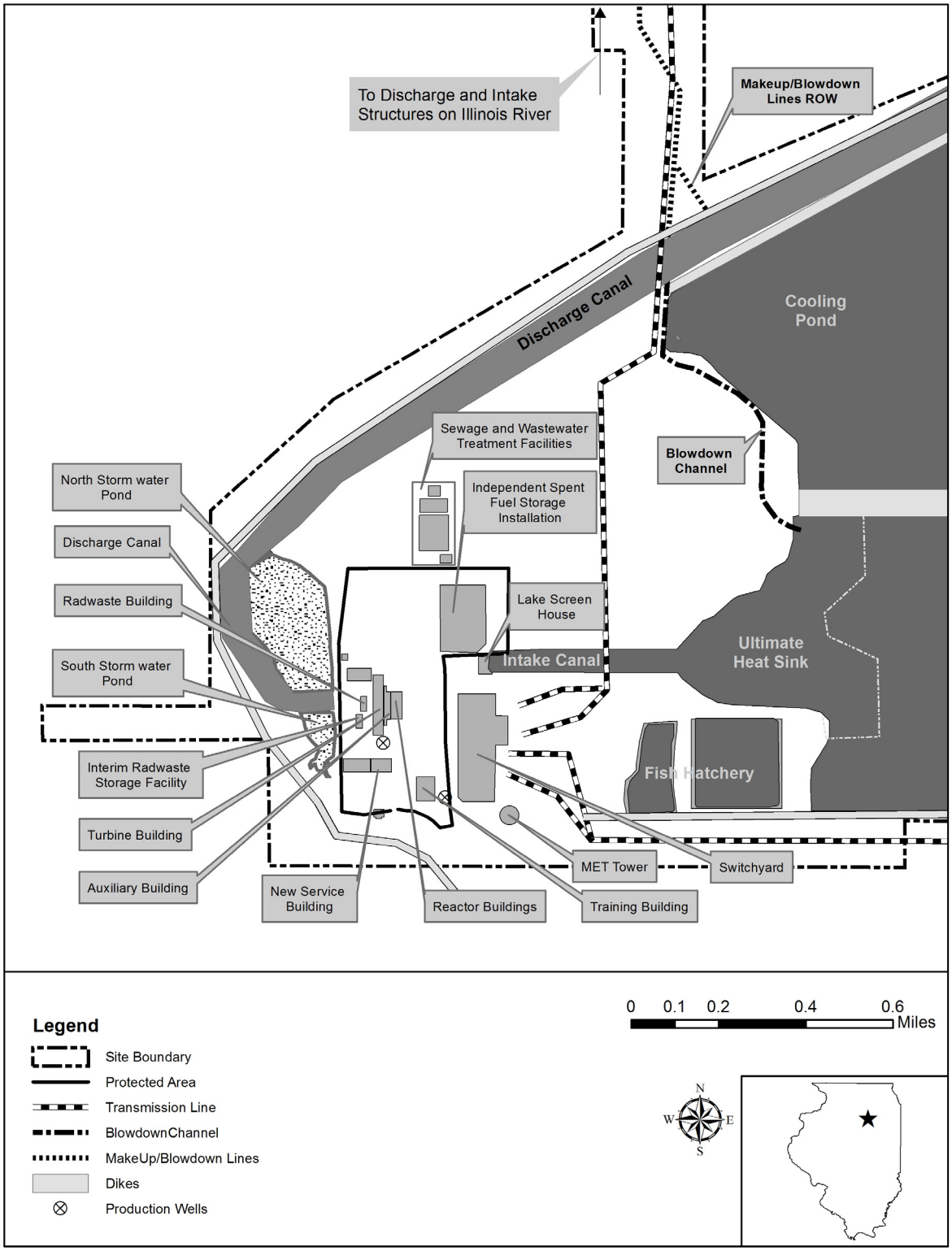

Figure 2.2-2 LSCS Plant Layout

3.1 Location and Features

LaSalle County Station (LaSalle) is in LaSalle County in northeastern Illinois, approximately 120 km (75 mi) southwest of downtown Chicago. Figure 3.1-1 shows LSCS's 80 km (50 mi) radius and Figure 3.1-2 shows the 10 km (6 mi) radius. LSCS is approximately 10 km (6 mi) southwest of Seneca, 11 km (7 mi) south-southeast of Marseilles, and 8 km (5 mi) south of the Illinois River. The area surrounding LSCS is rural and agricultural, with numerous wind turbines in the immediate vicinity and the region.

LaSalle occupies 1,528 ha (3,776 ac), of which approximately 833 ha (2,058 ac) comprise the cooling pond (ComEd 1977). The generating facilities are on the southwest portion of the site and include the reactor building and related structures, a switchyard, administration buildings, warehouses, and other structures (Figure 2.2-2).

The cooling pond was created by constructing dikes that rise above the surrounding land. The IDNR classifies the LSCS dike structure as a Class I dam (IDNR 2000). Class I dams are those for which failure has a high probability of causing loss of life or substantial economic loss, similar to that of US Army Corps of Engineers High Hazard Potential (17 Illinois Adm. Code, Ch. I, Sec. 3702, Jan 13, 1987). The cooling pond has an elevation of 213 m (700 ft) above mean sea level (msl) at normal pool elevation (ComEd 1977). IDNR leases the cooling pond, with the exception of the ultimate heat sink immediately in front of the intake canal, from Exelon Generation and manages it for public fishing (IDNR 2013). The cooling pond serves as a water supply for an IDNR fish hatchery on land adjacent to the pond that is also leased to IDNR by Exelon Generation (Exelon Generation 2013b) (Figure 2.2-2).

Underground makeup and blowdown pipelines approximately 5.6 km (3.5 mi) long connect the cooling pond to the Marseilles Pool portion of the Illinois River, which is the source of the cooling pond's makeup water and the receiving body of water for permitted discharges from the Station. The blowdown is subject to limitations established by National Pollutant Discharge Elimination System (NPDES) Permit IL0048151. The makeup and blowdown pipeline corridor right-of-way crosses the eastern portion of the Marseilles State Fish and Wildlife Area (Figure 3.1-2), a 1,032-ha (2,550-ac) area managed by IDNR for hunting and wildlife habitat. Marseilles State Fish and Wildlife Area (including the portion of the pipeline corridor that crosses it) also is used by the Illinois Army Reserve National Guard for training when hunting seasons are closed (IDNR 2013).

Illini State Park is approximately 10 km (6 mi) north-northwest of LSCS, on the south side of the Illinois River. This 206-ha (510-ac) park has facilities for camping, picnicking, boating, and fishing (ComEd 1977; IDNR 2013).

County Road 6, also known as North 21st Road and Grand Ridge-Mazon Road, runs parallel to LSCS's southern boundary and provides access to the site. State Highway 170 is 0.8 km (0.5 mi) east of the site and County Road 30, also known as East 25th Road, is slightly west of the site. Interstate Highway 80 is 13 km (8 mi) north of the site. The Chicago, Rock Island & Pacific Railroad, in this area parallel to and slightly north of the Illinois River, is the closest railroad line. A 10 km (6 mi) rail spur connects LSCS to the Atchison, Topeka, and Santa Fe Railroad south of the site (ComEd 1977).

