



Bureau of Radiation Safety



Environmental Monitoring Program for Nuclear Power Stations Report for Calendar Year 2013

September 2014

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Executive Summary

The Illinois Emergency Management Agency (IEMA) is mandated with protecting public health and safety and the environment from the potentially harmful effects of ionizing radiation. In support of that mission, IEMA's Bureau of Radiation Safety conducts environmental monitoring for the presence of radionuclides around Illinois' six operating nuclear power stations. IEMA also maintains a monitoring program in the environs of Zion Nuclear Power Station, which ceased operation in 1997 and is currently undergoing decommissioning.

IEMA's environmental monitoring program is completely independent and comprised of three primary functions: 1) collection of diverse samples from carefully chosen locations on a routine basis, including simultaneous field surveillance; 2) testing of samples for radionuclides; and 3) evaluation of test results on both an individual and long-term basis.

Federal regulations establish standards for protection against ionizing radiation resulting from activities conducted under U.S. Nuclear Regulatory Commission (US NRC) licenses, such as operation of nuclear power stations. The U.S. Environmental Protection Agency (US EPA) sets drinking water standards for several types of radioactive contaminants; the limit for tritium in drinking water is used for comparison purposes within this report.

In 2013, 1,100 samples were collected, tested, and evaluated. Sample types monitored by IEMA include water, sediment, soil, air, vegetation, vegetables, fish, milk, and environmental dosimetry.

In 2013, all test results for samples collected as part of IEMA's environmental monitoring program for nuclear power stations were below federal standards and guidelines.

Tritium was the only radionuclide detected attributable to nuclear power station operations. It was detected in several water samples. Tritium is a normal part of the effluent stream of nuclear power stations and the concentrations detected were well below the US EPA limit for tritium in drinking water.

Environmental dosimetry test results provide a baseline of ambient gamma radiation levels within a ten-mile radius of each nuclear power station, and other background reference locations across the state.

In 2013, all test results for environmental dosimetry were consistent with established background levels.

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**Illinois Emergency Management Agency
Bureau of Radiation Safety**

**Environmental Monitoring Program for Nuclear Power Stations
Report for Calendar Year 2013**

Introduction

With eleven operating reactors at six nuclear power stations, Illinois is home to more commercial nuclear power generation than any other state in the country. Although direct regulatory authority over all U.S. nuclear power stations resides with the U.S. Nuclear Regulatory Commission (US NRC), the Illinois Emergency Management Agency (IEMA) is mandated with protecting public health and safety and the environment from the potentially harmful effects of ionizing radiation. In support of that mission, IEMA's Bureau of Radiation Safety conducts environmental monitoring for the presence of radionuclides around Illinois' six operating nuclear power stations. IEMA also maintains a monitoring program in the environs of Zion Nuclear Power Station, which ceased operation in 1997 and is currently undergoing decommissioning. This report details IEMA's environmental monitoring program for the period January 2013 through December 2013 for the six operating nuclear power stations in Illinois and the one nuclear power station undergoing decommissioning.

Program Overview

IEMA has identified sampling locations which provide sample types appropriate to determine if a public health or environmental radiological impact is detected in the environs of the nuclear power stations due to their operation. In addition, test results establish baseline data which can be used to perform exposure assessments if necessary and to compare environmental radioactivity measurements in the event of a significant release of radioactivity anywhere in the world.

IEMA collects samples from designated sampling locations on a routine basis. IEMA tests these samples for the presence of radionuclides. Test results are evaluated on both an individual and long-term basis.

Sample matrices monitored by IEMA include water, sediment, soil, air, vegetation, vegetables, fish, milk, and environmental dosimetry. In 2013, 1,100 samples were collected, tested, and evaluated.

Program Update

In 2011, IEMA relied on Midwest Laboratory (Environmental, Inc.) for collection of the vast majority of samples taken in the environs of nuclear power stations. These samples were splits of samples collected by Midwest Laboratory for Exelon Corporation's Radiological Environmental Monitoring Program. All operating nuclear power stations in Illinois are owned by Exelon Corporation.

Following the Fukushima incident, IEMA commenced the process of moving towards independent sample collection. Since then, IEMA has developed and refined independent sampling plans in the environs of the six operating nuclear power stations and the one nuclear power station underdoing decommissioning. These sampling plans address all sample types with the exceptions of milk and fish, and IEMA collected samples in accordance with these plans throughout 2013.

This report includes test results for samples collected by both Midwest Laboratory and IEMA. IEMA discontinued its contract with Midwest Laboratory as 2013 came to a close; therefore, future reports will include only test results for samples collected by IEMA staff.

In late 2013, IEMA established Sangchris Lake State Park as a Background Reference Site and developed a corresponding sampling plan. This site was chosen due its distance from nuclear power stations and its close proximity to Springfield. Test results for samples collected in the environs of the Background Reference Site will be included in future reports.

Results at a Glance

Federal regulations establish standards for protection against ionizing radiation resulting from activities conducted under US NRC licenses, such as operation of nuclear power stations. The U.S. Environmental Protection Agency (US EPA) sets drinking water standards for several types of radioactive contaminants; the limit for tritium in drinking water is used for comparison purposes within this report.

In 2013, all test results for samples collected as part of IEMA's environmental monitoring program for nuclear power stations were below federal standards and guidelines.

Tritium was the only radionuclide detected attributable to nuclear power station operations. It was detected in several water samples. Tritium is a normal part of the effluent stream of nuclear power stations and the concentrations detected were well below the US EPA limit for tritium in drinking water.

Environmental dosimetry test results provide a baseline of ambient gamma radiation levels within a ten-mile radius of each nuclear power station, and other background reference locations across the state.

In 2013, all test results for environmental dosimetry were consistent with established background levels.

Analysis of Data

Negative numbers in the tables of this report are the values reported by the IEMA Radiochemistry Laboratory. Each batch of samples is counted with a sample blank to determine a background for each analytical instrument and each type of medium being analyzed. That background reading is then subtracted from the analytical result. When the sample has very little radioactivity, subtracting background values may actually result in a negative number.

Limits of Detection

All analytical methods have limitations: amounts that are just too small to be detected. The Minimum Detectable Concentration (MDC) is an “a priori” measure of that limitation – an estimate of the lower limit of detection. It is defined as the smallest quantity that an analytical method has 95% likelihood of detecting. For example, the MDC for IEMA’s method for tritium in water is 200 pCi/L. Given a sample with a tritium concentration of 200 pCi/L, our laboratory would detect that tritium approximately 95 times out of 100. Samples with less than 200 pCi/L could be detected, but with less certainty. Conversely, samples with more than 200 pCi/L would be more likely to be detected, approaching 100% as concentrations increase.

Analytical methods are chosen, in part, on their MDC. As a general rule, methods are chosen such that their MDC is less than 10% of any applicable regulatory limit. Table 1 lists MDCs for selected radionuclides in the various types of samples analyzed.

Table 1: Minimum Detectable Concentrations of Selected Radionuclides

Analyte	Water (pCi/L)	Fish (pCi/kg)	Milk (pCi/L)	Vegetables (pCi/kg)	Sediment (pCi/g)	Soil (pCi/g)
H-3	200					
I-131			5			
Cs-137	4	14	3	4	0.02	0.02
Co-60	4	15		4	0.02	0.02

Understanding a Test Result with a Confidence Interval

Test results in this report contain columns of information labeled Result, Uncertainty, and MDC. This is a standard method for reporting laboratory analysis results, and it allows the reader to look at factors that may affect the results, or may put the results into perspective.

MDC, minimum detectable concentration, is also an “a priori” value and can be thought of as “if it is in the sample you are likely to detect it” level. For this report, MDC’s are given as reference values and should not be used in comparison to the analytical result.

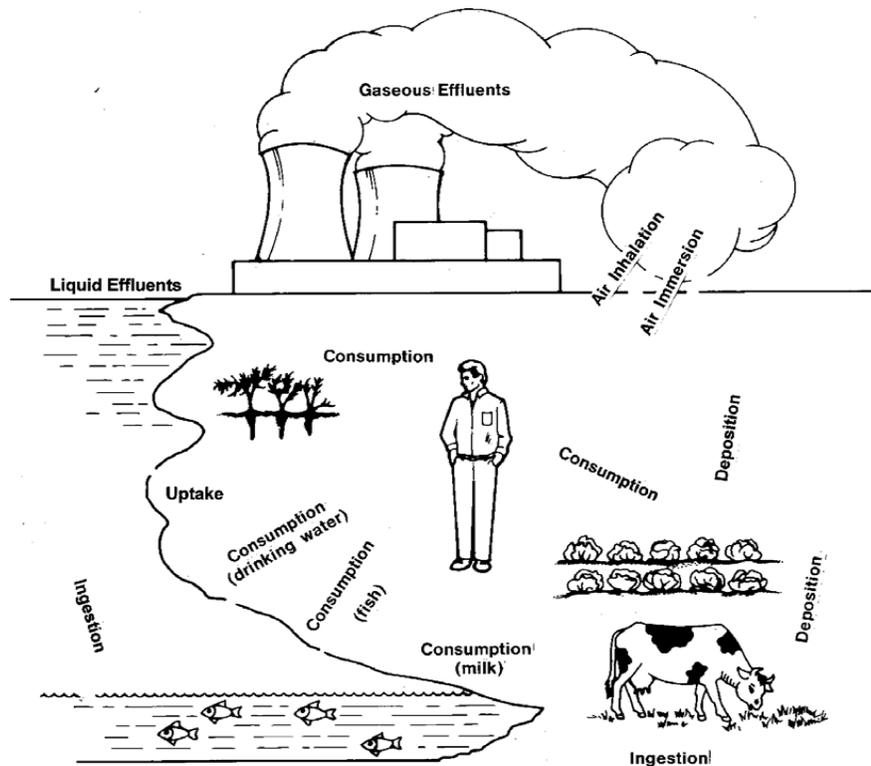
What does a tritium result of 519 ± 99.5 pCi/L, with 95% confidence, mean? First, the unit, pCi/L, is used to measure the amount of tritium, in picocuries (pCi), present in one liter (L) of water. Thus, the result tells us that the analysis found that the sample contains 519

picocuries of tritium per liter. However, all measurements have some uncertainty associated with them – some range of values which the analysis, if repeated, could reasonably be expected to be the result. In this case, the uncertainty is ± 99.5 pCi/L. If repeated, the analysis could reasonably be expected to return values as low as $519 - 99.5 = 419.5$ pCi/L and as high as $519 + 99.5 = 618.5$ pCi/L. The statement “with 95% confidence” tells us just how certain we can be about that range of values. In this case, there is a 95% probability that the sample contains between 419.5 and 618.5 picocuries of tritium per liter of water.

Radiation Exposure Pathways to Man

Samples collected for the IEMA environmental monitoring program reflect the critical pathways that radionuclides could be transported to and ingested by the general population: water, sediments, and fish from lakes and rivers downstream; groundwater from nearby wells; milk from local dairies; and, vegetables from nearby farms. Figure 1 depicts the different exposure pathways through which people may be other exposed to radiation, or may ingest radioactive material.

Figure 1. Radiation Exposure Pathways to Man



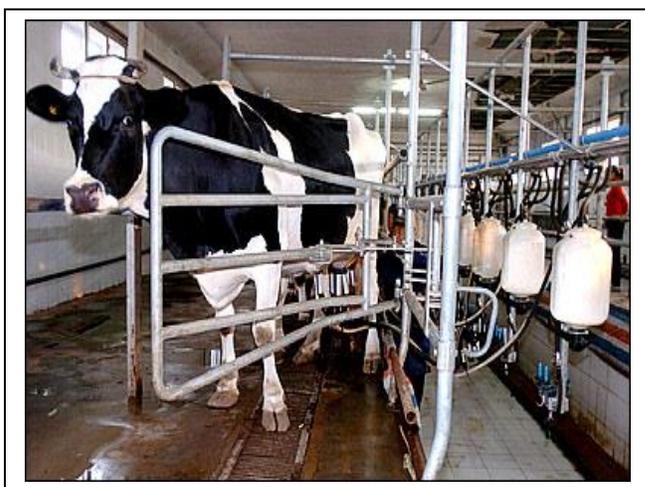
Water Samples

Nuclear power stations use large volumes of water and may, from time to time, discharge this water to rivers and lakes. This discharge is regulated by the US NRC and the Illinois Environmental Protection Agency (IEPA). Impacted bodies of water include the Kankakee, Illinois, Rock and Mississippi Rivers, Lake Michigan, and Clinton Lake. IEMA tests

samples from these bodies of water and from public drinking systems that draw their water from them.

Plant operations can also impact ground water so IEMA also analyzes samples collected from wells in and around the nuclear power stations. Ground water samples are collected and analyzed quarterly. For all water samples, typically 3-4 liters are collected per quarter. Water samples are monitored for several radionuclides associated with nuclear power plant operations including, but not limited to, H-3 (tritium), Co-60, Co-58, Cs-134, Cs-137, and gross alpha and gross beta radiation.

Milk Samples



In an emergency, a radioactive form of iodine, I-131 (iodine-131) can be released from nuclear power stations, be ingested or inhaled by cows, and exuded in their milk. Three of the stations, Braidwood, Byron and Quad Cities, have dairies operating within 10 miles of them, thus IEMA analyzed samples from these dairies. Samples consisted of approximately four liters of milk, mailed directly to IEMA and analyzed within five days of sampling by gamma spectroscopy, specifically for short-lived iodine isotopes. From May to October,

samples were collected every two weeks; samples were collected once a month for the rest of the year.

IEMA's results for I-131 concentrations in milk samples indicates that there were no milk samples with quantities of radioactive I-131 above "normal" or "background" levels.

Soil Samples

Radionuclides released into the air would be expected to eventually settle to the ground in locations downwind. IEMA analyzes soil samples collected from land around the nuclear power stations. Soil samples are collected annually in the summer. All soils are submitted for gamma spectroscopy analysis including, but not limited to, reactor-produced radionuclides such as Co-60, Co-58, Cs-134, and Cs-137. It should be noted that as a remnant of atmospheric nuclear weapons testing, Cs-137 is routinely observed in soil and sediment at concentrations of 0.1-0.2 pCi/g.

Sediment Samples

Radionuclides released into rivers would be expected to accumulate in sediments downstream. IEMA analyzes sediment samples that are collected from the rivers and lakes downstream of the nuclear power stations' effluent points. Sediments are collected semi-

annually in the spring and fall. All sediments are submitted for gamma spectroscopy analysis including, but not limited to, reactor-produced radionuclides such as Co-60, Co-58, Cs-134, and Cs-137. Again, it should be noted that as a remnant of atmospheric nuclear weapons testing, Cs-137 is routinely observed in sediment and soil at concentrations of 0.1-0.2 pCi/g.

Fish Samples

Like sediments, fish are excellent accumulators of radionuclides. Fish samples were collected from rivers, near nuclear power station discharge points. At each location, two different species of fish were collected. Edible portions of the fish were harvested and analyzed. Like sediments, fish samples were analyzed for reactor-produced radionuclides using gamma spectroscopy. During 2013, IEMA analyzed samples of Carp, Channel Catfish, Chinook Salmon, Freshwater Drum, Golden Redhorse, Largemouth Bass, Smallmouth Bass, Smallmouth Buffalo, and Walleye. The results showed no concentrations of reactor-produced radionuclides above background levels in any of the sampled fish.

Vegetation Samples

Radionuclides released into the atmosphere would be expected to deposit on the ground downwind from the nuclear power station, and are transported to the root system of plants when it rains. Plants may take up or metabolize radioactive materials in the soil. Vegetation samples were collected from the area around the each station in the late summer or fall. All vegetation samples were submitted to the IEMA Radiochemistry Laboratory for gamma spectroscopy analysis including, but not limited to, reactor-produced radionuclides such as Co-60, Co-58, Cs-134, and Cs-137. Only naturally occurring K-40 was detected.

Edible Vegetation (Vegetable) Samples



Edible vegetation and/or vegetables provide a pathway for human ingestion of radionuclides. Around each of the operating power stations except Clinton, vegetables were collected from nearby farms. Generally, two varieties of vegetables were collected: one root vegetable and one leafy green. Ideally, vegetables would be collected from four farms near each plant: one north of the plant, one east, one west, and one south, although the farms may vary from year to year. Like other accumulators, vegetable samples are analyzed for reactor-produced radionuclides such as Co-60, Co-58, Cs-134 and Cs-137, using gamma

spectroscopy. Results tables for vegetable samples analyzed during 2013 are included in the site-specific discussion sections of this report.

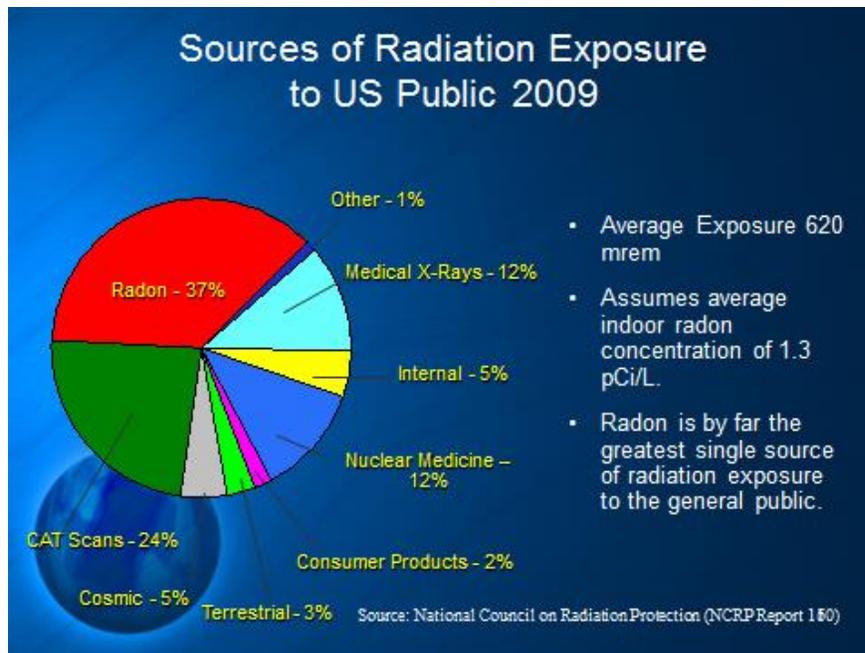
There is no indication of concentrations of reactor-produced radionuclides above background levels. Only naturally occurring K-40 was detected.

Ambient Gamma Monitoring

IEMA maintains a network of 515 environmental dosimeters around the six operating nuclear power stations and Zion. Unlike the environmental samples described above, dosimeters do not provide information on what radionuclides are found in the environment. Instead, dosimeters provide a direct measurement of the total dose produced by all sources of gamma radiation, including naturally occurring radionuclides and cosmic rays. The dosimeters are arrayed within a 10-mile radius of each plant and are exchanged and analyzed quarterly. IEMA performs the analysis of the dosimeters at the Springfield Laboratory location. While the dosimeters are used to monitor for small changes in ambient background levels of gamma radiation that could result from plant activities, they also play another important role. In the event of a significant off-site release from a nuclear plant the environmental dosimeters would be collected, read, and used to determine the extent and magnitude of the release, along with an estimate of the radiation dose that may have been received.

Results Tables for environmental dosimeters analyzed during 2013 are included in the site-specific sections of this report. In addition to the quarterly results, which are expressed as the average millirem per day, we have used those results to calculate the approximate millirem per year that would have been accrued by an individual at that location for an entire year. Those numbers can be compared to the average radiation exposure to an individual of 620 millirem per year from various sources (according to the 2009 National Council on Radiation Protection's Report). Approximately 8% of that exposure is from Terrestrial and Cosmic radiation (background radiation), and equals approximately 49.6 millirem per year.

Figure 2. Sources of Radiation Exposure to Man



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Braidwood Nuclear Power Station

Braidwood Station is located in Will County in northern Illinois, approximately fifteen miles south-southwest of Joliet, Illinois. This station utilizes two pressurized water reactors to generate electricity for Exelon. Unit 1 began operation in 1987 and Unit 2 in 1988.

Liquid effluents from the Braidwood Station are released in controlled batches to the Kankakee River. Critical pathways for potential radiation exposure to the public include milk, ingestion from drinking water and foodstuffs, and external gamma radiation from noble gases. Samples collected include: downstream surface and public drinking waters, private wells, a control surface water, milk from a local dairy farm, fish, local vegetables, and river sediments from the Kankakee River.

In 2005 it was discovered that a leak in the line that transported effluents to the Kankakee River had allowed for the unlicensed release of effluents to groundwater. As a result, tritium (H-3) was found in ground water and a pond outside the boundaries of the plant. As part of its efforts to identify releases and prevent future exposure to the public, IEMA samples water from public waterways, and analyzes samples to detect any further spread of the plume.



Water Samples

Water samples are collected from two locations in the Kankakee River, four surface water locations on-site, nine private drinking water wells, one public well and public drinking water supply that draws its water from the Kankakee River approximately six miles downstream of the effluent point. Ground water samples are collected once each quarter. Surface water samples are collected weekly and composited for quarterly analysis. All quarterly water samples are submitted for gross alpha, gross beta, tritium and gamma spectroscopy analyses.

Tritium (H-3) is a normal component of the effluent stream of nuclear power plants. Liquid effluents from the Braidwood station are released to the Kankakee River under permit from the Illinois Environmental Protection Agency (IEPA). Table 2 shows results for tritium in water samples taken around the Braidwood Nuclear Power Station. The highest tritium level, 9,890 pCi/L, was found in the Kankakee River in August, and is well below the US EPA drinking water standard of 20,000 pCi/L.

Water samples are screened for gross alpha and gross beta activity. Table 3 shows the results of alpha/beta screening. Samples are also analyzed for several gamma-emitting radionuclides associated with nuclear power plant operations including, but not limited to, Co-58, Co-60, Cs-134, and Cs-137. None of these were detected in 2013. Table 4 shows results for analysis of water samples taken from the Braidwood area.

