**BARBARA A. NICK**
**President and CEO**

**DAIRYLAND POWER**
**COOPERATIVE**

March 1, 2016

In reply, please refer to LAC-14374 10 CFR 50.36a(a)(2)

DOCKET NO. 50-409

Document Control Desk
U. S. Nuclear Regulatory Commission
Washington, DC 20555

SUBJECT: Dairyland Power Cooperative
La Crosse Boiling Water Reactor
Possession-Only License No. DPR-45
Annual Radioactive Effluent Report and
Radiological Environmental Monitoring Report

REFERENCES: (1) NRC Letter, Keppler to Linder, dated August 12, 1983, Inspection Report 50-409/83-10 (DRMSP)

In accordance with 10 CFR 50.36a(a)(2), this letter serves to transmit to you the Radioactive Effluent Report and Radiological Environmental Monitoring Report for the La Crosse Boiling Water Reactor (LACBWR) for 2015.

If you have any questions, please contact Cheryl Olson at 608-689-4207.

Sincerely,

Barbara A. Nick, President and CEO

BAN:CLO:tco

Enclosures

cc/encl: Cynthia Pederson, NRC Reg. III Administrator
Marlayna Vaaler, NRC Project Manager
Jason Hunt, Wisc. Div. of Health

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NMSS

# RADIOACTIVE EFFLUENT REPORT

# AND

# RADIOLOGICAL ENVIRONMENTAL MONITORING REPORT

FOR THE
LA CROSSE BOILING WATER REACTOR (LACBWR)

(January 1 to December 31, 2015)

DAIRYLAND POWER COOPERATIVE
3200 EAST AVENUE SOUTH
LA CROSSE, WI 54602-0817

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## SECTION B: RADIOLOGICAL ENVIRONMENTAL MONITORING REPORT

# 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 $MW_{(th)}$). The reactor is owned by Dairyland Power Cooperative (DPC).

The reactor went critical in July 1967 and first contributed electricity to DPC's 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.

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 ISFSI.

In accordance with LACBWR Appendix C Section 2 of the Quality Assurance Program Description (QAPD), this document is the Radioactive Effluent Report for the Period January 1 through December 31, 2015.

# EFFLUENT AND WASTE DISPOSAL REPORT

(Supplemental Information)

FACILITY: La Crosse Boiling Water Reactor LICENSEE: Dairyland Power Cooperative

DOCKET NO. 50-409 & 72-046

## 1.0 REGULATORY LIMITS

### 1.1 Gaseous Effluent Release Limits:

LACBWR's stack effluent release limitations for gaseous effluent releases of radioactive material limits the release rate of the sum of the individual radionuclides, so that the dose rates to members of the public beyond the Effluent Release Boundary do not exceed 500 mRem/year to the whole body and 1500 mRem/year to a critical organ from H-3 and particulates with half-lives greater than 8 days as per the requirements of the Offsite Dose Calculation Manual (ODCM).

Also, in accordance with 10 CFR 50, Appendix I, the ODCM limitations for gaseous effluent radioactive material limit the air dose to a member of the public from noble gases in areas beyond the Effluent Release Boundary to less than 5 mRad gamma and 10 mRad beta per calendar quarter, and less than 10 mRad gamma and 20 mRad beta per calendar year. The dose limits from H-3 and particulates with half-lives greater than 8 days are less than 7.5 mRem per calendar quarter, and less than 15 mRem per calendar year to any organ.

Cumulative dose contributions from gaseous effluent releases are determined in accordance with the LACBWR Offsite Dose Calculations Manual.

1.2 Liquid Effluent Release Limits:

LACBWR's liquid effluent release limitations for liquid effluent releases 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.

Cumulative quarterly and annual dose contributions from liquid effluent releases are determined for the adult fish ingestion pathway in accordance with the LACBWR Offsite Dose Calculation Manual.

1.3 Solid Radioactive Waste

All solid radioactive wastes are handled in accordance with a Process Control Program as defined by LACBWR procedures in order to assure that all applicable transportation and burial site disposal requirements are met. An amended report for 2014 is included in this report.