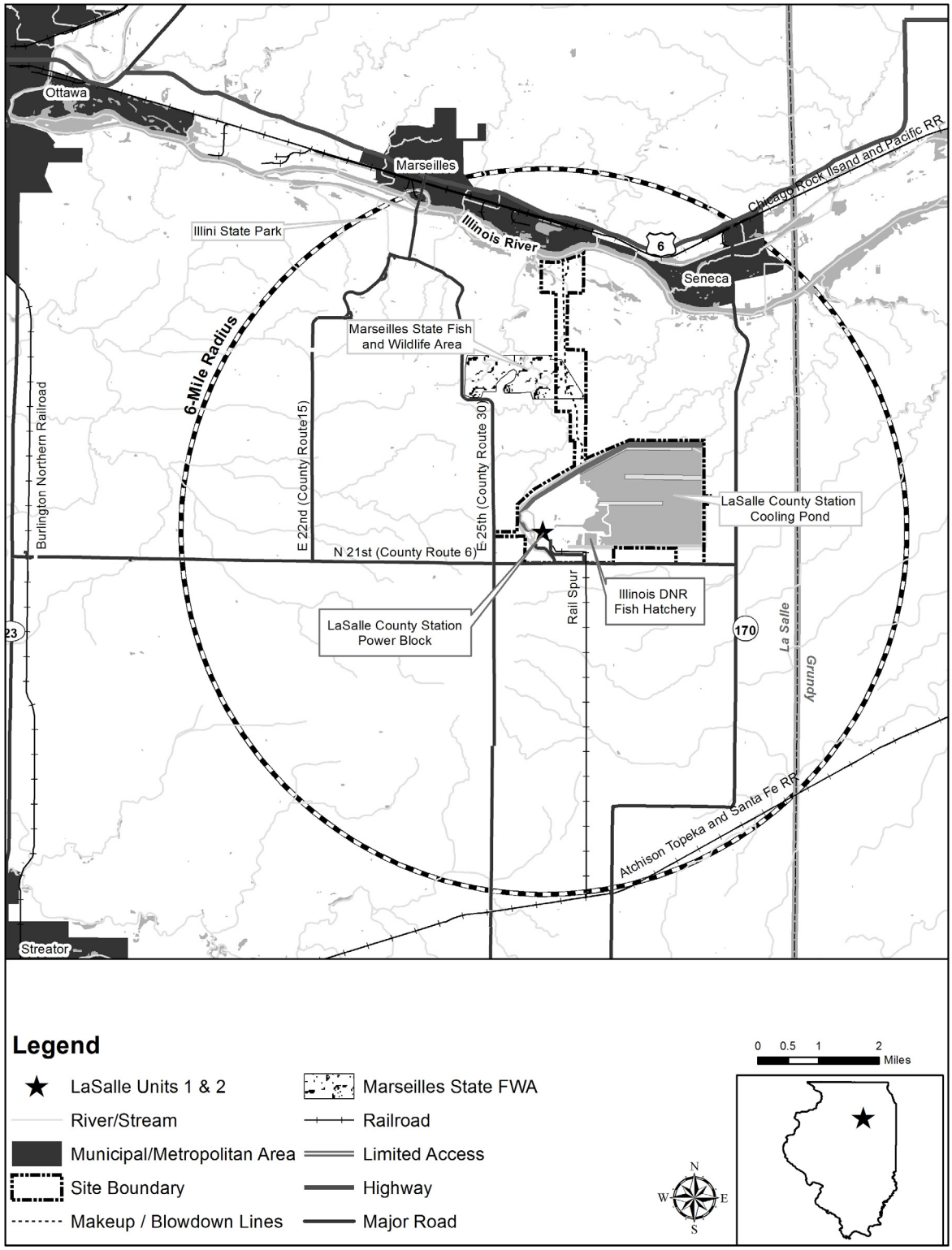

Figure 3.1-2 6 Mile (10 km) Radius Map

3.2 Land Use and Visual Resources

Offsite Land Use

Although less than 97 km (60 mi) from Chicago's southwestern city limits, LaSalle County is rural, comprised mostly (approximately 85 percent of total land area) of agricultural production (LEAMgroup and LaSalle County 2014). Land use within a 10-km (6-mi) radius of the Station is primarily agricultural, with cropland or pastures bordering the facility to the east, south, and west (see "pasture/hay" and "cultivated crop" legends on Figure 3.2-1). The bluffs overlooking the Illinois River north of the plant are mostly forested, with a scattering of residences and small farms. The broad south bank floodplain of the Illinois River is a mosaic of agricultural fields and woodlots, with more of the former than the latter. The north bank of the river is more developed, including parts of the incorporated towns of Seneca and Marseilles. Table 3.2-1 shows land cover in the 10-km (6-mi) region based on data downloaded from the National Land Cover Database 2011 and made available by the Multi-Resolution Land Characteristic's Consortium (NLCD 2012).

Three areas managed by the IDNR for public use and recreation are within 10 km (6 mi) of LaSalle: LaSalle Lake State Fish & Wildlife Area, Marseilles State Fish & Wildlife Area, and Illini State Park. The LaSalle Lake State Fish & Wildlife Area comprises the areas of the LSCS cooling pond that are open to the public and a small picnic and boat launch area, and provides recreational opportunities ranging from fishing to picnicking to bird watching (IDNR 2013). It is open to the public seven days a week in the spring, summer, and fall. Opening and closing dates change from year to year, based on agency personnel availability and funding, but it is generally open from mid-March until mid-October. The Marseilles State Fish & Wildlife Area is approximately 2.4 km (1.5 mi) north of the plant (see Figure 3.1-2). It is a 1,032-ha (2,550-acre) tract of mostly-wooded land managed by IDNR for wildlife and open to the public during certain times of the year (IDNR 2013). Illini State Park is approximately 10 km (6 mi) northwest of the plant. It is 206 ha (510-ac) along a 4.8-km (3-mi) strip of land on the south bank of the Illinois River, adjacent to the area known as the Great Rapids and directly across the river from the town of Marseilles (see Figure 3.1-2) (IDNR 2013).

The Illinois Department of Commerce and Economic Opportunity expect the population of LaSalle County to increase from an historic growth rate of 2 percent per decade, to 4 percent per decade by 2030. The LaSalle County Comprehensive Plan projects that the rate of land use for residential and commercial development will grow faster than the rate of population growth, and points out that new residential development and commercial growth are following established highway corridors, including Highways 6 between LaSalle and Ottawa, north of LSCS, 251 west of LSCS, and I-80, north of LSCS (see Figure 3.1-1). (LEAMgroup and LaSalle County 2014).

Onsite Land Use

As discussed in Section 3.1 and shown in Figure 3.2-2, the 833 ha (2,058 ac) cooling pond occupies more than half (52 percent) of the 1,528 ha (3,776 ac) LSCS site. The portion of the site that lies west of the cooling pond includes the generating facilities and associated infrastructure (roads, parking lots, warehouses, switchyard), but is surrounded by undeveloped areas that are maintained as buffer areas and natural areas for wildlife. These undeveloped areas contain grassland, old field, and scrub-shrub habitats as well as scattered "tree islands" (Exelon Generation 2013b). The generating facilities and associated infrastructure occupy approximately 65 ha (160 ac), while the surrounding undeveloped areas total approximately 142 ha (350 ac). The LaSalle Fish Hatchery, which is operated by the IDNR under a lease agreement with Exelon Generation, includes several small buildings and 16 fish-rearing pools