Table 2. Tritium in Water Sample Results for Braidwood Area
Results are in picocuries per liter (pCi/L)

Location	Date	Result	Error	MDC
BD-51 (PW-015) F. Residence Well	1/8/2013	-16.1	81.6	138.0
PW-006	1/8/2013	-29.9	81.2	138.0
PW-011	1/8/2013	-6.9	81.8	138.0
PW-013	1/8/2013	89.6	84.4	138.0
PW-016	1/8/2013	-36.7	81.0	138.0
BD-13; Braidwood City Hall	1/11/2013	-27.5	69.1	118.0
BD-34; G. Residence Well	1/11/2013	-15.4	99.5	168.0
BD-35; J. Residence Well	1/11/2013	4.4	99.9	168.0
BD-36 H. Residence (quarterly grab)	1/11/2013	180.0	104.0	168.0
BD-37; N. Residence Well	1/11/2013	0.0	67.7	114.0
BD-50 S. Residence Well	1/11/2013	-2.2	99.8	168.0
BD-51 (PW-015) F. Residence Well	1/11/2013	-11.0	99.5	168.0
BD-54 (PW-007) C. Residence Well	1/11/2013	72.5	101.0	168.0
DS-02	3/20/2013	132.0	84.7	137.0
BD-10 Kankakee River D.S.	3/31/2013	18.4	70.9	118.0
BD-22 Kankakee R. @ Wilmington Waterworks	3/31/2013	375.0	81.2	118.0
BD-25 Kankakee River U.S.(replaces BD-7)	3/31/2013	9.2	70.6	118.0
BD-38 Drainage Ditch H.	3/31/2013	124.0	74.1	118.0
BD-40 Cooling Lake	3/31/2013	106.0	73.5	118.0
BD-55 N. Pond F.	3/31/2013	87.4	73.0	118.0
BD-56 S. Pond F.	3/31/2013	-30.8	99.4	168.0
BD-13; Braidwood City Hall	4/11/2013	-49.9	66.2	114.0
BD-34; G. Residence Well	4/11/2013	-43.4	66.4	114.0
BD-35; J. Residence Well	4/11/2013	-2.3	70.0	118.0
BD-36 H. Residence (quarterly grab)	4/11/2013	105.0	73.3	118.0
BD-37; N. Residence Well	4/11/2013	32.1	71.0	118.0
BD-50 S. Residence Well	4/11/2013	-4.6	69.9	118.0
BD-51 (PW-015) F. Residence Well	4/11/2013	64.2	72.0	118.0
BD-54 (PW-007) C. Residence Well	4/11/2013	36.7	71.2	118.0
BD-51 (PW-015) F. Residence Well	4/16/2013	13.6	81.2	136.0
PW-006	4/16/2013	-11.3	80.5	136.0
PW-006P	4/16/2013	15.8	81.2	136.0
PW-011	4/16/2013	-72.4	78.8	136.0
PW-013	4/16/2013	4.5	80.9	136.0

Location	Date	Result	Error	MDC
PW-016	4/16/2013	-49.8	79.4	136.0
SW-005	4/16/2013	31.7	81.6	136.0
BD-13; Braidwood City Hall	6/11/2013	28.6	79.3	132.0
Braidwood Cooling Lake at north boat launch	6/19/2013	-65.3	65.3	113.0
Braidwood Cooling Lake at south boat launch	6/19/2013	69.6	69.4	113.0
Kankakee R. at Des Plaine Cons Area Boat Launch	6/19/2013	-13.0	66.8	113.0
Kankakee R. at Kankakee River State Park boat launch	6/19/2013	-8.7	67.0	113.0
Kankakee R. at Wilmington Island Park. S. end of island above dam	6/19/2013	26.1	68.0	113.0
BD-40 Cooling Lake	6/30/2013	35.1	79.2	132.0
BD-55 N. Pond F.	6/30/2013	149.0	82.2	132.0
BD-35; J. Residence Well	7/11/2013	-4.4	78.0	131.0
BD-36 H. Residence (quarterly grab)	7/11/2013	166.0	114.0	185.0
BD-37; N. Residence Well	7/11/2013	25.4	111.0	185.0
BD-50 S. Residence Well	7/11/2013	-106.0	108.0	185.0
BD-51 (PW-015) F. Residence Well	7/11/2013	27.7	111.0	185.0
BD-54 (PW-007) C. Residence Well	7/11/2013	57.7	111.0	185.0
BD-51 (PW-015) F. Residence Well	7/15/2013	-23.5	112.0	188.0
PW-006	7/15/2013	21.1	113.0	188.0
PW-006	7/15/2013	-64.7	77.9	134.0
PW-006P	7/15/2013	40.2	80.8	134.0
PW-011	7/15/2013	-37.9	78.7	134.0
PW-013	7/15/2013	-8.9	79.5	134.0
PW-016	7/15/2013	-18.8	112.0	188.0
SW-005	7/15/2013	115.0	114.0	188.0
BD-34; G. Residence Well	8/1/2013	-25.3	109.0	185.0
Braidwood Cooling Lake at south boat launch	8/8/2013	41.2	110.0	184.0
Braidwood Cooling Lake at north boat launch	8/28/2013	57.2	110.0	184.0
Kankakee R. at Des Plaine Cons Area Boat Launch	8/28/2013	9890.0	235.0	184.0
Kankakee R. at Kankakee River State Park boat launch	8/28/2013	-11.4	109.0	184.0
Kankakee R. at Wilmington Island Park. S. end of island above dam	8/28/2013	1650.0	139.0	184.0
DS-02	9/28/2013	146.0	82.7	133.0
DS-02	10/6/2013	538.0	92.1	132.0
MW-109 D	10/6/2013	48.5	80.0	132.0
MW-111 DR	10/6/2013	79.3	80.8	132.0
MW-130 D	10/6/2013	30.9	79.6	132.0
MW-131 D	10/6/2013	57.3	80.2	132.0
MW-131 D	10/6/2013	-44.0	77.4	132.0
MW-134 D	10/18/2013	19.8	79.1	132.0
BD-51 (PW-015) F. Residence Well	10/22/2013	-28.6	77.8	132.0
PW-006	10/22/2013	-37.4	77.5	132.0
PW-006 A	10/22/2013	-32.4	110.0	186.0
PW-006P	10/22/2013	59.4	80.1	132.0
PW-013	10/22/2013	-104.0	108.0	186.0
PW-016	10/22/2013	4.4	78.7	132.0
SW-005	10/22/2013	-6.9	110.0	186.0
BD-34; G. Residence Well	11/7/2013	39.5	79.5	132.0
Braidwood Cooling Lake at north boat launch	12/10/2013	13.1	78.6	131.0
Braidwood Cooling Lake at south boat launch	12/10/2013	15.3	78.6	131.0
Kankakee R. at Kankakee River State Park boat launch	12/10/2013	-2.3	110.0	185.0
Kankakee R. at Wilmington Island Park. S. end of island above dam	12/10/2013	48.2	79.5	131.0

Table 3. Sample Results for Alpha/Beta Screening of Water from the Braidwood Area
Results are in picocuries per liter (pCi/L)

Location	Quarter 1		Quarter 2		Quarter 3		Quarter 4	
	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta
BD-10 Kankakee River D.S.								
Results	0.6	3.5			2.1	2.5		
Error	1.3	2.2			1.2	2.1		
MDC	2.0	3.7			1.8	3.5		
BD-13; Braidwood City Hall								
Results	34.9	24.7	59.0	37.8	6.7	14.0		
Error	2.5	2.6	3.0	3.1	1.5	2.4		
MDC	1.7	3.4	1.9	3.8	1.8	3.5		
BD-22 Kankakee R. @ Wilmington Waterworks								
Results	-0.1	3.3			0.3	2.2		
Error	1.2	2.2			1.1	2.1		
MDC	2.0	3.7			1.8	3.5		
BD-25 Kankakee River U.S.(replaces BD-7)								
Results	-0.2	5.8			0.9	5.4		
Error	1.2	2.3			1.2	2.2		
MDC	2.0	3.7			1.8	3.5		
BD-34; G. Residence Well								
Results	0.5	5.8	1.0	3.1	2.7	6.6	0.8	0.8
Error	1.2	2.2	1.2	2.3	1.5	2.5	1.4	2.3
MDC	1.8	3.4	1.9	3.8	2.2	4.0	2.1	3.9
BD-35; J. Residence Well								
Results	4.4	6.2	1.5	7.5	-0.4	5.6		
Error	1.5	1.9	1.1	2.4	1.3	2.6		
MDC	1.9	3.0	1.6	3.8	2.1	4.2		
BD-36 H. Residence (quarterly grab)								
Results	1.3	8.9	1.3	6.8	2.1	5.6		
Error	1.2	2.2	1.1	2.4	1.5	2.5		
MDC	1.8	3.4	1.6	3.8	2.2	4.0		
BD-37; N. Residence Well								
Results	1.5	3.9	0.6	7.3	0.0	4.1		
Error	1.3	1.9	1.1	2.4	1.4	2.4		
MDC	1.9	3.0	1.6	3.8	2.2	4.0		
BD-38 Drainage Ditch H.								
Results	0.6	4.8			2.2	5.2		
Error	1.3	2.3			1.2	2.2		
MDC	2.0	3.7			1.8	3.5		
BD-40 Cooling Lake								
Results	1.5	6.4			0.4	3.2		
Error	1.3	2.3			1.3	2.6		
MDC	2.0	3.7			2.1	4.2		

Location	Quarter 1		Quarter 2		Quarter 3		Quarter 4	
	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta
BD-50 S. Residence Well								
Results	0.5	4.8	0.4	1.3	-0.3	1.1		
Error	1.3	1.9	1.0	2.3	1.3	2.4		
MDC	1.9	3.0	1.6	3.8	2.2	4.0		
BD-51 (PW-015) F. Residence Well								
Results	4.5	1.5	1.7	1.4	0.3	0.0		
Error	1.5	1.8	1.1	2.3	1.4	2.3		
MDC	1.9	3.0	1.6	3.8	2.2	4.0		
BD-54 (PW-007) C. Residence Well								
Results	-0.3	5.8	1.6	6.4	1.0	5.1		
Error	1.1	2.2	1.1	2.4	1.4	2.5		
MDC	1.8	3.4	1.6	3.8	2.2	4.0		
BD-55 N. Pond F.								
Results	0.7	3.3			0.1	1.6		
Error	1.3	2.2			1.3	2.5		
MDC	2.0	3.7			2.1	4.2		
BD-56 S. Pond F.								
Results					0.9	3.4		
Error					1.2	2.2		
MDC					1.8	3.5		
Braidwood Cooling Lake at north boat launch								
Results					2.6	11.0	3.5	4.2
Error					2.6	5.0	1.5	2.6
MDC					4.0	8.0	2.1	4.3
Braidwood Cooling Lake at south boat launch								
Results					1.3	5.0	3.8	4.5
Error					1.4	2.6	1.5	2.6
MDC					2.1	4.2	2.1	4.3
Kankakee R. at Des Plaines Cons Area Boat Launch								
Results					1.6	7.5		
Error					2.6	4.9		
MDC					4.0	8.0		
Kankakee R. at Kankakee River State Park boat launch								
Results					0.9	1.8	1.5	3.3
Error					2.5	4.7	1.4	2.6
MDC					4.0	8.0	2.1	4.3
Kankakee R. at Wilmington Island Park. S. end of island above dam								
Results					0.2	4.3	1.3	2.5
Error					2.5	4.8	1.4	2.6
MDC					4.0	8.0	2.1	4.3

Table 4. Gamma Spectroscopy Sample Results for Other Radionuclides in Water from the Braidwood Area
Results are in picocuries per liter (pCi/L)

Location	Date	Nuclide	Result	Error	MDC
BD-34; G. Residence Well	1/11/2013	Co-58	0.0	2.5	3.6
BD-34; G. Residence Well	1/11/2013	Co-60	1.0	1.7	2.8
BD-34; G. Residence Well	1/11/2013	Cs-134	0.6	1.7	2.7
BD-34; G. Residence Well	1/11/2013	Cs-137	0.8	1.6	2.6
BD-35; J. Residence Well	1/11/2013	Co-58	0.0	2.3	3.7
BD-35; J. Residence Well	1/11/2013	Co-60	-1.2	2.5	3.5
BD-35; J. Residence Well	1/11/2013	Cs-134	-1.2	2.3	3.5
BD-35; J. Residence Well	1/11/2013	Cs-137	-0.5	2.2	3.3
BD-36 H. Residence (quarterly grab)	1/11/2013	Co-58	-2.9	1.4	3.5
BD-36 H. Residence (quarterly grab)	1/11/2013	Co-60	0.8	1.1	3.1
BD-36 H. Residence (quarterly grab)	1/11/2013	Cs-134	1.7	1.1	3.3
BD-36 H. Residence (quarterly grab)	1/11/2013	Cs-137	-0.7	1.1	3.0
BD-37; N. Residence Well	1/11/2013	Co-58	0.3	1.5	4.3
BD-37; N. Residence Well	1/11/2013	Co-60	1.6	1.3	4.0
BD-37; N. Residence Well	1/11/2013	Cs-134	-0.8	1.5	4.0
BD-37; N. Residence Well	1/11/2013	Cs-137	-0.4	1.3	3.7
BD-50 S. Residence Well	1/11/2013	Co-58	-1.0	2.2	3.1
BD-50 S. Residence Well	1/11/2013	Co-60	1.0	2.1	3.2
BD-50 S. Residence Well	1/11/2013	Cs-134	-1.2	2.1	3.0
BD-50 S. Residence Well	1/11/2013	Cs-137	-0.5	2.2	3.2
BD-51 (PW-015) F. Residence Well	1/11/2013	Co-58	0.6	4.0	3.1
BD-51 (PW-015) F. Residence Well	1/11/2013	Co-60	-0.8	4.2	2.9
BD-51 (PW-015) F. Residence Well	1/11/2013	Cs-134	1.5	3.7	3.0
BD-51 (PW-015) F. Residence Well	1/11/2013	Cs-137	-0.1	3.2	2.5
BD-54 (PW-007) C. Residence Well	1/11/2013	Co-58	-1.3	1.0	3.0
BD-54 (PW-007) C. Residence Well	1/11/2013	Co-60	0.6	1.0	3.0
BD-54 (PW-007) C. Residence Well	1/11/2013	Cs-134	-0.2	0.9	2.8
BD-54 (PW-007) C. Residence Well	1/11/2013	Cs-137	-0.7	0.9	2.8
BD-10 Kankakee River D.S.	3/31/2013	Co-58	-0.6	1.6	4.7
BD-10 Kankakee River D.S.	3/31/2013	Co-60	1.4	1.4	4.3
BD-10 Kankakee River D.S.	3/31/2013	Cs-134	1.9	1.3	4.1
BD-10 Kankakee River D.S.	3/31/2013	Cs-137	1.7	1.2	3.8
BD-22 Kankakee R. @ Wilmington Waterworks	3/31/2013	Co-58	-1.3	1.4	4.2
BD-22 Kankakee R. @ Wilmington Waterworks	3/31/2013	Co-60	-2.2	1.3	3.5
BD-22 Kankakee R. @ Wilmington Waterworks	3/31/2013	Cs-134	-0.6	1.3	3.8
BD-22 Kankakee R. @ Wilmington Waterworks	3/31/2013	Cs-137	-0.2	1.1	3.2
BD-25 Kankakee River U.S.(replaces BD-7)	3/31/2013	Co-58	0.9	1.4	4.3
BD-25 Kankakee River U.S.(replaces BD-7)	3/31/2013	Co-60	0.4	1.2	3.5

Location	Date	Nuclide	Result	Error	MDC
BD-25 Kankakee River U.S.(replaces BD-7)	3/31/2013	Cs-134	1.3	1.1	3.4
BD-25 Kankakee River U.S.(replaces BD-7)	3/31/2013	Cs-137	-1.3	1.1	3.0
BD-38 Drainage Ditch H.	3/31/2013	Co-58	0.4	1.8	5.3
BD-38 Drainage Ditch H.	3/31/2013	Co-60	-1.7	1.6	4.2
BD-38 Drainage Ditch H.	3/31/2013	Cs-134	1.3	1.4	4.2
BD-38 Drainage Ditch H.	3/31/2013	Cs-137	-0.8	1.2	3.5
BD-40 Cooling Lake	3/31/2013	Co-58	-1.2	1.4	4.0
BD-40 Cooling Lake	3/31/2013	Co-60	0.8	0.9	2.9
BD-40 Cooling Lake	3/31/2013	Cs-134	1.1	1.0	3.2
BD-40 Cooling Lake	3/31/2013	Cs-137	1.2	0.9	3.0
BD-55 N. Pond F.	3/31/2013	Co-58	-0.9	1.5	4.4
BD-55 N. Pond F.	3/31/2013	Co-60	-3.7	1.4	3.3
BD-55 N. Pond F.	3/31/2013	Cs-134	-1.5	1.2	3.5
BD-55 N. Pond F.	3/31/2013	Cs-137	-1.0	1.0	3.0
BD-34; G. Residence Well	4/11/2013	Co-58	0.1	2.0	3.0
BD-34; G. Residence Well	4/11/2013	Co-60	-0.8	1.8	2.6
BD-34; G. Residence Well	4/11/2013	Cs-134	0.2	1.7	2.7
BD-34; G. Residence Well	4/11/2013	Cs-137	0.6	1.6	2.6
BD-35; J. Residence Well	4/11/2013	Co-58	0.6	1.2	3.7
BD-35; J. Residence Well	4/11/2013	Co-60	-0.3	1.1	3.0
BD-35; J. Residence Well	4/11/2013	Cs-134	-0.3	1.2	3.3
BD-35; J. Residence Well	4/11/2013	Cs-137	0.7	1.0	3.2
BD-36 H. Residence (quarterly grab)	4/11/2013	Co-58	0.9	1.3	3.8
BD-36 H. Residence (quarterly grab)	4/11/2013	Co-60	-0.4	1.3	3.5
BD-36 H. Residence (quarterly grab)	4/11/2013	Cs-134	-2.0	1.4	3.6
BD-36 H. Residence (quarterly grab)	4/11/2013	Cs-137	-1.4	1.1	3.1
BD-37; N. Residence Well	4/11/2013	Co-58	1.8	1.4	4.4
BD-37; N. Residence Well	4/11/2013	Co-60	1.5	1.1	3.6
BD-37; N. Residence Well	4/11/2013	Cs-134	0.9	1.2	3.8
BD-37; N. Residence Well	4/11/2013	Cs-137	-0.3	1.3	3.7
BD-50 S. Residence Well	4/11/2013	Co-58	0.3	1.2	3.6
BD-50 S. Residence Well	4/11/2013	Co-60	0.4	1.2	3.6
BD-50 S. Residence Well	4/11/2013	Cs-134	1.8	1.2	3.8
BD-50 S. Residence Well	4/11/2013	Cs-137	-0.7	1.1	3.2
BD-51 (PW-015) F. Residence Well	4/11/2013	Co-58	0.6	1.1	3.4
BD-51 (PW-015) F. Residence Well	4/11/2013	Co-60	0.4	1.1	3.2
BD-51 (PW-015) F. Residence Well	4/11/2013	Cs-134	-1.4	1.1	3.0
BD-51 (PW-015) F. Residence Well	4/11/2013	Cs-137	-2.4	1.1	2.9
BD-54 (PW-007) C. Residence Well	4/11/2013	Co-58	0.1	1.3	3.8
BD-54 (PW-007) C. Residence Well	4/11/2013	Co-60	2.1	1.1	3.6

Location	Date	Nuclide	Result	Error	MDC
BD-54 (PW-007) C. Residence Well	4/11/2013	Cs-134	0.4	1.3	3.8
BD-54 (PW-007) C. Residence Well	4/11/2013	Cs-137	-2.3	1.1	3.0
BD-13; Braidwood City Hall	6/11/2013	Co-58	1.0	2.6	7.6
BD-13; Braidwood City Hall	6/11/2013	Co-60	0.3	0.9	2.7
BD-13; Braidwood City Hall	6/11/2013	Cs-134	-0.6	1.1	3.0
BD-13; Braidwood City Hall	6/11/2013	Cs-137	-0.2	0.8	2.5
Braidwood Cooling Lake at north boat launch	6/19/2013	Co-58	2.6	1.6	5.3
Braidwood Cooling Lake at north boat launch	6/19/2013	Co-60	0.0	1.2	3.5
Braidwood Cooling Lake at north boat launch	6/19/2013	Cs-134	-0.1	1.2	3.5
Braidwood Cooling Lake at north boat launch	6/19/2013	Cs-137	-0.1	1.1	3.4
Braidwood Cooling Lake at south boat launch	6/19/2013	Co-58	0.5	1.2	3.7
Braidwood Cooling Lake at south boat launch	6/19/2013	Co-60	0.7	1.0	3.0
Braidwood Cooling Lake at south boat launch	6/19/2013	Cs-134	0.4	1.0	3.1
Braidwood Cooling Lake at south boat launch	6/19/2013	Cs-137	-1.4	0.9	2.7
Kankakee R. at Des Plaine Cons Area Boat Launch	6/19/2013	Co-58	0.9	1.9	5.7
Kankakee R. at Des Plaine Cons Area Boat Launch	6/19/2013	Co-60	-0.7	1.3	3.5
Kankakee R. at Des Plaine Cons Area Boat Launch	6/19/2013	Cs-134	0.0	1.4	4.0
Kankakee R. at Des Plaine Cons Area Boat Launch	6/19/2013	Cs-137	1.1	1.4	4.1
Kankakee R. at Kankakee River State Park boat launch	6/19/2013	Co-58	-1.3	1.6	4.8
Kankakee R. at Kankakee River State Park boat launch	6/19/2013	Co-60	-0.7	1.3	3.7
Kankakee R. at Kankakee River State Park boat launch	6/19/2013	Cs-134	0.4	1.2	3.8
Kankakee R. at Kankakee River State Park boat launch	6/19/2013	Cs-137	0.4	1.1	3.3
Kankakee R. at Wilmington Island Park. South end of island above dam	6/19/2013	Co-58	-1.0	1.7	4.8
Kankakee R. at Wilmington Island Park. South end of island above dam	6/19/2013	Co-60	-1.2	1.2	3.2
Kankakee R. at Wilmington Island Park. South end of island above dam	6/19/2013	Cs-134	0.4	1.2	3.6
Kankakee R. at Wilmington Island Park. South end of island above dam	6/19/2013	Cs-137	1.6	1.0	3.3
BD-10 Kankakee River D.S.	6/30/2013	Co-58	-5.5	2.4	6.3
BD-10 Kankakee River D.S.	6/30/2013	Co-60	-1.0	1.1	3.1
BD-10 Kankakee River D.S.	6/30/2013	Cs-134	0.3	1.2	3.7
BD-10 Kankakee River D.S.	6/30/2013	Cs-137	0.3	1.0	3.1
BD-22 Kankakee R. @ Wilmington Waterworks	6/30/2013	Co-58	2.1	1.7	5.5
BD-22 Kankakee R. @ Wilmington Waterworks	6/30/2013	Co-60	2.1	0.9	3.1
BD-22 Kankakee R. @ Wilmington Waterworks	6/30/2013	Cs-134	2.0	1.0	3.4
BD-22 Kankakee R. @ Wilmington Waterworks	6/30/2013	Cs-137	0.8	0.9	2.9
BD-25 Kankakee River U.S.(replaces BD-7)	6/30/2013	Co-58	0.8	2.3	6.6
BD-25 Kankakee River U.S.(replaces BD-7)	6/30/2013	Co-60	0.1	1.1	3.1

Location	Date	Nuclide	Result	Error	MDC
BD-25 Kankakee River U.S.(replaces BD-7)	6/30/2013	Cs-134	0.9	1.2	3.7
BD-25 Kankakee River U.S.(replaces BD-7)	6/30/2013	Cs-137	0.8	0.9	3.0
BD-38 Drainage Ditch H.	6/30/2013	Co-58	-0.4	2.0	6.2
BD-38 Drainage Ditch H.	6/30/2013	Co-60	-0.4	1.1	3.2
BD-38 Drainage Ditch H.	6/30/2013	Cs-134	-0.3	1.1	3.4
BD-38 Drainage Ditch H.	6/30/2013	Cs-137	1.1	0.9	2.9
BD-40 Cooling Lake	6/30/2013	Co-58	-0.2	2.1	6.5
BD-40 Cooling Lake	6/30/2013	Co-60	1.4	1.1	3.3
BD-40 Cooling Lake	6/30/2013	Cs-134	0.1	1.0	3.1
BD-40 Cooling Lake	6/30/2013	Cs-137	-0.8	0.9	2.8
BD-55 N. Pond F.	6/30/2013	Co-58	0.4	2.2	6.8
BD-55 N. Pond F.	6/30/2013	Co-60	0.8	1.0	3.1
BD-55 N. Pond F.	6/30/2013	Cs-134	0.0	1.1	3.3
BD-55 N. Pond F.	6/30/2013	Cs-137	0.3	0.9	2.9
BD-35; J. Residence Well	7/11/2013	Co-58	7.1	2.2	7.3
BD-35; J. Residence Well	7/11/2013	Co-60	-0.8	1.2	3.4
BD-35; J. Residence Well	7/11/2013	Cs-134	0.1	1.3	3.8
BD-35; J. Residence Well	7/11/2013	Cs-137	1.4	1.0	3.3
BD-36 H. Residence (quarterly grab)	7/11/2013	Co-58	3.9	2.2	6.9
BD-36 H. Residence (quarterly grab)	7/11/2013	Co-60	1.1	0.9	2.8
BD-36 H. Residence (quarterly grab)	7/11/2013	Cs-134	-1.3	1.1	3.0
BD-36 H. Residence (quarterly grab)	7/11/2013	Cs-137	0.3	0.9	2.8
BD-37; N. Residence Well	7/11/2013	Co-58	-0.4	2.1	6.6
BD-37; N. Residence Well	7/11/2013	Co-60	-0.1	1.0	2.9
BD-37; N. Residence Well	7/11/2013	Cs-134	0.2	1.0	3.2
BD-37; N. Residence Well	7/11/2013	Cs-137	-0.5	0.9	2.8
BD-50 S. Residence Well	7/11/2013	Co-58	0.1	3.4	5.4
BD-50 S. Residence Well	7/11/2013	Co-60	0.2	2.0	3.0
BD-50 S. Residence Well	7/11/2013	Cs-134	0.5	1.8	3.0
BD-50 S. Residence Well	7/11/2013	Cs-137	0.0	1.5	2.4
BD-51 (PW-015) F. Residence Well	7/11/2013	Co-58	-3.0	2.2	6.0
BD-51 (PW-015) F. Residence Well	7/11/2013	Co-60	1.3	0.9	2.9
BD-51 (PW-015) F. Residence Well	7/11/2013	Cs-134	1.1	1.1	3.3
BD-51 (PW-015) F. Residence Well	7/11/2013	Cs-137	1.0	0.9	2.9
BD-54 (PW-007) C. Residence Well	7/11/2013	Co-58	-1.2	2.1	6.3
BD-54 (PW-007) C. Residence Well	7/11/2013	Co-60	0.4	1.0	3.1
BD-54 (PW-007) C. Residence Well	7/11/2013	Cs-134	1.1	1.0	3.1
BD-54 (PW-007) C. Residence Well	7/11/2013	Cs-137	1.1	0.9	3.0
BD-34; G. Residence Well	8/1/2013	Co-58	-4.0	2.1	5.6