## 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 tank prior to discharge. In addition, each batch discharged tank sample is analyzed for alpha and tritium activity concentrations using an IPC. 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 and Strontium-90 by a contractor on a quarterly basis.

### 4.2 Airborne Particulates

Airborne particulate releases are determined by HPGe gamma isotopic analysis. This analysis is performed by analyzing a glass fiber filter paper, taken from the stack monitor which continuously samples from an isokinetic point monitoring the stack effluent. This filter is changed and analyzed on an approximate weekly basis and analyzed within 7 days after removal. This filter is also analyzed for alpha activity. A quarterly composite of these filters is sent to a contractor for Sr-90 analysis. Results of the analysis is shown in Table 1A and 1B.

### 4.3 Fission and Activation Gases

With the removal of spent fuel from the site no fission gases remain. In 2013 the monitoring for fission and activation gases was eliminated.

### 4.4 Tritium

With the removal of the spent fuel from the site, no means to produce tritium exist. Therefore, this process was discontinued in August of 2014 with the approved changes to the ODCM.

## 5.0 BATCH RELEASES

### 5.1 Airborne

All airborne effluent releases at LACBWR are from a single Continuous-Elevated Release Point. Results are shown in Table 1A.

### 5.2 Liquid

All liquid effluent releases at LACBWR are batch releases as described in the ODCM. There were no liquid releases in 2015.

## 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 ± 5%.

## EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT 2015

## TABLE 1A

## GASEOUS EFFLUENTS – SUMMATION OF ALL RELEASES

| | | UNIT | QTR | QTR | QTR | QTR | TOTAL |
|---|---|---|---|---|---|---|---|
| **A.** | **FISSION & ACTIVATION GASES - No longer analyzed** | | | | | | |
| | | | | | | | |
| **B.** | **IODINE I-131 - No longer analyzed** | | | | | | |
| | | | | | | | |
| **C.** | **PARTICULATES** | | | | | | |
| 1. | PARTICULATES WITH HALF-LIVES > 8 DAYS | Ci | 2.00E-7 | 4.30E-7 | 4.81E-6 | 1.05E-6 | 8.29E-6 |
| 2. | AVERAGE RELEASE RATE FOR PERIOD | µCi/ Sec | 1.92E+2 | 4.08E+2 | 4.52E+2 | 9.86E+2 | |
| 3. | GROSS ALPHA RADIOACTIVITY | Ci | <MDA | <MDA | 3.00E-8 | <MDA | |
| | | | | | | | |
| **D.** | **TRITIUM – No longer analyzed** | | | | | | |
| **E.** | **PERCENTAGE OF ODCM DOSE LIMITS FOR GASEOUS EFFLUENT RELEASES** | | | | | | |
| | | | QTR | QTR | QTR | QTR | YEARLY |
| 1. | NOBLE GAS RELEASE - No longer analyzed for. | | | | | | |
| | | | | | | | |
| 2. | H-3 AND ALL RADIONUCLIDES IN PARTICULATE FORM WITH HALF-LIVES GREATER THAN 8 DAYS | | | | | | |
| | GAMMA (Highest Organ) | % | 4.65E-6 | 2.02E-5 | 4.62E-5 | 4.44E-5 | 5.62E-5 |

## TABLE 1B

## GASEOUS EFFLUENTS – ELEVATED RELEASE

| | | | CONTINUOUS MODE | | | | |
|---|---|---|---|---|---|---|---|
| | | UNIT | 1st QTR | 2nd QTR | 3rd QTR | 4th QTR | TOTAL |
| **NUCLIDES RELEASED** | | | | | | | |
| 1. | FISSION GASES | | | | | | |
| | KRYPTON-85 – Analysis no longer required. | | | | | | |
| | | | | | | | |
| 2. | IODINE I-131 – Analysis no longer required. | | | | | | |
| | | | | | | | |
| 3. | PARTICULATES | | | | | | |
| | STRONTIUM-90 | Ci | 2.28E-12 | < MDA | 2.03E-12 | < MDA | 4.31E-12 |
| | CESIUM-134 | Ci | < MDA | < MDA | < MDA | < MDA | < MDA |
| | CESIUM-137 | Ci | < MDA | 4.30E-7 | 2.96E-6 | 8.90E-7 | 4.28E-6 |
| | COBALT-60 | Ci | 2.00E-7 | < MDA | 1.85E-6 | 1.60E-7 | 2.21E-6 |
| | | | | | | | |
| | TOTALS | Ci | 2.00E-7 | 4.30E-7 | 4.81E-6 | 1.05E-6 | 8.29E-6 |
| | | | | | | | |

