



10 CFR 50.36(a)(2)

February 22, 2018

LC-2018-0013

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

La Crosse Boiling Water Reactor  
Facility Operating License No. DPR-45  
NRC Docket Nos. 50-409 and 72-046

Subject: La Crosse Boiling Water Reactor (LACBWR) Annual Radioactive Environmental Monitoring Report and Radioactive Effluent Release Report

In accordance with Facility Operation License No. DPR-45, Quality Assurance Program Description (QAPD) Appendix C, Section 2.5.1, "Annual Radiological Environmental Monitoring Report," and Section 2.5.2, "Annual Radioactive Effluent Release Report," this letter submits these reports for the year 2017. The reports are required to be submitted prior to March 1 per QAPD Appendix C, Section 2.5 "Reporting Requirements," and are provided as enclosures to this letter.

The Radiological Effluent Release Report also contains changes to the Offsite Dose Calculation Manual (ODCM) per the requirements of QAPD Appendix C, Section 2.2, "Offsite Dose Calculation Manual." There were no changes to the Process Control Program for this reporting period. All revisions to the ODCM approved since the last report are provided as enclosures to this letter.

There are no new regulatory commitments in this submittal.

If you have any questions about this submittal please contact Mr. Joseph Jacobsen at (608) 689-4259.

Respectfully,

A handwritten signature in dark ink, appearing to read "Gerard van Noordennen", is written over the typed name.

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Attachments:

1. LACBWR Annual Radiological Environmental Operating Report
2. LACBWR Offsite Dose Calculation Manual, Revision 2
3. LACBWR Offsite Dose Calculation Manual, Revision 3
4. LACBWR Offsite Dose Calculation Manual, Revision 4

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**Attachment 1**

**LACBWR Annual Radiological Environmental Operating Report**



# **ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT**

**FOR THE  
LA CROSSE BOILING WATER REACTOR (LACBWR)**

**(January 1 to December 31, 2017)**

**LACROSSESOLUTIONS  
S4601 STATE HIGHWAY 35  
GENOA, WI 54632**

## TABLE OF CONTENTS

### SECTION A: RADIOACTIVE EFFLUENT REPORT

<u>Section</u>	<u>Title</u>	<u>Page</u>
	Introduction.....	5
1.0	Regulatory Limits.....	6
2.0	Effluent Release Concentration Limit.....	8
3.0	Average Energy.....	8
4.0	Analytical Methods.....	8
5.0	Releases.....	9
6.0	Abnormal Releases .....	10
7.0	Estimated Total Analytical Error .....	10
8.0	Offsite Dose Calculation Summary and Conclusions.....	16
9.0	Offsite Dose Calculation Manual (ODCM) Review.....	17
10.0	Process Control Program (PCP) Review .....	20
11.0	Errata Data .....	20

### SECTION A: RADIOACTIVE EFFLUENT REPORT

<u>Table No.</u>	<u>Title</u>	<u>Page</u>
1A	Effluent and Waste Disposal – Airborne Particulate Effluents Summation of All Releases.....	10
1B	Effluent and Waste Disposal – Airborne Particulate Effluents Ground Level Release .....	11
2A	Effluent and Waste Disposal – Liquid Effluents Summation of All Releases.....	12
2B	Effluent and Waste Disposal – Liquid Effluents .....	13
3	Effluent and Waste Disposal Annual Report – 2017 Solid Waste and Irradiated Fuel Shipments.....	14



## **SECTION B: RADIOLOGICAL ENVIRONMENTAL MONITORING REPORT**

<b>Section</b>	<b>Title</b>	<b>Page</b>
	Introduction.....	23
1.0	Sample Collection.....	24
2.0	Results of the 2017 Radio-Environmental Monitoring Survey.....	25
3.0	Conclusions.....	26
4.0	Interlaboratory Comparison Program Results.....	27

## **SECTION B: RADIOLOGICAL ENVIRONMENTAL MONITORING REPORT**

<b>Table No.</b>	<b>Title</b>	<b>Page</b>
4	ISFSI Environmental TLD Locations.....	32
5	Sample Frequency and Analysis of Radio Environmental Samples	33
6	Low Volume Environmental Air Monitoring Station Locations	34
7	LACBWR Environmental TLD Locations .....	35
8	Radiological Environmental Samples Collected	36
9	Quarterly Environmental TLD Results in LACBWR Vicinity .....	37
10	Bi-Weekly Gross Beta Environmental Air Sample Analysis Results	38
11	Bi-Weekly Gamma Spec Env. Air Sample Analysis Results .....	53
12	Semi Annual Mississippi River Water Analysis Results	54
13	Semi Annual Mississippi River Sediment Analysis Results	55
14	Quarterly Environmental TLD Results for ISFSI Area	56

## **SECTION B: RADIOLOGICAL ENVIRONMENTAL MONITORING REPORT**

<b>Figure No.</b>	<b>Title</b>	<b>Page</b>
1	LACBWR Property Map.....	28
2	LACBWR RCA Fence Line Environmental TLD Locations .....	30
3	LACBWR Environmental Low Volume Air Sampler Locations....	29
4	ISFSI Environmental TLD Locations .....	31

**SECTION A**

**RADIOACTIVE EFFLUENT  
REPORT**



### **INTRODUCTION**

The La Crosse Boiling Water Reactor (LACBWR), also known as Genoa Station No. 2, is located on the east bank of the Mississippi River near Genoa, Vernon County, Wisconsin. The plant was designed and constructed by the Allis-Chalmers Manufacturing Company. It was completed in 1967 and had a generation capacity of 50 MW (165 MW<sub>(th)</sub>). The reactor is owned by Dairyland Power Cooperative (DPC).

The reactor went critical in July 1967 and first contributed electricity to the DPC system in April 1968. After completing full power tests in August 1969, the plant operated between 60% and 100% full power, with the exception of plant shutdowns for maintenance and repair until 1987.

In April of 1987 plant operation was ceased. The reactor was defueled and placed in a SAFSTOR mode. In August of 1987 a possession-only license was received. In 2007 the reactor vessel was removed from the site and buried at the Barnwell waste repository. In 2012 all spent fuel was placed in dry storage and placed at the LACBWR Independent Spent Fuel Storage Installation (ISFSI).

In June of 2016 DPC, working with the selected decommissioning contractor LaCrosseSolutions LLC, transferred their NRC License to LaCrosseSolutions LLC for the purposes of decommissioning the site to unconditional release criteria, per license termination plan criteria.

In accordance with LC-RP-PG-004 "Radiological Environmental Monitoring Program and Preparation of the Annual Radiological Environmental Operating Report", this document is the Annual Radiological Environmental Operating Report (AREOR) for the Period January 1 through December 31, 2017.

## **EFFLUENT AND WASTE DISPOSAL REPORT**

(Supplemental Information)

FACILITY: La Crosse Boiling Water Reactor LICENSEE: LaCrosseSolutions

LICENSE NO. DPR-45

DOCKET NO. 50-409 & 72-046

### **1.0 REGULATORY LIMITS**

#### **1.1 Airborne Effluent Release Limits:**

LACBWR airborne particulates, with half-lives greater than 8 days, released to areas beyond the Effluent Release Boundary shall be limited to  $\leq 7.5$  mRem to any organ per calendar quarter and  $\leq 15$  mRem to any organ per calendar year. The cumulative dose contributions from airborne particulate effluent releases are determined in accordance with the LaCrosseSolutions, LLC Offsite Dose Calculational Manual (ODCM). The annual values for airborne effluent releases are reported in Table 1A and 1B.

Also, in accordance with the provisions of 40 CFR 190, the restrictions for total dose to any member of the public from all LACBWR related sources and dose pathways are evaluated quarterly and on an annual basis.

#### **1.2 Liquid Effluent Release Limits:**

LACBWR's liquid effluent release limitations are those concentrations specified in 10 CFR 20 Appendix B, Table 2, Column 2. The values reported in Tables 2A and 2B, Liquid Effluents, are based on dilution of the effluent with the Genoa Station No. 3 condenser cooling water flow prior to discharge to the Mississippi River. No credit is taken for further dilution in the mixing zone of the Mississippi River.



Also, in accordance with 10 CFR 50, Appendix I, the dose commitment to a member of the public from radioactive materials released in liquid effluents to areas beyond the Effluent Release Boundary are limited to less than 1.5 mRem whole body and 5.0 mRem organ dose per calendar quarter, and less than 3.0 mRem whole body and 10 mRem organ dose per calendar year via the critical ingestion pathway. The cumulative dose contributions from liquid effluent releases are determined in accordance with the LaCrosseSolutions, LLC Offsite Dose Calculational Manual.

In accordance with the provisions of 40 CFR 190, the restrictions for total dose to any member of the public from all LACBWR related sources and dose pathways are evaluated quarterly and on an annual basis.

### 1.3 Solid Radioactive Waste

All solid radioactive wastes are handled in accordance with a Process Control Program as defined by LaCrosseSolutions, LLC procedures, in order to assure that all applicable transportation and burial site disposal requirements are met. Table 3 summarizes the annual solid radioactive waste shipment/ disposal statistics for the site.

### **2.0 EFFLUENT RELEASE CONCENTRATION LIMIT**

The Effluent Release Concentration used to calculate permissible release rates are obtained from 10 CFR 20, Appendix B, Table 2, Column 2.

### **3.0 AVERAGE ENERGY**

The release rate limits for LACBWR are not based on average energy.