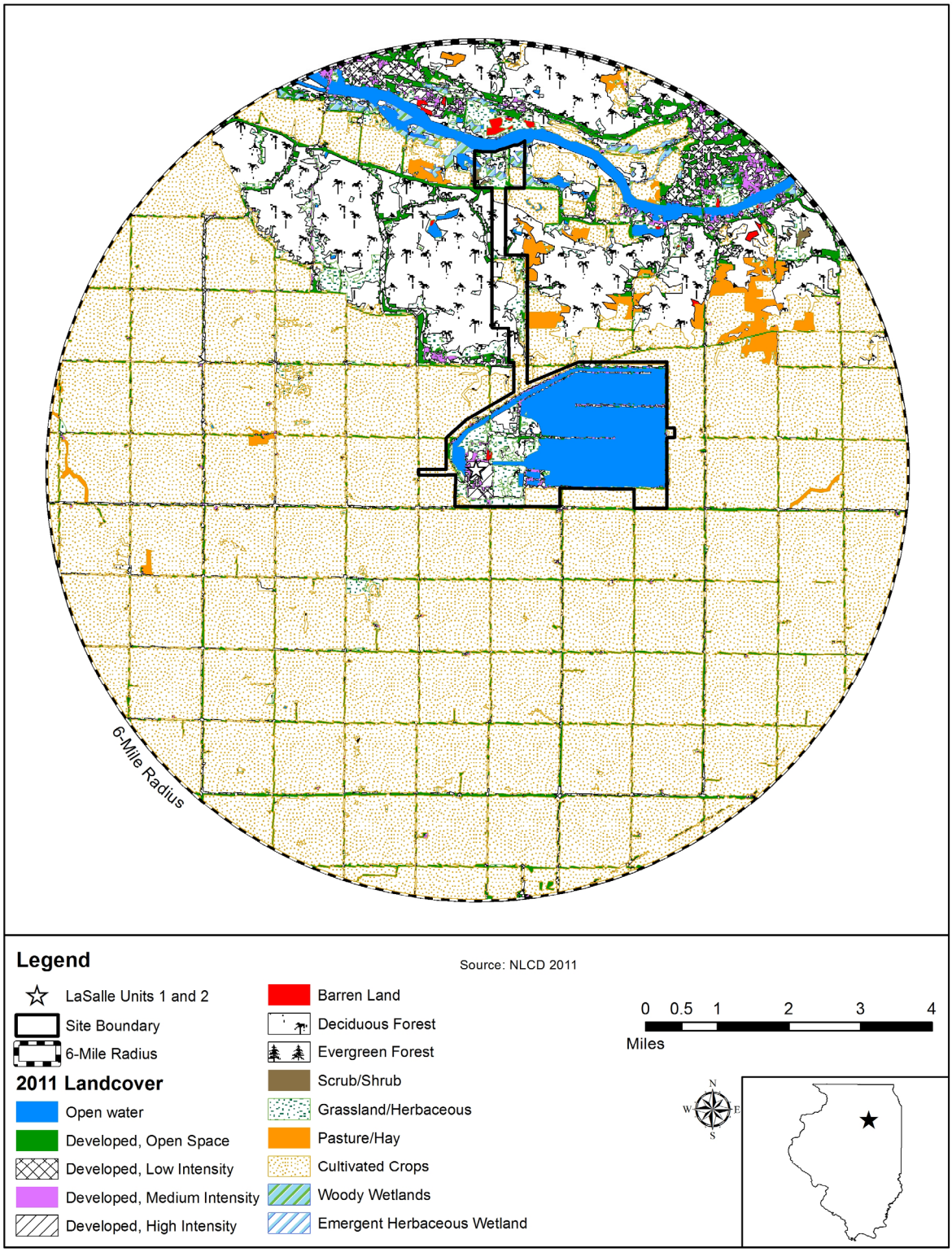

Figure 3.2-1 Land Use 6-Mile Map

Figure 3.2-2 Land Use - Site

Table 3.2-1 Land Use in the 10-km (6-mi) Radius of LSCS

Land Cover Class	Hectares (acres)	Percent of 10-km (6-mi) Radius
Open Water	1,180 (2,915)	4
Developed, Open Space	1,264 (3,124)	4
Developed, Low Intensity	1,083(2,676)	4
Developed, Medium Intensity	183 (451)	1
Developed, High Intensity	104 (256)	<1
Barren Land	34 (84)	<1
Deciduous Forest	3,431 (8,479)	12
Evergreen Forest	2 (4)	<1
Shrub/Scrub	17 (43)	<1
Grassland/Herbaceous	876 (2,165)	3
Pasture/Hay	391 (966)	1
Cultivated Crops	20,540 (50,755)	71
Woody Wetlands	172 (425)	1
Emergent Herbaceous Wetlands	3 (8)	<1
Total	29,279 (72,351)	100

In the GEIS, the NRC determined that onsite land use impacts, offsite land use impacts, and aesthetic impacts from continued plant operations over the license renewal term would be SMALL for all nuclear plants, and designated these Category 1 issues (NRC 2013b). Because the new and significant analysis identified no information regarding LSCS that is different from the assumptions in the GEIS or that would change the conclusions of the GEIS regarding land use or visual resources, no further analyses are required.

3.4 Noise

LSCS pumps, turbines, generators, switchyard equipment, transformers, and loudspeakers all generate intermittent or constant noise. Most equipment is inside structures, reducing the outdoor noise level. LSCS facilities that produce noise are more than 300 m (1,000 ft) from the nearest site boundary and 1.1 km (0.7 mi) from the nearest residence (Exelon Nuclear 2012a). The Illini State Park is approximately 10 km (6 mi) from LSCS, well beyond the range of LSCS noise.

Title 35, Subtitle H, of the Illinois Code (Illinois Noise Pollution Control Regulations) contains the state's noise regulations which are based on the relative sensitivity of adjacent properties. Class A land is the most sensitive and includes county/state/national parks, recreation areas, residential areas, nursing homes, retirement homes, hospitals, hotels, and motels. Class B lands are generally those occupied by retail businesses. Class C lands are those occupied by agricultural operations, manufacturing facilities, mines, refineries, and power plants, including nuclear plants. LSCS and the adjacent properties are considered Class C. The closest Class A property is the Marseilles State Fish and Wildlife Area, approximately 1.5 mi north of the plant boundary and more than 2 mi from the power block.

Section 5.6 of the 1977 operating license stage Environmental Report (ComEd 1977) confirms the applicability of Title 35, Subpart H of the Illinois Code and concludes that:

> Although predictions indicate that existing ambient noise levels near the plant boundary will be increased because of plant operation, the predicted levels are well within the federal guidelines, and the applicable environmental regulations of the State of Illinois.

Since 1977 no equipment changes have occurred at LSCS that would change this conclusion.

No record of an offsite noise survey since plant operations began has been found. However, since 2008, more than 100 wind turbines have been installed within a 10-km (6-mi) radius of LSCS. Exelon Generation believes that the wind turbines likely have increased offsite ambient noise in the vicinity of LSCS, but the increase seems imperceptible. No data have been collected by Exelon Generation to verify an increase in ambient noise, or support an assessment of its significance.

In the GEIS, the NRC determined that impacts of noise from continued plant operations over the license renewal term would be SMALL for all nuclear plants, and designated these Category 1 issues (NRC 2013b). Because the new and significant analysis identified no information regarding LSCS operations that would change the conclusions of the GEIS regarding noise, no further analyses are required.