## TABLE 2A

## SOLID WASTE AND IRRADIATED FUEL SHIPMENTS 2015

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

| 1. TYPE OF WASTE | UNIT | 6-MONTH PERIOD | 6-MONTH PERIOD | TOTAL |
|---|---|---|---|---|
| a. DRY COMPRESSIBLE WASTE, CONTAMINATED EQUIPMENT, ETC | $m^3$ | NA | 34.82 | 34.82 |
| | Ci | NA | 0.16 | 0.16 |
| b. BEAD RESIN | $m^3$ | NA | 5.89 | 5.89 |
| | Ci | NA | 7.00 | 7.00 |
| c. SLUDGE | $m^3$ | NA | 5.15 | 5.15 |
| | Ci | NA | 0.04 | 0.04 |

| 2. ESTIMATE OF MAJOR NUCLIDE COMPOSITION (BY TYPE OF WASTE) | PERCENT OF TOTAL | 6-MONTH PERIOD CURIES | 6-MONTH PERIOD CURIES |
|---|---|---|---|
| a. DRY COMPRESSIBLE WASTE, CONTAMINATED EQUIPMENT, ETC | | | |
| C-14 | 1 | NA | 0.0017 |
| Co-60 | 8 | NA | 0.0135 |
| Cs-137 | 77 | NA | 0.1255 |
| Ni-63 | 11 | NA | 0.0184 |
| Sr-90 | 2 | NA | 0.0029 |
| | | | |
| b. BEAD RESIN | | | |
| Co-60 | 1 | NA | 0.0597 |
| Cs-137 | 61 | NA | 4.26 |
| Ni-63 | 14 | NA | 0.957 |
| H-3 | 24 | NA | 1.7 |
| | | | |
| c. SLUDGE | | | |
| Am-241 | 1 | NA | 0.0003 |
| Co-60 | 26 | NA | 0.0103 |
| Cs-137 | 63 | NA | 0.0250 |
| Fe-55 | 1 | NA | 0.0006 |
| Ni-63 | 6 | NA | 0.0026 |
| Sr-90 | 2 | NA | 0.0007 |

3. SOLID WASTE DISPOSITION

| NO. OF SHIPMENTS | MODE OF TRANSPORTATION | DESTINATION |
|---|---|---|
| 1 | Sole use | Clive, UT |
| 2 | Sole use | Oak Ridge, TN |

## B. IRRADIATED FUEL SHIPMENTS (DISPOSITION) - None

## TABLE 2B

## SOLID WASTE AND IRRADIATED FUEL SHIPMENTS – 2014 amended

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

| 1. TYPE OF WASTE | UNIT | 6-MONTH PERIOD | 6-MONTH PERIOD | TOTAL |
|---|---|---|---|---|
| a. DRY COMPRESSIBLE WASTE, CONTAMINATED EQUIPMENT, METAL | $m^3$ | 232.4 | 353.3 | 585.7 |
| | Ci | 0.096 | 1.96 | 2.056 |
| b. ASBESTOS | $m^3$ | 30 | 37.45 | 67.45 |
| | Ci | 0.002 | 0.029 | 0.031 |
| c. ACTIVATED WASTE CONTROL ROD DRIVE MECHANISIM | $m^3$ | 0 | 32.85 | 32.85 |
| | Ci | 0 | 3.94 | 3.94 |
| d. OIL | $m^3$ | 0 | 5.26 | 5.26 |
| | Ci | 0 | 0.0742 | 0.0742 |
| e. LEAD | $m^3$ | 0 | 3.28 | 3.28 |
| | Ci | 0 | 0.0035 | 0.0035 |