### **4.0 ANALYTICAL METHODS**

#### **4.1 Liquid Effluents**

Liquid effluent measurements for gross radioactivity are performed by HPGe gamma isotopic analysis of a representative sample from each monitor tank prior to discharge. In addition, each batch monitor tank sample is analyzed for gross beta and gross alpha as well as tritium activity concentrations using site approved bench top analysis equipment. A composite sample is created by collecting representative aliquots from each tank batch discharged during a calendar quarter. This composite is analyzed for: Iron-55, Strontium-90, Nickel-59, Nickel-63, Americium-241, Plutonium-238, Plutonium 239/240, and Plutonium -241 by an off-site contractor on a quarterly basis.

#### **4.2 Airborne Particulates**

Airborne particulate releases are determined by HPGe gamma isotopic analysis and gross beta and gross alpha analyses of glass fiber filter paper taken from low volume air samplers placed either in prevailing downwind locations or in representative sampling locations on HEPA exhaust systems. The filter paper is change out weekly and analyzed approximately a week later. A quarterly composite of the filter papers is sent to an offsite lab for analysis of Sr-90/Fe-55/Ni-63.



### 5.0 **RELEASES**

5.1 Airborne To demonstrate compliance with the limits in Section 1.1 dose contributions have been calculated using a bounding assessment as described in Regulatory Guide 1.21. This analysis is summarized in the current Offsite Dose Calculation Manual. Routine low volume air sampling is in place at four locations outside the RCA in the predominant typical downwind locations, to be used to demonstrate compliance with dose limits in Section 1.1. Any HEPA system exhausting to the outside environment has representative air sampling performed of the exhaust air following passing thru the HEPA system also for the purposes of demonstrating compliance with Section 1.1.

#### 5.2 Liquid

All liquid effluent releases at LACBWR are batch releases as described in the ODCM. This is summarized as follows:

(1)	Number of Batch Releases:	6
(2)	Total Time Period for Batch Releases:	28.3 hours
(3)	Maximum Time Period for a Batch Release:	8.0 hours
(4)	Average Time Period for a Batch Release:	4.70 hours
(5)	Minimum Time Period for a Batch Release:	1.75 hours
(6)	Average Stream Flow Rate During Periods of Release of Effluent into a Flowing Stream:	59,400 ft <sup>3</sup> /sec

## 6.0 ABNORMAL RELEASES

There were no abnormal releases of radioactivity in plant effluents.

## 7.0 ESTIMATED TOTAL ANALYTICAL ERROR

The reported analytical results contain the following estimated errors:

Counting Error 95% Confidence Level

Sampling Volume Error  $\pm 5\%$ .

**TABLE 1A**

### EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT 2017

#### AIRBORNE PARTICULATE EFFLUENTS – SUMMATION OF ALL RELEASES

		UNIT	QTR 1	QTR 2	QTR 3	QTR 4	TOTAL
<b>A. PARTICULATES</b>							
1.	BETA-GAMMA PARTICULATES WITH HALF-LIVES > 8 DAYS	Ci	0	0	0	2.15E-06	2.15E-06
2.	AVERAGE RELEASE RATE FOR PERIOD	$\mu\text{Ci/ Sec}$	0	0	0	2.05E-06	
3.	GROSS ALPHA RADIOACTIVITY	Ci	0	0	0	7.40E-08	7.40E-08
<b>B. PERCENTAGE OF ODCM DOSE LIMITS FOR PARTICULATE EFFLUENT RELEASES</b>							
			QTR	QTR	QTR	QTR	YEARLY
1.	ALL RADIONUCLIDES IN PARTICULATE FORM WITH HALF-LIVES GREATER THAN 8 DAYS						
	Highest Organ % Limit	%	0	0	0	8.4%	4.2%



# Radioactive Effluent Report

## TABLE 1B

### EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT 2017

#### AIRBORNE PARTICULATE EFFLUENTS –GROUND LEVEL RELEASE

			CONTINUOUS OR BATCH MODE				
		UNIT	QTR 1	QTR 2	QTR 3	QTR 4	TOTAL
NUCLIDES RELEASED							
1.	PARTICULATES						
	Fe-55	Ci	0	0	0	3.90E-08	3.90E-08
	Ni-59	Ci	0	0	0	8.60E-08	8.60E-08
	Co-60	Ci	0	0	0	7.95E-07	7.95E-07
	Ni-63	Ci	0	0	0	5.73E-07	5.73E-07
	Sr-90	Ci	0	0	0	5.80E-08	5.80E-08
	Nb-94	Ci	0	0	0	2.85E-10	2.85E-10
	Tc-99	Ci	0	0	0	3.33E-10	3.33E-10
	Cs-137	Ci	0	0	0	5.88E-07	5.88E-07
	Eu-152	Ci	0	0	0	4.00E-09	4.00E-09
	Eu-154	Ci	0	0	0	3.00E-09	3.00E-09
	Eu-155	Ci	0	0	0	2.00E-09	2.00E-09
	Np-237	Ci	0	0	0	3.00E-09	3.00E-09
	Pu-238	Ci	0	0	0	3.00E-09	3.00E-09
	Pu-239/240	Ci	0	0	0	3.00E-09	3.00E-09
	Pu-241	Ci	0	0	0	5.90E-08	5.90E-08
	Am-241	Ci	0	0	0	6.00E-09	6.00E-09
	Am-243	Ci	0	0	0	1.46E-10	1.46E-10
	Cm-243/244	Ci	0	0	0	3.45 E-10	3.45E-10
	TOTAL	Ci	0	0	0	2.22E-06	2.22E-06

# Radioactive Effluent Report

## TABLE 2A

### EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT 2017

#### LIQUID EFFLUENTS – SUMMATION OF ALL RELEASES

		UNIT	QTR 1	QTR 2	QTR 3	QTR 4	TOTAL
<b>A</b>	<b>FISSION &amp; ACTIVATION PRODUCTS</b>						
1.	TOTAL RELEASE (NOT INCL. TRITIUM, ALPHA)	Ci	6.30E-04	2.68E-05	3.60E-05	0	6.93E-04
2.	AVERAGE DILUTED CONCENTRATION DURING PERIOD	μCi/ ml	3.00E-09	4.60E-10	1.25E-09	—	
<b>B.</b>	<b>TRITIUM</b>						
1.	TOTAL RELEASE	Ci	2.29E-03	1.72E-03	2.31E-03	0	6.32E-03
	AVERAGE DILUTED CONCENTRATION DURING PERIOD	μCi/ ml	2.22E-08	5.00E-09	1.40E-08		
<b>C.</b>	<b>DISSOLVED AND ENTRAINED GASES – no releases - no longer analyzed for.</b>						
<b>D.</b>	<b>GROSS ALPHA RADIOACTIVITY</b>						
1.	TOTAL RELEASE	Ci	4.38E-08	0	0	0	4.38E-08
<b>E.</b>	<b>VOLUME OF WASTE RELEASED (PRIOR TO DILUTION)</b>						
		Liters	6.66E+04	9.58E+04	5.49E+04	0	2.17E+05
<b>F.</b>	<b>VOLUME OF DILUTION WATER USED DURING PERIOD</b>						
		Liters	1.03E+08	3.45E+08	1.71E+08	0	6.19E+08
<b>G.</b>	<b>PERCENTAGE OF ODCM LIMITS FOR LIQUID RELEASES</b>						
			QTR	QTR	QTR	QTR	YEARLY
	HIGHEST ORGAN	%	1.54%	1.54%	1.54%	1.54%	3.08%
	WHOLE BODY	%	3.08%	3.08%	3.08%	3.08%	6.15%



## Radioactive Effluent Report

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**TABLE 2B**

**EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT 2017**

**LIQUID EFFLUENTS**

NUCLIDES RELEASED	UNIT	QTR-1	QTR-2	QTR-3	QTR-4
Fe-55	Ci	0.0	0.0	0.0	0.0
Ni-59	Ci	0.0	0.0	0.0	0.0
Co-60	Ci	1.01E-05	0.0	0.0	0.0
Ni-63	Ci	5.05E-04	1.77E-05	2.38E-05	0.0
Sr-90	Ci	1.49E-04	5.68E-06	7.36E-06	0.0
Cs-137	Ci	4.68E-04	3.37E-06	4.53E-06	0.0
Pu-238	Ci	0.0	0.0	0.0	0.0
Pu-239/240	Ci	0.0	0.0	0.0	0.0
Pu-241	Ci	0.0	0.0	0.0	0.0
Am-241	Ci	4.38E-08	0.0	0.0	0.0
TOTAL FOR PERIOD (ABOVE)	Ci	1.13E-03	2.68E-05	3.57E-05	0.0

# Radioactive Effluent Report

## TABLE 3

### EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT – 2017

#### SOLID WASTE AND IRRADIATED FUEL SHIPMENTS

#### A. SOLID WASTE SHIPPED OFFSITE FOR DISPOSAL (Not Irradiated Fuel)

1. TYPE OF WASTE	UNIT	1 <sup>st</sup> 6-MONTH PERIOD	2 <sup>nd</sup> 6-MONTH PERIOD	TOTAL
a. Spent resins, filter sludges, evaporator bottoms, etc.	m <sup>3</sup>	0	0	0
	Ci	0	0	0
b. Dry compressible waste, contaminated equipment, etc.	m <sup>3</sup>	2315	9067	11382
	Ci	1.908	34.462	36.370
c. Irradiated components, control rods, etc.	m <sup>3</sup>	0.00	0	0
	Ci	0.00	0	0
d. Other	m <sup>3</sup>	0	0.00	0
	Ci	0	0.00	0