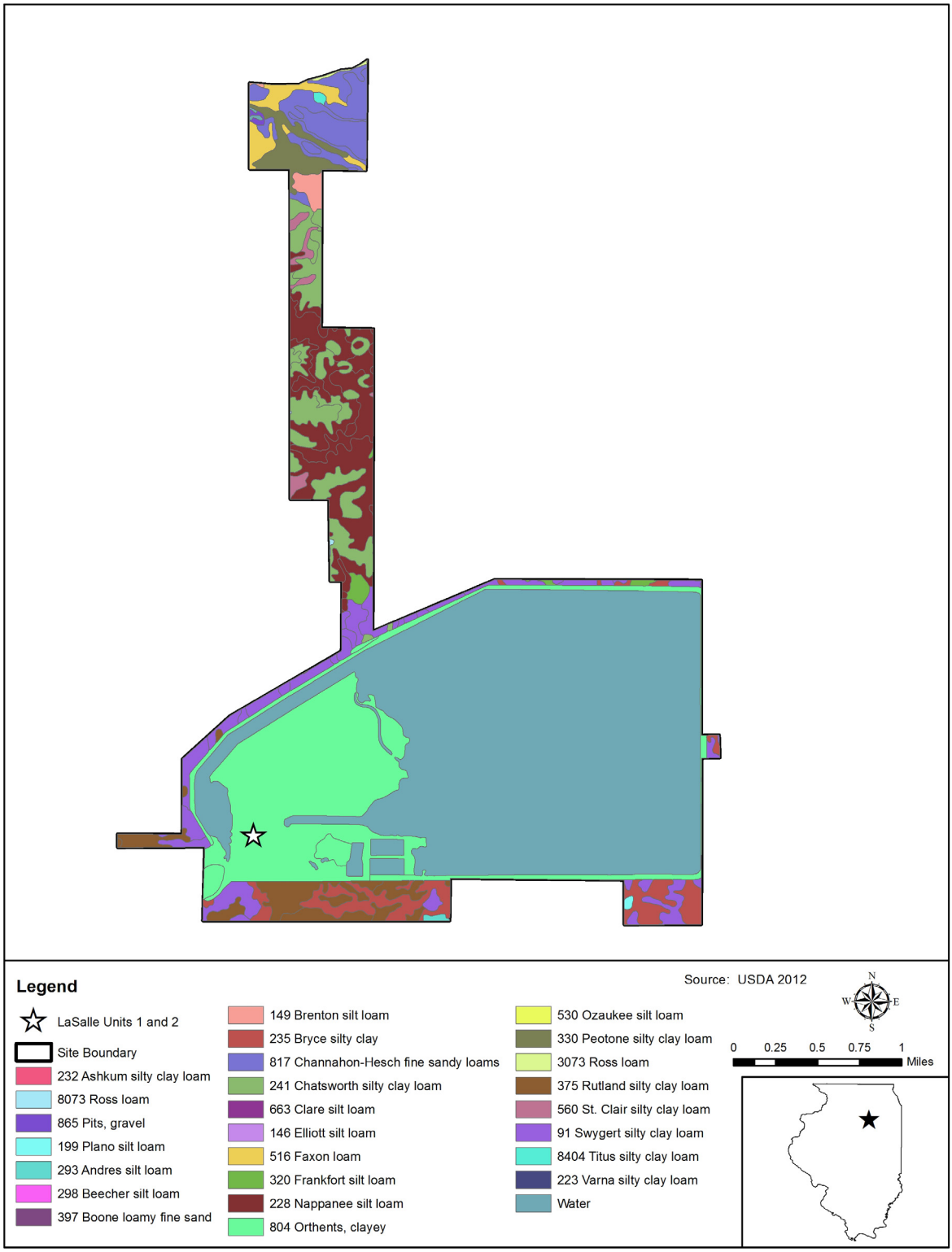

Figure 3.5-2 Agricultural Soil Characterization Map

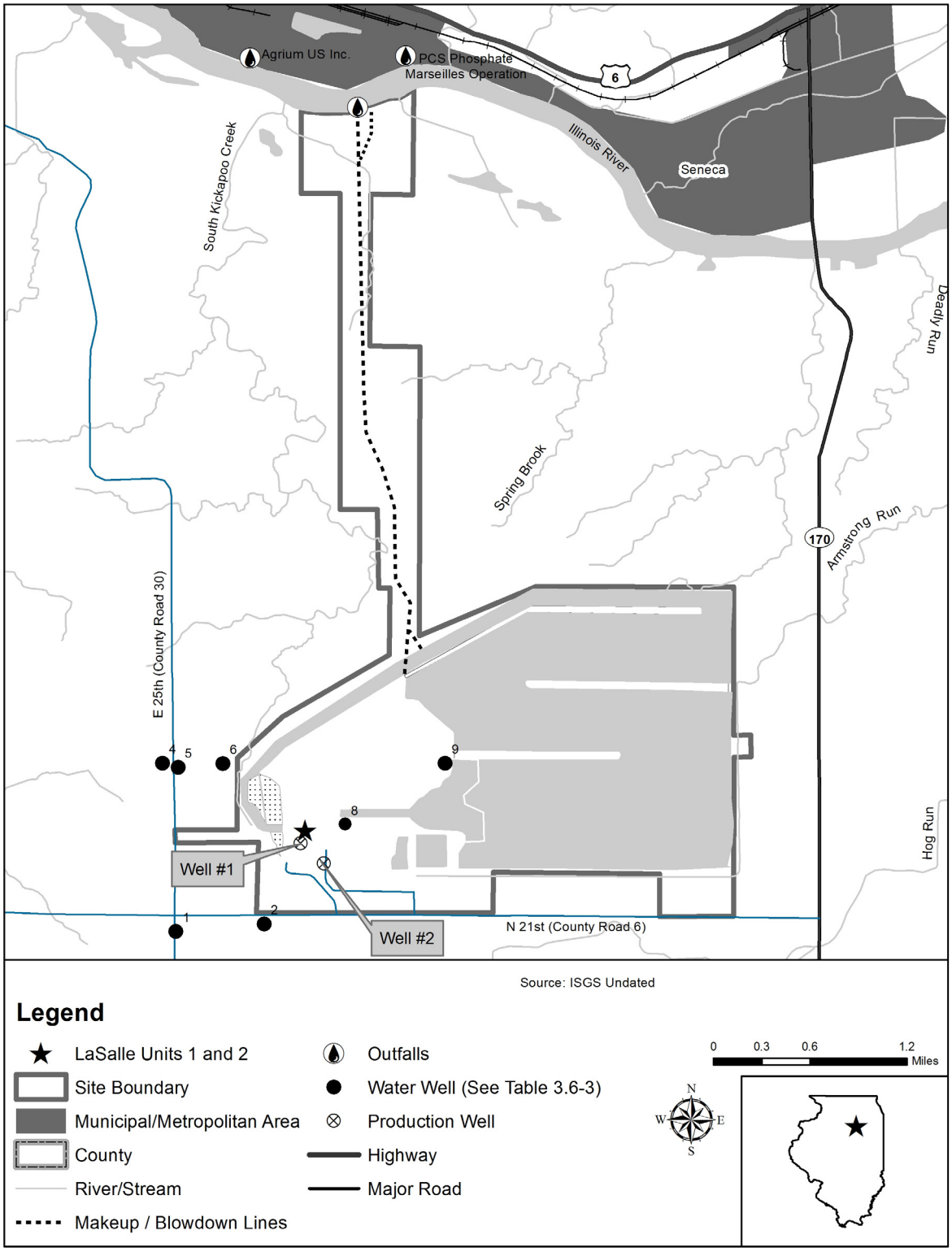

Figure 3.6-1 Surface Waters and Groundwater Well Locations at LSCS

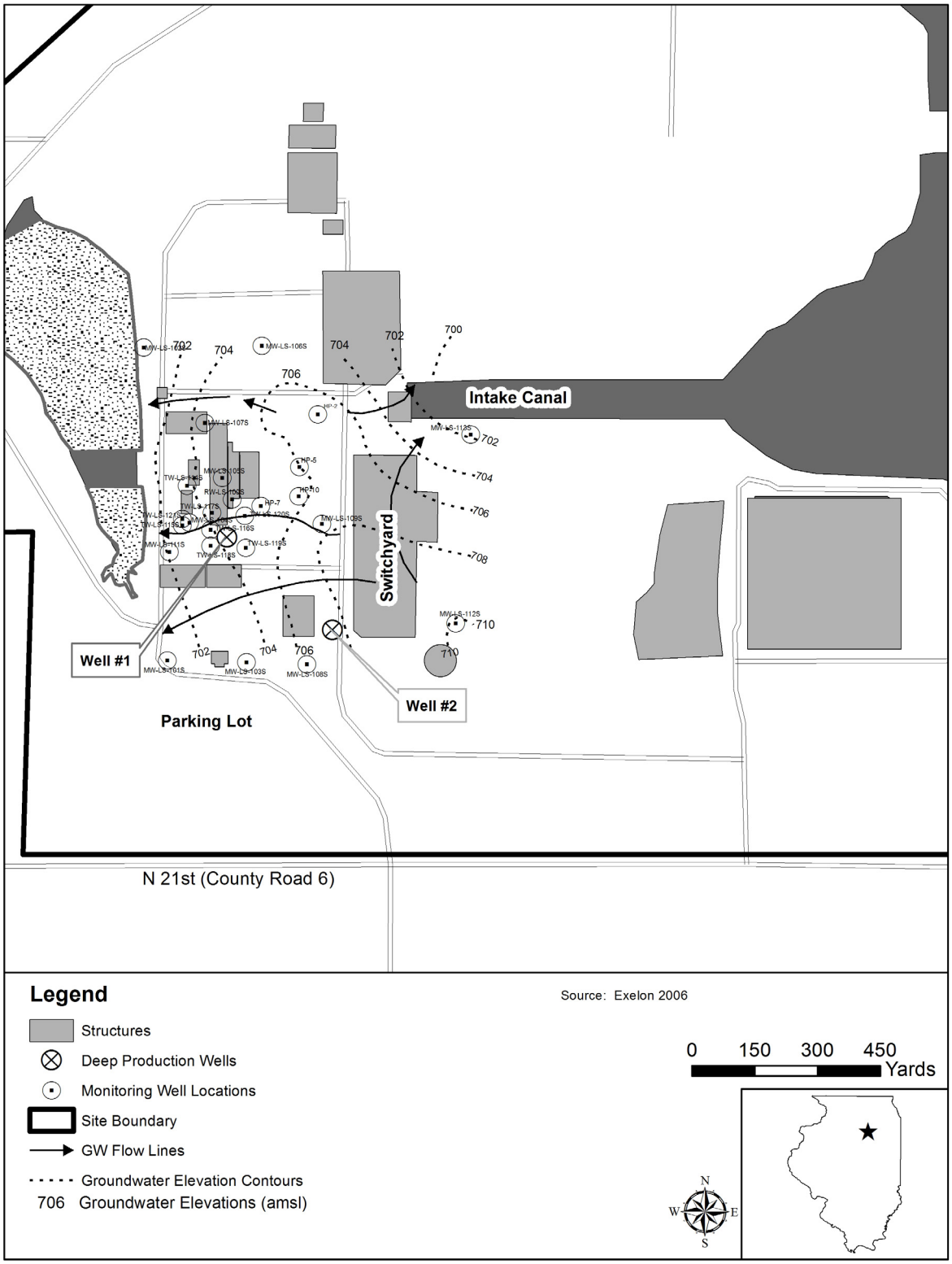

Figure 3.6-2 Groundwater Flow Map

Table 3.6-3 Wells within a 1-mi (1.6-km) Radius of LSCS

Well Id[a]	ISGS API ID	Owner	Use	Date Installed	Well Depth [m] (ft)	Aquifer / Bedrock Type
1	120992820900	Gage, Duane & Kathy	Private	2011	91 (300)	Gray shale & limestone
2	120992547800	David, Mike	Private	1997	152 (500)	St. Peters Sandstone
Well #2	120990234900	Commonwealth Edison	Not Available	1972	494 (1620)	Ironton-Galesville Sandstone
4	120992744500	Frye, Richard	Private	2004	165 (540)	Sandstone
5	120992811400	Invenergy LLC	Commercial	2009	171 (560)	St. Peters Sandstone
6	120990041700	Rose, A. D.	Not Available	1916	57(187)	Not Available
Well #1	120992245100	Commonwealth Edison	Not Available	1974	496.5 (1629)	Ironton-Galesville Sandstone
8	120992464100	Commonwealth Edison	Surface Water Recharge Well	1992	235 (770)	Limestone
9	120990041600	Marsh, J. J.	Not Available	1916	81 (265)	Not Available

Source: ISGS Undated
[a] The well ID refers to the numbers on Figure 3.6-1.
API – American Petroleum Institute
Wells #1 and #2 are the LaSalle production wells

3.7 Ecological Resources

LSCS occupies 1,528 ha (3,776 ac) in LaSalle County, Illinois. The Station's 833 ha (2,058 ac) cooling pond, which serves as the heat sink for dissipation to the atmosphere of waste heat from LSCS, was created by constructing dikes that rise above the surrounding land (ComEd 1977), and by pumping water into the dry, diked area through a pipeline from the Illinois River, which is located approximately 5.6 kilometers (km) (3.5 miles [mi]) north from the cooling pond.