| 2. ESTIMATE OF MAJOR NUCLIDE COMPOSITION (BY TYPE OF WASTE) | PERCENT OF TOTAL (>1%) | TOTAL CURIES |
|---|---|---|
| a. DRY COMPRESSIBLE WASTE, CONTAMINATED EQUIPMENT,METAL | | |
| Co-60 | 12.6 | 0.260 |
| Cs-137 | 8.9 | 0.182 |
| Fe-55 | 1.5 | 0.030 |
| H-3 | 2.4 | 0.049 |
| Ni-63 | 69.9 | 1.438 |
| Pu-241 | 2 | 0.041 |
| | | |
| b. ASBESTOS | | |
| Co-60 | 22.6 | 0.007 |
| Fe-55 | 3.2 | 0.001 |
| Ni-59 | 1 | 0.0002 |
| Ni-63 | 69 | 0.0214 |
| Pu-241 | 3.2 | 0.001 |

| c. ACTIVATED WASTE CONTROL ROD DRIVE MECHANISIM | | |
|---|---|---|
| Co-60 | 39 | 2.36 |
| H-3 | 2 | 0.104 |
| Ni-63 | 24 | 1.47 |
| | | |
| d. OIL | | |
| Co-60 | 5.4 | 0.004 |
| Cs-137 | 10.8 | 0.008 |
| H-3 | 2.7 | 0.002 |
| N-63 | 79.5 | 0.059 |
| Pu-241 | 1.3 | 0.001 |
| | | |
| e. LEAD | | |
| Co-60 | 22.8 | 0.008 |
| Fe-55 | 2.9 | 0.001 |
| Ni-59 | 1 | 0.0002 |
| Ni-63 | 68.6 | 0.024 |
| Pu-241 | 2.9 | 0.001 |

3. SOLID WASTE DISPOSITION

| NO. OF SHIPMENTS | MODE OF TRANSPORTATION | DESTINATION |
|---|---|---|
| 23 | Sole use | Oak Ridge, TN |

**B. IRRADIATED FUEL SHIPMENTS (DISPOSITION) - None**

## 8.0 OFFSITE DOSE CALCULATIONS SUMMARY AND CONCLUSIONS:

### 8.1 Gaseous Effluent Releases

The maximum quarterly offsite gamma dose due to noble gases was 0.00 mRad. The cumulative 2015 annual offsite gamma dose due to noble gases was 0.00 mRad.

The maximum quarterly offsite beta dose due to noble gases was 0.00 mRad. The cumulative 2015 annual offsite beta dose due to noble gases was 0.00 mRad.

The maximum quarterly offsite dose to any organ from the release of H-3 and all radionuclides in particulate form with half-lives greater than 8 days was approximately 3.47E-6 mRem. The cumulative 2015 annual maximum organ dose from these radionuclides was also approximately 8.43E-6 mRem.

The highest historical annual average X/Q equal to 1.82 E-6 sec/m3 for the period 1985-1987 for the worst case offsite receptor location, in accordance with the ODCM, was used to calculate these offsite dose values.

### 8.2 Liquid Effluent Releases

There were no liquid releases and therefore no dose from liquid releases.

### 8.3 Conclusion

All calculated offsite doses were below ODCM limits.

## 9.0 OFFSITE DOSE CALCULATION MANUAL (ODCM) REVIEW

Revision 15 to the ODCM was issued in August of 2014. The majority of the changes were made to reflect the current status of the facility with respect to its calculated radionuclide inventory. The calculation confirms it is not possible to

either (a) exceed the annual dose limits, or (b) reach the current airborne effluent monitor instantaneous release rate setpoint of 1500 mrem/yr. The LACBWR facility discontinued the monitoring of main stack air, offsite particulate air, OSL quarterly (not including ISFSI) monitoring as well as fish sampling from the Mississippi river.