2. ESTIMATE OF MAJOR NUCLIDE COMPOSITION (BY TYPE OF WASTE)	PERCENT OF TOTAL	1 <sup>st</sup> 6-MONTH PERIOD CURIES	2 <sup>nd</sup> 6-MONTH PERIOD CURIES	Estimated Error Values %
Cs-137	43.94%	0.8	15.1	+/- 10
Fe-55	17.00	0.3	5.9	+/- 10
Ni-63	15.16	0.3	5.2	+/- 10
H-3	8.32	0.2	2.9	+/- 10
Pu-241	5.51	0.1	1.9	+/- 10
Co-60	2.78	0.1	1.0	+/- 10
C-14	2.45	0	0.8	+/- 10
Sr-90	1.61	0	0.6	+/- 10
Tc-99	1.31	0	0.5	+/- 10
*NOTE: showing all nuclides >1% of total				



## Radioactive Effluent Report

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### 3. SOLID WASTE DISPOSITION

NO. OF SHIPMENTS	MODE OF TRANSPORTATION	DESTINATION
918	Truck and Rail	Clive, UT

### B. IRRADIATED FUEL SHIPMENTS (DISPOSITION)

<u>NO OF SHIPMENTS</u>	<u>MODE OF TRANSPORTATION</u>	<u>DESTINATION</u>
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NONE

### 8.0 OFFSITE DOSE CALCULATIONS SUMMARY AND CONCLUSIONS:

#### 8.1 Particulate Effluent Releases

The maximum quarterly offsite dose to any organ from the release of all radionuclides in particulate form with half-lives greater than 8 days was 0.63 mRem. The cumulative 2017 annual maximum organ dose from these radionuclides was also 0.63 mRem.

#### 8.2 Liquid Effluent Releases

The maximum quarterly organ dose from liquid releases was approximately 7.5E-02 mRem. The cumulative 2017 annual organ dose was approximately 0.3 mRem. The maximum quarterly total body dose for liquid releases was approximately 4.62E-02 mRem, and the cumulative 2017 annual total body dose was approximately 0.19 mRem.

#### 8.3 Conclusion

All calculated offsite doses were below ODCM limits.



## Radioactive Effluent Report

### 9.0 OFFSITE DOSE CALCULATION MANUAL (ODCM) REVIEW

#### List of Changes to the ODCM

In accordance with ODCM Section 4.6 the following is a summary of changes made to the ODCM thru the revision process since the previous submittal of this annual report.

A summarized list of the changes is presented here. A complete copy of each ODCM revision with applicable technical reviews is included as an attachment to this submittal.

#### ODCM Rev 2

Page	Section	Change Summary
4	Purpose	Added the words direct exposure and clarity to reporting
5	References	Added four references that support the ODCM basis as written
5	Definition	Clarified definition of member of public to include DPC site
6-7	Responsibilities	Some clarifications that do not effect requirements
9	4.1.1	Some clarifications that do not effect requirements
11-13	4.14-4.16	<p>Added Section 4.1.4-4.1.6 to describe the process to be used for calculating ground type airborne releases. The LACBWR Stack had been discontinued from use starting January 1, 2016 to ready it for near future decommissioning. A need developed to develop monitoring of airborne emissions from decommissioning work tied to take down of facilities and removal of subsurface structures and components. A 10CFR50.59 evaluation #2017-004 was performed to evaluate the change from the LACBWR Stack monitoring system for air releases to the mobile airborne effluent sampling methodology using low volume air samplers. The portable air samplers were evaluated to determine their ability to maintain requirements for monitoring airborne effluent emissions and calculating dose and reporting as described in the ODCM and Decommissioning Plan and Post Shutdown Decommissioning Activities Report (D-Plan/PSDAR) which is the LACBWR Safety Analysis Report equivalent.</p> <p>The results of the 10CFR50.59 review show that the operation of the portable air sampling equipment meets the requirements of the ODCM and D-Plan/PSDAR. The previously analyzed airborne event consequences are bounded by the airborne related accident event described in the revised D-Plan/PSDAR.</p>
14	Section 4.2.3	Added with same reasoning as above
15-16	Section 4.2.5-4.2.6	Added with same reasoning as above



## Radioactive Effluent Report

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16-17	Section 4.2.6	Added details that airborne emissions would be considered in the determination of total dose to a member of the public and reporting requirements.
20-21	Section 4.3.3	Added clarity to REMP LLD detection section-no required changes as a result of these clarifications.
30	Table 5.4	Added an air particulates section to the LLD table based on site lab equipment LLD calculations.

### ODCM Rev 3

Page	Section	Change Summary
9	Section 4.1.1	Change from processing the liquid wastes from the Turbine Building East Sump to the Temporary Liquid Waste Processing System to accommodate near future decommissioning of the Turbine building structure and its components. A 10CFR50.59 evaluation #2017-002 was performed to evaluate the change of the liquid waste discharges using the current process in the Turbine Building to the temporary and portable liquid waste processing system with filtration and demineralizer components. The portable liquid waste processing system was evaluated to determine its ability to maintain requirements of remaining liquid effluents during processing and for calculating doses for reporting as described in the ODCM and D-Plan/PSDAR. The results of the 10CFR50.59 review determined that the operation of the portable liquid waste system maintains the requirements of the ODCM and determined that any consequences of operating the system are bounded by the liquid waste accident as described in the revised D-Plan/PSDAR.
13	Section 4.2.2 (1).	Further discussion on the new temporary liquid waste processing system and operation of its filtration and demineralizer systems.
27	Table 5.2	Added additional radionuclides to analyze for liquids quarterly composite samples-in line with development of radionuclides of concern for decommissioning project.



## Radioactive Effluent Report

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### ODCM Revision 4

Page #	Section	Description of change
6	References	Added LC-RP-TSD-004 "La Crosse Airborne Release Bounding Assessment"
12	4.1.3	Added operational details to section-no requirements changed
13	4.1.5	Added the methodology of performing a bounding assessment as per Reg Guide 1.21 to evaluate the release of airborne effluents during decommissioning work with take down of the Reactor Building.
14	4.1.6	Added details to the section for the calculations to support the use of the bounding calculations as described in Reg Guide 1.21.
16-17	4.2.4	Added clarity to the section for release limitations including details from the 10CFR 50.59 review #2017-002 for the temporary liquid waste system.
19-22	4.2.5	Added operational clarity to this section into a format of surveillance requirement and action(s). New conservative requirements added in sub Sections 4.2.5.A.2 and 4.2.5.B.2/3 to verify maintenance of operational equipment for air monitoring and attention to the bounding assessment for airborne radionuclides release to the environment.
24	4.2.7(A)	Added details that the airborne effluents and associated release quantities have been calculated using a bounding assessment. These values are used for annual Radioactive Effluent Release Report requirements and the associated values are presented in Appendix A of this version of the ODCM.
29-30	4.6	Added clarity to what was required for documentation and justification for changes to the ODCM and the Process Control Program (PCP).
33	Table 5.1	Removed the first page of the Liquid Waste Batch Form to allow for operational flexibility in the first page's presentation. The full liquid waste batch form and the sample collection and processing methods are described in ODCM Reference 2.12- LC-OP-PR-001.
36	Table 5.4	Added a gamma spec LLD value for Co-60

## Radioactive Effluent Report

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38-39	Appendix A	Presentation of the output of the bounding assessment in LC-RP-TSD-004 "LaCrosse Airborne Release Bounding Assessment" as to tracked values during decommissioning.
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ODCM Revisions 2, 3, and 4 are included as attachments to this report.

### **10.0 PROCESS CONTROL PROGRAM (PCP) REVIEW**

The LaCrosseSolutions, LLC PCP was not revised in 2017.

### **11.0 Errata Data**

There were a few minor corrections and clarifications from the 2016 La Crosse Boiling Water Reactor (LACBWR) Annual Radioactive Environmental Monitoring Report and Radioactive Effluent Release Report:

- 1) In the Index Section B (ii) 2.0 should be 2016 not 2014 as to the year of the report.
- 2) Section 5.2 (5) - minimum time for a liquid release was 0.5 hours not 1.5 hours.
- 3) Table 8 there were a total of (47) air particulate air samples taken not (52).
- 4) The submitted Process Control Program contained a small explanation of the issued Rev 0 as to its basis and why the change as follows:

"The PCP addresses the waste management administrative and operational controls to be used by LaCrosseSolutions during the course of the decommissioning work to ensure the final waste product meets requirements of applicable federal, state, and disposal site waste requirements."



In addition for clarification purposes, the PCP was issued as a Rev 0 by LaCrosseSolutions, LLC to comply with procedure and program document preparation requirements. Some of the content of the former PCP (HSP-04.0 Issue 1) were removed as the operational process to store wastes in stand-alone facilities would no longer apply during the decommissioning process as facilities were removed during the decommissioning process. No actions taken by the 2016 submitted PCP would reduce the overall conformance of the radioactive waste product to existing criteria for solid wastes. The current PCP is completely supported by a complete waste management program including operational procedures and trained personnel providing brokering and packaging services.