According to the land classification system used by the U.S. Forest Service, which is based on climate, geology, topography, and vegetation, LSCS is within the Central Loess Plains Section of the Prairie Parkland (Temperate) Province of the Prairie Division of the Humid Temperate Domain. The classification Humid Temperate Domain describes a region that is affected by both tropical and polar air masses, resulting in pronounced seasons and strong annual cycles of temperature and precipitation. The Prairie Division is dominated by tall grasses with subdominant broad-leaved plants (forbs). Rates of precipitation and evapotranspiration are roughly equal, leaving little moisture available for tree growth. The vegetation consists primarily of tall prairie grasses and forbs, with trees nearly absent, except in depressions and valleys where tree roots can reach the water table. The Prairie Parkland (Temperate) Province is typically a gently rolling area of plains and low hills, with some higher hills and steep bluffs bordering river valleys. Dominant vegetation in the Prairie Parkland (Temperate) Province originally consisted of alternating prairie and deciduous forest, but much of this region has been converted to agriculture. In addition, many of the native prairies have become overgrown with trees and shrubs, and no longer resemble prairie habitats. The climate within the Prairie Parkland (Temperate) Province consists of hot summers and cold winters, with precipitation ranging from 50 to 100 cm (20 to 40 in) annually. The Central Loess Plains Section is composed of smooth and irregular plains covered with loess, which is wind-deposited fine-grained silt or clay. Vegetation communities in The Central Loess Plains were historically bluestem prairie on uplands and floodplain forests in river and creek drainages. Most small wetlands were drained when the land was converted to agriculture. Today, the Central Loess Plains is predominantly highly productive farmland, with approximately 60 percent in crops and 25 percent used for grazing (Exelon Generation 2013b).

Land use in LaSalle County is primarily agricultural, and soybeans is the most abundant crop (Exelon Generation 2013b). The area surrounding the Station is rural and agricultural, with numerous wind turbines.

3.7.1 Aquatic Communities

3.7.1.1 Introduction

The Illinois River is formed by the confluence of the Des Plaines and Kankakee Rivers in eastern Grundy County, Illinois. From its origin, the Illinois River flows west, then southwest, for 439 km (273 mi) before emptying into the Mississippi River (Lerczak, et.al 1994). Six major tributaries --- the Fox River, the Vermillion River, the Mackinaw River, the Spoon River, the Sangamon River, and the La Moine River -- and many smaller streams join the Illinois River downstream of LSCS as the Illinois River flows to the Mississippi (ISWS 2003).

The Illinois River is part of the Illinois Waterway, which provides a navigable link between Lake Michigan and the Mississippi River, and ultimately the Gulf of Mexico. This waterway consists of the Illinois River, the Des Plaines River, the Chicago Sanitary & Ship Canal, and part of the Chicago River, and is made navigable by a series of eight locks and dams along the Illinois River and its tributaries (ISWS 2002). The waterway ends at Grafton, Illinois, about 35 mi (56 km) upstream of St. Louis, Missouri, where the Illinois River joins the Mississippi River.

species, reflecting poor water quality in this reach of the river. The FES noted that "there are no records, either old or recent, of any rare or endangered fishes in this stretch of the Illinois River" (NRC 1978).

However, the improved water quality and restoration efforts discussed earlier in this section have resulted in an increase in abundance of sensitive, pollution-intolerant species. Several darter and dace species, the blackstripe topminnow (*Fundulus notatus*) and the state-listed banded killifish (*F. diaphanus*) have appeared in INHS collections over the last 10 to 15 years (McClelland, et al. 2012). The banded killifish normally occurs in shallows of glacial lakes and in clear, sandy streams with weedy margins. Locally common in New England, Minnesota, Wisconsin, and Michigan, the species is rare in Illinois, found mostly in clear lakes in Lake and Cook counties. According to Illinois DNR records, banded killifish were collected in the Illinois River immediately upstream of its confluence with the Vermillion River between 2000 and 2010 (IDNR 2012a).

The Illinois Natural Heritage Database for LaSalle County has two state-listed mussels and three-state listed fish (IDNR 2012b), but does not provide locations. U.S. Fish and Wildlife Service's (USFWS) Midwest Region website indicates no federally listed aquatic species occur in LaSalle County (USFWS 2012).

Biologists conducting impingement studies at the LSCS river screen house observed a single American eel (*Anguilla rostrata*) in screenwash samples in June 2014 (EA 2015). The American eel was nominated for listing by Illinois DNR staff in 2012 due to declining statewide abundance and was listed as Threatened in May 2015 (IDNR 2014a, 2015). The Illinois Natural Heritage Database (IDNR 2014b) does not show the American eel occurring in LaSalle County, but since 1977, eels have been recorded from locations all along the lower and middle reaches of the Illinois River, from its mouth to Marshall County (south of the Big Bend) (INHS 2012).

The American eel is not listed by the U.S. Fish and Wildlife Service (USFWS) as either a threatened or endangered species or a candidate species. USFWS reviewed the status of the American eel in 2007, but determined that federal listing as either threatened or endangered was not warranted at that time (72 FR 4967). In September 2011, however, USFWS announced a 90-day finding (76 FR 60432) on another petition to list the species, having determined that there was substantial information indicating that listing was warranted, and a more comprehensive status review, which is still ongoing, was initiated. The USFWS is scheduled to complete a finding on whether listing is warranted by September 30, 2015. The USFWS finding could determine that (1) listing is not warranted, (2) listing is warranted but precluded by other higher-priority listing actions, or (3) listing is warranted and will be combined with a proposed rule to list the species. A "warranted but precluded" finding (i.e., option 2) would place the American eel on the USFWS "candidate species" list.

the area are consistent with the trend noted throughout the Prairie Peninsula of early farmers settling along the ecotone and accessing the forest for wood for fuel and building materials, using the prairie as open range for cattle, and plowing the more easily tillable forest soils with newly introduced steel-tipped plows. Historical sites are in very different locations compared to prehistoric sites. Whereas prehistoric sites are found along rivers, historic sites are predominantly in the uplands.

Based on the results of Exelon Generation's 2013 search of the Illinois State Archaeological Site Files, a proprietary database maintained by the Illinois State Historic Preservation Office (SHPO) and open only to cultural resource professionals, the Illinois Archaeological Survey (IAS) completed a Phase I Archaeological Survey of the LSCS site (originally proposed as the Collins Generating Station) in 1972 and concluded that the construction of the facility would have no significant impact on archaeological resources. The findings apparently were reported by Stuever in a 1972 report that has been lost[2]. Locations LS00207, LS00208, and LS00209 were three of five isolated finds identified in the 1972 survey. At the time of the Phase I survey, IAS did not recognize isolated finds as sites, and the isolated finds were not recorded or assigned IAS accession numbers. Because isolated finds LS00207, LS00208, and LS00209, by definition, were not eligible for inclusion on the NRHP, they were not evaluated. The NRC's Final Environmental Statement relating to the operation of LSCS, which was published in November 1978 (NUREG-0486), stated that "[t]here are no historical and cultural sites recorded in the National Registry of National Landmarks, as supplemented 8 June 1976, or the National Register of Historic Places, as supplemented 3 January 1978, located on the LaSalle County Station site."

3.8.3 Post-Construction Known Historical and Archaeological Resources

For this Environmental Report, the National Register Information System (NRIS) on-line database was used to locate historic properties listed on the National Register of Historic Places (NRHP) within a 10 km (6-mi) radius of LSCS. Seven properties listed on the NRHP were identified (Table 3.8-1).

In 1993, the Illinois State Museum Society (ISMS) contracted with the Illinois Department of Military Affairs to document and analyze prehistoric and historic cultural resources in the Marseilles Training Area, which is located immediately northwest of LSCS, and is used by the Illinois Army Reserve National Guard (Ferguson, et al. 1995). A portion of the Marseilles Training Area intersects the right-of-way for the LSCS makeup and blowdown pipelines and is leased to the National Guard by Exelon Generation. Fieldwork was conducted during 1993-1994. The ISMS previously conducted a survey in portions of the project area in 1983, the results of which are discussed in the Ferguson, et al. 1995 report. Forty-eight prehistoric archaeological sites and four historic archaeological sites were found in the project area during the 1993-1994 survey, including prehistoric archaeological site LS00514 and historic archaeological site LS00527. Both sites were determined not NRHP-eligible (Table 3.8-2).