Location	Date	Nuclide	Result	Error	MDC
BD-34; G. Residence Well	8/1/2013	Co-60	0.4	1.2	3.6
BD-34; G. Residence Well	8/1/2013	Cs-134	-0.5	1.2	3.4
BD-34; G. Residence Well	8/1/2013	Cs-137	0.0	1.0	3.0
Braidwood Cooling Lake at south boat launch	8/8/2013	Co-58	1.9	1.5	4.6
Braidwood Cooling Lake at south boat launch	8/8/2013	Co-60	0.5	0.9	2.7
Braidwood Cooling Lake at south boat launch	8/8/2013	Cs-134	0.6	1.0	3.1
Braidwood Cooling Lake at south boat launch	8/8/2013	Cs-137	0.9	0.9	2.7
Braidwood Cooling Lake at north boat launch	8/28/2013	Co-58	4.5	1.5	4.8
Braidwood Cooling Lake at north boat launch	8/28/2013	Co-60	0.9	1.0	2.9
Braidwood Cooling Lake at north boat launch	8/28/2013	Cs-134	-0.5	1.0	2.8
Braidwood Cooling Lake at north boat launch	8/28/2013	Cs-137	2.9	0.8	2.8
Kankakee R. at Des Plaine Cons Area Boat Launch	8/28/2013	Co-58	-2.2	2.1	5.6
Kankakee R. at Des Plaine Cons Area Boat Launch	8/28/2013	Co-60	1.0	1.4	4.0
Kankakee R. at Des Plaine Cons Area Boat Launch	8/28/2013	Cs-134	1.7	1.4	4.2
Kankakee R. at Des Plaine Cons Area Boat Launch	8/28/2013	Cs-137	0.8	1.2	3.7
Kankakee R. at Kankakee River State Park boat launch	8/28/2013	Co-58	-3.2	1.5	4.2
Kankakee R. at Kankakee River State Park boat launch	8/28/2013	Co-60	0.1	1.0	3.1
Kankakee R. at Kankakee River State Park boat launch	8/28/2013	Cs-134	0.3	1.0	3.2
Kankakee R. at Kankakee River State Park boat launch	8/28/2013	Cs-137	-0.6	0.9	2.8
Kankakee R. at Wilmington Island Park. South end of island above dam	8/28/2013	Co-58	1.5	1.6	5.0
Kankakee R. at Wilmington Island Park. South end of island above dam	8/28/2013	Co-60	-0.9	1.2	3.3
Kankakee R. at Wilmington Island Park. South end of island above dam	8/28/2013	Cs-134	0.1	1.2	3.6
Kankakee R. at Wilmington Island Park. South end of island above dam	8/28/2013	Cs-137	-2.2	1.1	3.0
BD-13; Braidwood City Hall	10/10/2013	Co-58	2.2	1.9	6.2
BD-13; Braidwood City Hall	10/10/2013	Co-60	-0.7	1.3	3.5
BD-13; Braidwood City Hall	10/10/2013	Cs-134	0.1	1.2	3.5
BD-13; Braidwood City Hall	10/10/2013	Cs-137	0.8	1.0	3.2
BD-35; J. Residence Well	10/11/2013	Co-58	-1.7	3.4	4.8
BD-35; J. Residence Well	10/11/2013	Co-60	0.6	1.9	3.0
BD-35; J. Residence Well	10/11/2013	Cs-134	2.4	1.9	3.2
BD-35; J. Residence Well	10/11/2013	Cs-137	-0.6	1.7	2.6
BD-36 H. Residence (quarterly grab)	10/11/2013	Co-58	-0.4	3.3	4.7
BD-36 H. Residence (quarterly grab)	10/11/2013	Co-60	0.4	1.8	2.8
BD-36 H. Residence (quarterly grab)	10/11/2013	Cs-134	-0.2	1.8	2.9
BD-36 H. Residence (quarterly grab)	10/11/2013	Cs-137	-0.5	1.7	2.5

Location	Date	Nuclide	Result	Error	MDC
BD-37; N. Residence Well	10/11/2013	Co-58	-0.1	1.7	4.9
BD-37; N. Residence Well	10/11/2013	Co-60	0.5	0.9	2.6
BD-37; N. Residence Well	10/11/2013	Cs-134	-0.8	1.1	3.2
BD-37; N. Residence Well	10/11/2013	Cs-137	-1.7	0.9	2.6
BD-50 S. Residence Well	10/11/2013	Co-58	-0.7	2.1	6.2
BD-50 S. Residence Well	10/11/2013	Co-60	-0.2	1.4	3.9
BD-50 S. Residence Well	10/11/2013	Cs-134	-1.0	1.4	3.9
BD-50 S. Residence Well	10/11/2013	Cs-137	-0.8	1.1	3.2
BD-51 (PW-015) F. Residence Well	10/11/2013	Co-58	2.4	1.5	5.1
BD-51 (PW-015) F. Residence Well	10/11/2013	Co-60	-0.4	1.1	3.2
BD-51 (PW-015) F. Residence Well	10/11/2013	Cs-134	2.0	1.1	3.8
BD-51 (PW-015) F. Residence Well	10/11/2013	Cs-137	-0.6	1.0	3.1
BD-54 (PW-007) C. Residence Well	10/11/2013	Co-58	1.6	1.6	5.0
BD-54 (PW-007) C. Residence Well	10/11/2013	Co-60	0.8	1.1	3.2
BD-54 (PW-007) C. Residence Well	10/11/2013	Cs-134	2.4	1.0	3.4
BD-54 (PW-007) C. Residence Well	10/11/2013	Cs-137	-1.4	1.0	2.9
BD-10 Kankakee River D.S.	10/15/2013	Co-58	2.8	1.8	5.7
BD-10 Kankakee River D.S.	10/15/2013	Co-60	1.1	1.1	3.5
BD-10 Kankakee River D.S.	10/15/2013	Cs-134	-0.2	1.3	3.7
BD-10 Kankakee River D.S.	10/15/2013	Cs-137	-0.5	1.0	3.0
BD-22 Kankakee R. @ Wilmington Waterworks	10/15/2013	Co-58	-1.8	3.4	4.8
BD-22 Kankakee R. @ Wilmington Waterworks	10/15/2013	Co-60	-0.3	2.0	2.8
BD-22 Kankakee R. @ Wilmington Waterworks	10/15/2013	Cs-134	0.5	1.7	2.7
BD-22 Kankakee R. @ Wilmington Waterworks	10/15/2013	Cs-137	0.1	1.7	2.6
BD-25 Kankakee River U.S.(replaces BD-7)	10/15/2013	Co-58	-1.3	2.3	6.4
BD-25 Kankakee River U.S.(replaces BD-7)	10/15/2013	Co-60	-1.1	1.4	3.6
BD-25 Kankakee River U.S.(replaces BD-7)	10/15/2013	Cs-134	2.3	1.3	4.1
BD-25 Kankakee River U.S.(replaces BD-7)	10/15/2013	Cs-137	-0.6	1.3	3.6
BD-38 Drainage Ditch H.	10/15/2013	Co-58	-0.7	1.9	5.8
BD-38 Drainage Ditch H.	10/15/2013	Co-60	0.8	1.2	3.6
BD-38 Drainage Ditch H.	10/15/2013	Cs-134	2.4	1.2	4.0
BD-38 Drainage Ditch H.	10/15/2013	Cs-137	-0.5	1.1	3.3
BD-40 Cooling Lake	10/15/2013	Co-58	-1.8	1.6	4.7
BD-40 Cooling Lake	10/15/2013	Co-60	2.2	1.0	3.3
BD-40 Cooling Lake	10/15/2013	Cs-134	0.6	1.0	3.2
BD-40 Cooling Lake	10/15/2013	Cs-137	0.9	0.9	2.9
BD-55 N. Pond F.	10/15/2013	Co-58	0.0	1.8	5.2
BD-55 N. Pond F.	10/15/2013	Co-60	1.0	0.9	2.8
BD-55 N. Pond F.	10/15/2013	Cs-134	-0.9	1.0	2.9
BD-55 N. Pond F.	10/15/2013	Cs-137	0.1	0.8	2.6

Location	Date	Nuclide	Result	Error	MDC
BD-56 S. Pond F.	10/15/2013	Co-58	-3.4	2.1	5.5
BD-56 S. Pond F.	10/15/2013	Co-60	-0.3	1.1	3.1
BD-56 S. Pond F.	10/15/2013	Cs-134	0.8	1.3	3.7
BD-56 S. Pond F.	10/15/2013	Cs-137	0.6	0.9	3.0
BD-34; G. Residence Well	11/7/2013	Co-58	-0.6	1.4	3.9
BD-34; G. Residence Well	11/7/2013	Co-60	-0.6	0.9	2.5
BD-34; G. Residence Well	11/7/2013	Cs-134	0.2	1.0	3.0
BD-34; G. Residence Well	11/7/2013	Cs-137	0.4	0.8	2.6

Milk Samples

Milk samples were collected from two nearby dairies. Each month, approximately four liters of milk were collected and mailed directly to the IEMA Radiochemistry Laboratory. Samples were analyzed within five days of sampling by gamma spectroscopy, specifically for short-lived iodine isotopes.

No radionuclides associated with nuclear power station operations were detected in milk samples collected near Braidwood. Only naturally occurring K-40 was detected, and it was within the range typical of established background (1,266 to 14,700 pCi/L). See Table 5 (below) for Iodine-131 results from milk samples taken from Braidwood-area dairies.

Table 5. Iodine-131 in Milk Sample Results for Braidwood Area
Results are in picocuries per liter (pCi/L)

DATE	BD-17 Dairy Farm H			BD-18 Dairy Farm B		
	Error	Result	MDC	Error	Result	MDC
1/4/2013	2.5	-0.3	3.8	2.7	-1.7	4.0
2/7/2013	1.4	-2.1	4.3	1.7	0.7	5.1
3/7/2013	1.6	0.0	4.7	2.0	-1.9	5.8
4/4/2013	1.5	0.5	4.4	1.5	-1.4	4.3
5/2/2013	1.0	0.1	3.4	1.6	1.7	4.9
5/16/2013	1.5	0.0	4.5	1.4	2.0	4.4
5/30/2013	2.5	-0.9	3.8	2.8	-1.1	4.2
6/13/2013	6.2	0.7	9.5	6.3	3.7	19.5
6/27/2013	1.7	-0.1	5.1	2.4	2.7	3.9
7/11/2013	1.5	0.9	4.6	1.4	0.6	4.3
8/8/2013	1.6	1.8	5.0	1.0	0.5	3.4
8/22/2013	1.4	-1.3	4.1	1.5	-1.3	4.5
9/5/2013	1.1	0.5	3.6	1.1	0.6	3.5
9/19/2013	2.2	0.2	3.4	1.4	-0.5	4.2
10/3/2013	1.3	1.6	4.1	1.5	1.9	4.8
10/17/2013	1.6	-1.3	4.7	1.6	0.4	4.7
10/31/2013	1.4	-0.1	4.1	1.2	0.5	3.7
11/14/2013	1.3	-2.4	3.8	2.3	-0.2	3.6
12/5/2013	1.3	-2.2	4.1			
12/8/2013				1.6	-0.1	4.9

Soil Samples

Soil samples were collected from land surrounding the plant in the fall. All samples were submitted for gamma spectroscopy analysis.

Sediment samples are monitored for several radionuclides associated with nuclear power plant operations including, but not limited to, Co-58, Co-60, Cs-134, and Cs-137. It should be noted that as a remnant of atmospheric nuclear weapons testing, Cs-137 is routinely observed in sediment and soil at concentrations of 0.1-0.2 pCi/g. Table 6 shows the results of analysis of sediment samples taken from the Braidwood Area.

No radionuclides associated with nuclear power plant operations were detected in samples collected near Braidwood. Other radionuclides detected were naturally occurring.

Table 6. Soil Sample Results for Braidwood Area
Results are in picocuries per gram (pCi/g)

Location	Date	Nuclide	Result	Error	MDC
Evans-Judge Preserve	8/29/2013	Co-58	0.0	0.0	0.0
Evans-Judge Preserve	8/29/2013	Co-60	0.0	0.0	0.0
Evans-Judge Preserve	8/29/2013	Cs-134	0.0	0.0	0.0
Evans-Judge Preserve	8/29/2013	Cs-137	0.1	0.0	0.0

Sediment Samples

Sediment samples were collected from the Kankakee River downstream of the plant's effluent point. All sediments are submitted for gamma spectroscopy analysis.

Sediment samples are analyzed for several radionuclides associated with nuclear power plant operations including, but not limited to, Co-58, Co-60, Cs-134, and Cs-137. A remnant of atmospheric nuclear weapons testing, Cs-137 is present in most sediment and soil at concentrations of 0.1-0.2 pCi/g. Table 7 shows the results of analysis of sediment samples taken from the Braidwood Area.

No radionuclides associated with nuclear power plant operations were detected in samples collected near Braidwood. Other radionuclides detected were naturally occurring.

Table 7. Sediment Sample Results for Braidwood Area
Results are in picocuries per gram (pCi/g)

Location	Date	Nuclide	Result	Error	MDC
BD-57 Circulating Water Blowdown	5/16/2013	Co-58	-0.1	0.1	0.3
BD-57 Circulating Water Blowdown	5/16/2013	Co-60	0.0	0.0	0.2
BD-57 Circulating Water Blowdown	5/16/2013	Cs-134	0.1	0.0	0.1
BD-57 Circulating Water Blowdown	5/16/2013	Cs-137	0.0	0.0	0.1
Braidwood Cooling Lake at north boat launch	6/19/2013	Co-58	0.0	0.0	0.0

Location	Date	Nuclide	Result	Error	MDC
Braidwood Cooling Lake at north boat launch	6/19/2013	Co-60	0.0	0.0	0.0
Braidwood Cooling Lake at north boat launch	6/19/2013	Cs-134	0.0	0.0	0.0
Braidwood Cooling Lake at north boat launch	6/19/2013	Cs-137	0.0	0.0	0.0
Kankakee R. at Kankakee River State Park boat launch	6/19/2013	Co-58	0.0	0.0	0.1
Kankakee R. at Kankakee River State Park boat launch	6/19/2013	Co-60	0.0	0.0	0.0
Kankakee R. at Kankakee River State Park boat launch	6/19/2013	Cs-134	0.0	0.0	0.0
Kankakee R. at Kankakee River State Park boat launch	6/19/2013	Cs-137	0.1	0.0	0.0
Kankakee R. at Wilmington Island Park. South end of island above dam	6/19/2013	Co-58	0.0	0.0	0.1
Kankakee R. at Wilmington Island Park. South end of island above dam	6/19/2013	Co-60	0.0	0.0	0.0
Kankakee R. at Wilmington Island Park. South end of island above dam	6/19/2013	Cs-134	0.0	0.0	0.0
Kankakee R. at Wilmington Island Park. South end of island above dam	6/19/2013	Cs-137	0.1	0.0	0.0
BD-57 Circulating Water Blowdown	10/3/2013	Co-58	-0.1	0.1	0.2
BD-57 Circulating Water Blowdown	10/3/2013	Co-60	0.0	0.0	0.1
BD-57 Circulating Water Blowdown	10/3/2013	Cs-134	-0.1	0.0	0.1
BD-57 Circulating Water Blowdown	10/3/2013	Cs-137	0.0	0.1	0.2

Fish Samples

Like sediments, fish were collected from rivers, typically near the plant discharge point. At each location, two different species of fish were collected. Edible portions of the fish were harvested by technicians at Midwest Laboratory and prepared for analysis. Splits of the samples were provided to the IEMA Radiochemistry Laboratory. Fish samples are analyzed for reactor-produced radionuclides using gamma spectroscopy.

No radionuclides associated with nuclear power plant operations were detected in fish samples collected near Braidwood. Other radionuclides detected were naturally occurring. Table 8 shows results from fish sampling during 2013.

Table 8. Fish Sample Results for Braidwood Area
Results are in picocuries per kilogram (pCi/kg)

Location	Date	Nuclide	Result	Error	MDC	Comments
BD-28 @ Discharge Point (Sector E)	5/1/2013	Co-58	-148.0	43.0	110.0	Freshwater Drum
BD-28 @ Discharge Point (Sector E)	5/1/2013	Co-60	11.1	14.1	43.6	Freshwater Drum
BD-28 @ Discharge Point (Sector E)	5/1/2013	Cs-134	15.3	13.5	43.9	Freshwater Drum
BD-28 @ Discharge Point (Sector E)	5/1/2013	Cs-137	-3.5	11.2	34.0	Freshwater Drum
BD-28 @ Discharge Point (Sector E)	5/1/2013	Co-58	19.8	29.0	86.9	Largemouth Bass
BD-28 @ Discharge Point (Sector E)	5/1/2013	Co-60	-0.2	9.0	25.1	Largemouth Bass

Location	Date	Nuclide	Result	Error	MDC	Comments
BD-28 @ Discharge Point (Sector E)	5/1/2013	Cs-134	7.0	9.2	27.4	Largemouth Bass
BD-28 @ Discharge Point (Sector E)	5/1/2013	Cs-137	-11.1	7.7	20.9	Largemouth Bass
BD-41; Kankakee River, DS Cooling Lake Boat Ramp	5/1/2013	Co-58	19.7	21.6	69.9	Channel Catfish
BD-41; Kankakee River, DS Cooling Lake Boat Ramp	5/1/2013	Co-60	-16.7	8.6	22.2	Channel Catfish
BD-41; Kankakee River, DS Cooling Lake Boat Ramp	5/1/2013	Cs-134	10.8	7.6	24.8	Channel Catfish
BD-41; Kankakee River, DS Cooling Lake Boat Ramp	5/1/2013	Cs-137	1.3	6.5	20.0	Channel Catfish
BD-41; Kankakee River, DS Cooling Lake Boat Ramp	5/1/2013	Co-58	10.1	22.8	67.1	Largemouth Bass
BD-41; Kankakee River, DS Cooling Lake Boat Ramp	5/1/2013	Co-60	15.0	6.4	21.7	Largemouth Bass
BD-41; Kankakee River, DS Cooling Lake Boat Ramp	5/1/2013	Cs-134	-1.3	8.2	23.4	Largemouth Bass
BD-41; Kankakee River, DS Cooling Lake Boat Ramp	5/1/2013	Cs-137	-0.8	5.6	17.2	Largemouth Bass
BD-28 @ Discharge Point (Sector E)	10/1/2013	Co-58	62.5	38.6	121.0	Channel Catfish
BD-28 @ Discharge Point (Sector E)	10/1/2013	Co-60	-25.7	24.5	66.7	Channel Catfish
BD-28 @ Discharge Point (Sector E)	10/1/2013	Cs-134	39.6	28.7	87.1	Channel Catfish
BD-28 @ Discharge Point (Sector E)	10/1/2013	Cs-137	46.7	23.6	76.9	Channel Catfish
BD-41; Kankakee River, DS Cooling Lake Boat Ramp	10/1/2013	Co-58	3.3	10.0	31.5	Common Carp
BD-41; Kankakee River, DS Cooling Lake Boat Ramp	10/1/2013	Co-60	6.0	6.8	21.2	Common Carp
BD-41; Kankakee River, DS Cooling Lake Boat Ramp	10/1/2013	Cs-134	10.4	6.1	20.1	Common Carp
BD-41; Kankakee River, DS Cooling Lake Boat Ramp	10/1/2013	Cs-137	-5.7	5.8	17.1	Common Carp
BD-41; Kankakee River, DS Cooling Lake Boat Ramp	10/1/2013	Co-58	22.0	11.7	36.7	Largemouth Bass
BD-41; Kankakee River, DS Cooling Lake Boat Ramp	10/1/2013	Co-60	11.0	6.9	22.5	Largemouth Bass
BD-41; Kankakee River, DS Cooling Lake Boat Ramp	10/1/2013	Cs-134	8.9	7.2	22.0	Largemouth Bass
BD-41; Kankakee River, DS Cooling Lake Boat Ramp	10/1/2013	Cs-137	-4.5	6.4	19.1	Largemouth Bass

Vegetation Samples

Vegetation samples are collected annually in the fall from land in the vicinity of the plant. All vegetation samples are submitted for gamma spectroscopy analysis.

Vegetation samples are monitored for several radionuclides associated with nuclear power plant operations including, but not limited to, Co-58, Co-60, Cs-134, and Cs-137. Table 9 shows the results of analysis of vegetation samples taken from the Braidwood Area, and Table 10 shows the results of analysis of edible vegetation samples harvested September 4 and 11, 2013 from the Braidwood Area.

No radionuclides associated with nuclear power plant operations were detected in samples collected near Braidwood. Other radionuclides detected were naturally occurring.

Table 9. Vegetation Sample Results for Braidwood Area
Results are in picocuries per kilogram (pCi/kg)

Location	Date	Nuclide	Result	Error	MDC
Evans-Judge Preserve	8/29/2013	Co-58	0.0	0.0	0.1
Evans-Judge Preserve	8/29/2013	Co-60	0.0	0.0	0.1
Evans-Judge Preserve	8/29/2013	Cs-134	0.0	0.0	0.1
Evans-Judge Preserve	8/29/2013	Cs-137	0.0	0.0	0.1

Table 10. Edible Vegetation Sample Results for Braidwood Area
Results are in picocuries per kilogram (pCi/kg)

Values	BD Farm Quad 1 - Beets				BD Farm Quad 1 - Cabbage			
	Co-58	Co-60	Cs-134	Cs-137	Co-58	Co-60	Cs-134	Cs-137
Result	-6.7	-6.4	5.3	4.1	-4.9	-8.3	5.2	10.2
Error	18.2	8.2	7.6	6.9	13.6	6.1	5.9	5.3
MDC	52.1	21.5	22.9	20.4	41.2	16.4	18.9	17.2
	BD Farm Quad 2 - Beet Greens				BD Farm Quad 2 - Beets			
	Co-58	Co-60	Cs-134	Cs-137	Co-58	Co-60	Cs-134	Cs-137
Result	20.5	-6.3	6.3	7.2	47.5	-11.3	10.4	-2.1
Error	15.6	5.8	6.3	5.0	24.9	11.9	10.8	9.1
MDC	47.4	16.0	18.8	16.1	83.5	32.6	34.8	27.8
	BD Farm Quad 3 - Beet Greens				BD Farm Quad 3 - Beets			
	Co-58	Co-60	Cs-134	Cs-137	Co-58	Co-60	Cs-134	Cs-137
Result	-12.5	6.1	-3.2	-7.5	-36.9	5.0	11.6	-2.1
Error	28.9	10.7	11.3	10.2	22.1	7.2	7.7	6.9
MDC	87.5	32.3	34.4	30.2	58.9	20.6	23.8	19.7
	BD Farm Quad 4 - Lettuce				BD Farm Quad 4 - Radishes			
	Co-58	Co-60	Cs-134	Cs-137	Co-58	Co-60	Cs-134	Cs-137
Result	-2.1	2.5	5.5	11.1	11.6	0.9	0.6	6.9
Error	16.4	6.9	6.3	5.3	18.9	6.6	8.3	5.4
MDC	50.3	20.1	20.0	17.3	56.1	19.7	23.5	17.3

Ambient Gamma

IEMA maintains a network of 143 environmental dosimeters in a ten-mile radius around the Braidwood and Dresden stations. Because of the proximity of the two stations, the network includes dosimeters that fall within the ten-mile monitoring radius of both stations. Unlike the environmental samples described above, dosimeters do not provide information on what radionuclides are found in the environment. Instead, dosimeters provide a direct measurement of the total dose produced by all sources of gamma radiation, including naturally occurring radionuclides and cosmic rays. Dosimeters are exchanged and analyzed quarterly. In 2013, measurements at all 143 locations were consistent with established

background measurements. Table 11 summarizes quarterly radiation readings in millirem per day (mrem/day) for Braidwood.