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**SECTION B**

**ANNUAL  
RADIOLOGICAL  
ENVIRONMENTAL MONITORING  
REPORT**



INTRODUCTION:

*The Radiological Environmental Monitoring (REM) Program is conducted to comply with the requirements of the ODCM and in accordance with 10 CFR 50 Part 50.36a and 10 CFR 72.104. The REM Program provides measurements of radiation and of radioactive materials in those exposure pathways and for those radionuclides which could potentially lead to radiation doses to Members of the Public resulting from plant effluents. Environmental samples are taken within the surrounding areas of the plant and in selected control or background locations.*

*The monitoring program at the LACBWR facility includes monitoring of liquid and airborne particulate releases from the plant, as well as collecting environmental samples of surface air, river water, river sediment, and ambient radiation.*

*The REM program therefore supplements the Radioactive Effluent analyses by verifying that the measurable concentrations of radioactive materials and levels of radiation are not higher than expected on the basis of the effluent measurements and modeling of the environmental exposure pathways using the methodology of the Offsite Dose Calculation Manual (ODCM).*

*An Interlaboratory Comparison Program is provided to ensure that independent checks on the precision and accuracy of the measurements of radioactive material in environmental samples are performed.*

## 1.0 SAMPLE COLLECTION

Environmental samples are collected from the area surrounding LACBWR at the frequencies outlined in the ODCM and the Environmental Monitoring Program. A series of figures and tables are included in this report to explain the LACBWR environmental program.

FIGURE 1            This map includes the plant exclusion boundary, roads, other generation plants, and the relationship of the plant to the nearest local community.

FIGURE 2            This map shows the location of the LACBWR RCA Fence Line Area Environmental TLD Locations.

FIGURE 3            These maps show the location of environmental low volume air sampler locations.

FIGURE 4            This map shows the location of ISFSI environmental TLDs.

TABLE 4              This table logs the environmental TLD locations at the ISFSI.

TABLE 5              This table shows the sampling frequency of the various environmental samples and the analyses performed on these samples

TABLE 6              This table shows the environmental air monitoring stations used in LACBWR's environmental program.

TABLE 7              This table logs the LACBWR environmental TLD locations.

TABLE 8              This table shows the number of various samples collected and analyzed during 2016.

TABLE 9              Quarterly Environmental TLD results for LACBWR Area

TABLE 10             Bi-Weekly Gross Beta Env. Air Sample Analysis Results for LACBWR Vicinity



TABLE 11	Bi-weekly Gamma Spec Env. Air Sample Analysis Results for LACBWR Vicinity
TABLE 12	Semi Annual Mississippi River Water Analysis Results
TABLE 13	Semi Annual Mississippi River Sediment Analysis Results
TABLE 14	Quarterly Environmental TLD results for ISFSI Area

## 2.0 RESULTS OF THE 2017 RADIO-ENVIRONMENTAL MONITORING SURVEYS

During 2017, activity levels in the local environment were normal, indicating no significant plant attributed radioactivity.

### 2.1 PENETRATING RADIATION

The environmental penetrating radiation dose is measured by environmental TLDs.

2.1.1 LACBWR Plant - These environmental TLDs were changed on a quarterly basis.. The results for the LACBWR Plant from 2017 are shown on Table 9.

2.1.2 ISFSI – These environmental TLDs are changed on a quarterly basis. Table 14 results for 2017 are shown.

### 2.2 AIR PARTICULATE

Air samples were collected continuously from various sites (see Figure 3) around LACBWR. Low volume particulate air samplers were used to collect air samples. The air filter consists of a glass fiber filter with an associated pore size of approximately 0.45  $\mu\text{m}$ . The particulate filters were analyzed bi-weekly for gross

beta activity with an internal proportional counter, as well as analyzed by gamma spectroscopy for individual isotopic concentration.

TABLE 10 This table shows the bi-weekly gross beta gamma activity concentration from the air particulate filters.

TABLE 11 This table shows the individual air sample particulate isotopic analysis results.

### 2.3 RIVER WATER

River water is collected semi-annually. River water samples before the intake structure, at plant outfall, and below the plant outfall are collected and are gamma analyzed for isotopic concentration and tritium analysis. The river water gamma isotopic analysis results are shown in Table 12. The results indicate that there were no significant plant attributable radionuclides in the river water.

### 2.4 SEDIMENT SAMPLES

Sediment samples are collected semi-annually before the intake structure, at plant outfall, and below the plant outfall. These samples are gamma analyzed and these results appear on Table 13. They indicated that small amounts of plant-attributed radionuclides have accumulated in river sediments near the outfall. The amount of radionuclides in the sediment has declined significantly after plant shutdown. These amounts have remained relatively constant the last few years.

## 3.0 CONCLUSIONS

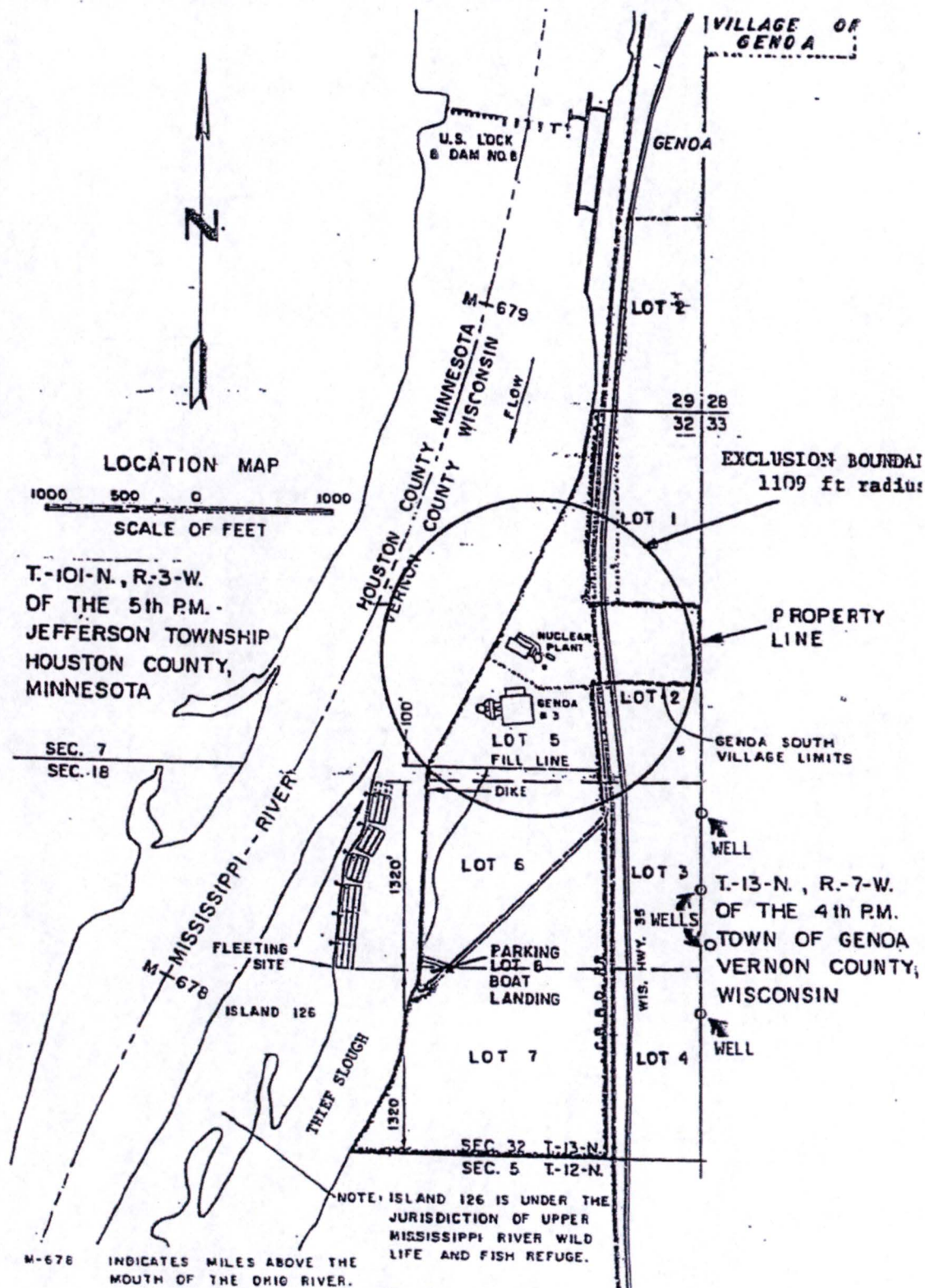
All environmental samples collected and analyzed during 2017 exhibited no significant contribution from LACBWR or ISFSI operations.



#### 4.0 INTERLABORATORY COMPARISON PROGRAM RESULTS

During 2017, interlaboratory comparison samples were obtained from an outside contractor. The equipment used to analyze the environmental samples was tested against the contractors' results. The following are the results of these comparisons.