The search of the Illinois State Archaeological Site Files identified 146 previously recorded archaeological sites within 10 km (6 mi) of LSCS. Five sites are on LSCS property, including the three isolated finds identified in the 1972 survey discussed above. The remaining two sites were identified in archaeological surveys conducted during 1993-1994 for the Marseilles Training Area (Struever 1975; Ferguson, et al. 1995). No additional archaeological resources have been

[2] Exelon Generation ascertained this information from extant reports at the Illinois SHPO and from information in the LSCS operating license stage FES (NRC 1978)

recorded on the LSCS property since the completion of these surveys. Table 3.8-2 lists the known archaeological resources on the LSCS property.

Table 3.8-1 Sites listed on National Register of Historic Places within approximately 6 mi (10 km) of LSCS

Site Name/Number	Address	City, County	Distance from LSCS (km [mi])
Sacred Heart Church (NR165052)	221 W. Emmet St.	Kinsman, Grundy	10.2 (6.3)
Hay Barn (NR165106)	2319 N. 14th Rd.	Streator, LaSalle	12.4 (7.7)
Ransom Water Tower (NR200859)	Plumb St.	Ransom, LaSalle	9.7 (6.0)
Marseilles Hydro Plant (NR200999)	Commercial St.	Marseilles, LaSalle	9.8 (6.0)
Armour's Warehouse (NR201063)	William & Bridge Sts.	Seneca, LaSalle	9.0 (5.6)
Rock Island & Pacific Railroad Depot (NR201098)	151 Washington St.	Marseilles, LaSalle	10.4 (6.5)
Illinois & Michigan Canal (NR200462)	U.S. 6 in Channahon State Park	Lockport to LaSalle-Peru; Will, Grundy, LaSalle	7.8 (4.7)

Table 3.8-2 Archaeological Sites located within the LSCS Property

Site Number/Name	Site Types	NRHP Eligibility
LS00207/ Collins Station Site #1	Unknown Prehistoric	Isolated, Not Eligible
LS00208/ Collins Station Site #2	Unknown Prehistoric	Isolated, Not Eligible
LS00209/ Collins Station Site #3	Unknown Prehistoric	Isolated, Not Eligible
LS00514/ Boog Powell	Unknown Prehistoric	Not Eligible
LS 00527	Historic	Not Eligible

3.10 Human Health

3.10.1 Microbiological Hazards

As discussed in Section 2.2, LSCS uses a cooling pond for condenser cooling. Under an NPDES permit (Appendix C), the Station continually releases blowdown water from the cooling pond to the Illinois River to prevent the buildup of salts and solids in the cooling pond. Most of the cooling pond is managed by the Illinois Department of Natural Resources as a recreational resource that is open to the public for fishing from approximately mid-March through mid-October. Some areas of the cooling pond are off-limits to the public; these areas are clearly marked with either buoys or signs. Swimming, wading, water skiing, and sailing are not allowed.

The license renewal GEIS (NRC 2013b) discusses microbiological hazards around nuclear power plants, including background information, results of studies of microbiological hazards in cooling towers, hazards to plant workers, and hazards to members of the public. The discussion of specific hazards focuses on the thermophilic microorganisms, *Legionella* spp. and *Naegleria fowleri*, which can be a hazard, respectively, in cooling towers and cooling water discharge. There have been no Exelon Generation or state studies done to determine the presence of these microorganisms in waters influenced by LSCS.

Legionella can be a hazard to plant workers performing maintenance in cooling towers and on condenser tubes. Although LSCS does not use cooling towers, condenser tube maintenance may occur. Plant workers cleaning condenser tubes are protected by a plant procedure that provides a standard methodology for identifying industrial hazards prior to performance of jobs. Under this procedure, possible factors that may influence safe execution of the job, including chemical and biological hazards, would be considered and appropriate worker protection measures would be designated for use during performance of the work. Exposure of members of the public to *Legionella* from LSCS operations would not be expected because there is no opportunity for these pathogens to be sufficiently concentrated at expected exposure points.

Naegleria fowleri in heated plant effluent can be a hazard to recreational water users. Potential for exposure by recreational users exists in the cooling pond and in the discharge to the Illinois River. *Naegleria* infection is the cause of primary amebic meningoencephalitis, an extremely rare disease that is usually fatal: only 28 cases involving recreational surface water were reported in the entire US from 2003 to 2012 (CDC 2013).

The GEIS (NRC 2013b) states that *Naegleria* is rarely found in water cooler than 35°C (95°F), but it thrives in temperatures ranging from 35°C (95°F) to 41°C (106°F) or higher. During 2011 and 2012, the highest maximum daily temperatures in the cooling pond discharge to the Illinois River occurred in August and were 38°C (101°F) and 37°C (99°F), respectively (Exelon Nuclear 2011b; Exelon Nuclear 2012b). LSCS's NPDES permit allows a zone of mixing in the river and limits the temperature at the edge of the mixing zone to less than 5°F higher than the ambient river temperature. Furthermore, the temperature beyond the mixing zone cannot exceed specified monthly limits for longer than 1 percent of any 12-month period, and cannot at any time exceed the specified monthly limit by more than 1.7°C (3°F). The specified limit in August is 32°C (90°F). Hence, in extremely hot weather, plant operations must be adjusted, if necessary, to assure that the river temperature outside the mixing zone does not exceed 34°C (93°F) (See Special Condition C of the NPDES permit, Appendix C). A 2009 Exelon Generation thermal evaluation indicates that the average August river temperature is 24.7°C (76.5°F) (Exelon Nuclear 2009b) and that well-mixed river water temperatures would not approach the permit limits at any time (Exelon Nuclear 2009b).

4.13 Impacts Common to All Alternatives: Uranium Fuel Cycle

Non-radiological impacts of the uranium fuel cycle, which the GEIS (NRC 2013b) designates as a Category 1 issue, were reviewed for new and significant information that could make the generic finding for a resource as described in the 2013 GEIS inapplicable at LSCS. No new and significant information was identified. Therefore, Exelon Generation adopts the non-radiological impacts of the uranium fuel cycle on environmental resources that are described in the GEIS, and no further analysis is needed for LSCS.

The final spent fuel continued storage rule and Generic EIS for Continued Storage of Spent Nuclear Fuel (79 *Federal Register* 56238, 56250 (September 19, 2014)) update the 2013 GEIS evaluation of the effects of onsite storage of spent fuel during the term of an extended license (resulting from the renewal of the plant's operating license). The updated evaluation concludes that impacts, including radiological impacts, of onsite storage of spent fuel during the term of an extended license would be SMALL. Exelon Generation is aware of no new and significant information that could make the generic finding regarding radiological impacts of onsite storage of spent fuel during the term of an extended license invalid for LSCS. Therefore, Exelon Generation adopts the conclusion described in the Generic EIS for Continued Storage of Spent Nuclear Fuel for this Category 1 issue (NRC 2013b), and no further analysis is needed for LSCS.

The final spent fuel continued storage rule and Generic EIS for Continued Storage of Spent Nuclear Fuel also update the evaluation in the 2013 GEIS regarding the radiological impacts to the environment from the offsite disposal of spent nuclear fuel and high-level waste and reclassify the issue from an uncategorized issue to a Category 1 issue (79 *Federal Register* 56238, 56263 (September 19, 2014)). The updated evaluation concludes that radiological impacts of offsite disposal of spent nuclear fuel and high-level waste would not be sufficiently large to require elimination of the option of extended operation under 10 CFR Part 54. Exelon Generation is aware of no new and significant information that could make the generic finding regarding radiological impacts of offsite disposal of spent nuclear fuel and high-level waste invalid for LSCS-generated spent nuclear fuel. Therefore, Exelon Generation adopts the conclusion described in the Generic EIS for Continued Storage of Spent Nuclear Fuel for this Category 1 issue, and no further analysis is needed for LSCS.

Information regarding the impacts of transporting spent nuclear fuel, which is a Category 1 issue, was also reviewed. Some information for LSCS was found to be new but is not significant for the reasons explained below.

NRC has standardized the analysis of impacts for transporting radioactive materials to and from nuclear reactors in Table S-4 of 10 CFR 51.52. Table S-4 provides the impacts for transport of fresh fuel to and spent fuel from a reference 1,100-MWe reactor operating at 80 percent capacity factor under normal and accident conditions (AEC 1972). The 2013 GEIS (NRC 2013b) concluded that such impacts would be SMALL for fresh fuel enriched up to 5 percent uranium-235 and for spent fuel with an average burnup for the peak rod of up to 62,000 MWd/MTU (megawatt-days per metric ton uranium). Also, the cumulative impacts of transporting spent fuel to a single repository, such as Yucca Mountain, Nevada were found to be consistent with the impact values contained in Table S-4. Accordingly, the GEIS concluded that transportation of radiological materials was a Category 1 issue with SMALL impacts, regardless of the nuclear plant being considered.