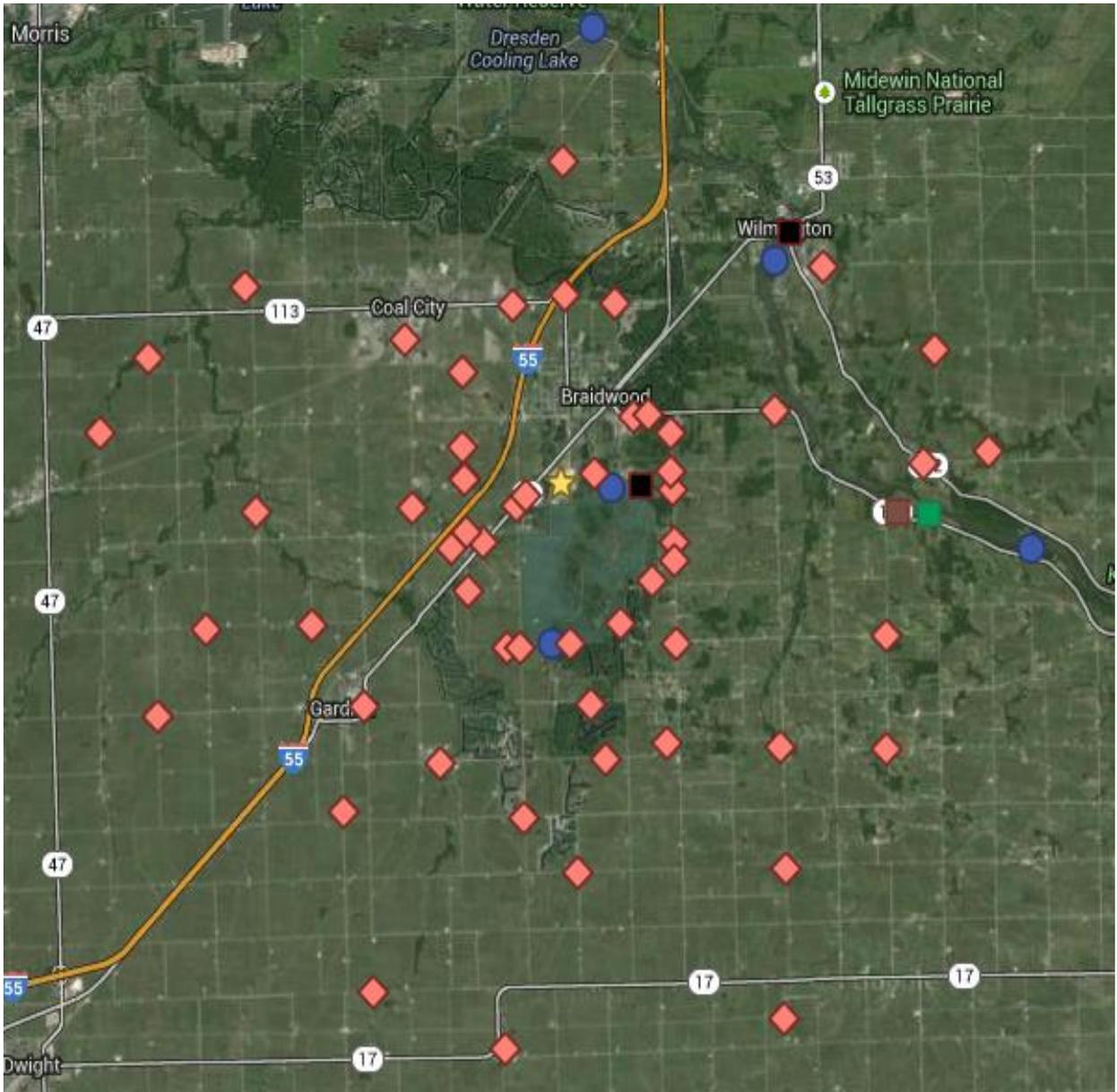
Table 11. Summary of Ambient Gamma Results for Braidwood Area

Location	Quarter 1 mrem/day	Quarter 2 mrem/day	Quarter 3 mrem/day	Quarter 4 mrem/day	Annual Dose mrem/year
BR001	0.115	0.142	0.127	0.116	45.63
BR005	0.128	0.102	0.135	0.099	42.34
BR008	0.114	0.13	0.134	0.121	45.53
BR010	0.097	0.115	0.115	0.109	39.79
BR012	0.074	0.076	0.09	0.065	27.83
BR014	0.063	0.089	0.073	0.069	26.83
BR015	0.073	0.072	0.06	0.061	24.27
BR016	0.071	0.068	0.084	0.079	27.56
BR017	0.068	0.076	0.071	0.072	26.19
BR020	0.074		0.082	0.077	28.35
BR025	0.105	0.115	0.101	0.094	37.87
BR027	0.096	0.088	0.097	0.081	33.03
BR029	0.082	0.095	0.081	0.077	30.57
BR031	0.067			0.054	22.08
BR032	0.075	0.074	0.08	0.074	27.65
BR033	0.079	0.088	0.093		31.63
BR034	0.113	0.117	0.132	0.114	43.44
BR035	0.113	0.115	0.133	0.119	43.80
BR036	0.063	0.077	0.075	0.06	25.09
BR037	0.05	0.074	0.092	0.07	26.10
BR038	0.074	0.093	0.085	0.087	30.93
BR039	0.102	0.124	0.127	0.093	40.70
BR040	0.106	0.113	0.133	0.103	41.52
BR041	0.067	0.088	0.087	0.072	28.65
BR042	0.083	0.114	0.112	0.104	37.69
BR043	0.047	0.077	0.084	0.08	26.28
BR044	0.066	0.085	0.072	0.06	25.82
BR045	0.068	0.076	0.061	0.062	24.36
BR046	0.053	0.079	0.082	0.075	26.37
BR047	0.066	0.07	0.075	0.061	24.82
BR048	0.061	0.061	0.068	0.076	24.27
BR049	0.058	0.081	0.083	0.082	27.74
BR050	0.078	0.077	0.1	0.091	31.57
BR051	0.058	0.076	0.073	0.063	24.64
BR052	0.064	0.079	0.083	0.058	25.92
BR053	0.1	0.131	0.121	0.105	41.70
BR054	0.062	0.064	0.078	0.071	25.09
BR055	0.075	0.079	0.102	0.072	29.93
BR056	0.099	0.087	0.097	0.078	32.94
BR057	0.112	0.136	0.121	0.106	43.34
BR058		0.13	0.113	0.114	43.44

Location	Quarter 1 mrem/day	Quarter 2 mrem/day	Quarter 3 mrem/day	Quarter 4 mrem/day	Annual Dose mrem/year
BR-RSA	0.069	0.069	0.074	0.08	26.65
BR-RSB	0.071	0.059	0.074	0.054	23.54
BR-RSC	0.054	0.075	0.068	0.072	24.55
BR-RSD	0.064	0.074	0.074	0.064	25.19
BR-RSE	0.061	0.07	0.073	0.062	24.27
BR-RSF	0.077	0.062	0.081	0.063	25.82
BR-RSG	0.081	0.101	0.055		28.84
BR-RSH	0.087	0.122	0.071	0.095	34.22
BR-RSJ	0.104	0.138	0.071	0.114	38.96
BR-RSK	0.083	0.077	0.07	0.054	25.92
BR-RSL	0.081	0.09	0.073	0.079	29.47
BR-RSM	0.057	0.067	0.064	0.066	23.18
BR-RSN	0.074	0.092	0.079	0.066	28.38
BR-RSP	0.065	0.081	0.064	0.078	26.28
BR-RSQ	0.061	0.072	0.066	0.053	23.00
BR-RSR	0.089	0.095	0.086	0.088	32.67

Blanks in the table indicate that dosimeters were missing at the end of the quarter.
Annual Dose column based on averages of all available data.

Figure 3. Overview of IEMA's Monitoring Locations for Braidwood



MAP KEY:					
	Nuclear Power plant		Dosimeter		Water Sample
	Soil Sample		Sediment Sample		Vegetation Sample

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Dresden Nuclear Power Station

Dresden Station is located in Grundy County in northern Illinois, approximately twelve miles southwest of Joliet, Illinois at the confluence of the Des Plaines and Kankakee rivers where they form the Illinois River. This station utilizes two boiling water reactors to generate electricity for Exelon.

Liquid effluents from the Dresden Station are released to the Illinois River. Critical pathways for radiation exposure to the public include: ingestion from drinking water and foodstuffs and external gamma radiation from noble gases. Environmental samples collected include: upstream and downstream surface water, a private well, local vegetables, fish, and river sediment from the Illinois River.



Water Samples

Water samples are collected from five locations in the Kankakee, Des Plaines and Illinois Rivers and two ground water wells. Ground water samples are collected once each quarter. Surface water samples are collected weekly and composited for quarterly analysis. Typically, 3-4 liters are collected per quarter.

Water samples are analyzed for several radionuclides associated with nuclear power plant operations including, but not limited to, Co-58, Co-60, Cs-134, and Cs-137. None of these were detected in 2013. Gross alpha and beta analyses were consistent with background. In addition, samples were analyzed for the presence of H-3 (tritium).

Tritium is a normal component of the effluent stream of nuclear power plants and its release to the environment is regulated by US NRC and Illinois Environmental Protection Agency

(IEPA) permitting. It is instructive to compare these concentrations to the US EPA drinking water standard of 20,000 pCi/L. The highest concentration seen at any of the Dresden monitoring sites was 3,290 pCi/L from the Illinois River, which is only a fraction of the US EPA drinking water standard. Table 12 shows the results of tritium analysis of water samples around Dresden.

Water samples are screened for gross alpha and gross beta activity. Table 13 shows the results of alpha/beta screening. Samples are also analyzed for several gamma-emitting radionuclides associated with nuclear power plant operations including, but not limited to, Co-58, Co-60, Cs-134 and Cs-137. None of these were detected in 2013. Table 14 shows results for analysis of water samples taken from the Dresden area.

Table 12. Tritium in Water Sample Results for Dresden Area
Results are in picocuries per liter (pCi/L)

Location	Date	Result	Error	MDC
D-21 IL River @ EJ&E Bridge	3/31/2013	725.0	87.5	114.0
D-21 IL River @ EJ&E Bridge	6/30/2013	107.0	81.1	132.0
D-34A Dresden Road Crossing A	3/31/2013	1380.0	102.0	114.0
D-52 0.9m ESE Desplaines River-Sector F	3/31/2013	0.0	68.0	114.0
D-35 Well @ Dresden Lock & Dam (quarterly grab)	1/11/2013	-52.8	98.7	168.0
D-35 Well @ Dresden Lock & Dam (quarterly grab)	4/12/2013	-16.0	69.5	118.0
D-57 Kankakee River, Upstream	3/31/2013	816.0	89.6	114.0
D-57 Kankakee River, Upstream	6/30/2013	793.0	97.3	132.0
Des Plaines R. at Channahon St. Park (I&M Canal Trail)	6/19/2013	4.4	67.4	113.0
I&M Canal above Chann. St. Park	6/19/2013	4.4	67.4	113.0
I&M Canal above Chann. St. Park	8/28/2013	48.2	79.5	131.0
I&M Canal above Chann. St. Park	12/10/2013	6.6	78.4	131.0
Des Plaines R. at McKinley Woods Will Co. Forest Preserve	6/19/2013	-8.7	67.0	113.0
Des Plaines R. at McKinley Woods Will Co. Forest Preserve	8/28/2013	17.5	78.7	131.0
Illinois R. at Morris boat launch (Rte 47 bridge)	6/20/2013	2.2	67.3	113.0
Illinois R. at Morris boat launch (Rte 47 bridge)	8/29/2013	2720.0	132.0	131.0
Illinois R. at Morris boat launch (Rte 47 bridge)	12/10/2013	543.0	91.7	131.0
Heideke Lake Bank Fish area	6/20/2013	23.9	68.0	113.0
Heideke Lake Bank Fish area	8/29/2013	30.7	79.0	131.0
Illinois R. at Dresden Island Lock and Dam	6/20/2013	-17.4	66.7	113.0
Illinois R. at Dresden Island Lock and Dam	8/29/2013	3290.0	141.0	131.0
Illinois R. at Dresden Island Lock and Dam	12/10/2013	56.9	79.7	131.0
Well @ Dresden Island Lock & Dam	6/20/2013	-8.7	67.0	113.0
Well @ Dresden Island Lock & Dam	12/10/2013	-56.9	76.7	131.0
D-23 T. Residence Well (quarterly grab)	1/11/2013	273.0	78.1	118.0
D-23 T. Residence Well (quarterly grab)	4/19/2013	278.0	78.5	118.0
D-23 T. Residence Well (quarterly grab)	7/12/2013	295.0	85.7	131.0
D-31 Goose Lake Corp. (quarterly grab)	1/11/2013	48.4	101.0	168.0

Location	Date	Result	Error	MDC
D-31 Goose Lake Corp. (quarterly grab)	4/12/2013	106.0	73.3	118.0
D-31 Goose Lake Corp. (quarterly grab)	7/12/2013	89.7	80.5	131.0

Table 13. Sample Results for Alpha/Beta Screening of Water from the Dresden Area
Results are in picocuries per liter (pCi/L)

Location	Quarter 1		Quarter 2		Quarter 3		Quarter 4	
	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta
D-21 IL River @ EJ&E Bridge								
Results	1.6	4.7	-0.2	4.9				
Error	1.3	2.3	1.3	2.6				
MDC	2.0	3.7	2.1	4.2				
D-23 T. Residence Well (quarterly grab)								
Results	5.3	7.1	1.7	4.4	2.0	4.6		
Error	1.4	2.2	1.3	2.3	1.4	2.6		
MDC	1.8	3.4	1.9	3.7	2.1	4.2		
D-31 Goose Lake Corp. (quarterly grab)								
Results	1.8	4.4	2.2	4.0	-0.5	3.8		
Error	1.2	2.1	1.1	2.4	1.3	2.6		
MDC	1.8	3.4	1.6	3.8	2.1	4.2		
D-34A Dresden Road Crossing A								
Results	2.3	4.1	1.7	2.5				
Error	1.4	2.3	1.2	2.1				
MDC	2.0	3.7	1.8	3.5				
D-35 Well @ Dresden Lock & Dam (quarterly grab)								
Results	10.2	14.5	6.6	13.7	11.9	13.8		
Error	1.7	2.4	1.4	2.6	1.7	2.4		
MDC	1.8	3.4	1.6	3.8	1.8	3.5		
D-52 0.9m ESE Desplaines River-Sector F								
Results	0.5	5.9	1.4	5.3				
Error	1.3	2.3	1.2	2.2				
MDC	2.0	3.7	1.8	3.5				
D-57 Kankakee River, Upstream								
Results	2.1	3.0	-0.2	2.9				
Error	1.3	2.2	1.3	2.6				
MDC	2.0	3.7	2.1	4.2				
Des Plaines R. at Channahon St. Park (I&M Canal Trail)								
Results			-0.5	5.3				
Error			1.2	2.4				
MDC			2.0	3.8				
Des Plaines R. at McKinley Woods Will Co. Forest Preserve								
Results					-0.5	5.2		
Error					1.3	2.6		
MDC					2.1	4.2		

Location	Quarter 1		Quarter 2		Quarter 3		Quarter 4	
	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta
Heideke Lake Bank Fish area								
Results			1.4		0.0	5.1		
Error			1.3		1.3	2.6		
MDC			2.0		2.1	4.2		
I&M Canal above Chann. St. Park								
Results			-1.1	2.6	0.3	7.4	1.3	3.6
Error			1.2	2.3	1.3	2.6	1.4	2.6
MDC			2.0	3.8	2.1	4.2	2.1	4.3
Illinois R. at Dresden Island Lock and Dam								
Results			0.7	3.7	0.0	6.4	1.2	6.5
Error			1.2	2.3	1.3	2.6	1.3	2.5
MDC			2.0	3.8	2.1	4.2	2.0	3.9
Illinois R. at Morris boat launch (Rte 47 bridge)								
Results					-0.2	6.4	1.5	3.5
Error					1.3	2.6	1.4	2.6
MDC					2.1	4.2	2.1	4.3
Well @ Dresden Island Lock & Dam								
Results			9.7	15.4			8.6	15.9
Error			1.7	2.6			1.6	2.7
MDC			2.0	3.8			2.0	3.9

Table 14. Gamma Spectroscopy Sample Results for Other Radionuclides in Water from the Dresden Area
Results are in picocuries per liter (pCi/L)

Location	Date	Nuclide	Result	Error	MDC
D-31 Goose Lake Corp. (quarterly grab)	1/11/2013	Co-58	-0.8	1.5	4.2
D-31 Goose Lake Corp. (quarterly grab)	1/11/2013	Co-60	0.1	1.3	3.8
D-31 Goose Lake Corp. (quarterly grab)	1/11/2013	Cs-134	2.6	1.4	4.4
D-31 Goose Lake Corp. (quarterly grab)	1/11/2013	Cs-137	-0.8	1.0	3.1
D-35 Well @ Dresden Lock & Dam (quarterly grab)	1/11/2013	Co-58	1.1	1.4	4.2
D-35 Well @ Dresden Lock & Dam (quarterly grab)	1/11/2013	Co-60	0.1	1.2	3.2
D-35 Well @ Dresden Lock & Dam (quarterly grab)	1/11/2013	Cs-134	-1.7	1.2	3.1
D-35 Well @ Dresden Lock & Dam (quarterly grab)	1/11/2013	Cs-137	-1.4	1.1	3.1
D-21 IL River @ EJ&E Bridge	3/31/2013	Co-58	0.3	1.7	5.0
D-21 IL River @ EJ&E Bridge	3/31/2013	Co-60	0.4	1.5	4.1
D-21 IL River @ EJ&E Bridge	3/31/2013	Cs-134	-1.9	1.5	4.0
D-21 IL River @ EJ&E Bridge	3/31/2013	Cs-137	2.9	1.2	3.9
D-34A Dresden Road Crossing A	3/31/2013	Co-58	-0.5	1.7	5.0
D-34A Dresden Road Crossing A	3/31/2013	Co-60	-1.1	1.4	3.6
D-34A Dresden Road Crossing A	3/31/2013	Cs-134	-1.2	1.4	3.7
D-34A Dresden Road Crossing A	3/31/2013	Cs-137	-1.1	1.0	3.1

Location	Date	Nuclide	Result	Error	MDC
D-52 0.9m ESE Desplaines River-Sector F	3/31/2013	Co-58	0.8	1.5	4.7
D-52 0.9m ESE Desplaines River-Sector F	3/31/2013	Co-60	-0.6	1.3	3.6
D-52 0.9m ESE Desplaines River-Sector F	3/31/2013	Cs-134	3.9	1.1	4.0
D-52 0.9m ESE Desplaines River-Sector F	3/31/2013	Cs-137	-0.2	1.2	3.6
D-57 Kankakee River, Upstream	3/31/2013	Co-58	-1.3	1.3	3.7
D-57 Kankakee River, Upstream	3/31/2013	Co-60	0.1	1.0	3.0
D-57 Kankakee River, Upstream	3/31/2013	Cs-134	0.6	1.0	3.0
D-57 Kankakee River, Upstream	3/31/2013	Cs-137	-0.4	0.9	2.6
D-31 Goose Lake Corp. (quarterly grab)	4/12/2013	Co-58	0.5	1.4	4.1
D-31 Goose Lake Corp. (quarterly grab)	4/12/2013	Co-60	0.0	1.5	4.0
D-31 Goose Lake Corp. (quarterly grab)	4/12/2013	Cs-134	2.0	1.2	3.9
D-31 Goose Lake Corp. (quarterly grab)	4/12/2013	Cs-137	-0.5	1.1	3.3
D-35 Well @ Dresden Lock & Dam (quarterly grab)	4/12/2013	Co-58	-2.2	1.4	3.7
D-35 Well @ Dresden Lock & Dam (quarterly grab)	4/12/2013	Co-60	0.1	1.1	3.2
D-35 Well @ Dresden Lock & Dam (quarterly grab)	4/12/2013	Cs-134	0.8	1.2	3.6
D-35 Well @ Dresden Lock & Dam (quarterly grab)	4/12/2013	Cs-137	-0.8	1.0	3.1
D-23 T. Residence Well (quarterly grab)	4/19/2013	Co-58	-1.0	2.5	3.5
D-23 T. Residence Well (quarterly grab)	4/19/2013	Co-60	0.0	1.8	2.6
D-23 T. Residence Well (quarterly grab)	4/19/2013	Cs-134	0.1	1.8	2.9
D-23 T. Residence Well (quarterly grab)	4/19/2013	Cs-137	-1.3	1.7	2.6
Des Plaines R. at Channahon St. Park (I&M Canal Trail)	6/19/2013	Co-58	-0.7	1.8	5.3
Des Plaines R. at Channahon St. Park (I&M Canal Trail)	6/19/2013	Co-60	0.8	1.1	3.4
Des Plaines R. at Channahon St. Park (I&M Canal Trail)	6/19/2013	Cs-134	1.0	1.2	3.7
Des Plaines R. at Channahon St. Park (I&M Canal Trail)	6/19/2013	Cs-137	-0.1	1.1	3.2
Des Plaines R. at McKinley Woods Will Co. Forest Preserve	6/19/2013	Co-58	1.1	1.3	4.1
Des Plaines R. at McKinley Woods Will Co. Forest Preserve	6/19/2013	Co-60	1.8	1.0	3.3
Des Plaines R. at McKinley Woods Will Co. Forest Preserve	6/19/2013	Cs-134	0.3	1.0	3.1
Des Plaines R. at McKinley Woods Will Co. Forest Preserve	6/19/2013	Cs-137	2.2	0.9	3.2
I&M Canal above Chann. St. Park	6/19/2013	Co-58	1.6	1.6	5.2
I&M Canal above Chann. St. Park	6/19/2013	Co-60	0.0	1.2	3.4
I&M Canal above Chann. St. Park	6/19/2013	Cs-134	1.7	1.2	3.9
I&M Canal above Chann. St. Park	6/19/2013	Cs-137	0.4	1.1	3.4
Heideke Lake Bank Fish area	6/20/2013	Co-58	3.0	1.8	5.6
Heideke Lake Bank Fish area	6/20/2013	Co-60	-0.6	1.4	3.9
Heideke Lake Bank Fish area	6/20/2013	Cs-134	0.4	1.3	3.9
Heideke Lake Bank Fish area	6/20/2013	Cs-137	-2.3	1.3	3.5
Illinois R. at Dresden Island Lock and Dam	6/20/2013	Co-58	1.4	2.1	6.2
Illinois R. at Dresden Island Lock and Dam	6/20/2013	Co-60	1.3	1.4	4.1
Illinois R. at Dresden Island Lock and Dam	6/20/2013	Cs-134	1.0	1.2	3.8
Illinois R. at Dresden Island Lock and Dam	6/20/2013	Cs-137	0.5	1.3	3.8
Illinois R. at Morris boat launch (Rte 47 bridge)	6/20/2013	Co-58	-2.5	1.4	3.7

Location	Date	Nuclide	Result	Error	MDC
Illinois R. at Morris boat launch (Rte 47 bridge)	6/20/2013	Co-60	0.5	1.1	3.3
Illinois R. at Morris boat launch (Rte 47 bridge)	6/20/2013	Cs-134	0.3	1.0	3.1
Illinois R. at Morris boat launch (Rte 47 bridge)	6/20/2013	Cs-137	1.3	0.9	3.0
Well @ Dresden Island Lock & Dam	6/20/2013	Co-58	-1.9	1.8	5.1
Well @ Dresden Island Lock & Dam	6/20/2013	Co-60	-0.3	1.0	2.9
Well @ Dresden Island Lock & Dam	6/20/2013	Cs-134	-0.5	1.3	3.5
Well @ Dresden Island Lock & Dam	6/20/2013	Cs-137	-2.3	1.0	2.7
D-21 IL River @ EJ&E Bridge	6/30/2013	Co-58	0.9	2.6	7.7
D-21 IL River @ EJ&E Bridge	6/30/2013	Co-60	0.2	1.4	4.0
D-21 IL River @ EJ&E Bridge	6/30/2013	Cs-134	0.4	1.5	4.4
D-21 IL River @ EJ&E Bridge	6/30/2013	Cs-137	-1.8	1.4	3.7
D-34A Dresden Road Crossing A	6/30/2013	Co-58	-1.1	1.9	5.6
D-34A Dresden Road Crossing A	6/30/2013	Co-60	2.5	1.0	3.3
D-34A Dresden Road Crossing A	6/30/2013	Cs-134	-1.7	1.1	3.1
D-34A Dresden Road Crossing A	6/30/2013	Cs-137	0.9	0.9	3.0
D-52 0.9m ESE Desplaines River-Sector F	6/30/2013	Co-58	0.8	2.1	6.0
D-52 0.9m ESE Desplaines River-Sector F	6/30/2013	Co-60	-1.0	1.0	2.7
D-52 0.9m ESE Desplaines River-Sector F	6/30/2013	Cs-134	0.7	1.1	3.3
D-52 0.9m ESE Desplaines River-Sector F	6/30/2013	Cs-137	0.3	0.9	2.8
D-57 Kankakee River, Upstream	6/30/2013	Co-58	-3.1	2.5	7.4
D-57 Kankakee River, Upstream	6/30/2013	Co-60	2.3	1.2	4.0
D-57 Kankakee River, Upstream	6/30/2013	Cs-134	-1.7	1.2	3.5
D-57 Kankakee River, Upstream	6/30/2013	Cs-137	-1.1	1.1	3.2
D-23 T. Residence Well (quarterly grab)	7/12/2013	Co-58	1.4	2.1	6.3
D-23 T. Residence Well (quarterly grab)	7/12/2013	Co-60	0.2	1.1	3.3
D-23 T. Residence Well (quarterly grab)	7/12/2013	Cs-134	1.9	1.2	3.8
D-23 T. Residence Well (quarterly grab)	7/12/2013	Cs-137	1.1	1.0	3.2
D-31 Goose Lake Corp. (quarterly grab)	7/12/2013	Co-58	1.3	1.9	6.1
D-31 Goose Lake Corp. (quarterly grab)	7/12/2013	Co-60	0.0	1.1	3.3
D-31 Goose Lake Corp. (quarterly grab)	7/12/2013	Cs-134	1.1	1.0	3.3
D-31 Goose Lake Corp. (quarterly grab)	7/12/2013	Cs-137	1.7	0.9	3.0
D-35 Well @ Dresden Lock & Dam (quarterly grab)	7/12/2013	Co-58	0.4	1.4	5.7
D-35 Well @ Dresden Lock & Dam (quarterly grab)	7/12/2013	Co-60	0.1	1.0	3.1
D-35 Well @ Dresden Lock & Dam (quarterly grab)	7/12/2013	Cs-134	1.1	1.0	3.2
D-35 Well @ Dresden Lock & Dam (quarterly grab)	7/12/2013	Cs-137	1.4	0.9	3.0
Des Plaines R. at McKinley Woods Will Co. Forest Preserve	8/28/2013	Co-58	3.2	2.1	6.6
Des Plaines R. at McKinley Woods Will Co. Forest Preserve	8/28/2013	Co-60	-0.7	1.5	3.9
Des Plaines R. at McKinley Woods Will Co. Forest Preserve	8/28/2013	Cs-134	0.3	1.4	4.0
Des Plaines R. at McKinley Woods Will Co. Forest Preserve	8/28/2013	Cs-137	1.5	1.2	3.8
I&M Canal above Chann. St. Park	8/28/2013	Co-58	-1.9	1.8	5.2
I&M Canal above Chann. St. Park	8/28/2013	Co-60	0.9	1.1	3.5