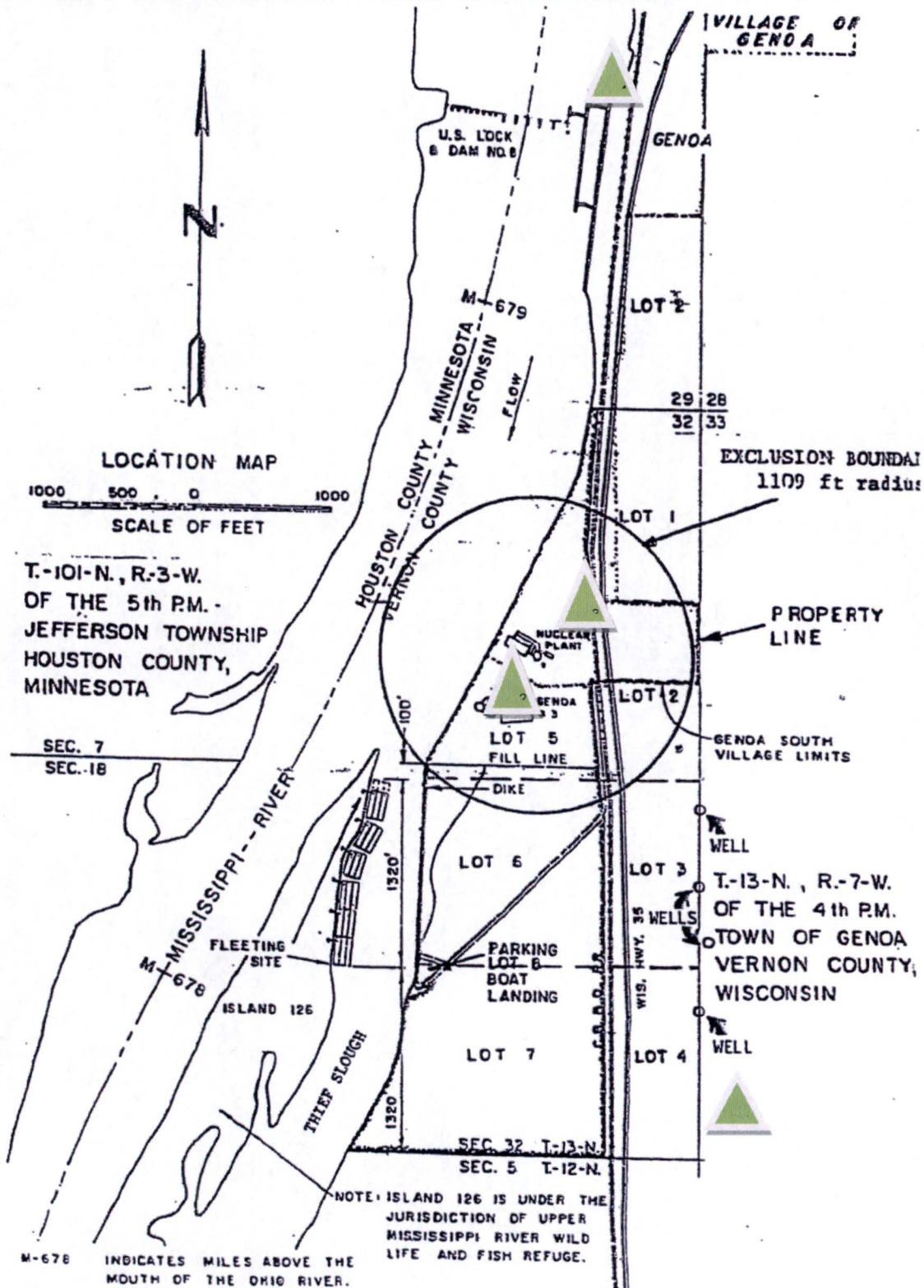
ANALYSIS	LACBWR RESULTS	CONTRACTOR RESULTS	RATIO
GROSS BETA	148 pCi	151 pCi	0.98
GROSS ALPHA	39.8 pCi	45.2 pCi	0.88
I-131	54.9 pCi/l	49.5 pCi/l	1.11
Cr-51	171 pCi/l	154 pCi/l	1.11
Cs-134	69.6 pCi/l	79.2 pCi/l	0.88
Cs-137	98.3 pCi/l	89.7 pCi/l	1.10
Co-58	61.7 pCi/l	57.0 pCi/l	1.08
Mn-54	113 pCi/l	102 pCi/l	1.11
Fe-59	86.1 pCi/l	71.9 pCi/l	1.20
Zn-65	147 pCi/l	134 pCi/l	1.10
Co-60	116 pCi/l	110 pCi/l	1.06
H-3	14600 pCi/l	13400 pCi/l	1.09



**FIGURE 1 - LACBWR PROPERTY MAP**



**FIGURE 3 – LACBWR ENVIRONMENTAL AIR SAMPLER LOCATIONS**



RADIOLOGICAL ENVIRONMENTAL MONITORING REPORT – (cont'd)

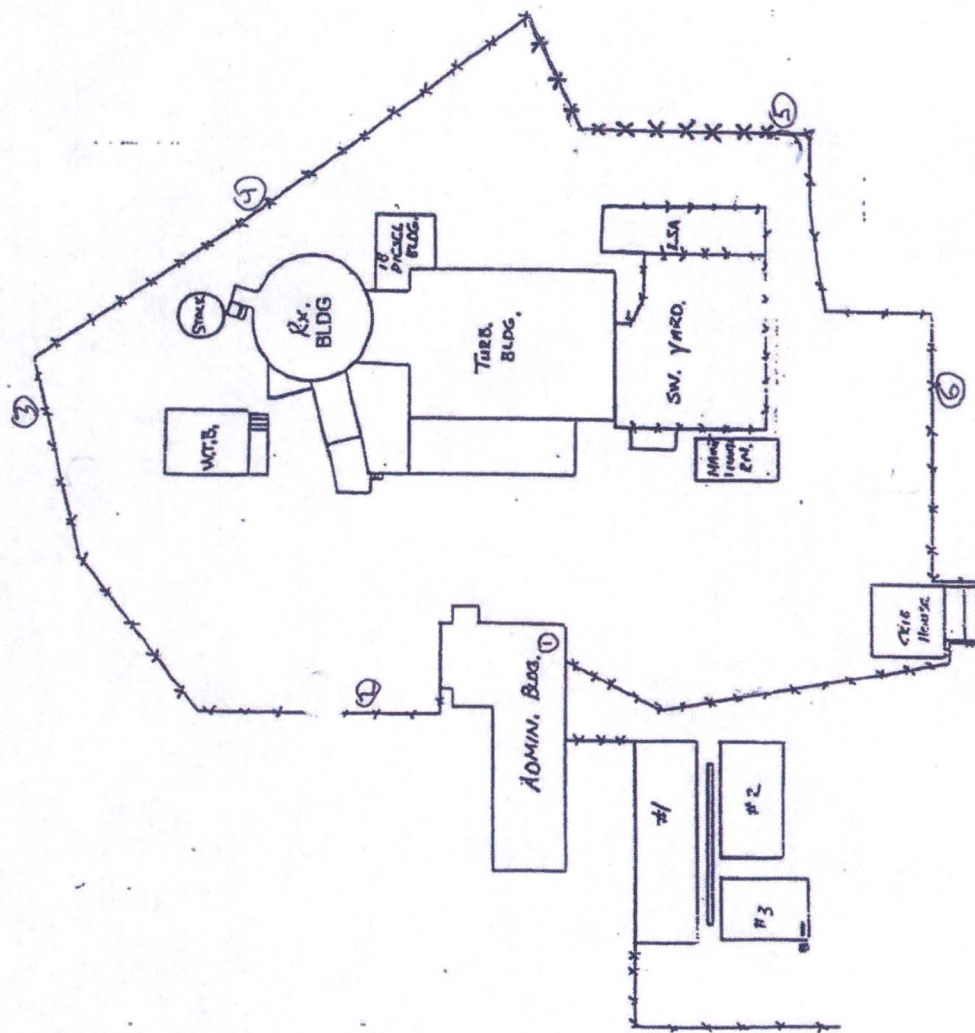
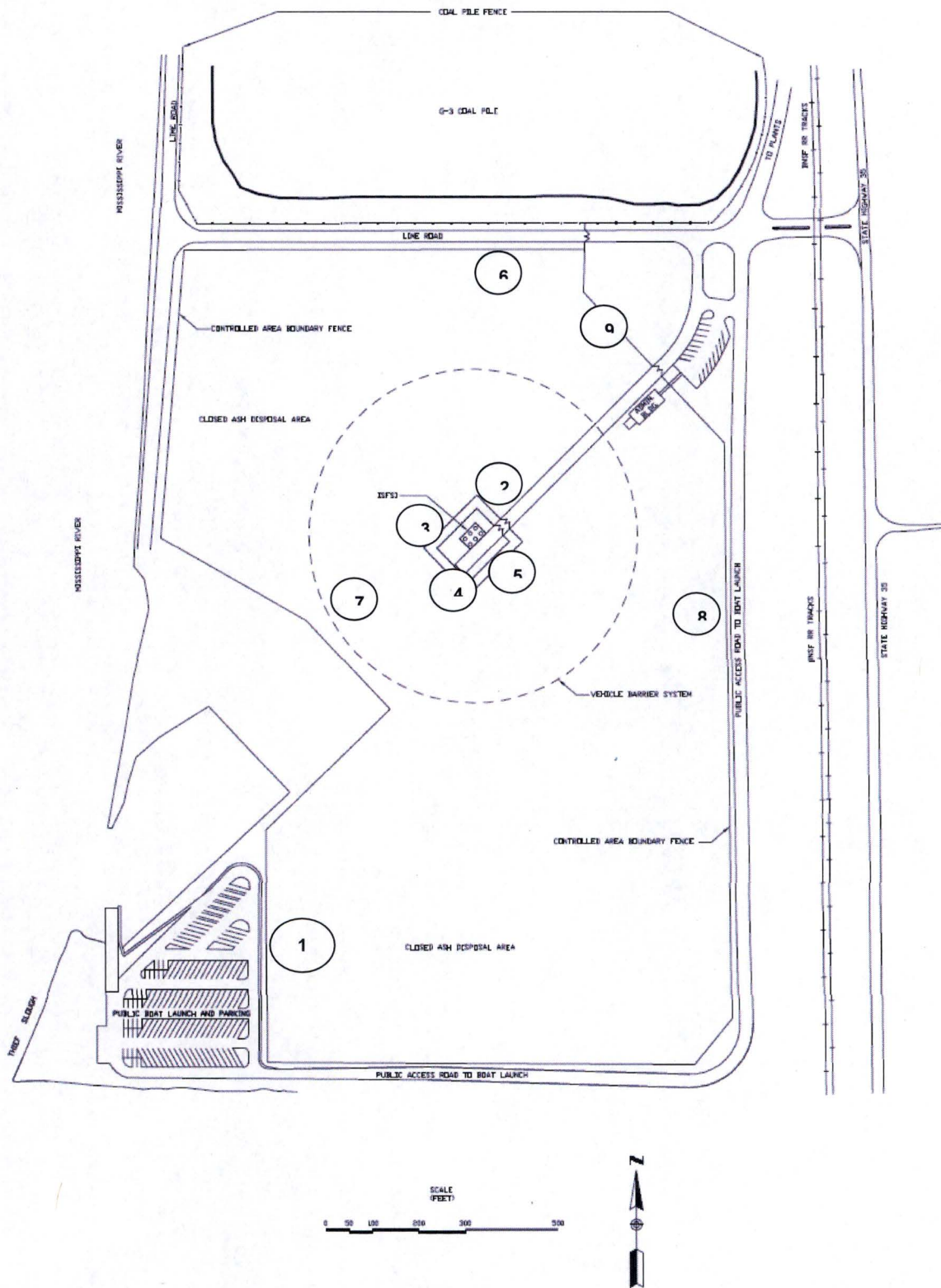