As Section 2.2.2 indicates, both LSCS units are licensed for low-enriched, uranium dioxide fuel with enrichment not exceeding a nominal 5.0 percent by weight of uranium-235. However, the average peak rod fuel burn-up for both LSCS units is projected to exceed 62,000 MWd/MTU in some rods in some fuel cycles. Accordingly, Exelon Generation has assessed the implications for the environmental impact values reported in Table S-4 of 10 CFR 51.52. Results of the assessment are summarized below.

Spent Fuel Characteristics

Both LSCS units have fuel in the core that includes part-length rods. The fuel includes the Global Nuclear Fuel (GNF) 2 and AREVA ATRIUM-10 nuclear fuel assemblies. (Weggeman 2014; BWR 2008)

- The GNF2 design is a 10×10 array with 92 fuel rods and two large central water rods, eight long part-length rods and six short part-length rods. (Exelon Generation 2013d).
- The ATRIUM-10 design is a 10×10 array with 83 full-length fuel rods, 8 part-length fuel rods, and one centrally located water channel (Exelon Nuclear 2012a).

The part-length fuel rods are attached to the fuel bundle lower tie plate and typically experience higher burnups and higher power than full-length rods due to the bottom-peaked axial power shapes that exist throughout a large portion of a BWR fuel cycle. Average peak rod burnup for some LSCS Unit 1 part-length rods has been estimated to reach approximately 63,600 MWd/MTU in a near-term fuel cycle. Average peak rod burnup for full-length rods is not expected to exceed 62,000 MWd/MTU.

Methodology

Exelon Generation evaluated the radiological effects of transporting either GNF2 or ATRIUM-10 spent fuel assemblies with high burnup. The ORIGEN code was used to estimate radionuclide inventories for the fuel. A representative high-burnup case was identified for the GNF2 fuel at a burnup level of 75,000 MWd/MTU and enrichment of 5.0 percent by weight of uranium-235. The radionuclide inventory for this case was used in the RADTRAN analysis to estimate the radiological impacts of transportation of high-burnup spent fuel to a repository for disposal. For purposes of analysis, the destination for the shipments was assumed to be Yucca Mountain Nevada. Exelon Generation assumed that all spent fuel shipments would be made using legal weight trucks. Fuel shipments were assumed to take place 5 years after discharge from the reactor. The average annual quantity of spent fuel shipped is assumed to equal the average annual reload quantity (approximately 138 fuel assemblies per year per reactor) for a 24-month refueling cycle.

Environmental Impacts of Transportation

Incident-free Transportation

An evaluation of incident-free transportation of LSCS spent fuel was performed. It considered whether the environmental effects of normal (incident-free) spent fuel shipments of LSCS spent fuel would be within the bounds established by Table S-4 in 10 CFR 51.52. The Table S-4 cumulative doses to the exposed populations are:

Transportation workers	4 person-rem/reactor-year
General public (onlookers)[4]	3 person-rem/reactor-year
General public (along route)[5]	3 person-rem/reactor year

The RADTRAN analysis output provides the population doses for LSCS spent fuel as person-rem per shipment. These doses have been converted to person-rem per reactor-year of operation, as summarized in the table below, for comparison with the Table S-4 values. The per-shipment results are independent of burnup because the external radiation dose rate emitted from the shipping cask was set to the regulatory limit established by U.S. Department of Transportation regulation 49 CFR §173.441(b) and is independent of the actual cask contents. The characteristics of the LSCS reactors (annualized number of fuel assemblies discharged, combined electrical output of 2,327 MW(e), capacity factor of 92 percent) were used to normalize the results to a reference reactor year for comparison to Table S-4.

The population dose estimates for LSCS spent fuel shipments are summarized below.

Population dose (person-rem per shipment)		
Transportation workers	General public (onlookers)	General public (along route)
0.0357	0.439	0.0335
Population dose (person-rem per reactor year)		
Transportation workers	General public (onlookers)	General public (along route)
1.43	17.6	1.34

Annual population doses associated with incident-free transportation of LSCS spent fuel with burnup to 75,000 MWD/MTU are within the bounds of the doses given in 10 CFR 51.52, Table S-4, for transportation workers and members of the general public living near the highway along the route. For onlookers along the transportation route, however, the population dose is higher than the Table S-4 value. For the reasons discussed below, Exelon Generation does not consider impacts to human health or the environment caused by these higher onlooker population doses to be so different from the impacts for incident-free spent fuel transport envisioned in the 2013 GEIS as to be significant.

[4] Persons at stops and sharing the highway
[5] Persons living near the highway (within 800-meter buffer on each side)

Two key reasons for the higher onlooker population dose relative to Table S-4 are the number of spent fuel shipments and the shipping distances assumed for the LSCS analysis relative to the assumptions used in WASH-1238, which was the basis for the Table S-4 values.

- The analyses in WASH-1238 used a "typical" distance for a spent fuel shipment of 1,000 miles. The shipping distance used in this LSCS assessment is about 1,800 miles.
- The number of spent fuel shipments evaluated in WASH-1238 is based on shipping casks designed to transport 0.5 MTU/cask while meeting the regulatory limit for dose rate from the cask. Accordingly, for the purpose of comparison with Table S-4 values, the LSCS analysis also assumes a shipping capacity of 0.5 MTU per cask with a limit of one cask per legal-weight truck shipment. However, the actual number of spent fuel shipments from LSCS is likely to be smaller than is predicted by this assumption for the following reasons.
    1. Because LSCS spent fuel will have undergone much longer cooling times before being transported than was assumed in WASH-1238 (i.e., at least 5 years versus 150 days), it will in reality be shipped in casks with newer designs that have larger capacities than were assumed in WASH-1238. For example, spent fuel shipping cask capacities used in the Yucca Mountain environmental impact statement (DOE 2002) were approximately 1.8 MTU with a limit of one cask per legal-weight truck shipment. Also, the spent fuel shipping cask expected to actually be used to ship LSCS spent fuel is designed to hold approximately 1.6 MTU. Hence, if the transportation analysis is completed using this newer shipping cask design, the number of assumed spent fuel shipments for LSCS spent fuel decreases by a factor of approximately three.
    2. Allowing higher fuel burnup in the reactor core reduces the annual number of spent fuel shipments needed to support generation of a given amount of power because the length of time between refueling outages would be lengthened to reach the higher burnup level, which would result in removal of fewer spent fuel assemblies on an annual basis.

If the number of spent fuel shipments from LSCS in the transportation analysis is reduced to a more likely smaller number than is predicted by assuming shipments limited to 0.5 MTU per cask, the associated environmental impacts are reduced correspondingly (since the dose rates used to assess impacts are fixed at the regulatory limit rather than based on the contents). Such an approach is supported by the 1999 addendum to the 1996 GEIS (NRC 1999), in which NRC considered transportation impacts associated with higher enrichment fuel irradiated to higher burnup levels. Therein, NRC concluded higher burnup fuel could be accommodated without increasing the number of single-cask shipments (and hence without increasing the transportation impacts) through dose control measures such as increasing spent fuel storage times prior to shipment (15 years instead of 5 years), blending higher burnup and lower burnup fuel assemblies in the same shipping cask, or using inserts to reduce the external dose and enable shipping casks to be certified for higher burnup fuel without impacting cask capacity.

Other conservative assumptions in the spent fuel transportation impacts calculation for LSCS include:

- Use of the regulatory maximum dose rate (10 millirem per hour at 2 meters) in the LSCS RADTRAN calculations. In reality, most spent fuel from LSCS will have cooled for much longer than 5 years before it is shipped to a possible geologic repository. In the Yucca Mountain environmental impact statement (DOE 2002), NRC developed a probabilistic distribution of dose rates based on fuel cooling times that indicates that approximately three-fourths of the spent fuel to be transported to a possible geologic repository will have dose rates less than half of the regulatory limit (Sprung et al. 2000) as a result of cooling times being longer than 5 years. Consequently, the estimated population doses could be divided in half if more realistic dose rate projections are used for LSCS spent fuel shipments.
- Use in the LSCS RADTRAN calculations of 30 minutes as the average time at a truck stop. Many stops made for actual spent fuel shipments are short duration stops (i.e., 10 minutes) for brief visual inspections of the cargo (checking the cask tie-downs). These stops typically occur in minimally populated areas, such as an overpass or freeway ramp in an unpopulated area. Based on data for actual truck stops, NRC concluded that the assumption of a 30-minute stop for every 4 hours of driving time used in Early Site Permit applications to evaluate spent fuel shipments from potential nuclear plant sites would overestimate public doses at stops by at least a factor of two (NRC 2006a, 2006b, 2006c). Consequently, the estimated doses to onlookers along the transportation route during transport of LSCS spent fuel could be reduced by a factor of two if more realistic truck shipping conditions were assumed.