Location	Date	Nuclide	Result	Error	MDC
I&M Canal above Chann. St. Park	8/28/2013	Cs-134	1.5	1.1	3.7
I&M Canal above Chann. St. Park	8/28/2013	Cs-137	0.9	1.1	3.3
Heideke Lake Bank Fish area	8/29/2013	Co-58	0.4	1.7	4.9
Heideke Lake Bank Fish area	8/29/2013	Co-60	1.1	0.9	2.9
Heideke Lake Bank Fish area	8/29/2013	Cs-134	0.9	1.0	3.1
Heideke Lake Bank Fish area	8/29/2013	Cs-137	-1.4	0.9	2.5
Illinois R. at Morris boat launch (Rte 47 bridge)	8/29/2013	Co-58	-0.9	1.5	4.2
Illinois R. at Morris boat launch (Rte 47 bridge)	8/29/2013	Co-60	0.0	1.0	2.8
Illinois R. at Morris boat launch (Rte 47 bridge)	8/29/2013	Cs-134	0.5	1.1	3.1
Illinois R. at Morris boat launch (Rte 47 bridge)	8/29/2013	Cs-137	0.1	0.8	2.6
D-23 T. Residence Well (quarterly grab)	10/11/2013	Co-58	3.6	1.8	5.7
D-23 T. Residence Well (quarterly grab)	10/11/2013	Co-60	-2.6	1.2	3.0
D-23 T. Residence Well (quarterly grab)	10/11/2013	Cs-134	-0.2	1.3	3.9
D-23 T. Residence Well (quarterly grab)	10/11/2013	Cs-137	-1.2	1.0	2.8
D-31 Goose Lake Corp. (quarterly grab)	10/11/2013	Co-58	1.6	1.5	4.4
D-31 Goose Lake Corp. (quarterly grab)	10/11/2013	Co-60	1.0	0.8	2.6
D-31 Goose Lake Corp. (quarterly grab)	10/11/2013	Cs-134	0.9	1.0	3.0
D-31 Goose Lake Corp. (quarterly grab)	10/11/2013	Cs-137	1.0	0.8	2.6
D-35 Well @ Dresden Lock & Dam (quarterly grab)	10/11/2013	Co-58	0.6	1.5	4.6
D-35 Well @ Dresden Lock & Dam (quarterly grab)	10/11/2013	Co-60	0.2	0.9	2.8
D-35 Well @ Dresden Lock & Dam (quarterly grab)	10/11/2013	Cs-134	0.7	1.0	3.1
D-35 Well @ Dresden Lock & Dam (quarterly grab)	10/11/2013	Cs-137	-1.0	0.9	2.6
D-21 IL River @ EJ&E Bridge	10/15/2013	Co-58	-0.1	1.6	4.8
D-21 IL River @ EJ&E Bridge	10/15/2013	Co-60	-1.6	1.1	2.9
D-21 IL River @ EJ&E Bridge	10/15/2013	Cs-134	0.6	0.9	3.0
D-21 IL River @ EJ&E Bridge	10/15/2013	Cs-137	0.0	0.9	2.8
D-34A Dresden Road Crossing A	10/15/2013	Co-58	-0.8	2.0	5.5
D-34A Dresden Road Crossing A	10/15/2013	Co-60	-1.4	1.1	2.9
D-34A Dresden Road Crossing A	10/15/2013	Cs-134	1.1	1.3	3.7
D-34A Dresden Road Crossing A	10/15/2013	Cs-137	1.3	1.0	3.1
D-52 0.9m ESE Desplaines River-Sector F	10/15/2013	Co-58	-2.6	1.9	5.5
D-52 0.9m ESE Desplaines River-Sector F	10/15/2013	Co-60	-0.7	1.2	3.4
D-52 0.9m ESE Desplaines River-Sector F	10/15/2013	Cs-134	-1.4	1.3	3.7
D-52 0.9m ESE Desplaines River-Sector F	10/15/2013	Cs-137	1.5	1.1	3.5
D-57 Kankakee River, Upstream	10/15/2013	Co-58	1.5	1.6	4.9
D-57 Kankakee River, Upstream	10/15/2013	Co-60	0.9	0.9	2.7
D-57 Kankakee River, Upstream	10/15/2013	Cs-134	0.1	1.1	3.2
D-57 Kankakee River, Upstream	10/15/2013	Cs-137	-0.9	0.9	2.6

Milk Samples

No dairy falls within ten miles of Dresden. In the event that milk samples were collected, the samples collected for Braidwood would provide a control sample.

Soil Samples

Soil samples are collected from land surrounding the plant, and are collected annually in the fall. All samples are submitted for gamma spectroscopy analysis.

Sediment samples are monitored for several radionuclides associated with nuclear power plant operations including, but not limited to, Co-58, Co-60, Cs-134, and Cs-137. It should be noted that as a remnant of atmospheric nuclear weapons testing, Cs-137 is routinely observed in sediment and soil at concentrations of 0.1-0.2 pCi/g. Table 15 shows the results of analyses of sediment samples taken from the Dresden Area.

No radionuclides associated with nuclear power plant operations were detected in samples collected near Dresden. Other radionuclides detected were naturally occurring.

Table 15. Soil Sample Results for Dresden Area
Results are in picocuries per gram (pCi/g)

Location	Media	Date	Nuclide	Result	Error	MDC
Minooka Comm HS	08	8/29/2013	Co-58	0.0	0.0	0.1
Minooka Comm HS	08	8/29/2013	Co-60	0.0	0.0	0.0
Minooka Comm HS	08	8/29/2013	Cs-134	0.0	0.0	0.0
Minooka Comm HS	08	8/29/2013	Cs-137	0.1	0.0	0.0

Sediment Samples

Sediment samples are collected annually from the rivers downstream of the plant effluent points. All sediments are submitted for gamma spectroscopy analysis.

Sediment samples are monitored for several radionuclides associated with nuclear power plant operations including, but not limited to, Co-58, Co-60, Cs-134, and Cs-137. A remnant of atmospheric nuclear weapons testing, Cs-137 is present in most sediment and soil at concentrations of 0.1-0.2 pCi/g. Table 16 shows the results of analysis of sediment samples taken from the Dresden Area.

Table 16. Sediment Sample Results for Dresden Area
Results are in picocuries per gram (pCi/g)

Location	Date	Nuclide	Result	Error	MDC
D-27 Dresden Lock & Dam (Sector Q)	5/10/2013	Co-58	-0.1	0.2	0.5
D-27 Dresden Lock & Dam (Sector Q)	5/10/2013	Co-60	-0.1	0.1	0.2
D-27 Dresden Lock & Dam (Sector Q)	5/10/2013	Cs-134	0.0	0.0	0.1
D-27 Dresden Lock & Dam (Sector Q)	5/10/2013	Cs-137	0.0	0.1	0.2

Location	Date	Nuclide	Result	Error	MDC
Dresden Lock and Dam	6/19/2013	Co-58	0.0	0.0	0.1
Dresden Lock and Dam	6/19/2013	Co-60	0.0	0.0	0.1
Dresden Lock and Dam	6/19/2013	Cs-134	0.0	0.0	0.0
Dresden Lock and Dam	6/19/2013	Cs-137	0.1	0.0	0.1
D-27 Dresden Lock & Dam (Sector Q)	10/4/2013	Co-58	0.0	0.0	0.1
D-27 Dresden Lock & Dam (Sector Q)	10/4/2013	Co-60	0.0	0.0	0.1
D-27 Dresden Lock & Dam (Sector Q)	10/4/2013	Cs-134	0.0	0.0	0.1
D-27 Dresden Lock & Dam (Sector Q)	10/4/2013	Cs-137	0.2	0.0	0.1

Fish Samples

Like sediments, fish are collected from rivers, typically near the plant discharge point. At each location, two different species of fish are collected annually, typically in October. Edible portions of the fish are harvested by technicians at Midwest Laboratory and prepared for analysis. Splits of the samples are provided to the IEMA Radiochemistry Laboratory and are analyzed for reactor-produced radionuclides using gamma spectroscopy.

No radionuclides associated with nuclear power plant operations were detected in fish samples collected near Dresden. Other radionuclides detected were naturally occurring. Table 17 shows results from fish sampling during 2013.

Table 17. Fish Sample Results for Dresden Area
Results are in picocuries per kilogram (pCi/kg)

Location	Date	Nuclide	Result	Error	MDC	Comments
D-28 IL River, Dresden Pool (Sector Q)	5/2/2013	Co-58	10.7	18.3	57.8	Channel Catfish
D-28 IL River, Dresden Pool (Sector Q)	5/2/2013	Co-60	-1.7	6.8	19.6	Channel Catfish
D-28 IL River, Dresden Pool (Sector Q)	5/2/2013	Cs-134	2.0	6.1	19.3	Channel Catfish
D-28 IL River, Dresden Pool (Sector Q)	5/2/2013	Cs-137	3.7	5.2	16.3	Channel Catfish
D-28 IL River, Dresden Pool (Sector Q)	5/2/2013	Co-58	-9.3	25.9	74.3	Golden Redhorse
D-28 IL River, Dresden Pool (Sector Q)	5/2/2013	Co-60	-4.2	8.7	23.4	Golden Redhorse
D-28 IL River, Dresden Pool (Sector Q)	5/2/2013	Cs-134	4.2	9.3	27.5	Golden Redhorse
D-28 IL River, Dresden Pool (Sector Q)	5/2/2013	Cs-137	-13.2	8.1	21.5	Golden Redhorse
D-28 IL River, Dresden Pool (Sector Q)	10/2/2013	Co-58	-4.5	9.0	27.1	Common Carp
D-28 IL River, Dresden Pool (Sector Q)	10/2/2013	Co-60	1.6	6.4	18.8	Common Carp
D-28 IL River, Dresden Pool (Sector Q)	10/2/2013	Cs-134	7.8	5.7	18.5	Common Carp
D-28 IL River, Dresden Pool (Sector Q)	10/2/2013	Cs-137	-0.3	5.2	16.1	Common Carp
D-28 IL River, Dresden Pool (Sector Q)	10/2/2013	Co-58	-11.9	12.7	35.1	Largemouth Bass
D-28 IL River, Dresden Pool (Sector Q)	10/2/2013	Co-60	0.8	6.8	20.2	Largemouth Bass
D-28 IL River, Dresden Pool (Sector Q)	10/2/2013	Cs-134	2.6	8.3	24.1	Largemouth Bass
D-28 IL River, Dresden Pool (Sector Q)	10/2/2013	Cs-137	11.2	5.9	19.4	Largemouth Bass

Vegetation Samples

Vegetation samples are collected from land in the vicinity of the plant, and are collected annually in the fall and are submitted for gamma spectroscopy analysis. Vegetation samples are analyzed for several radionuclides associated with nuclear power plant operations including, but not limited to, Co-58, Co-60, Cs-134 and Cs-137. Table 18 shows the results of analysis of vegetation samples taken from the Dresden Area, and Table 19 shows the results of analysis of edible vegetation samples harvested September 13 and 14, 2013 from the Dresden Area.

No radionuclides associated with nuclear power plant operations were detected in samples collected near Dresden. Other radionuclides detected were naturally occurring.

Table 18. Vegetation Sample Results for Dresden Area
Results are in picocuries per kilogram (pCi/kg)

Location	Date	Nuclide	Result	Error	MDC
Heideke Lake Boat Launch Area	8/29/2013	Co-58	0.0	0.0	0.1
Heideke Lake Boat Launch Area	8/29/2013	Co-60	0.0	0.0	0.1
Heideke Lake Boat Launch Area	8/29/2013	Cs-134	0.0	0.0	0.1
Heideke Lake Boat Launch Area	8/29/2013	Cs-137	0.0	0.0	0.1
Minooka Community High School	8/29/2013	Co-58	0.0	0.0	0.1
Minooka Community High School	8/29/2013	Co-60	0.0	0.0	0.0
Minooka Community High School	8/29/2013	Cs-134	0.0	0.0	0.0
Minooka Community High School	8/29/2013	Cs-137	0.0	0.0	0.0

Table 19. Edible Vegetation Sample Results for Dresden Area
Results are in picocuries per kilogram (pCi/kg)

Values	DN Farm Quad 1-Beets				DN Farm Quad 1-Cabbage			
	Co-58	Co-60	Cs-134	Cs-137	Co-58	Co-60	Cs-134	Cs-137
Result	49.4	0.3	-4.9	2.8	-10.3	1.8	-13.2	6.4
Error	17.4	5.6	4.9	4.5	31.9	9.6	10.0	8.5
MDC	56.1	16.6	14.5	14.2	96.2	28.9	28.9	26.9
	DN Farm Quad 2-Beets				DN Farm Quad 2-Broccoli			
	Co-58	Co-60	Cs-134	Cs-137	Co-58	Co-60	Cs-134	Cs-137
Result	-6.0	-11.0	-0.6	2.4	20.0	2.9	-3.3	-0.4
Error	32.0	10.0	9.7	7.6	13.0	4.0	3.2	3.6
MDC	46.0	14.0	15.1	12.2	40.0	12.3	11.8	10.9
	DN Farm Quad 3-Brussel Sprouts				DN Farm Quad 3-Radishes			
	Co-58	Co-60	Cs-134	Cs-137	Co-58	Co-60	Cs-134	Cs-137
Result	4.0	4.7	5.8	7.9	-6.0	-8.0	-4.0	11.3
Error	18.0	5.8	5.3	5.5	40.0	13.0	10.0	9.9
MDC	55.0	17.8	16.7	17.6	116.0	35.0	31.0	31.9

	DN Farm Quad 4-Cabbage				DN Farm Quad 4-Carrots			
	Co-58	Co-60	Cs-134	Cs-137	Co-58	Co-60	Cs-134	Cs-137
Result	-29.3	6.8	-18.0	1.0	1.2	-2.3	9.6	15.7
Error	22.7	7.2	8.0	6.9	0.8	8.5	7.0	8.1
MDC	61.1	21.7	20.5	19.5	2.7	23.9	23.1	26.8

Ambient Gamma

IEMA maintains a network of 143 environmental dosimeters in a ten-mile radius around the Braidwood and Dresden stations. Because of the proximity of the two stations, the network includes dosimeters that fall within the ten-mile monitoring radius of both stations. Unlike the environmental samples described above, dosimeters do not provide information on what radionuclides are found in the environment. Instead, dosimeters provide a direct measurement of the total dose produced by all sources of gamma radiation, including naturally occurring radionuclides and cosmic rays. Dosimeters are exchanged and analyzed quarterly. In 2013, measurements at all 143 locations were consistent with established background measurements. Table 20 summarizes the quarterly radiation readings in millirem per day (mrem/day) for Dresden.

Table 20. Summary of Ambient Gamma Results for the Dresden Area

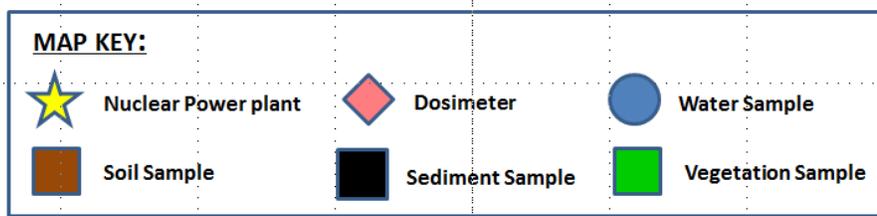
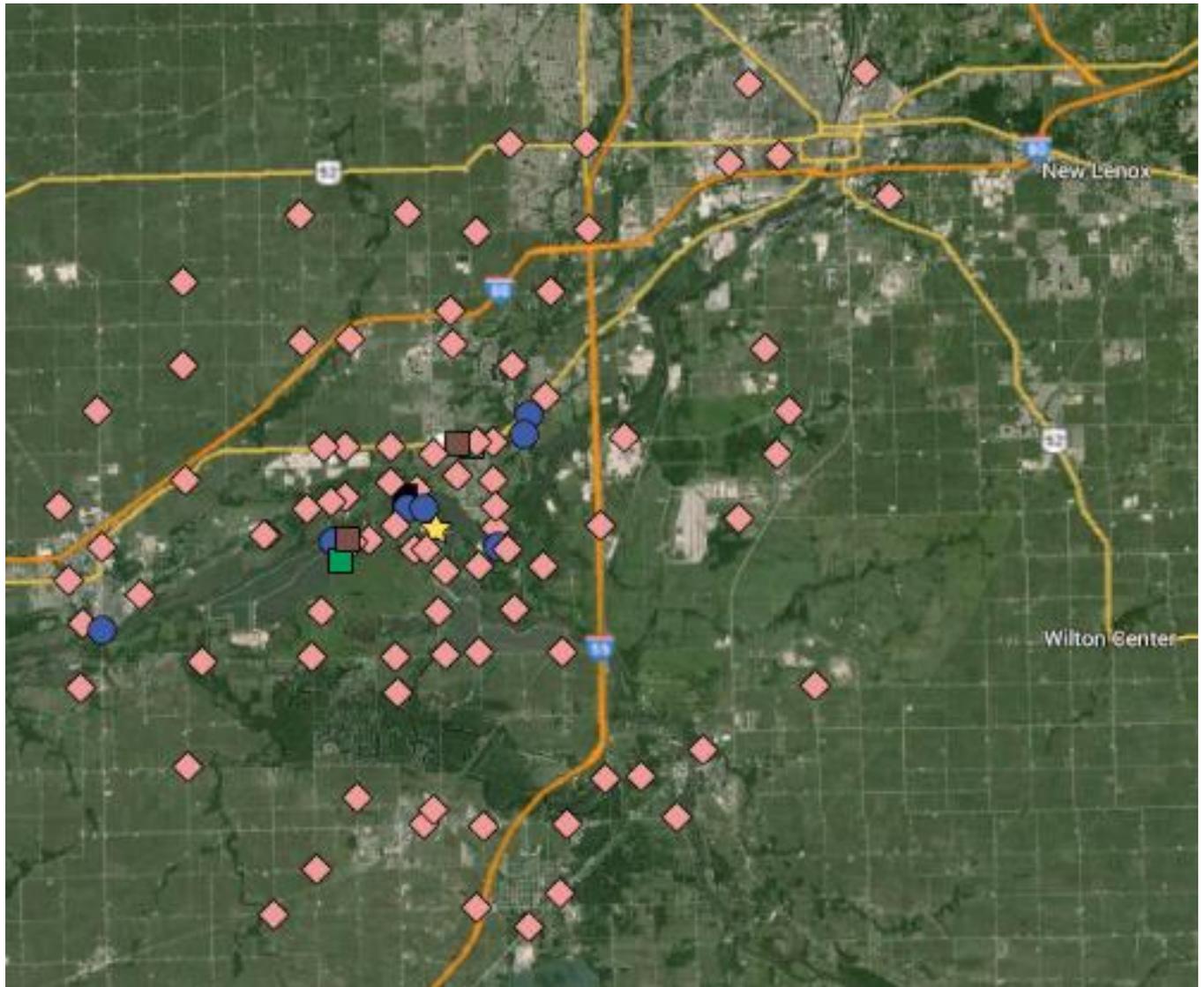
Location	Quarter 1 mrem/day	Quarter 2 mrem/day	Quarter 3 mrem/day	Quarter 4 mrem/day	Annual Dose mrem/year
DR001		0.067	0.076	0.07	25.92
DR002		0.087	0.089	0.072	30.17
DR003	0.066		0.088	0.073	27.62
DR004	0.101	0.116	0.127	0.106	41.06
DR007	0.078	0.087	0.087	0.083	30.57
DR009	0.06		0.101	0.074	28.59
DR013	0.086	0.099	0.104	0.09	34.58
DR020	0.118	0.097	0.095	0.09	36.50
DR021	0.051	0.073	0.066	0.068	23.54
DR022	0.052	0.083	0.08	0.069	25.92
DR023	0.073	0.053	0.07	0.058	23.18
DR025	0.059	0.067	0.062	0.056	22.27
DR026	0.057	0.074	0.088	0.057	25.19
DR027	0.076	0.076	0.071	0.054	25.28
DR031	0.063	0.08	0.085	0.074	27.56
DR033	0.051	0.071	0.056	0.061	21.81
DR036	0.091	0.131	0.124	0.12	42.52
DR039	0.115	0.127	0.121	0.104	42.61
DR040	0.1	0.103	0.123	0.101	38.96
DR041	0.084	0.094	0.114	0.09	34.86
DR043	0.09	0.122		0.107	38.81
DR046	0.039	0.068	0.069	0.06	21.54
DR048	0.099	0.095	0.114	0.096	36.87
DR050	0.072	0.086	0.091	0.08	30.02
DR052	0.095	0.105	0.112	0.101	37.69

Location	Quarter 1 mrem/day	Quarter 2 mrem/day	Quarter 3 mrem/day	Quarter 4 mrem/day	Annual Dose mrem/year
DR053	0.046	0.07	0.076	0.06	23.00
DR056	0.083	0.148	0.132	0.116	43.71
DR060		0.099	0.104	0.073	33.58
DR062	0.077	0.094	0.106	0.092	33.67
DR065	0.111	0.143	0.128	0.115	45.35
DR066	0.062	0.072	0.08		26.04
DR068	0.067	0.093	0.101	0.073	30.48
DR070	0.07	0.088	0.097	0.086	31.12
DR073	0.088	0.096	0.101	0.097	34.86
DR075	0.09	0.112	0.112	0.055	33.67
DR076	0.054	0.061	0.081		23.85
DR077	0.06	0.086	0.083	0.064	26.74
DR078	0.121	0.132	0.131	0.098	43.98
DR080	0.102	0.125	0.12	0.105	41.25
DR081	0.094	0.112	0.123	0.077	37.05
DR082	0.092	0.106	0.114	0.086	36.32
DR083	0.076	0.096	0.104	0.072	31.76
DR084	0.079		0.112	0.087	33.82
DR087	0.085	0.116	0.091	0.085	34.40
DR089	0.073	0.096	0.099	0.073	31.12
DR091	0.08	0.095	0.098	0.071	31.39
DR093	0.089	0.093	0.093	0.078	32.21
DR095	0.079	0.086	0.11	0.079	32.30
DR096	0.083	0.094	0.093	0.08	31.94
DR097	0.115	0.11	0.134	0.116	43.34
DR098	0.06	0.077	0.081	0.064	25.73
DR099	0.123	0.149	0.141	0.113	48.00
DR100	0.079	0.103	0.099	0.071	32.12
DR102	0.113	0.122	0.135	0.09	41.98
DR103	0.108	0.144	0.152	0.104	46.36
DR104	0.117		0.153	0.105	45.63
DR105	0.06	0.08	0.092	0.059	26.55
DR106	0.028	0.054	0.055	0.046	16.70
DR107	0.083	0.094	0.107	0.074	32.67
DR108	0.099	0.103	0.118	0.085	36.96
DR109	0.097	0.112	0.113	0.104	38.87
DR110	0.053	0.055	0.078	0.058	22.27
DR111	0.061	0.078	0.092	0.056	26.19
DR112	0.104	0.105	0.115	0.103	38.96
DR113	0.107	0.144	0.153	0.1	45.99
DR114	0.121	0.138	0.146	0.093	45.44
DR115	0.089	0.115	0.111	0.095	37.41
DR116	0.058	0.066	0.09	0.066	25.55
DR117	0.068	0.083	0.102	0.067	29.20
DR118	0.06		0.082	0.076	26.52
DR-RSA	0.089	0.116	0.11		38.33
DR-RSB	0.099	0.121	0.134	0.1	41.43
DR-RSC	0.097	0.12	0.13	0.105	41.25
DR-RSD	0.082	0.118	0.127	0.111	39.97
DR-RSE	0.069	0.097	0.102	0.078	31.57

Location	Quarter 1 mrem/day	Quarter 2 mrem/day	Quarter 3 mrem/day	Quarter 4 mrem/day	Annual Dose mrem/year
DR-RSF	0.07	0.093	0.096	0.068	29.84
DR-RSG	0.076	0.097	0.103	0.078	32.30
DR-RSH	0.064	0.083	0.068	0.075	26.46
DR-RSJ	0.083	0.099	0.095	0.075	32.12
DR-RSK	0.074	0.084	0.105	0.083	31.57
DR-RSL	0.092	0.1	0.102	0.083	34.40
DR-RSM	0.103	0.133	0.177	0.11	47.72
DR-RSN	0.063	0.066	0.065	0.056	22.81
DR-RSP	0.07	0.101	0.105	0.075	32.03
DR-RSQ	0.072	0.089	0.113	0.076	31.94
DR-RSR	0.085	0.117	0.105	0.081	35.41

Blanks in the table indicate that dosimeters were missing at the end of the quarter.
Annual Dose column based on averages of all available data.