FIGURE 2 - LACBWR RCA FENCELINE ENVIRONMENTAL TLD LOCATIONS



# ANNUAL RADIOLOGICAL ENVIRONMENTAL MONITORING REPORT



**FIGURE 4 - ISFSI ENVIRONMENTAL TLD LOCATIONS**

**TABLE 4****ISFSI ENVIRONMENTAL TLD LOCATIONS**

LOCATION NO.	LOCATION
1	ISFSI ADMINISTRATIVE BUILDING WEST
2	ISFSI PROTECTED AREA NORTH EAST SIDE
3	ISFSI PROTECTED AREA NORTH WEST SIDE
4	ISFSI PROTECTED AREA SOUTH WEST SIDE
5	ISFSI PROTECTED AREA SOUTH EAST SIDE
6	ISFSI OWNER Controlled FENCE NORTH
7	ISFSI OWNER CONTROLLED FENCE WEST
8	ISFSI OWNER CONTROLLED FENCE EAST
9	ISFSI OWNER CONTROLLED FENCE NORTH EAST BY HEAVY HALL PATH
10	ISFSI OWNER CONTROLLED FENCE WEST BY BOAT LANDING



**TABLE 5**

**SAMPLE FREQUENCY AND ANALYSIS OF RADIOLOGICAL ENVIRONMENTAL SAMPLES**

<b><u>SAMPLE</u></b>	<b><u>FREQUENCY</u></b>	<b><u>ANALYSIS PERFORMED</u></b>
Environmental TLDs	Quarterly	Dose in mRem
Particulate Air - Glass Fiber Filters	Bi-Weekly	Gross Beta and Gamma Spectroscopy
River Sediment	Semi-annually	Gamma Spectroscopy
River Water	Semi-annually	Gamma Spectroscopy and Tritium (Liquid Scintillation Analyzer)

**TABLE 6**

**LOW VOLUME ENVIRONMENTAL AIR MONITORING STATION LOCATIONS**

(Refer to Figure 3)

LOCATION NO.	LOCATION
1	Trailer Park
2	Coal Plant - North Side
3	SW of Main Switch Yard
4	Lock and Dam #8 - North Side



TABLE 7

**LACBWR ENVIRONMENTAL TLD LOCATIONS**

LOCATION NO.	LOCATION
1	ADMINISTRATION BUILDING VAULT WEST END
2	RCA FENCE LINE NORTH
3	RCA FENCELINE SOUTHEAST
4	RCA FENCELINE SOUTH
5	RCA FENCE LINE SOUTHWEST
6	RCA FENCE LINE WEST
	G-3 Crib House
	Barge Wash Break Shack
	G-3 Control Room
	LACBWR Warehouse
	Modular Meeting Trailer-East of LACBWR Admin Building

**TABLE 8**

**RADIOLOGICAL ENVIRONMENTAL SAMPLES COLLECTED**

**JANUARY- DECEMBER 2017**

TYPE OF SAMPLE	NUMBER OF SAMPLES
Penetrating Radiation(Environmental TLDs)	84
Air Particulate	104
River Water	6
River Sediment	6



TABLE 9

**QUARTERLY ENVIRONMENTAL TLD RESULTS IN THE LACBWR VICINITY****JANUARY- DECEMBER 2017**

STATION NO.	1st QUARTER mRem	2nd QUARTER mRem	3rd QUARTER mRem	4th QUARTER mRem
1(*)	0.10	0.10	<0.10	<0.10
2*	0.10	0.10	<0.10	<0.10
3*	<0.10	<0.10	<0.10	<BKG
4*	0.20	0.50	0.35	0.15
5*	<0.10	<0.10	<0.10	<BKG
6*	0.6	0.30	<0.10	<BKG
G-3 Crib House	1.0	1.5	BKG	<BKG
Barge Wash Break Shack	<BKG	BKG	<BKG	<BKG
G-3 Control Room	<BKG	<BKG	<BKG	<BKG
LACBWR Warehouse	3.0	4.0	3.0	BKG
Modular Meeting Trailer- East of LACBWR Admin Building	1.5	2.5	2.0	<BKG

ALL BACKGROUND (BKG) CORRECTED RESULTS AND IF WITH (\*) ARE ALSO OCCUPANCY FACTOR CORRECTED

**TABLE 10 BI-WEEKLY GROSS BETA ENVIRONMENTAL AIR SAMPLE RESULTS**

COLLECTION DATE	COAL PLANT pCi/m <sup>3</sup>	TRAILER COURT pCi/m <sup>3</sup>	LOCK AND DAM #8 pCi/m <sup>3</sup>	SW MAIN SWITCHYARD pCi/m <sup>3</sup>
1-4-2017	.021 ± .002	.021 ± .002	.021 ± .002	.006 ± .002
1-18-2017	.020 ± .002	.021 ± .002	.024 ± .002	.037 ± .002
2-1-2017	.017 ± .003	.016 ± .003	.011 ± .003	.019 ± .003
2-15-2017	.021 ± .002	.019 ± .002	.020 ± .002	.026 ± .002
3-1-2017	.018 ± .002	.020 ± .002	.019 ± .002	.018 ± .002
3-15-2017	.017 ± .002	.016 ± .002	.024 ± .002	.020 ± .002
3-29-2017	.015 ± .002	.014 ± .002	.014 ± .002	.013 ± .002
4-12-2017	.016 ± .002	.012 ± .002	.012 ± .002	.014 ± .002
4-26-2017	.001 ± .002	.014 ± .001	.016 ± .002	.001 ± .002
5-10-2017	.011 ± .001	.012 ± .001	.001 ± .002	.002 ± .001
5-24-2017	.011 ± .002	.015 ± .001	.011 ± .002	.011 ± .002
6-7-2017	.011 ± .002	.002 ± .001	.012 ± .003	.001 ± .002
6-21-2017	.010 ± .002	.018 ± .002	.012 ± .002	.002 ± .002
7-5-2017	.011 ± .002	.015 ± .002	.011 ± .002	.010 ± .002
7-19-2017	.001 ± .002	.022 ± .002	.011 ± .002	.010 ± .002
8-2-2017	.011 ± .002	.013 ± .002	.012 ± .002	.001 ± .002
8-16-2017	.013 ± .002	.013 ± .002	.012 ± .002	.001 ± .002
8-30-2017	.014 ± .001	.018 ± .001	.015 ± .002	.013 ± .001
9-13-2017	.015 ± .002	.015 ± .001	.011 ± .002	.011 ± .002
9-27-2017	.017 ± .002	.020 ± .001	.026 ± .003	.018 ± .002



**TABLE 10 BI-WEEKLY GROSS BETA ENVIRONMENTAL AIR SAMPLE RESULTS**

10-11-17	.013±.002	.014 ±.001	.013 ± .002	.013 ± .002
10-25-2017	.012 ± .001	.011 ± .001	.012 ± .002	.013 ± .001
11-8-2017	.001 ± .001	.001 ± .001	.001 ± .001	.001 ± .001
11-21-2017	.020 ± .002	.023 ± .002	.016 ± .002	.018 ± .002
12-6-2017	.017 ± .002	.017 ± .001	.014 ± .002	.016 ± .002
12-20-2017	.016 ± .002	.012 ± .002	.014 ± .002	.014 ± .001

ANNUAL RADIOLOGICAL ENVIRONMENTAL MONITORING REPORT

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LOCATION	COAL PLANT	TRAILER COURT	LOCK AND DAM #8	SW MAIN SWITCHYARD
START DATE	12-22-2016	12-22-2016	12-22-2016	12-22-2016
END DATE	1-4-2017	1-4-2017	1-4-2017	1-4-2017
ISOTOPES				
Cs-134	< 3.73 E-03	< 1.64 E-03	< 3.73 E-03	< 3.03 E-03
Cs-137	< 3.91 E-03	< 1.75 E-03	< 3.89 E-03	< 3.29 E-03
Co-60	< 4.02 E-03	< 1.72 E-03	< 3.86 E-03	< 3.30 E-03