## 10.0 PROCESS CONTROL PROGRAM

The process control program was last revised in 2012.

# 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 Appendix I 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 gaseous releases from the plant, as well as environmental samples of surface air, river water, river sediment, milk, fish, and penetrating radiation.

The REM program theory 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. A series of tables are included in this report to better show LACBWR's environmental program.

| | |
|---|---|
| TABLE 1 | This table shows the OSL locations at the ISFSI. |
| TABLE 2 | This table shows the sampling frequency of the various environmental samples and the analyses performed on these samples |
| TABLE 3 | This table shows the number of various samples collected and analyzed during 2015. |

## 2.0 RESULTS OF THE 2015 RADIO-ENVIRONMENTAL MONITORING SURVEYS

During 2015, 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 optically stimulated luminescent (OSL) dosimetry. These OSL's at the ISFSI are changed on a quarterly basis. Table 6 OSL results for 2015 are shown.

### 2.2 AIR PARTICULATE

Air particulate samples were discontinued in August 2014 when the requirements of the ODCM were updated.

### 2.3 RIVER WATER

River water was collected monthly and is now collected semi-annually. River water samples above at, and below the plant site are collected and are gamma

analyzed for isotopic concentration. The river water gamma isotopic analysis results are shown in Table 4. The results indicate that there were no significant plant attributable radionuclides in the river water.

### 2.4 SEDIMENT SAMPLES

Sediment samples are collected twice per year above, at, and below the plant outfall. These samples are gamma analyzed and these results appear on Table 5. They indicated that small amounts of plant-attributed radionuclides have accumulated in river sediments near the outfall. The amount of radionuclides in this sediment declined significantly after plant shutdown. These amounts have remained relatively constant the last few years.

### 2.5 FISH

Fish sampling has been eliminated as of August 2014 when the requirements of the ODCM were updated.

## 3.0 CONCLUSIONS

All environmental samples collected and analyzed during 2015 exhibited no significant contribution from LACBWR.

## 4.0 INTERLABORATORY COMPARISON PROGRAM RESULTS

During 2015, 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 is the result of this comparison. (results in pCi/L)

| ANALYSIS | LACBWR RESULTS | CONTRACTOR RESULTS | RATIO |
|---|---|---|---|
| GROSS BETA | 2.55E2 | 2.46E2 | 1.04 |
| GROSS ALPHA | 4.62E1 | 4.63E1 | 1 |
| I-131 | 9.58E1 | 9.26E1 | 1.03 |
| Cr-51 | 2.68E2 | 2.44E2 | 1.10 |
| Cs-134 | 1.24E2 | 1.39E2 | 0.89 |
| Cs-137 | 1.09E2 | 9.95E1 | 1.10 |
| Co-58 | 1.03E2 | 9.56E1 | 1.08 |
| Mn-54 | 1.42E2 | 1.26E2 | 1.13 |
| Fe-59 | 1.07E2 | 9.34E1 | 1.15 |
| Zn-65 | 2.46E2 | 2.15E2 | 1.14 |
| Co-60 | 1.92E2 | 1.85E2 | 1.04 |
| H-3 | 9.48E3 | 8.50E3 | 1.12 |

## TABLE 1

## ISFSI ENVIRONMENTAL DIRECT RADIATION BADGE LOCATIONS

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

## TABLE 2

## SAMPLE FREQUENCY AND ANALYSIS OF RADIO-ENVIRONMENTAL SAMPLES

| SAMPLE | FREQUENCY | ANALYSIS PERFORMED |
|---|---|---|
| OSL Dosimeters | Quarterly * | Dose in mRem |
| Particulate Air Glass Fiber Filters | Weekly ** | Gross Beta and Gamma Spectroscopy of Composites Monthly (HPGe-MCA) |
| Milk | Obtain sample as directed if abnormal stack particulate release occurs. | Gamma Spectroscopy |
| Sediment | Semi-annually | Gamma Spectroscopy |
| Fish | Quarterly ** | Gamma Spectroscopy |
| River | Semi-annually | Gamma isotopic analysis and tritium (Liquid Scintillation Analyzer) |
| Vegetation | Obtain sample as directed if abnormal stack particulate release occurs. | Gamma Spectroscopy |

*LACBWR Plant Monitoring discontinued in August 2014. LACBWR ISFSI Monitoring continues.