Figure 4. Overview of IEMA Monitoring Locations for Dresden



Byron Nuclear Power Station

Byron Station is located in Ogle County in northern Illinois, approximately seventeen miles southwest of Rockford, Illinois. This station utilizes two pressurized water reactors to generate electricity for Exelon. Unit 1 began operation in February 1985 and Unit 2 in January 1987.

Liquid effluents from the Byron Station are released to the Rock River. Critical pathways for radiation exposure to the public include I-131 in milk, ingestion of water and foodstuffs, and external gamma radiation from noble gases. Samples collected include: surface and well waters, milk from local dairy farms, fish, local vegetation, and river sediments from the Rock River.



Water Samples

Water samples are collected from two locations in the Rock River and six ground water wells. Ground water samples are collected once each quarter. Surface water samples are collected weekly and composited for quarterly analysis. Typically, 3-4 liters are collected per quarter. Water samples are submitted for gross alpha, gross beta, tritium and gamma spectroscopy analyses.

Water samples are monitored for several radionuclides associated with nuclear power plant operations including, but not limited to, Co-58, Co-60, Cs-134, and Cs-137. None of these were detected in 2013. Gross alpha and beta analyses were consistent with background. In addition, samples were tested for the presence of H-3 (tritium).

Tritium is a normal component of the effluent stream of nuclear power plants and its release to the environment is regulated by US NRC and Illinois Environmental Protection Agency (IEPA) permitting. The highest concentration seen at any Byron monitoring site in 2013 was

1,890 pCi/L from the Rock River which is only a fraction of the US EPA drinking water standard of 20,000 pCi/L. Table 21 shows the results of tritium analysis of water samples around Byron.

Water samples are screened for gross alpha and gross beta activity. Table 22 shows the results of alpha/beta screening. Samples are also analyzed for several gamma-emitting radionuclides associated with nuclear power plant operations including, but not limited to, Co-58, Co-60, Cs-134 and Cs-137. None of these were detected in 2013. Table 23 shows results for analysis of water samples taken from the Byron area.

Table 21. Tritium in Water Sample Results for Byron Area
Results are in picocuries per liter (pCi/L)

Location	Date	Result	Error	MDC
BY-14-1; 3200 N. German Church Road	1/8/2013	10.8	68.1	114.0
BY-32; W. Residence Well	1/8/2013	-79.2	98.2	168.0
BY-35 V. Residence Well	1/8/2013	-15.4	99.5	168.0
BY-36 B. Residence Well	1/8/2013	-43.6	68.7	118.0
BY-37 A. Residence Well	1/8/2013	-52.8	98.8	168.0
Lake Louise Area, Rock R. Boat Entry, Byron, Illinois (Upstream)	1/16/2013	-2.2	99.6	167.0
Rock R. Boat Ramp Near the Lake Louise Sample Point	1/16/2013	-29.7	68.9	117.0
BY-12 Oregon Pool Of Rock River	3/31/2013	-23.9	67.2	114.0
BY-29 (Replaces BY-9 & BY-13)	3/31/2013	-28.3	67.1	114.0
BY-14-1; 3200 N. German Church Road	4/9/2013	-26.0	66.9	114.0
BY-32; W. Residence Well	4/9/2013	6.5	68.0	114.0
BY-35 V. Residence Well	4/9/2013	19.5	68.4	114.0
BY-36 B. Residence Well	4/9/2013	-13.0	67.4	114.0
BY-37 A. Residence Well	4/9/2013	13.0	68.2	114.0
BY-18-1 C. Residence	4/16/2013	-9.2	69.7	118.0
Lake Louise Area, Rock R. Boat Entry, Byron, Illinois (Upstream)	4/25/2013	13.2	100.0	168.0
Pool of the Rock R., Oregon, Illinois	4/25/2013	-34.7	66.6	114.0
Rock R. Boat Ramp Near the Lake Louise Sample Point	4/25/2013	59.4	101.0	168.0
Rock R., DS of the Intersection With Woodland Creek (Upstream)	4/25/2013	4.3	67.8	114.0
Rock R., Just Upstream of the Byron Cooling Water Discharge	4/25/2013	-8.8	99.7	168.0
Woodland Creek, Upstream of the Intersection With Rock R.	4/25/2013	28.6	101.0	168.0
BY-12 Oregon Pool Of Rock River	6/30/2013	1890.0	119.0	132.0
BY-14-1; 3200 N. German Church Road	7/9/2013	24.1	78.8	131.0
BY-18-1 C. Residence	7/9/2013	-53.1	109.0	185.0
BY-32; W. Residence Well	7/9/2013	90.1	112.0	185.0
BY-35 V. Residence Well	7/9/2013	26.3	78.8	131.0
BY-36 B. Residence Well	7/9/2013	-15.3	77.7	131.0
BY-37 A. Residence Well	7/9/2013	30.6	78.9	131.0
Lake Louise Area, Rock R. Boat Entry, Byron, Illinois (Upstream)	7/17/2013	8.7	67.3	113.0
Pool of the Rock R., Oregon, Illinois	7/17/2013	13.0	67.5	113.0
Rock R. Boat Ramp Near the Lake Louise Sample Point	7/17/2013	-28.2	66.2	113.0

Location	Date	Result	Error	MDC
Rock R., DS of the Intersection With Woodland Creek (Upstream)	7/17/2013	-30.4	66.1	113.0
Rock R., Just Upstream of the Byron Cooling Water Discharge	7/17/2013	17.3	67.6	113.0
Woodland Creek, Upstream of the Intersection With Rock R.	7/17/2013	17.3	67.6	113.0
Lake Louise Area, Rock R. Boat Entry, Byron, Illinois (Upstream)	10/17/2013	-65.7	76.4	132.0
Pool of the Rock R., Oregon, Illinois	10/17/2013	-59.8	109.0	185.0
Rock R. Boat Ramp Near the Lake Louise Sample Point	10/17/2013	-16.1	110.0	185.0
Rock R., DS of the Intersection With Woodland Creek (Upstream)	10/17/2013	-24.1	77.6	132.0
Rock R., Just Upstream of the Byron Cooling Water Discharge	10/17/2013	2.3	110.0	185.0
Woodland Creek, Upstream of the Intersection With Rock R.	10/17/2013	-61.3	76.6	132.0

Table 22. Sample Results for Alpha/Beta Screening of Water from the Byron Area
Results are in picocuries per liter (pCi/L)

Location	Quarter 1		Quarter 2		Quarter 3		Quarter 4	
	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta
BY-12 Oregon Pool Of Rock River								
Results			0.3	1.7	-0.7	2.1		
Error			1.3	2.2	1.3	2.5		
MDC			2.0	3.7	2.1	4.2		
BY-14-1; N. German Church Road								
Results	0.4	3.5	-0.9	-1.3	0.3	-4.3		
Error	1.3	1.8	1.1	2.2	1.3	2.2		
MDC	1.9	3.0	1.9	3.8	2.2	4.0		
BY-18-1 C. Residence								
Results			2.6	4.3				
Error			1.2	2.4				
MDC			1.6	3.8				
BY-29 (Replaces BY-9 & BY-13)								
Results			-0.1	4.0				
Error			1.2	2.3				
MDC			2.0	3.7				
BY-32; W. Residence Well								
Results	-0.1	-0.6	0.0	-3.0	0.2	0.5		
Error	1.1	2.0	1.1	2.2	1.4	2.4		
MDC	1.8	3.4	1.9	3.8	2.2	4.0		
BY-35 V. Residence Well								
Results	0.4	0.4	0.1	0.3	-0.3	0.2		
Error	1.1	2.0	1.2	2.2	1.3	2.5		
MDC	1.8	3.4	1.9	3.8	2.1	4.2		
BY-36 B. Residence Well								
Results	0.3	0.5	0.5	-1.3	-0.2	0.5		
Error	1.1	2.0	1.2	2.2	1.3	2.5		
MDC	1.7	3.4	1.9	3.8	2.1	4.2		
BY-37 A. Residence Well								
Results	0.3	1.1	1.0	-0.4	0.2	0.8		
Error	1.1	2.0	1.2	2.2	1.3	2.5		
MDC	1.8	3.4	1.9	3.8	2.1	4.2		

Location	Quarter 1		Quarter 2		Quarter 3		Quarter 4	
	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta
Lake Louise Area, Rock R. Boat Entry, Byron (US)								
Results	-0.1	3.8	-1.1	3.2	-0.6	3.8		
Error	1.4	2.1	1.1	2.3	1.1	2.4		
MDC	2.2	3.4	1.9	3.7	1.9	3.9		
Pool of the Rock R., Oregon, Illinois								
Results			-0.8	2.4	0.3	3.7		
Error			1.1	2.2	1.2	2.4		
MDC			1.9	3.7	1.9	3.9		
Rock R. Boat Ramp Near the Lake Louise Sample Point								
Results	0.2	2.8	-2.1	3.5	0.0	2.1		
Error	1.4	2.1	1.1	2.3	1.1	2.4		
MDC	2.2	3.4	1.9	3.7	1.9	3.9		
Rock R., DS of the Intersection With Woodland Creek (US)								
Results			-1.2	4.2	0.4	4.3		
Error			1.1	2.3	1.2	2.4		
MDC			1.9	3.7	1.9	3.9		
Rock R., Just US of the Byron Cooling Water Discharge								
Results			-0.4	3.6	0.2	3.4		
Error			1.2	2.3	1.2	2.4		
MDC			1.9	3.7	1.9	3.9		
Woodland Creek, Upstream of the Intersection With Rock R.								
Results			-0.7	4.0				
Error			1.1	2.3				
MDC			1.9	3.7				
Woodland Creek, US of the Intersection With Rock R.								
Results					0.1	3.0		
Error					1.2	2.4		
MDC					1.9	3.9		

Table 23. Gamma Spectroscopy Sample Results for Other Radionuclides in Water from the Byron Area
Results are in picocuries per liter (pCi/L)

Location	Date	Nuclide	Result	Error	MDC
BY-14-1; 3200 N. German Church Road	1/8/2013	Co-58	-1.3	1.5	4.3
BY-14-1; 3200 N. German Church Road	1/8/2013	Co-60	-1.4	1.1	2.9
BY-14-1; 3200 N. German Church Road	1/8/2013	Cs-134	1.3	1.3	3.8
BY-14-1; 3200 N. German Church Road	1/8/2013	Cs-137	-1.3	1.0	2.9
BY-32; W. Residence Well	1/8/2013	Co-58	1.3	1.3	4.2
BY-32; W. Residence Well	1/8/2013	Co-60	0.9	1.1	3.5
BY-32; W. Residence Well	1/8/2013	Cs-134	1.3	1.2	3.8

Location	Date	Nuclide	Result	Error	MDC
BY-32; W. Residence Well	1/8/2013	Cs-137	-0.4	1.1	3.4
BY-35 V. Residence Well	1/8/2013	Co-58	1.2	1.3	4.1
BY-35 V. Residence Well	1/8/2013	Co-60	1.2	1.1	3.6
BY-35 V. Residence Well	1/8/2013	Cs-134	-0.9	1.2	3.5
BY-35 V. Residence Well	1/8/2013	Cs-137	1.3	1.1	3.6
BY-37 A. Residence Well	1/8/2013	Co-58	0.1	1.5	4.6
BY-37 A. Residence Well	1/8/2013	Co-60	-0.4	1.2	3.3
BY-37 A. Residence Well	1/8/2013	Cs-134	2.8	1.2	4.0
BY-37 A. Residence Well	1/8/2013	Cs-137	-0.9	1.1	3.3
Lake Louise Area, Rock R. Boat Entry, Byron, (US)	1/16/2013	Co-58	-0.5	3.8	2.8
Lake Louise Area, Rock R. Boat Entry, Byron, (US)	1/16/2013	Co-60	-1.8	4.3	2.8
Lake Louise Area, Rock R. Boat Entry, Byron, (US)	1/16/2013	Cs-134	0.2	3.7	2.8
Lake Louise Area, Rock R. Boat Entry, Byron, (US)	1/16/2013	Cs-137	-0.5	3.1	2.5
Rock R. Boat Ramp Near the Lake Louise Sample Point	1/16/2013	Co-58	1.3	2.5	3.8
Rock R. Boat Ramp Near the Lake Louise Sample Point	1/16/2013	Co-60	-1.7	2.9	3.8
Rock R. Boat Ramp Near the Lake Louise Sample Point	1/16/2013	Cs-134	1.2	2.4	3.7
Rock R. Boat Ramp Near the Lake Louise Sample Point	1/16/2013	Cs-137	-0.1	2.5	3.7
BY-12 Oregon Pool Of Rock River	3/31/2013	Co-58	0.8	1.4	4.1
BY-12 Oregon Pool Of Rock River	3/31/2013	Co-60	0.5	1.0	3.0
BY-12 Oregon Pool Of Rock River	3/31/2013	Cs-134	-2.6	1.2	3.1
BY-12 Oregon Pool Of Rock River	3/31/2013	Cs-137	0.0	1.1	3.1
BY-29 (Replaces BY-9 & BY-13)	3/31/2013	Co-58	3.0	1.5	4.7
BY-29 (Replaces BY-9 & BY-13)	3/31/2013	Co-60	-0.2	1.2	3.4
BY-29 (Replaces BY-9 & BY-13)	3/31/2013	Cs-134	-1.8	1.3	3.5
BY-29 (Replaces BY-9 & BY-13)	3/31/2013	Cs-137	-2.0	1.0	2.8
BY-35 V. Residence Well	4/9/2013	Co-58	-0.7	1.1	3.2
BY-35 V. Residence Well	4/9/2013	Co-60	0.2	1.1	3.2
BY-35 V. Residence Well	4/9/2013	Cs-134	0.8	0.9	3.0
BY-35 V. Residence Well	4/9/2013	Cs-137	-0.3	0.9	2.6
BY-18-1 C. Residence	4/16/2013	Co-58	0.4	2.1	3.1
BY-18-1 C. Residence	4/16/2013	Co-60	0.5	1.8	2.8
BY-18-1 C. Residence	4/16/2013	Cs-134	0.8	1.7	2.8
BY-18-1 C. Residence	4/16/2013	Cs-137	-1.5	1.7	2.4
Lake Louise Area, Rock R. Boat Entry, Byron, (US)	4/25/2013	Co-58	0.4	2.1	3.1
Lake Louise Area, Rock R. Boat Entry, Byron, (US)	4/25/2013	Co-60	-0.5	1.8	2.6
Lake Louise Area, Rock R. Boat Entry, Byron, (US)	4/25/2013	Cs-134	1.0	1.9	3.1
Lake Louise Area, Rock R. Boat Entry, Byron, (US)	4/25/2013	Cs-137	0.3	1.7	2.6
Pool of the Rock R., Oregon, Illinois	4/25/2013	Co-58	3.5	1.2	3.9
Pool of the Rock R., Oregon, Illinois	4/25/2013	Co-60	1.6	1.0	3.4
Pool of the Rock R., Oregon, Illinois	4/25/2013	Cs-134	-2.5	1.3	3.3
Pool of the Rock R., Oregon, Illinois	4/25/2013	Cs-137	-0.5	0.9	2.8

Location	Date	Nuclide	Result	Error	MDC
Rock R. Boat Ramp Near the Lake Louise Sample Point	4/25/2013	Co-58	0.8	1.3	3.8
Rock R. Boat Ramp Near the Lake Louise Sample Point	4/25/2013	Co-60	-0.6	1.1	3.1
Rock R. Boat Ramp Near the Lake Louise Sample Point	4/25/2013	Cs-134	1.3	1.2	3.7
Rock R. Boat Ramp Near the Lake Louise Sample Point	4/25/2013	Cs-137	0.8	1.0	3.1
Rock R., DS of the Intersection With Woodland Creek (US)	4/25/2013	Co-58	1.1	1.4	4.3
Rock R., DS of the Intersection With Woodland Creek (US)	4/25/2013	Co-60	1.0	1.2	3.7
Rock R., DS of the Intersection With Woodland Creek (US)	4/25/2013	Cs-134	-0.2	1.4	4.1
Rock R., DS of the Intersection With Woodland Creek (US)	4/25/2013	Cs-137	-1.0	1.2	3.5
Rock R., Just US of the Byron Cooling Water Discharge	4/25/2013	Co-58	1.1	1.4	4.2
Rock R., Just US of the Byron Cooling Water Discharge	4/25/2013	Co-60	-1.5	1.5	3.9
Rock R., Just US of the Byron Cooling Water Discharge	4/25/2013	Cs-134	0.7	1.3	3.8
Rock R., Just US of the Byron Cooling Water Discharge	4/25/2013	Cs-137	-0.9	1.0	3.0
Woodland Creek, US of the Intersection With Rock R.	4/25/2013	Co-58	0.0	1.3	3.7
Woodland Creek, US of the Intersection With Rock R.	4/25/2013	Co-60	1.1	1.1	3.4
Woodland Creek, US of the Intersection With Rock R.	4/25/2013	Cs-134	1.9	1.2	3.9
Woodland Creek, US of the Intersection With Rock R.	4/25/2013	Cs-137	-0.1	1.0	3.2
BY-12 Oregon Pool Of Rock River	6/30/2013	Co-58	-2.2	2.2	6.4
BY-12 Oregon Pool Of Rock River	6/30/2013	Co-60	-0.4	1.1	3.2
BY-12 Oregon Pool Of Rock River	6/30/2013	Cs-134	0.8	1.0	3.2
BY-12 Oregon Pool Of Rock River	6/30/2013	Cs-137	0.1	0.9	2.9
BY-14-1; 3200 N. German Church Road	7/9/2013	Co-58	-0.1	2.4	7.3
BY-14-1; 3200 N. German Church Road	7/9/2013	Co-60	0.0	1.3	3.9
BY-14-1; 3200 N. German Church Road	7/9/2013	Cs-134	0.1	1.2	3.8
BY-14-1; 3200 N. German Church Road	7/9/2013	Cs-137	-1.7	1.1	3.3
BY-18-1 C. Residence	7/9/2013	Co-58	0.5	2.6	7.3
BY-18-1 C. Residence	7/9/2013	Co-60	-0.3	1.3	3.4
BY-18-1 C. Residence	7/9/2013	Cs-134	1.5	1.3	3.8
BY-18-1 C. Residence	7/9/2013	Cs-137	0.7	0.9	3.0
BY-32; W. Residence Well	7/9/2013	Co-58	-1.1	2.1	5.8
BY-32; W. Residence Well	7/9/2013	Co-60	-0.5	0.9	2.6
BY-32; W. Residence Well	7/9/2013	Cs-134	-0.3	1.2	3.4
BY-32; W. Residence Well	7/9/2013	Cs-137	-0.2	0.9	2.7
BY-35 V. Residence Well	7/9/2013	Co-58	-3.2	2.7	7.5
BY-35 V. Residence Well	7/9/2013	Co-60	-0.8	1.5	4.1
BY-35 V. Residence Well	7/9/2013	Cs-134	-0.7	1.4	3.9
BY-35 V. Residence Well	7/9/2013	Cs-137	-2.7	1.3	3.4
BY-36 B. Residence Well	7/9/2013	Co-58	-0.8	2.0	5.8
BY-36 B. Residence Well	7/9/2013	Co-60	-0.4	1.0	2.8
BY-36 B. Residence Well	7/9/2013	Cs-134	0.8	1.1	3.3
BY-36 B. Residence Well	7/9/2013	Cs-137	0.3	0.8	2.5
BY-37 A. Residence Well	7/9/2013	Co-58	-1.4	2.1	6.4

Location	Date	Nuclide	Result	Error	MDC
BY-37 A. Residence Well	7/9/2013	Co-60	-1.9	1.1	2.8
BY-37 A. Residence Well	7/9/2013	Cs-134	0.0	1.0	3.1
BY-37 A. Residence Well	7/9/2013	Cs-137	-0.7	0.9	2.8
Lake Louise Area, Rock R. Boat Entry, Byron, (US)	7/17/2013	Co-58	-2.6	1.7	4.7
Lake Louise Area, Rock R. Boat Entry, Byron, (US)	7/17/2013	Co-60	0.6	1.1	3.3
Lake Louise Area, Rock R. Boat Entry, Byron, (US)	7/17/2013	Cs-134	1.1	1.2	3.5
Lake Louise Area, Rock R. Boat Entry, Byron, (US)	7/17/2013	Cs-137	2.1	0.9	3.2
Pool of the Rock R., Oregon, Illinois	7/17/2013	Co-58	0.0	2.5	3.9
Pool of the Rock R., Oregon, Illinois	7/17/2013	Co-60	-0.3	1.8	2.5
Pool of the Rock R., Oregon, Illinois	7/17/2013	Cs-134	0.0	1.6	2.6
Pool of the Rock R., Oregon, Illinois	7/17/2013	Cs-137	-2.0	1.7	2.5
Rock R. Boat Ramp Near the Lake Louise Sample Point	7/17/2013	Co-58	-0.9	2.6	4.0
Rock R. Boat Ramp Near the Lake Louise Sample Point	7/17/2013	Co-60	-0.8	1.9	2.6
Rock R. Boat Ramp Near the Lake Louise Sample Point	7/17/2013	Cs-134	1.8	1.6	2.8
Rock R. Boat Ramp Near the Lake Louise Sample Point	7/17/2013	Cs-137	-0.9	1.7	2.6
Rock R., DS of the Intersection With Woodland Creek (US)	7/17/2013	Co-58	0.5	1.0	3.1
Rock R., DS of the Intersection With Woodland Creek (US)	7/17/2013	Co-60	2.2	1.0	3.3
Rock R., DS of the Intersection With Woodland Creek (US)	7/17/2013	Cs-134	-0.2	1.0	3.0
Rock R., DS of the Intersection With Woodland Creek (US)	7/17/2013	Cs-137	0.3	0.9	2.9
Rock R., Just US of the Byron Cooling Water Discharge	7/17/2013	Co-58	-0.5	2.3	3.6
Rock R., Just US of the Byron Cooling Water Discharge	7/17/2013	Co-60	-0.1	1.7	2.5
Rock R., Just US of the Byron Cooling Water Discharge	7/17/2013	Cs-134	0.0	1.8	2.9
Rock R., Just US of the Byron Cooling Water Discharge	7/17/2013	Cs-137	0.8	1.6	2.6
Woodland Creek, US of the Intersection With Rock R.	7/17/2013	Co-58	-1.2	1.9	5.3
Woodland Creek, US of the Intersection With Rock R.	7/17/2013	Co-60	0.1	1.1	3.1
Woodland Creek, US of the Intersection With Rock R.	7/17/2013	Cs-134	1.5	1.3	3.8
Woodland Creek, US of the Intersection With Rock R.	7/17/2013	Cs-137	0.6	1.0	3.1
BY-14-1; 3200 N. German Church Road	10/8/2013	Co-58	-2.1	3.6	4.9
BY-14-1; 3200 N. German Church Road	10/8/2013	Co-60	-1.6	2.0	2.7
BY-14-1; 3200 N. German Church Road	10/8/2013	Cs-134	0.7	1.9	3.0
BY-14-1; 3200 N. German Church Road	10/8/2013	Cs-137	-0.7	1.7	2.6
BY-18-1 C. Residence	10/8/2013	Co-58	0.4	1.7	5.0
BY-18-1 C. Residence	10/8/2013	Co-60	-0.7	0.9	2.7
BY-18-1 C. Residence	10/8/2013	Cs-134	1.5	1.0	3.1
BY-18-1 C. Residence	10/8/2013	Cs-137	0.6	0.8	2.6
BY-32; W. Residence Well	10/8/2013	Co-58	0.8	2.9	4.5
BY-32; W. Residence Well	10/8/2013	Co-60	3.2	1.7	3.1
BY-32; W. Residence Well	10/8/2013	Cs-134	1.0	1.9	3.1
BY-32; W. Residence Well	10/8/2013	Cs-137	0.5	1.6	2.6
BY-35 V. Residence Well	10/8/2013	Co-58	1.6	2.4	7.1
BY-35 V. Residence Well	10/8/2013	Co-60	1.3	1.3	3.9