LOCATION	COAL PLANT	TRAILER COURT	LOCK AND DAM #8	SW MAIN SWITCHYARD
START DATE	1-4-2017	1-4-2017	1-4-2017	1-4-2017
END DATE	1-18-2017	1-18-2017	1-18-2017	1-18-2017
ISOTOPES				
Cs-134	< 2.88 E-03	< 1.72 E-03	< 3.58 E-03	< 3.06 E-03
Cs-137	< 3.07 E-03	< 1.80 E-03	< 3.80 E-03	< 3.44 E-03
Co-60	< 3.06 E-03	< 1.82 E-03	< 2.71 E-03	< 3.30 E-03



ANNUAL RADIOLOGICAL ENVIRONMENTAL MONITORING REPORT

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LOCATION	COAL PLANT	TRAILER COURT	LOCK AND DAM #8	SW MAIN SWITCHYARD
START DATE	1-18-2017	1-18-2017	1-18-2017	1-18-2017
END DATE	2-1-2017	2-1-2017	2-1-2017	2-1-2017
ISOTOPES				
Cs-134	<3.63E-03	<1.64E-03	<3.65E-03	<3.17E-03
Cs-137	<3.77E-03	<1.79E-03	<3.90E-03	<3.28E-03
Co-60	<2.28E-03	<1.14E-03	<3.90E-03	<1.74E-03

LOCATION	COAL PLANT	TRAILER COURT	LOCK AND DAM#8	SW MAIN SWICHYARD
START DATE	2-1-2017	2-1-2017	2-1-2017	2-1-2017
END DATE	2-15-2017	2-15-2017	2-15-2017	2-15-2017
ISOTOPES				
Cs-134	<3.94E-03	<1.71E-03	<3.61E-03	<3.36E-03
Cs-137	<4.01E-03	<1.78E-03	<3.83E-03	<3.46E-03
Co-60	<3.92E-03	<1.77E-03	<3.99E-03	<3.49E-03

ANNUAL RADIOLOGICAL ENVIRONMENTAL MONITORING REPORT

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LOCATION	COAL PLANT	TRAILER COURT	LOCK AND DAM #8	SW MAIN SWITCHYARD
START DATE	2-15-2017	2-15-2017	2-15-2017	2-15-2017
END DATE	3-1-2017	3-1-2017	3-1-2017	3-1-2017
ISOTOPES				
Cs-134	<3.54E-03	<1.67E-03	<3.48E-03	3.12E-03
Cs-137	<3.96E-03	<1.75E-03	<3.94E-03	<3.26E-03
Co-60	2.35E-03	<2.01E-03	<3.82E-03	<3.37E-03

LOCATION	COAL PLANT	TRAILER COURT	LOCK AND DAM#8	SW MAIN SWITCHYARD
START DATE	3-1-2017	3-1-2017	3-1-2017	3-1-2017
END DATE	3-15-2017	3-15-2017	3-15-2017	3-15-2017
ISOTOPES/RL*				
Cs-134	<3.81E-03	<1.74E-03	<5.05E-03	<3.18E-03
Cs-137	<4.02E-03	<1.93E-03	<5.44E-03	<3.19E-03
Co-60	<3.88E-03	<1.70E-03	<5.54E-03	<3.31E-03



ANNUAL RADIOLOGICAL ENVIRONMENTAL MONITORING REPORT

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LOCATION	COAL PLANT	TRAILER COURT	LOCK AND DAM #8	SW MAIN SWITCHYARD
START DATE	3-15-2017	3-15-2017	3-15-2017	3-15-2017
END DATE	3-29-2017	3-29-2017	3-29-2017	3-29-2017
ISOTOPES				
Cs-134	<3.75E-03	<1.74E-03	<4.01E-03	<3.20E-03
Cs-137	<4.03E-03	<1.76E-03	<3.89E-03	<3.41E-03
Co-60	<2.27E-03	<1.75E-03	<4.00E-03	<3.36E-03

LOCATION	COAL PLANT	TRAILER COURT	LOCK AND DAM #	SW MAIN SWITCHYARD
START DATE	3-29-2017	3-29-2017	3-29-2017	3-29-2017
END DATE	4-12-2017	4-12-2017	4-12-2017	4-12-2017
ISOTOPES				
Cs-134	<3.78E-03	<1.80E-03	<3.71E-03	<3.16E-03
Cs-137	<3.88E-03	<1.80E-03	<3.94E-03	<3.41E-03
Co-60	<3.79E-03	<1.79E-03	<3.91E-03	<3.41E-03

ANNUAL RADIOLOGICAL ENVIRONMENTAL MONITORING REPORT

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LOCATION	COAL PLANT	TRAILER COURT	LOCK AND DAM #	SW MAIN SWITCHYARD
START DATE	4-12-2017	4-12-2017	4-12-2017	4-12-2017
END DATE	4-26-2017	4-26-2017	4-26-2017	4-26-2017
ISOTOPES				
Cs-134	<1.08E-03	<1.68E-03	<3.79E-03	<1.10E-03
Cs-137	1.10E-03	1.63E-03	2.61E-03	8.15E-04
Co-60	<1.15E-03	<1.72E-03	<3.80E-03	<1.15E-03

LOCATION	COAL PLANT	TRAILER COURT	LOCK AND DAM#8	SW MAIN SWICHYARD
START DATE	4-26-2017	4-26-2017	4-26-2017	4-26-2017
END DATE	5-10-2017	5-10-2017	5-10-2017	5-10-2017
ISOTOPES				
Cs-134	<1.06E-03	<2.39E-03	<2.37E-03	<1.03E-03
Cs-137	<1.68E-03	2.58E-03	2.00E-03	<1.07E-03
Co-60	<1.15E-03	<1.60E-03	<2.51E-03	<1.09E-03



ANNUAL RADIOLOGICAL ENVIRONMENTAL MONITORING REPORT

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LOCATION	COAL PLANT	TRAILER COURT	LOCK AND DAM#8	SW MAIN SWICHYARD
START DATE	5-10-2017	5-10-2017	5-10-2017	5-10-2017
END DATE	5-24-2017	5-24-2017	5-24-2017	5-24-2017
ISOTOPES				
Cs-134	<1.09E-03	<2.74E-03	<2.33E-03	<1.01E-03
Cs-137	<1.17E-03	<2.86E-03	<2.50E-03	<1.09E-03
Co-60	<1.14E-03	<2.87E-03	<1.41E-03	<1.08E-03

LOCATION	COAL PLANT	TRAILER COURT	LOCK AND DAM#8	SW MAIN SWICHYARD
START DATE	5-24-2017	5-24-2017	5-24-2017	5-24-2017
END DATE	6-7-2017	6-7-2017	6-7-2017	6-7-2017
ISOTOPES				
Cs-134	<1.07E-03	<4.19E-03	<2.42E-03	<1.02E-03
Cs-137	6.86E-04	3.94E-03	2.14E-03	1.14E-03
Co-60	<1.14E-03	<4.16E-03	<1.40E-03	<1.05E-03

ANNUAL RADIOLOGICAL ENVIRONMENTAL MONITORING REPORT

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LOCATION	COAL PLANT	TRAILER COURT	LOCK AND DAM#8	SW MAIN SWICHYARD
START DATE	6-7-2017	6-7-2017	6-7-2017	6-7-2017
END DATE	6-21-2017	6-21-2017	6-21-2017	6-21-2017
ISOTOPES				
Cs-134	<1.10E-03	<2.42E-03	<2.43E-03	< 9.90E-04
Cs-137	<1.17E-03	<2.46E-03	<2.47E-03	<1.09E-03
Co-60	<1.17E-03	<2.49E-03	<2.51E-03	<1.07E-03

LOCATION	COAL PLANT	TRAILER COURT	LOCK AND DAM#8	SW MAIN SWICHYARD
START DATE	6-21-2017	6-21-2017	6-21-2017	6-21-2017
END DATE	7-5-2017	7-5-2017	7-5-2017	7-5-2017
ISOTOPES				
Cs-134	<1.09E-03	<2.27E-03	<2.31E-03	<9.97E-04
Cs-137	<1.12E-03	<2.49E-03	<2.50E-03	<1.08E-03
Co-60	<1.16E-03	<2.42E-03	<2.50E-03	<1.05E-03



ANNUAL RADIOLOGICAL ENVIRONMENTAL MONITORING REPORT

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LOCATION	COAL PLANT	TRAILER COURT	LOCK AND DAM#8	SW MAIN SWICHYARD
START DATE	7-5-2017	7-5-2017	7-5-2017	7-5-2017
END DATE	7-19-2017	7-19-2017	7-19-2017	7-19-2017
ISOTOPES				
Cs-134	<1.08E-03	<2.42E-03	<2.36E-03	<1.02E-03
Cs-137	<1.15E-03	<2.49E-03	<2.42E-03	<1.06E-03
Co-60	<1.14E-03	<2.47E-03	<2.35E-03	<1.08E-03

LOCATION	COAL PLANT	TRAILER COURT	LOCK AND DAM#8	SW MAIN SWICHYARD
START DATE	7-19-2017	7-19-2017	7-19-2017	7-19-2017
END DATE	8-2-2017	8-2-2017	8-2-2017	8-2-2017
ISOTOPES				
Cs-134	<1.11E-03	<2.52E-03	< 2.33E-03	<1/01E-03
Cs-137	<1.23E-03	<2.63E-03	<2.53E-03	<1.03E-03
Co-60	7.80E-04	<1.62E-03	<2.45E-03	<1.07E-03