**Monitoring requirement eliminated in August 2014.

## TABLE 3

## RADIO-ENVIRONMENTAL SAMPLES COLLECTED

## JANUARY-DECEMBER 2015

| TYPE OF SAMPLE | NUMBER OF SAMPLES |
|---|---|
| Penetrating Radiation (OSL's) | 40 |
| Air Particulate | 0 |
| River Water | 6 |
| Sediment | 6 |

**TABLE 4**

RESULTS OF ANALYSIS OF MISSISSIPPI RIVER WATER IN THE VICINITY OF LACBWR

(Concentrations in pCi/Liter)

| COLLECTION DATE:<br>SAMPLE LOCATION: | SAMPLE #1<br>DAM 8<br>4/14/15 | SAMPLE #2<br>OUTFALL<br>4/14/15 | SAMPLE #3<br>VICTORY<br>4/14/15 | SAMPLE #1<br>DAM 8<br>10/14/15 | SAMPLE #2<br>OUTFALL<br>10/14/15 | SAMPLE #3<br>VICTORY<br>10/14/15 |
|---|---|---|---|---|---|---|
| ISOTOPES/RL * | | | | | | |
| H-3 | <114 | <114 | <114 | <746 | <746 | <746 |
| Mn-54/1000 | <3.97 | <3.99 | <3.96 | <4.07 | <3.97 | <3.97 |
| Co-60/300 | <4.24 | <4.17 | <4.15 | <4.49 | <4.30 | <4.22 |
| Zn-65/300 | <9.13 | <9.06 | <9.42 | <9.36 | <8.04 | <9.48 |
| Cs-134/30 | <4.49 | <4.47 | <4.60 | <4.59 | <4.48 | <4.52 |
| Cs-137/50 | <4.68 | <4.69 | <4.67 | <4.73 | <4.59 | <4.77 |

*RL = REPORTING LEVEL

**TABLE 5**

RESULTS OF ANALYSIS OF MISSISSIPPI RIVER SEDIMENT IN THE VICINITY OF LACBWR

(Concentration in pCi/Kg)

| SAMPLE LOCATION<br>COLLECTION DATE | UPSTREAM | OUTFALL | DOWNSTREAM | UPSTREAM | OUTFALL | DOWNSTREAM |
|---|---|---|---|---|---|---|
| ISOTOPES | | | | | | |
| Cs-134 | <6.53 | <5.98 | <8.39 | <6.34 | <5.82 | <8.45 |
| Cs-137 | <5.99 | 1110 | 92.2 | <5.69 | 240 | 62 |
| Co-60 | <6.35 | 12.9 | <10.4 | <5.97 | 21.5 | <8.01 |

**TABLE 6**

QUARTERLY OSL DOSIMETER DOSE MEASUREMENTS
IN THE ISFSI VICINITY BACKGROUND CORRECTED

JANUARY-DECEMBER 2015

| STATION NO. | 1st QUARTER mRem | 2nd QUARTER mRem | 3rd QUARTER mRem | 4th QUARTER mRem |
|---|---|---|---|---|
| 1 | 0 | 0 | 0 | 0 |
| 2 | 36.1 | 37.2 | 39.9 | 31.5 |
| 3 | 11.1 | 122.6 | 111.1 | 88.2 |
| 4 | 17.7 | 21.8 | 20.6 | 16.5 |
| 5 | 38.8 | 35.6 | 43.9 | 32.0 |
| 6 | 0 | 0 | 0 | 0 |
| 7 | 0 | 0 | 0 | 0 |
| 8 | 0 | 0 | 0 | 0 |
| 9 | 1.4 | 1.1 | 0 | 0 |
| 10 | 1.0 | 1.1 | 1.8 | 0.3 |