Location	Date	Nuclide	Result	Error	MDC
BY-35 V. Residence Well	10/8/2013	Cs-134	-0.1	1.4	4.1
BY-35 V. Residence Well	10/8/2013	Cs-137	-1.3	1.1	3.1
BY-36 B. Residence Well	10/8/2013	Co-58	-1.2	2.8	4.0
BY-36 B. Residence Well	10/8/2013	Co-60	0.7	1.6	2.6
BY-36 B. Residence Well	10/8/2013	Cs-134	-0.2	1.8	2.8
BY-36 B. Residence Well	10/8/2013	Cs-137	0.0	1.7	2.6
BY-37 A. Residence Well	10/8/2013	Co-58	-0.5	2.0	5.8
BY-37 A. Residence Well	10/8/2013	Co-60	-1.7	1.4	3.6
BY-37 A. Residence Well	10/8/2013	Cs-134	0.1	1.4	4.0
BY-37 A. Residence Well	10/8/2013	Cs-137	-1.2	1.0	3.0
BY-12 Oregon Pool Of Rock River	10/15/2013	Co-58	0.6	3.2	4.8
BY-12 Oregon Pool Of Rock River	10/15/2013	Co-60	0.6	1.8	2.9
BY-12 Oregon Pool Of Rock River	10/15/2013	Cs-134	-0.2	1.9	3.0
BY-12 Oregon Pool Of Rock River	10/15/2013	Cs-137	0.4	1.6	2.6
BY-29 (Replaces BY-9 & BY-13)	10/15/2013	Co-58	-5.0	2.2	5.7
BY-29 (Replaces BY-9 & BY-13)	10/15/2013	Co-60	1.0	1.3	3.9
BY-29 (Replaces BY-9 & BY-13)	10/15/2013	Cs-134	-0.6	1.3	3.6
BY-29 (Replaces BY-9 & BY-13)	10/15/2013	Cs-137	0.7	1.3	3.7
Lake Louise Area, Rock R. Boat Entry, Byron, (US)	10/17/2013	Co-58	0.9	1.1	3.5
Lake Louise Area, Rock R. Boat Entry, Byron, (US)	10/17/2013	Co-60	0.1	0.9	2.8
Lake Louise Area, Rock R. Boat Entry, Byron, (US)	10/17/2013	Cs-134	0.8	1.0	3.1
Lake Louise Area, Rock R. Boat Entry, Byron, (US)	10/17/2013	Cs-137	-0.2	1.0	2.9
Pool of the Rock R., Oregon, Illinois	10/17/2013	Co-58	1.4	2.8	4.3
Pool of the Rock R., Oregon, Illinois	10/17/2013	Co-60	-0.3	2.0	2.9
Pool of the Rock R., Oregon, Illinois	10/17/2013	Cs-134	0.7	1.7	2.8
Pool of the Rock R., Oregon, Illinois	10/17/2013	Cs-137	-1.3	1.7	2.5
Rock R. Boat Ramp Near the Lake Louise Sample Point	10/17/2013	Co-58	0.7	2.8	4.2
Rock R. Boat Ramp Near the Lake Louise Sample Point	10/17/2013	Co-60	-0.2	1.9	2.8
Rock R. Boat Ramp Near the Lake Louise Sample Point	10/17/2013	Cs-134	-0.1	1.8	2.9
Rock R. Boat Ramp Near the Lake Louise Sample Point	10/17/2013	Cs-137	-0.7	1.8	2.7
Rock R., DS of the Intersection With Woodland Creek (US)	10/17/2013	Co-58	2.2	1.4	4.3
Rock R., DS of the Intersection With Woodland Creek (US)	10/17/2013	Co-60	-2.0	1.0	2.5
Rock R., DS of the Intersection With Woodland Creek (US)	10/17/2013	Cs-134	-0.2	1.1	3.0
Rock R., DS of the Intersection With Woodland Creek (US)	10/17/2013	Cs-137	-0.1	0.9	2.8
Rock R., Just US of the Byron Cooling Water Discharge	10/17/2013	Co-58	0.2	1.9	5.5
Rock R., Just US of the Byron Cooling Water Discharge	10/17/2013	Co-60	-0.9	1.3	3.4
Rock R., Just US of the Byron Cooling Water Discharge	10/17/2013	Cs-134	1.3	1.3	3.9
Rock R., Just US of the Byron Cooling Water Discharge	10/17/2013	Cs-137	-0.5	1.0	3.0
Woodland Creek, US of the Intersection With Rock R.	10/17/2013	Co-58	1.3	1.5	4.5
Woodland Creek, US of the Intersection With Rock R.	10/17/2013	Co-60	1.3	1.0	3.3

Location	Date	Nuclide	Result	Error	MDC
Woodland Creek, US of the Intersection With Rock R.	10/17/2013	Cs-134	1.4	1.2	3.6
Woodland Creek, US of the Intersection With Rock R.	10/17/2013	Cs-137	1.5	0.9	3.0

Milk Samples

Milk samples are collected from two nearby dairies. Each month, approximately four liters of milk are collected and are mailed directly to the IEMA laboratory. Samples are analyzed within five days of sampling by gamma spectroscopy, specifically for short-lived iodine isotopes.

No radionuclides associated with nuclear power plant operations were detected in milk samples collected near Byron. Only naturally occurring K-40 was detected, and it was within the range typical of established background (1,266 to 14,700 pCi/L). See Table 24 for Iodine-131 results from milk samples taken from Byron-area dairies.

Table 24. Iodine-131 in Milk Sample Results for Byron Area
Results are in picocuries per liter (pCi/L)

DATE	BY-20-1 Dairy S			BY-26 Dairy Farm		
	Result	Error	MDC	Result	Error	MDC
1/2/2013	0.5	2.1	3.3	0.5	2.4	3.7
2/5/2013	0.9	1.1	3.3	-1.2	1.0	3.0
3/4/2013	0.7	1.0	3.0	0.6	1.1	3.4
4/2/2013	1.8	1.0	3.1	0.5	1.1	3.4
5/7/2013	-0.2	0.8	2.7	-1.9	1.3	3.6
5/21/2013	0.8	1.1	3.4	1.1	1.0	3.0
6/4/2013	-4.2	2.9	4.1	0.5	17.5	26.7
6/18/2013				-0.6	6.4	19.2
6/19/2013	1.1	5.2	15.8			
7/2/2013	0.4	0.9	3.1	-0.6	0.9	2.7
7/16/2013	-0.4	1.2	3.6	-0.3	1.1	3.3
7/30/2013	1.3	1.2	3.6	1.6	1.1	3.3
8/13/2013	0.5	1.0	2.9	1.1	1.0	2.9
8/27/2013	0.2	2.7	8.8	0.0	3.3	9.9
9/10/2013	1.1	1.1	3.5	0.1	1.1	3.4
9/24/2013	-1.0	1.0	3.0			
10/8/2013	1.0	1.4	4.1	1.8	1.2	3.7
10/22/2013	-0.1	0.9	2.7			
11/5/2013	-0.6	1.2	3.6	-1.0	1.1	3.2
12/3/2013	-0.2	1.1	3.2	1.0	1.0	3.0

Soil Samples

Soil samples are collected from land surrounding the plant, and are collected annually in the fall. All sediments are submitted for gamma spectroscopy analysis.

Soil samples are monitored for several radionuclides associated with nuclear power plant operations including, but not limited to, Co-58, Co-60, Cs-134, and Cs-137. It should be noted that as a remnant of atmospheric nuclear weapons testing, Cs-137 is routinely observed in sediment and soil at concentrations of 0.1-0.2 pCi/g. Table 25 shows the results of analysis of sediment samples taken from the Byron Area.

No radionuclides associated with nuclear power plant operations were detected in samples collected near Byron. Other radionuclides detected were naturally occurring.

Table 25. Soil Sample Results for Byron Area
Results are in picocuries per gram (pCi/g)

Location	Date	Nuclide	Result	Error	MDC
Nachusa Grasslands Area (Upwind)	7/17/2013	Co-58	0.0	0.0	0.0
Nachusa Grasslands Area (Upwind)	7/17/2013	Co-60	0.0	0.0	0.0
Nachusa Grasslands Area (Upwind)	7/17/2013	Cs-134	0.0	0.0	0.0
Nachusa Grasslands Area (Upwind)	7/17/2013	Cs-137	0.2	0.0	0.0

Sediment Samples

Sediment samples are collected at least annually from the rivers downstream of the plant effluent points. All sediments are submitted for gamma spectroscopy analysis.

Sediment samples are monitored for several radionuclides associated with nuclear power plant operations including, but not limited to, Co-58, Co-60, Cs-134, and Cs-137. It should be noted that as a remnant of atmospheric nuclear weapons testing, Cs-137 is routinely observed in sediment and soil at concentrations of 0.1-0.2 pCi/g. Table 24 shows the results of analysis of sediment samples taken from the Byron Area.

Table 26. Sediment Sample Results for Byron Area
Results are in picocuries per gram (pCi/g)

Location	Date	Nuclide	Result	Error	MDC
BY-34, Oregon Pool of Rock River	5/21/2013	Co-58	-0.1	0.1	0.3
BY-34, Oregon Pool of Rock River	5/21/2013	Co-60	0.0	0.1	0.2
BY-34, Oregon Pool of Rock River	5/21/2013	Cs-134	-0.1	0.0	0.1
BY-34, Oregon Pool of Rock River	5/21/2013	Cs-137	0.1	0.0	0.2
BY-34, Oregon Pool of Rock River	10/1/2013	Co-58	0.0	0.0	0.0
BY-34, Oregon Pool of Rock River	10/1/2013	Co-60	0.0	0.0	0.0
BY-34, Oregon Pool of Rock River	10/1/2013	Cs-134	0.0	0.0	0.0
BY-34, Oregon Pool of Rock River	10/1/2013	Cs-137	0.0	0.0	0.0
Lake Louise Area, Rock R. Boat Entry, Byron, (US)	10/17/2013	Co-58	0.0	0.0	0.0
Lake Louise Area, Rock R. Boat Entry, Byron, (US)	10/17/2013	Co-60	0.0	0.0	0.0

Location	Date	Nuclide	Result	Error	MDC
Lake Louise Area, Rock R. Boat Entry, Byron, (US)	10/17/2013	Cs-134	0.0	0.0	0.0
Lake Louise Area, Rock R. Boat Entry, Byron, (US)	10/17/2013	Cs-137	0.0	0.0	0.0
Rock R., Just US of the Byron Cooling Water Discharge	10/17/2013	Co-58	0.0	0.0	0.0
Rock R., Just US of the Byron Cooling Water Discharge	10/17/2013	Co-60	0.0	0.0	0.0
Rock R., Just US of the Byron Cooling Water Discharge	10/17/2013	Cs-134	0.0	0.0	0.0
Rock R., Just US of the Byron Cooling Water Discharge	10/17/2013	Cs-137	0.0	0.0	0.0

Fish Samples

Like sediments, fish are collected from rivers, typically near the plant discharge point. At each location, two different species of fish are collected annually, typically in October. Edible portions of the fish are harvested by technicians at Midwest Laboratory and prepared for analysis. Splits of the samples are provided to the IEMA laboratory. Fish samples are analyzed for reactor-produced radionuclides using gamma spectroscopy.

No radionuclides associated with nuclear power plant operations were detected in fish samples collected near Byron. Other radionuclides detected were naturally occurring. Table 27 shows results from fish sampling during 2013.

Table 27. Fish Sample Results for Byron Area
Results are in picocuries per kilogram (pCi/kg)

Location	Date	Nuclide	Result	Error	MDC	Comments
BY-31 Rock Riv @ Discharge	5/7/2013	Co-58	-22.1	29.6	81.9	Channel Catfish
BY-31 Rock Riv @ Discharge	5/7/2013	Co-60	2.6	9.7	27.2	Channel Catfish
BY-31 Rock Riv @ Discharge	5/7/2013	Cs-134	-15.9	9.9	25.8	Channel Catfish
BY-31 Rock Riv @ Discharge	5/7/2013	Cs-137	-11.2	8.4	22.7	Channel Catfish
BY-31 Rock Riv @ Discharge	10/2/2013	Co-58	16.3	12.0	37.0	Channel Catfish
BY-31 Rock Riv @ Discharge	10/2/2013	Co-60	6.3	7.2	22.3	Channel Catfish
BY-31 Rock Riv @ Discharge	10/2/2013	Cs-134	15.7	8.0	25.2	Channel Catfish
BY-31 Rock Riv @ Discharge	10/2/2013	Cs-137	-9.2	6.6	19.1	Channel Catfish
BY-31 Rock Riv @ Discharge	10/2/2013	Co-58	39.6	40.3	122.0	Small Mouth Bass
BY-31 Rock Riv @ Discharge	10/2/2013	Co-60	-12.5	23.0	64.8	Small Mouth Bass
BY-31 Rock Riv @ Discharge	10/2/2013	Cs-134	2.3	26.6	77.3	Small Mouth Bass
BY-31 Rock Riv @ Discharge	10/2/2013	Cs-137	10.9	24.0	74.7	Small Mouth Bass

Vegetation Samples

Vegetation samples are collected from land in the vicinity of the plant, and are collected annually in the fall. All vegetation samples are submitted for gamma spectroscopy analysis.

Vegetation samples are analyzed for several radionuclides associated with nuclear power plant operations including, but not limited to, Co-58, Co-60, Cs-134, and Cs-137. Table 28 shows the results of analysis of vegetation samples taken from the Byron Area.

No radionuclides associated with nuclear power plant operations were detected in samples collected near Byron. Other radionuclides detected were naturally occurring.

Table 28. Vegetation Sample Results for Byron Area
Results are in picocuries per kilogram (pCi/kg)

Location	Media	Date	Nuclide	Result	Error	MDC
Nachusa Grasslands Area (Upwind)	07	7/17/2013	Co-58	0.0	0.0	0.1
Nachusa Grasslands Area (Upwind)	07	7/17/2013	Co-60	0.0	0.0	0.0
Nachusa Grasslands Area (Upwind)	07	7/17/2013	Cs-134	0.0	0.0	0.0
Nachusa Grasslands Area (Upwind)	07	7/17/2013	Cs-137	0.0	0.0	0.0
Southwest of Rockford, (Downwind)	07	7/17/2013	Co-58	0.0	0.0	0.1
Southwest of Rockford, (Downwind)	07	7/17/2013	Co-60	0.0	0.0	0.1
Southwest of Rockford, (Downwind)	07	7/17/2013	Cs-134	0.0	0.0	0.1
Southwest of Rockford, (Downwind)	07	7/17/2013	Cs-137	0.0	0.0	0.0

Ambient Gamma

IEMA maintains a network of 74 environmental dosimeters in a ten-mile radius around the Byron station. Unlike the environmental samples described above, dosimeters do not provide information on what radionuclides are found in the environment. Instead, dosimeters provide a direct measurement of the total dose produced by all sources of gamma radiation, including naturally occurring radionuclides and cosmic rays. Dosimeters are exchanged and analyzed quarterly. In 2013, measurements at all locations were consistent with established background measurements. Table 29 summarizes the radiation readings in millirem per day (mrem/day) for Byron.

Table 29. Summary of Ambient Gamma Results for the Byron Area

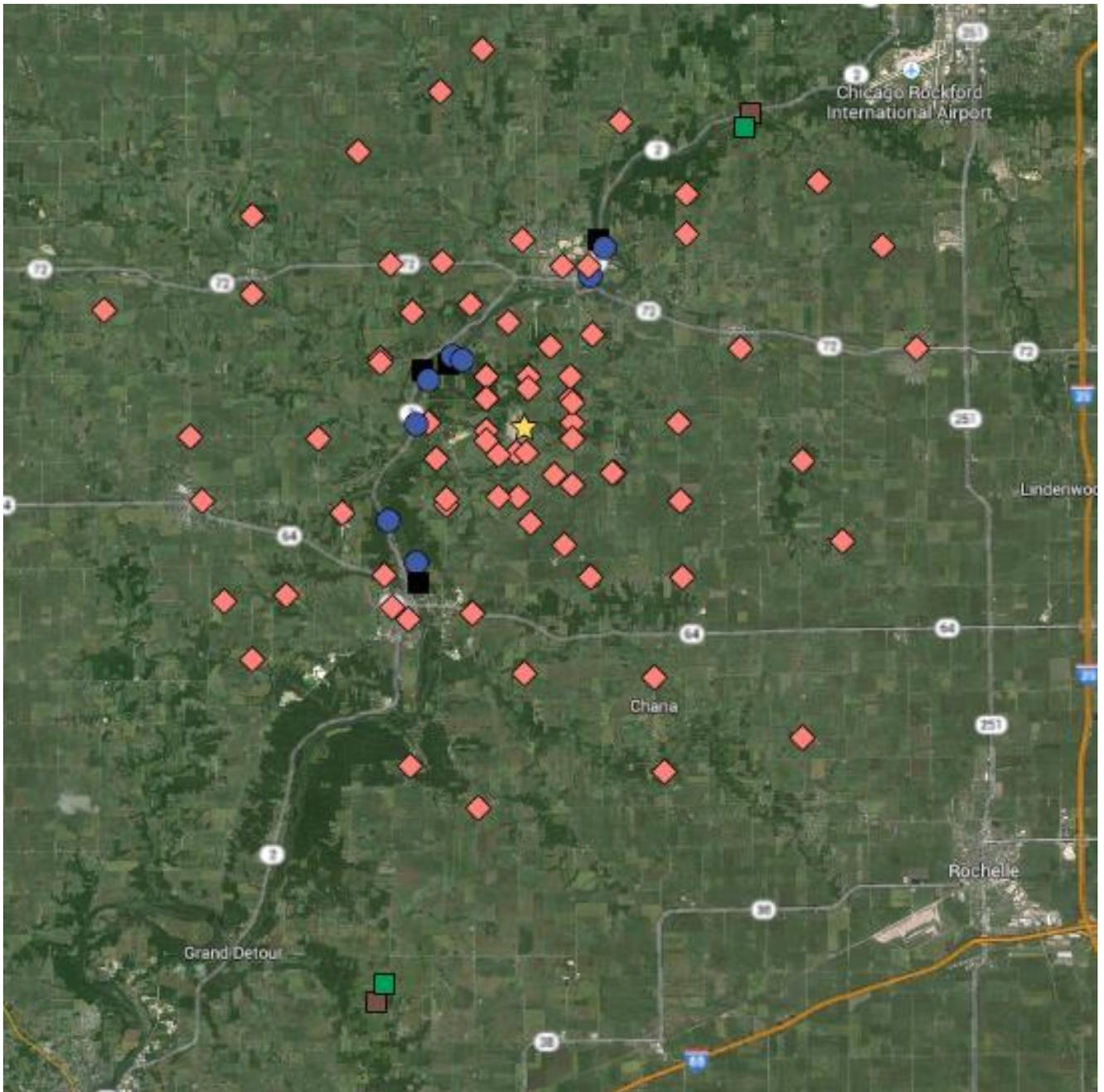
Location	Quarter 1 mrem/day	Quarter 2 mrem/day	Quarter 3 mrem/day	Quarter 4 mrem/day	Annual Dose mrem/year
BY001	0.091	0.079	0.113	0.098	34.77
BY003	0.077	0.063	0.091		28.11
BY004	0.091	0.072	0.1	0.094	32.58
BY005	0.087	0.062	0.093	0.089	30.20
BY006	0.093	0.08	0.091	0.086	31.94
BY007	0.086	0.069		0.093	30.17
BY008	0.095	0.08	0.096	0.082	32.21
BY011	0.074	0.057	0.103	0.098	30.30
BY013	0.118	0.1	0.125	0.113	41.61
BY014	0.085	0.082	0.087	0.096	31.94
BY015	0.088	0.089	0.098		33.46
BY018	0.071	0.059	0.081	0.06	24.73
BY020	0.115	0.094	0.12	0.105	39.60
BY022	0.1	0.093	0.14	0.104	39.88
BY023	0.102	0.09	0.113	0.108	37.69
BY026	0.08	0.092	0.111	0.102	35.13
BY027	0.112	0.097	0.149	0.123	43.89
BY029	0.108	0.094	0.12	0.097	38.23
BY030	0.086	0.1	0.111	0.097	35.95
BY033	0.108	0.099	0.119	0.099	38.78
BY034	0.094	0.07	0.104	0.089	32.58

Location	Quarter 1 mrem/day	Quarter 2 mrem/day	Quarter 3 mrem/day	Quarter 4 mrem/day	Annual Dose mrem/year
BY035	0.074	0.078	0.099	0.092	31.30
BY037	0.067	0.057	0.088	0.076	26.28
BY040	0.11	0.107	0.124	0.115	41.61
BY041	0.082	0.078	0.102	0.077	30.93
BY044	0.068	0.06	0.099	0.077	27.74
BY045	0.093	0.069	0.098	0.094	32.30
BY049	0.077	0.059	0.087	0.088	28.38
BY050	0.12	0.109	0.127	0.115	42.98
BY051	0.069	0.082	0.091	0.088	30.11
BY052	0.083	0.087	0.113	0.108	35.68
BY053	0.104	0.097	0.118	0.104	38.60
BY055	0.115	0.096	0.136	0.121	42.71
BY056	0.078	0.099	0.112	0.096	35.13
BY057	0.116	0.096	0.107	0.1	38.23
BY058	0.103	0.093	0.12	0.099	37.87
BY059	0.092	0.092	0.12	0.098	36.68
BY060	0.104	0.081	0.117	0.086	35.41
BY061	0.118	0.108	0.126	0.139	44.80
BY062	0.112	0.094	0.116	0.123	40.61
BY063	0.11	0.093	0.117	0.103	38.60
BY064	0.123	0.11	0.137	0.115	44.26
BY065	0.092	0.087	0.106	0.102	35.31
BY066	0.086	0.157	0.116	0.094	41.34
BY067	0.105	0.074	0.11	0.093	34.86
BY068	0.105	0.095	0.109	0.104	37.69
BY069	0.1	0.106	0.098	0.1	36.87
BY070	0.108	0.083	0.114	0.106	37.50
BY071	0.064	0.072	0.084	0.077	27.10
BY072	0.105	0.096	0.121	0.101	38.60
BY073	0.085	0.091	0.117	0.1	35.86
BY074	0.095	0.096	0.106	0.103	36.50
BY075	0.086	0.082	0.116	0.107	35.68
BY076	0.085	0.08	0.103	0.072	31.03
BY077	0.093	0.083	0.117	0.113	37.05
BY078	0.104	0.105	0.135	0.111	41.52
BY079	0.07	0.055	0.081	0.07	25.19
BY080	0.066	0.047	0.092	0.081	26.10
BY-RSA	0.09	0.073	0.099	0.081	31.30
BY-RSB	0.097	0.076	0.104	0.093	33.76
BY-RSC	0.078	0.068	0.08	0.082	28.11
BY-RSD	0.095	0.098	0.129	0.104	38.87
BY-RSE	0.085	0.093	0.1	0.079	32.58
BY-RSF	0.108	0.096	0.128	0.101	39.51
BY-RSG	0.08	0.077	0.104	0.101	33.03
BY-RSH	0.098	0.091	0.119	0.083	35.68
BY-RSJ	0.086	0.087	0.112	0.094	34.58
BY-RSK	0.088	0.078	0.103	0.108	34.40
BY-RSL	0.098	0.083	0.093	0.083	32.58
BY-RSM	0.069	0.049	0.072	0.058	22.63
BY-RSN	0.058	0.048	0.073	0.077	23.36

Location	Quarter 1 mrem/day	Quarter 2 mrem/day	Quarter 3 mrem/day	Quarter 4 mrem/day	Annual Dose mrem/year
BY-RSP	0.087	0.068	0.096	0.079	30.11
BY-RSQ	0.093	0.082	0.107	0.08	33.03
BY-RSR	0.117	0.107	0.12	0.12	42.34

Blanks in the table indicate that dosimeters were missing at the end of the quarter.
Annual Dose column based on averages of all available data.

Figure 5. Overview of IEMA Monitoring Locations for Byron



MAP KEY:					
	Nuclear Power plant		Dosimeter		Water Sample
	Soil Sample		Sediment Sample		Vegetation Sample

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Clinton Nuclear Power Station

Clinton Station is located in DeWitt County, approximately six miles east of the city of Clinton in central Illinois. The station has one boiling water reactor used to generate electricity for Exelon.

Liquid effluents from the Clinton Station are released into the eastern arm of Clinton Lake, a 4900-acre man-made cooling lake. Outflow from Lake Clinton falls into Salt Creek, a tributary of the Sangamon River. Critical pathways for radiation exposure to the public include ingestion from drinking water, and external gamma radiation from noble gases. Environmental samples collected include: lake sediment, soil, vegetation, and surface and well waters.



Water Samples

Water samples are collected from two wells in public recreation areas, seven locations around Lake Clinton. All water samples are collected once each quarter and typically 1 liter of water is collected per quarter. Water samples are submitted for gross alpha, gross beta, tritium and gamma spectroscopy analyses.

Water samples are monitored for several radionuclides associated with nuclear power plant operations including, but not limited to, Co-58, Co-60, Cs-134, and Cs-137. None of these were detected in 2013. Gross alpha and beta analyses were consistent with background. In addition, samples were tested for the presence of H-3 (tritium).

Tritium is a normal component of the effluent stream of nuclear power plants and its release to the environment is regulated by US NRC and Illinois Environmental Protection Agency

(IEPA) permitting. It is instructive to compare these concentrations to the US EPA drinking water standard of 20,000 pCi/L. Table 30 shows the results of tritium analysis of water samples around Clinton.