ANNUAL RADIOLOGICAL ENVIRONMENTAL MONITORING REPORT

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LOCATION	COAL PLANT	TRAILER COURT	LOCK AND DAM#8	SW MAIN SWICHYARD
START DATE	8-2-2017	8-2-2017	8-2-2017	8-2-2017
END DATE	8-16-2017	8-16-2017	8-16-2017	8-16-2017
ISOTOPES				
Cs-134	<1.13E-03	<2.35E-03	<2.33E-03	<1.00E-03
Cs-137	<1.15E-03	<2.50E-03	<2.57E-03	<1.01E-03
Co-60	<1.13E-03	<2.53E-03	<2.53E-03	<6.06E-04

LOCATION	COAL PLANT	TRAILER COURT	LOCK AND DAM#8	SW MAIN SWICHYARD
START DATE	8-16-2017	8-16-2017	8-16-2017	8-16-2017
END DATE	8-30-2017	8-30-2017	8-30-2017	8-30-2017
ISOTOPES				
Cs-134	<1.09E-03	<2.32E-03	<2.39E-03	<9.79E-04
Cs-137	<1.18E-03	<2.23E-03	<2.47E-03	<1.07E-03
Co-60	<1.13E-03	<2.56E-03	<2.45E-03	<1.06E-03



ANNUAL RADIOLOGICAL ENVIRONMENTAL MONITORING REPORT

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LOCATION	COAL PLANT	TRAILER COURT	LOCK AND DAM#8	SW MAIN SWICHYARD
START DATE	8-30-2017	8-30-2017	8-30-2017	8-30-2017
END DATE	9-13-2017	9-13-2017	9-13-2017	9-13-2017
ISOTOPES				
Cs-134	<1.13E-03	<2.38E-03	<2.41E-03	<9.90E-04
Cs-137	<1.16E-03	<2.49E-03	<2.55E-03	<1.06E-03
Co-60	<1.11E-03	<2.45E-03	<2.39E-03	<1.08E-03

LOCATION	COAL PLANT	TRAILER COURT	LOCK AND DAM#8	SW MAIN SWICHYARD
START DATE	9-13-2017	9-13-2017	9-13-2017	9-13-2017
END DATE	9-27-2017	9-27-2017	9-27-2017	9-27-2017
ISOTOPES				
Cs-134	<1.12E-03	<2.31E-03	<2.31E-03	<1.04E-03
Cs-137	<1.15E-03	<2.57E-03	<2.44E-03	<1.0E-03
Co-60	<1.18E-03	<2.47E-03	<2.53E-03	<1.07E-03

ANNUAL RADIOLOGICAL ENVIRONMENTAL MONITORING REPORT

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LOCATION	COAL PLANT	TRAILER COURT	LOCK AND DAM#8	SW MAIN SWICHYARD
START DATE	9-27-2017	9-27-2017	9-27-2017	9-27-2017
END DATE	10-11-2017	10-11-2017	10-11-2017	10-11-2017
ISOTOPES				
Cs-134	<1.10E-03	<2.36E-03	<2.30E-03	<9.86E-04
Cs-137	<1.18E-03	<2.46E-03	<2.51E-03	<1.06E-03
Co-60	<1.12E-03	<2.49E-03	<2.43E-03	<1.00E-03

LOCATION	COAL PLANT	TRAILER COURT	LOCK AND DAM#8	SW MAIN SWICHYARD
START DATE	10-11-2017	10-11-2017	10-11-2017	10-11-2017
END DATE	10-25-2017	10-25-2017	10-25-2017	10-25-2017
ISOTOPES				
Cs-134	<1.08E-03	<2.41E-03	<2.41E-03	<1.01E-03
Cs-137	<1.13E-03	<2.46E-03	<2.50E-03	<1.04E-03
Co-60	<6.83 E-04	<2.51E-03	<2.54E-03	<1.03E-03



ANNUAL RADIOLOGICAL ENVIRONMENTAL MONITORING REPORT

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LOCATION	COAL PLANT	TRAILER COURT	LOCK AND DAM#8	SW MAIN SWICHYARD
START DATE	10-25-2017	10-25-2017	10-25-2017	10-25-2017
END DATE	11-8-2017	11-8-2017	11-8-2017	11-8-2017
ISOTOPES				
Cs-134	<2.44E-03	<2.45E-03	<2.44E-03	<1.01E-03
Cs-137	<2.58E-03	<2.49E-03	<2.58E-03	<1.03E-03
Co-60	<1.31E-03	<2.53E-03	<1.31E-03	<1.03E-03

LOCATION	COAL PLANT	TRAILER COURT	LOCK AND DAM#8	SW MAIN SWICHYARD
START DATE	11-8-2017	11-8-2017	11-8-2017	11-8-2017
END DATE	11-21-2017	11-21-2017	11-21-2017	11-21-2017
ISOTOPES				
Cs-134	<1.22E-03	<2.58E-03	<4.06E-03	<1.11E-03
Cs-137	<1.14E-03	1.89E-03	3.51E-03	1.37E-03
Co-60	<1.26E-03	<2.70E-03	2.86E-03	<1.12E-03

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ANNUAL RADIOLOGICAL ENVIRONMENTAL MONITORING REPORT

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LOCATION	COAL PLANT	TRAILER COURT	LOCK AND DAM#8	SW MAIN SWICHYARD
START DATE	11-21-2017	11-21-2017	11-21-2017	11-21-2017
END DATE	12-6-2017	12-6-2017	12-6-2017	12-6-2017
ISOTOPES				
Cs-134	<1.10E-03	<2.22E-03	<2.27E-03	<1.03E-03
Cs-137	<1.07E-03	<1.95E-03	<2.31E-03	<8.98 E-04
Co-60	<1.10E-03	<2.32E-03	<2.25E-03	<9.93E-04



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ANNUAL RADIOLOGICAL ENVIRONMENTAL MONITORING REPORT

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**TABLE 11**  
**BI-WEEKLY AIR SAMPLE GAMMA SPECTROSCOPY ENVIRONMENTAL AIR SAMPLE RESULTS**  
(Concentrations in pCi/m<sup>3</sup>)

LOCATION	COAL PLANT	TRAILER COURT	LOCK AND DAM#8	SW MAIN SWICHYARD
START DATE	12-6-2017	12-6-2017	12-6-2017	12-6-2017
END DATE	12-20-2017	12-20-2017	12-20-2017	12-20-2017
ISOTOPES				
Cs-134	<1.21E-03	<2.47E-03	<2.50E-03	<1.03E-03
Cs-137	<1.16E-03	<2.54E-03	<2.52E-03	8.18E-04
Co-60	<1.14E-03	<2.38E-03	<2.59E-03	<1.05E-03

**TABLE 12**  
**SEMI ANNUAL MISSISSIPPI RIVER WATER ANALYSIS RESULTS**  
 (Concentrations in pCi/Liter)

COLLECTION DATE: SAMPLE LOCATION:	SAMPLE #1 LOCK and DAM # 8 4/19/17	SAMPLE #2 LACBWR OUTFALL 4/19/17	SAMPLE #3 Dairyland Public River Access 4/19/17	SAMPLE #1 LOCK and DAM #8 10/11/17	SAMPLE #2 LACBWR OUTFALL 10/11/17	SAMPLE #3 Dairyland Public River Access 10/11/17
ISOTOPES/RL*						
H-3/20000	277	</= 189	</=189	443	443	547
Mn-54/1000	< 4.14	< 4.23	< 4.28	< 4.26	< 4.00	< 4.22
Co-60/300	< 4.32	< 4.40	< 4.44	< 4.27	< 4.46	< 4.33
Zn-65/300	< 9.25	< 9.15	< 9.66	< 9.93	< 10.00	< 9.76
Cs-134/30	< 4.67	< 4.74	< 4.80	< 4.48	< 4.80	< 4.53
Cs-137/50	< 4.69	< 4.70	< 4.85	< 4.59	< 4.46	< 4.77

RL = REPORTING LEVEL



**TABLE 13**  
**SEMI ANNUAL MISSISSIPPI RIVER SEDIMENT ANALYSIS RESULTS**  
(Concentration in pCi/Kg)

SAMPLE LOCATION COLLECTION DATE	UPSTREAM 04/18/17	OUTFALL 04/18/17	DOWNSTREAM 04/18/17	UPSTREAM 10/17/17	OUTFALL 10/24/17	DOWNSTREAM 10/17/17
ISOTOPES						
Cs-134	< 4.98	<5.90	< 12.70	< 5.45	< 4.76	< 7.35
Cs-137	4.61	9.68 ± 0.95	125.0 ± 4.24	4.50± 0.56	153 ± 4.45	45.2 ± 1.73
Co-60	< 4.68	<5.52	< 11.40	< 5.09	< 4.51	< 6.72

TABLE 14  
QUARTERLY ENVIRONMENTAL TLD RESULTS FOR ISFSI AREA  
JANUARY-DECEMBER 2017

<u>STATION NO.</u>	1st QUARTER mRem	2nd QUARTER mRem	3rd QUARTER mRem	4th QUARTER mRem
1	2.0	3.25	3.0	<BKG
2	30.0	23.5	31.0	26.0
3	89.5	74.0	96.0	96.75
4	19.0	17.0	19.25	17.50
5	31.25	29.0	28.0	28.75
6 (*)	<0.10	<0.10	<0.10	<BKG
7	3.0	3.0	2.50	BKG
8 (*)	<0.10	<0.10	<0.10	<BKG
9 (*)	<0.10	<0.10	<0.10	<BKG
10 (*)	<0.10	<0.10	<0.10	BKG

ALL BACKGROUND CORRECTED AND THOSE ON CONTROLLED AREA FENCE  
LINE IDENTIFIED WITH (\*) AND HAD OCCUPANCY FACTOR APPLIED