In conclusion, if (1) the shipping distance to a repository was reduced for LSCS spent fuel to 1,000 miles, (2) conservative assumptions affecting the number of spent fuel shipments were replaced in the dose estimates with more realistic assumptions specific to LSCS, and (3) other conservative assumptions about dose rates and the length of truck stops were changed to be more realistic, then the onlooker population doses from LSCS high-burnup fuel shipments would be expected to fall within Table S-4 values. Therefore, because the predicted population doses to transportation workers and persons living near the highway are within the bounds of the Table S-4 population dose values, and the conservatively predicted population dose to onlookers would likely also be below Table S-4 values if more realistically estimated, Exelon Generation concludes that impacts to human health or the environment from incident-free LSCS high-burnup spent fuel transport would be similar to the impacts envisioned in the 2013 GEIS, and would therefore be SMALL.

Accidents during Transportation

Exelon Generation evaluated the environmental effects of accidents during transport of LSCS high-burnup spent fuel. Accident risks are the multiplicative product of the likelihood of an accident involving a spent-fuel shipment and the consequences of a release of radioactive material resulting from the accident. The consequences of such a transportation accident are represented by the population dose risk from a release of radioactive material, assuming that an accident occurs that results in the breach of a shipping cask's containment systems. The consequences are a function of the total amount of radioactive material in the shipment, the fraction that escapes from a shipping cask, the existence of a pathway that introduces radioactive material to humans, and the characteristics of the exposed population.

Exelon Generation used the RADTRAN code to estimate impacts of transportation accidents involving spent fuel shipments. In the RADTRAN analysis, increasing burnup affects both the likelihood of transportation accidents and the potential consequences of a release. The likelihood of an accident is directly proportional to the number of spent fuel shipments.

Assuming shipments containing 0.5 MTU of spent fuel at the peak rod burnup, the postulated accident risks associated with transportation of spent fuel are provided below.

Population dose-risk (person-rem per shipment)[6]	Population dose-risk (person-rem per reference reactor year)
5.64×10^{-7}	2.25×10^{-5}

Table S-4 characterizes the radiological effects of transportation accidents as SMALL, but does not numerically quantify these effects. The accident collective dose-risk consequences from shipments of spent fuel from LSCS are very small, as shown in the table above. For comparison, the U.S. average background radiation is approximately 620 mrem per year, with roughly half of the dose (310 mrem per year) coming from natural radiation exposure and the other half from man-made sources (NRC 2014). The total population within the 800-meter buffer zone along the transport route is 521,025 people. Thus, the population along the transport route receives an average collective dose-risk of approximately 162,000 person-rem per year from exposure to natural sources of radiation. Given that the probability of occurrence of this dose is one, the dose-risk is also 162,000 person-rem per year. Comparing the average annual collective dose-risk to the probability-weighted collective dose-risk from the annualized spent fuel shipments shows that the contribution of fuel shipments from LSCS to the total population collective dose is extremely small. Therefore, no detectable increase in environmental effects is expected as a result of the population dose caused by accidents that may result from shipments of high-burnup spent fuel from LSCS to a repository. Accordingly, Exelon Generation concludes that impacts to human health or the environment from accidents during LSCS high-burnup spent fuel transport would be similar to the impacts envisioned in the 2013 GEIS and would therefore be SMALL.

Heat Load

Table S-4 characterizes the heat load for a spent fuel cask as 250,000 Btu/hr. Exelon Generation used the ORIGEN code to estimate the decay heat 5 years after discharge for spent fuel with burnup of 75,000 MWD/MTU. The estimated heat load for a cask containing 0.5 MTU of such high-burnup fuel is approximately 7,370 BTU/hr. This amount of heat is small and released over the entire transportation route. Accordingly, Exelon Generation concludes that impacts during shipment of LSCS high-burnup spent fuel would be similar to the impacts envisioned in the 2013 GEIS, and would therefore be SMALL.

[6] The value presented is the product of probability times collective dose.

Conclusion

Based on the analyses above, Exelon Generation concludes that, overall, impacts of transporting LSCS's high-burnup spent nuclear fuel would be consistent with the impacts from doses given in 10 CFR 51.52, Table S-4, and hence, would be SMALL. Accordingly, while the expectation that average peak rod burnup in some part-length fuel rods at LSCS will exceed 62,000 MWd/MTU is new information, it is not significant because it does not provide a seriously different picture of the environmental consequences of transporting spent fuel than previously considered in the 2013 GEIS (NRC 2013b) for all plants. Therefore, no further mitigation would be required based on this new information.

5.2 Uranium Fuel Cycle – Transportation

In 1999, the NRC issued an addendum to the 1996 GEIS (NRC 1999b) in which the agency concluded that the values given in 10 CFR 51.52, Table S-4 would bound the environmental impacts of transporting spent fuel and waste to and from one nuclear power plant, as long as (1) enrichment of the fresh fuel was 5 percent or less, (2) burn-up of the spent fuel was 62,000 MWd/MTU or less, and (3) spent fuel was cooled for at least 5 years before being shipped offsite. In the 2013 GEIS (NRC 2013b), the NRC noted that a later study found that the impacts presented in Table S-4 would also bound the potential environmental impacts that would be associated with transportation of spent nuclear fuel with up to 75,000 MWd/MTU burnup, provided that the fuel is cooled for at least 5 years before shipment (NRC 2013b).

As noted in Section 2.2.2, the peak fuel burnup at LSCS is projected to exceed 62,000 MWd/MTU in some part-length fuel rods during some fuel cycles. Accordingly, Exelon Generation assessed the potential impacts of the fuel burnup of partial-length rods exceeding 62,000 MWd/MTU and compared the results with the environmental impact values reported in 10 CFR 51.52, Table S-4. Based on this analysis, which is described in Section 4.13 of this environmental report, Exelon Generation concludes that, while this information for LSCS is new, it is not significant because impacts from transporting LSCS spent fuel with higher burnup would be SMALL and similar to the values presented in 10 CFR 51.52, Table S-4. Therefore, future transportation of LaSalle-generated spent fuel with burnup exceeding 62,000 MWd/MTU does not present a seriously different picture of environmental consequences from the spent fuel transportation circumstances generically resolved in the 2013 GEIS to be a Category 1 issue.

6.5 Short-Term Use Versus Long-Term Productivity of the Environment

NRC

The environmental report shall discuss the "...relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity..." 10 CFR 51.45(b)(4) as adopted by 10 CFR 51.53(c)(2)

The current balance between short-term use and long-term productivity at LSCS was established with the decision to convert approximately 1,528 ha (3,776 ac) to energy production. The Final Environmental Statement related to operation (NRC 1978) evaluated the impacts of operating LSCS. Natural resources that would be subjected to short-term use include land and water. Land in the immediate vicinity of LSCS is largely rural and agricultural.

At 100 percent load, LSCS's net consumptive loss rate of Illinois River water is less than 0.5 percent of the 92-year annual average mean flow at Marseilles. LSCS withdraws approximately 99 L/min (26.1 gpm) of groundwater from the Cambrian-Ordovician Ironton-Galesville Sandstone Aquifer.

Tritium from historic releases is present in shallow groundwater beneath LSCS. The contaminated plume does not extend offsite. Exelon Generation is performing mitigation that will avoid any long-term adverse impacts to groundwater. LSCS has a radiological groundwater protection program that includes groundwater monitoring and provides for timely identification and remediation of spills to groundwater or soils. Impacts to groundwater have been minor and would cease once reactor operations, including decommissioning, cease.

After decommissioning of the nuclear facilities at the site, most environmental disturbances would cease and restoration of the natural habitat could occur. Thus, the "trade-off" between the production of electricity and changes in the local environment is reversible to some extent. The cooling pond cannot be maintained without input from the Illinois River to replace water lost to naturally-occurring surface evaporation and seepage (although seepage is minimal, some seepage does occur). Because the cooling pond is an important recreational facility in the area and supports aquatic waterfowl, Exelon Generation and Illinois would decide its fate at the time of decommissioning.

Experience with other experimental, developmental, and commercial nuclear plants has demonstrated the feasibility of decommissioning and dismantling such plants sufficiently to restore a site to its former use. The degree of dismantlement will take into account the intended new use of the site and a balance among health and safety considerations, salvage values, and environmental impacts. However, decisions on the ultimate disposition of these lands have not yet been made. Continued operation for an additional 20 years would not increase the short-term productivity impacts described here.

Chapter 10

References

10.0 References

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