Water samples are screened for gross alpha and gross beta activity. Table 31 shows the results of alpha/beta screening. Samples are also monitored for several gamma-emitting radionuclides associated with nuclear power plant operations including, but not limited to, Co-58, Co-60, Cs-134, and Cs-137. None of these were detected in 2013. Table 32 shows results for analysis of water samples taken from the Clinton area.

Table 30. Tritium in Water Sample Results for Clinton Area
Results are in picocuries per liter (pCi/L)

Location	Date	Result	Error	MDC
Clinton Lake: Boat Ramp P.	3/29/2013	21.6	68.3	114.0
Clinton Lake: Bridge Over Lake At Rte 1489	3/29/2013	10.8	67.9	114.0
Clinton Lake: Bridge Over Lake At Rte 48	3/29/2013	26.0	68.4	114.0
Clinton Lake: North Branch @ Rte 54 Bridge	3/29/2013	-34.6	66.5	114.0
Effluent Flume @ Bridge Rt 1489	3/29/2013	62.8	69.5	114.0
Effluent from Alternate Cooling Pond	3/29/2013	0.0	67.6	114.0
North Fork Creek	3/29/2013	2.2	67.7	114.0
Salt Creek D.S. From Spillway	3/29/2013	26.0	68.4	114.0
Clinton Lake: Boat Ramp P.	5/30/2013	29.8	71.1	118.0
Clinton Lake: Bridge Over Lake At Rte 1489	5/30/2013	16.0	70.2	117.0
Clinton Lake: Bridge Over Lake At Rte 48	5/30/2013	2.3	70.2	118.0
Clinton Lake: North Branch @ Rte 54 Bridge	5/30/2013	-4.6	70.0	118.0
Effluent Flume @ Bridge Rt 1489	5/30/2013	38.9	70.9	117.0
Effluent from Alternate Cooling Pond	5/30/2013	-20.7	69.5	118.0
Mascutin Recreation Area Well	5/30/2013	11.5	70.5	118.0
North Fork Creek	5/30/2013	-27.4	68.9	117.0
Salt Creek D.S. From Spillway	5/30/2013	11.4	70.1	117.0
Well#7 At Weldon Springs Park	5/30/2013	0.0	69.7	117.0
Clinton Lake: Boat Ramp P.	7/24/2013	-6.5	66.8	113.0
Clinton Lake: Bridge Over Lake At Rte 1489	7/24/2013	-8.7	66.7	113.0
Clinton Lake: Bridge Over Lake At Rte 48	7/24/2013	-56.3	65.2	113.0
Clinton Lake: North Branch @ Rte 54 Bridge	7/24/2013	19.5	67.6	113.0
Mascutin Recreation Area Well	7/24/2013	-8.7	66.7	113.0
North Fork Creek	7/24/2013	52.0	68.6	113.0
Salt Creek D.S. From Spillway	7/24/2013	-30.3	66.0	113.0
Well#7 At Weldon Springs Park	7/24/2013	-26.0	66.2	113.0
Clinton Lake: Bridge Over Lake At Rte 1489	10/2/2013	-24.1	77.7	132.0
Clinton Lake: Bridge Over Lake At Rte 48	10/2/2013	-11.0	78.0	132.0
Clinton Lake: Bridge Over Lake At Rte 48	10/2/2013	4.4	78.4	132.0
Clinton Lake: North Branch @ Rte 54 Bridge	10/2/2013	-8.8	78.1	132.0
Effluent Flume @ Bridge Rt 1489	10/2/2013	28.5	79.1	132.0
North Fork Creek	10/2/2013	-11.0	78.0	132.0
Salt Creek D.S. From Spillway	10/2/2013	-6.6	78.1	132.0
Well#7 At Weldon Springs Park	10/2/2013	-113.0	108.0	185.0

Table 31. Sample Results for Alpha/Beta Screening of Water from the Clinton Area
Results are in picocuries per liter (pCi/L)

Location	Quarter 1		Quarter 2		Quarter 3		Quarter 4	
	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta
Clinton Lake: Boat Ramp P.								
Results	-0.4	1.4	0.8	3.9	1.6	2.0	0.3	3.0
Error	1.3	2.2	1.4	2.2	1.2	2.4	1.5	2.6
MDC	2.1	3.7	2.2	3.6	1.9	3.9	2.4	4.4
Clinton Lake: Bridge Over Lake At Rte 1489								
Results	-0.4	2.0	0.4	3.2	1.5	2.8	0.5	4.0
Error	1.3	2.2	1.4	2.2	1.2	2.4	1.4	2.6
MDC	2.1	3.7	2.2	3.6	1.9	3.9	2.3	4.3
Clinton Lake: Bridge Over Lake At Rte 48								
Results	0.1	2.2	1.2	3.0	0.6	3.1	0.5	2.0
Error	1.3	2.2	1.4	2.2	1.2	2.4	1.5	2.6
MDC	2.1	3.7	2.2	3.6	1.9	3.9	2.4	4.4
Clinton Lake: North Branch @ Rte 54 Bridge								
Results	-0.1	0.3	-0.2	3.4	1.1	0.2	1.2	2.7
Error	1.3	2.1	1.3	2.2	1.2	2.3	1.5	2.6
MDC	2.1	3.7	2.2	3.6	1.9	3.9	2.3	4.3
Effluent Flume @ Bridge Rt 1489								
Results	1.0	2.1	0.9	4.0	1.3	2.1	1.2	4.9
Error	1.4	2.2	1.4	2.2	1.2	2.1	1.5	2.6
MDC	2.1	3.7	2.2	3.6	1.8	3.5	2.3	4.3
Effluent from Alternate Cooling Pond								
Results	1.7	2.1	1.3	3.0				
Error	1.4	2.2	1.4	2.2				
MDC	2.1	3.7	2.2	3.6				
Mascutin Recreation Area Well								
Results			0.1	3.6	1.0	0.8		
Error			1.3	2.2	1.2	2.3		
MDC			2.2	3.6	1.9	3.9		
North Fork Creek								
Results	-1.0	2.9	0.9	3.3	0.7	-0.1	1.2	6.2
Error	1.2	2.2	1.4	2.2	1.1	2.1	1.5	2.7
MDC	2.1	3.7	2.2	3.6	1.8	3.5	2.3	4.3
Salt Creek D.S. From Spillway								
Results	0.6	2.2	0.8	4.4	1.0	2.1	-0.2	2.1
Error	1.3	2.2	1.4	2.3	1.2	2.1	1.5	2.6
MDC	2.1	3.7	2.2	3.6	1.8	3.5	2.4	4.4
Well#7 At Weldon Springs Park								
Results			-0.8	3.9	0.7	2.0	-0.3	0.9
Error			1.3	2.2	1.2	2.4	1.5	2.6
MDC			2.2	3.6	1.9	3.9	2.4	4.4

**Table 32. Gamma Spectroscopy Sample Results for Other Radionuclides in Water
from the Clinton Area
Results are in picocuries per liter (pCi/L)**

Location	Date	Nuclide	Result	Error	MDC
Clinton Lake: Boat Ramp P.	3/29/2013	Co-58	-0.5	1.1	3.2
Clinton Lake: Boat Ramp P.	3/29/2013	Co-60	-0.3	1.1	2.9
Clinton Lake: Boat Ramp P.	3/29/2013	Cs-134	0.9	1.1	3.3
Clinton Lake: Boat Ramp P.	3/29/2013	Cs-137	1.7	1.0	3.2
Clinton Lake: Bridge Over Lake At Rte 1489	3/29/2013	Co-58	0.5	1.2	3.5
Clinton Lake: Bridge Over Lake At Rte 1489	3/29/2013	Co-60	-2.0	1.1	2.9
Clinton Lake: Bridge Over Lake At Rte 1489	3/29/2013	Cs-134	2.3	1.2	3.7
Clinton Lake: Bridge Over Lake At Rte 1489	3/29/2013	Cs-137	-0.1	1.0	3.1
Clinton Lake: Bridge Over Lake At Rte 48	3/29/2013	Co-58	0.3	1.2	3.7
Clinton Lake: Bridge Over Lake At Rte 48	3/29/2013	Co-60	1.1	1.4	4.1
Clinton Lake: Bridge Over Lake At Rte 48	3/29/2013	Cs-134	1.3	1.2	3.8
Clinton Lake: Bridge Over Lake At Rte 48	3/29/2013	Cs-137	-0.1	1.3	3.6
Clinton Lake: North Branch @ Rte 54 Bridge	3/29/2013	Co-58	-0.4	0.9	2.7
Clinton Lake: North Branch @ Rte 54 Bridge	3/29/2013	Co-60	-0.4	1.0	3.0
Clinton Lake: North Branch @ Rte 54 Bridge	3/29/2013	Cs-134	1.6	1.0	3.2
Clinton Lake: North Branch @ Rte 54 Bridge	3/29/2013	Cs-137	1.5	0.9	3.1
Effluent Flume @ Bridge Rt 1489	3/29/2013	Co-58	-0.3	0.9	2.9
Effluent Flume @ Bridge Rt 1489	3/29/2013	Co-60	1.3	1.1	3.3
Effluent Flume @ Bridge Rt 1489	3/29/2013	Cs-134	1.4	0.9	3.1
Effluent Flume @ Bridge Rt 1489	3/29/2013	Cs-137	-0.1	0.9	2.7
Effluent from Alternate Cooling Pond	3/29/2013	Co-58	-1.6	1.2	3.2
Effluent from Alternate Cooling Pond	3/29/2013	Co-60	1.4	1.0	3.2
Effluent from Alternate Cooling Pond	3/29/2013	Cs-134	0.2	1.2	3.5
Effluent from Alternate Cooling Pond	3/29/2013	Cs-137	0.6	1.0	3.2
North Fork Creek	3/29/2013	Co-58	0.5	1.1	3.4
North Fork Creek	3/29/2013	Co-60	0.5	1.2	3.7
North Fork Creek	3/29/2013	Cs-134	2.3	1.2	3.8
North Fork Creek	3/29/2013	Cs-137	0.0	1.1	3.3
Salt Creek D.S. From Spillway	3/29/2013	Co-58	-0.6	0.9	2.6
Salt Creek D.S. From Spillway	3/29/2013	Co-60	-0.8	1.1	3.2
Salt Creek D.S. From Spillway	3/29/2013	Cs-134	1.1	0.9	3.0
Salt Creek D.S. From Spillway	3/29/2013	Cs-137	-0.4	0.9	2.8
Clinton Lake: Boat Ramp P.	5/30/2013	Co-58	-1.3	1.9	5.2
Clinton Lake: Boat Ramp P.	5/30/2013	Co-60	0.7	1.0	3.0
Clinton Lake: Boat Ramp P.	5/30/2013	Cs-134	0.2	1.2	3.6
Clinton Lake: Boat Ramp P.	5/30/2013	Cs-137	-0.7	1.0	3.0
Clinton Lake: Bridge Over Lake At Rte 1489	5/30/2013	Co-58	-3.0	1.8	4.9
Clinton Lake: Bridge Over Lake At Rte 1489	5/30/2013	Co-60	0.7	1.0	3.1
Clinton Lake: Bridge Over Lake At Rte 1489	5/30/2013	Cs-134	2.5	1.2	3.8
Clinton Lake: Bridge Over Lake At Rte 1489	5/30/2013	Cs-137	0.3	1.0	3.2
Clinton Lake: Bridge Over Lake At Rte 48	5/30/2013	Co-58	-5.0	1.8	4.8
Clinton Lake: Bridge Over Lake At Rte 48	5/30/2013	Co-60	1.3	1.3	4.1
Clinton Lake: Bridge Over Lake At Rte 48	5/30/2013	Cs-134	2.8	1.1	3.9
Clinton Lake: Bridge Over Lake At Rte 48	5/30/2013	Cs-137	-0.6	1.0	3.1
Clinton Lake: North Branch @ Rte 54 Bridge	5/30/2013	Co-58	-2.5	2.1	5.6
Clinton Lake: North Branch @ Rte 54 Bridge	5/30/2013	Co-60	-0.5	1.3	3.5

Location	Date	Nuclide	Result	Error	MDC
Clinton Lake: North Branch @ Rte 54 Bridge	5/30/2013	Cs-134	-0.6	1.4	4.0
Clinton Lake: North Branch @ Rte 54 Bridge	5/30/2013	Cs-137	-1.4	1.3	3.5
Effluent Flume @ Bridge Rt 1489	5/30/2013	Co-58	-0.3	1.8	5.4
Effluent Flume @ Bridge Rt 1489	5/30/2013	Co-60	-1.3	1.3	3.5
Effluent Flume @ Bridge Rt 1489	5/30/2013	Cs-134	2.4	1.2	4.0
Effluent Flume @ Bridge Rt 1489	5/30/2013	Cs-137	0.4	1.1	3.4
Effluent from Alternate Cooling Pond	5/30/2013	Co-58	2.9	1.7	5.3
Effluent from Alternate Cooling Pond	5/30/2013	Co-60	-1.3	1.2	3.2
Effluent from Alternate Cooling Pond	5/30/2013	Cs-134	0.8	1.2	3.6
Effluent from Alternate Cooling Pond	5/30/2013	Cs-137	-1.0	0.9	2.7
Mascutin Recreation Area Well	5/30/2013	Co-58	1.7	1.7	5.4
Mascutin Recreation Area Well	5/30/2013	Co-60	0.3	1.2	3.7
Mascutin Recreation Area Well	5/30/2013	Cs-134	1.1	1.2	3.7
Mascutin Recreation Area Well	5/30/2013	Cs-137	-1.7	1.1	3.3
North Fork Creek	5/30/2013	Co-58	-0.1	1.7	5.0
North Fork Creek	5/30/2013	Co-60	1.2	1.1	3.3
North Fork Creek	5/30/2013	Cs-134	0.2	1.3	3.6
North Fork Creek	5/30/2013	Cs-137	-0.5	1.0	2.9
Salt Creek D.S. From Spillway	5/30/2013	Co-58	-1.0	1.9	5.3
Salt Creek D.S. From Spillway	5/30/2013	Co-60	1.0	1.3	3.7
Salt Creek D.S. From Spillway	5/30/2013	Cs-134	-0.3	1.4	4.0
Salt Creek D.S. From Spillway	5/30/2013	Cs-137	2.3	1.2	3.9
Well#7 At Weldon Springs Park	5/30/2013	Co-58	1.7	1.9	5.8
Well#7 At Weldon Springs Park	5/30/2013	Co-60	-2.0	1.5	3.7
Well#7 At Weldon Springs Park	5/30/2013	Cs-134	1.9	1.2	3.9
Well#7 At Weldon Springs Park	5/30/2013	Cs-137	-0.4	1.3	3.6
Clinton Lake: Boat Ramp P.	7/24/2013	Co-58	0.1	2.6	4.1
Clinton Lake: Boat Ramp P.	7/24/2013	Co-60	-0.1	1.7	2.6
Clinton Lake: Boat Ramp P.	7/24/2013	Cs-134	1.7	1.8	3.0
Clinton Lake: Boat Ramp P.	7/24/2013	Cs-137	-1.0	1.6	2.5
Clinton Lake: Bridge Over Lake At Rte 1489	7/24/2013	Co-58	-1.0	1.3	3.9
Clinton Lake: Bridge Over Lake At Rte 1489	7/24/2013	Co-60	1.1	1.0	3.2
Clinton Lake: Bridge Over Lake At Rte 1489	7/24/2013	Cs-134	-0.7	1.0	3.0
Clinton Lake: Bridge Over Lake At Rte 1489	7/24/2013	Cs-137	0.1	0.9	2.9
Clinton Lake: Bridge Over Lake At Rte 48	7/24/2013	Co-58	-1.5	2.6	3.7
Clinton Lake: Bridge Over Lake At Rte 48	7/24/2013	Co-60	-0.1	1.6	2.4
Clinton Lake: Bridge Over Lake At Rte 48	7/24/2013	Cs-134	-0.4	1.8	2.9
Clinton Lake: Bridge Over Lake At Rte 48	7/24/2013	Cs-137	0.9	1.6	2.6
Clinton Lake: North Branch @ Rte 54 Bridge	7/24/2013	Co-58	-0.3	1.7	4.7
Clinton Lake: North Branch @ Rte 54 Bridge	7/24/2013	Co-60	1.4	1.0	3.4
Clinton Lake: North Branch @ Rte 54 Bridge	7/24/2013	Cs-134	-0.5	1.3	3.6
Clinton Lake: North Branch @ Rte 54 Bridge	7/24/2013	Cs-137	-1.2	1.0	2.9
Effluent Flume @ Bridge Rt 1489	7/24/2013	Co-58	-1.5	2.5	3.7
Effluent Flume @ Bridge Rt 1489	7/24/2013	Co-60	-0.4	1.9	2.7
Effluent Flume @ Bridge Rt 1489	7/24/2013	Cs-134	0.2	1.7	2.7
Effluent Flume @ Bridge Rt 1489	7/24/2013	Cs-137	0.3	1.7	2.7
Mascutin Recreation Area Well	7/24/2013	Co-58	-1.1	1.7	5.1
Mascutin Recreation Area Well	7/24/2013	Co-60	-0.2	1.3	3.6
Mascutin Recreation Area Well	7/24/2013	Cs-134	-0.8	1.2	3.6
Mascutin Recreation Area Well	7/24/2013	Cs-137	-1.2	1.1	3.1

Location	Date	Nuclide	Result	Error	MDC
North Fork Creek	7/24/2013	Co-58	0.7	1.4	4.3
North Fork Creek	7/24/2013	Co-60	-0.4	1.1	3.0
North Fork Creek	7/24/2013	Cs-134	0.6	1.0	3.1
North Fork Creek	7/24/2013	Cs-137	0.9	0.9	2.9
Salt Creek D.S. From Spillway	7/24/2013	Co-58	-0.4	1.7	5.0
Salt Creek D.S. From Spillway	7/24/2013	Co-60	-0.1	1.1	3.3
Salt Creek D.S. From Spillway	7/24/2013	Cs-134	-0.3	1.2	3.5
Salt Creek D.S. From Spillway	7/24/2013	Cs-137	0.5	1.0	3.1
Well#7 At Weldon Springs Park	7/24/2013	Co-58	0.8	2.0	5.9
Well#7 At Weldon Springs Park	7/24/2013	Co-60	0.1	1.3	3.7
Well#7 At Weldon Springs Park	7/24/2013	Cs-134	0.6	1.3	3.8
Well#7 At Weldon Springs Park	7/24/2013	Cs-137	-1.8	1.3	3.4
Clinton Lake: Boat Ramp P.	10/2/2013	Co-58	-1.1	1.9	5.4
Clinton Lake: Boat Ramp P.	10/2/2013	Co-60	1.8	1.4	4.4
Clinton Lake: Boat Ramp P.	10/2/2013	Cs-134	1.1	1.3	4.0
Clinton Lake: Boat Ramp P.	10/2/2013	Cs-137	-1.5	1.4	3.7
Clinton Lake: Bridge Over Lake At Rte 1489	10/2/2013	Co-58	1.4	1.5	4.9
Clinton Lake: Bridge Over Lake At Rte 1489	10/2/2013	Co-60	-1.4	1.3	3.4
Clinton Lake: Bridge Over Lake At Rte 1489	10/2/2013	Cs-134	-0.1	1.2	3.8
Clinton Lake: Bridge Over Lake At Rte 1489	10/2/2013	Cs-137	0.3	1.1	3.2
Clinton Lake: Bridge Over Lake At Rte 48	10/2/2013	Co-58	-2.1	1.6	4.6
Clinton Lake: Bridge Over Lake At Rte 48	10/2/2013	Co-60	-0.9	1.2	3.2
Clinton Lake: Bridge Over Lake At Rte 48	10/2/2013	Cs-134	1.8	1.1	3.8
Clinton Lake: Bridge Over Lake At Rte 48	10/2/2013	Cs-137	-1.5	1.1	3.1
Clinton Lake: North Branch @ Rte 54 Bridge	10/2/2013	Co-58	1.6	1.6	4.9
Clinton Lake: North Branch @ Rte 54 Bridge	10/2/2013	Co-60	0.7	1.1	3.2
Clinton Lake: North Branch @ Rte 54 Bridge	10/2/2013	Cs-134	1.8	1.2	3.6
Clinton Lake: North Branch @ Rte 54 Bridge	10/2/2013	Cs-137	0.2	0.9	2.9
Effluent Flume @ Bridge Rt 1489	10/2/2013	Co-58	-0.1	1.4	4.2
Effluent Flume @ Bridge Rt 1489	10/2/2013	Co-60	1.5	1.0	3.2
Effluent Flume @ Bridge Rt 1489	10/2/2013	Cs-134	-0.1	1.0	3.1
Effluent Flume @ Bridge Rt 1489	10/2/2013	Cs-137	1.1	0.9	2.9
North Fork Creek	10/2/2013	Co-58	-0.2	1.4	4.0
North Fork Creek	10/2/2013	Co-60	-1.3	1.0	2.5
North Fork Creek	10/2/2013	Cs-134	-0.5	1.1	3.2
North Fork Creek	10/2/2013	Cs-137	-0.9	0.8	2.4
Salt Creek D.S. From Spillway	10/2/2013	Co-58	3.5	1.8	5.6
Salt Creek D.S. From Spillway	10/2/2013	Co-60	-2.7	1.5	3.7
Salt Creek D.S. From Spillway	10/2/2013	Cs-134	0.2	1.2	3.6
Salt Creek D.S. From Spillway	10/2/2013	Cs-137	0.2	1.3	3.6
Well#7 At Weldon Springs Park	10/2/2013	Co-58	-1.9	3.0	4.1
Well#7 At Weldon Springs Park	10/2/2013	Co-60	1.7	1.6	2.7
Well#7 At Weldon Springs Park	10/2/2013	Cs-134	1.1	1.9	3.1
Well#7 At Weldon Springs Park	10/2/2013	Cs-137	-0.4	1.8	2.7

Milk Samples

No dairy falls within ten miles of Clinton. In the event that milk samples were collected, the samples collected for Braidwood would provide a control sample.

Soil Samples

Soil samples are collected from land surrounding the plant, and are collected annually. All sediments are submitted for gamma spectroscopy analysis.

Soil samples are monitored for several radionuclides associated with nuclear power plant operations including, but not limited to, Co-58, Co-60, Cs-134, and Cs-137. It should be noted that as a remnant of atmospheric nuclear weapons testing, Cs-137 is routinely observed in sediment and soil at concentrations of 0.1-0.2 pCi/g. Table 33 shows the results of analysis of sediment samples taken from the Clinton Area.

No radionuclides associated with nuclear power plant operations were detected in samples collected near Braidwood. Other radionuclides detected were naturally occurring.

Table 33. Soil Sample Results for Clinton Area
Results are in picocuries per gram (pCi/g)

Location	Date	Nuclide	Result	Error	MDC
Mascoutin Recreation Area	7/24/2013	Co-58	0.0	0.0	0.0
Mascoutin Recreation Area	7/24/2013	Co-60	0.0	0.0	0.0
Mascoutin Recreation Area	7/24/2013	Cs-134	0.0	0.0	0.0
Mascoutin Recreation Area	7/24/2013	Cs-137	0.1	0.0	0.0
Weldon Springs Entrance	7/24/2013	Co-58	0.0	0.0	0.1
Weldon Springs Entrance	7/24/2013	Co-60	0.0	0.0	0.0
Weldon Springs Entrance	7/24/2013	Cs-134	0.0	0.0	0.0
Weldon Springs Entrance	7/24/2013	Cs-137	0.0	0.0	0.0

Sediment Samples

Sediment samples are collected from six locations in Clinton Lake. Sediments are collected at least annually and are submitted for gamma spectroscopy analyses.

Sediment samples are monitored for several radionuclides associated with nuclear power plant operations including, but not limited to, Co-58, Co-60, Cs-134, and Cs-137. It should be noted that as a remnant of atmospheric nuclear weapons testing, Cs-137 is routinely observed in sediment and soil at concentrations of 0.1-0.2 pCi/g. Table 34 shows the results of analysis of sediment samples taken from the Clinton Area.

Table 34. Sediment Sample Results for Clinton Area
Results are in picocuries per gram (pCi/g)

Location	Date	Nuclide	Result	Error	MDC
Parnell Boat Ramp	10/2/2013	Co-58	0.0	0.0	0.0
Parnell Boat Ramp	10/2/2013	Co-60	0.0	0.0	0.0
Parnell Boat Ramp	10/2/2013	Cs-134	0.0	0.0	0.0
Parnell Boat Ramp	10/2/2013	Cs-137	0.0	0.0	0.0
Lake Louise Area, Rock R. Boat Entry, Byron, (US)	10/17/2013	Co-58	0.0	0.0	0.0
Lake Louise Area, Rock R. Boat Entry, Byron, (US)	10/17/2013	Co-60	0.0	0.0	0.0

Location	Date	Nuclide	Result	Error	MDC
Lake Louise Area, Rock R. Boat Entry, Byron, (US)	10/17/2013	Cs-134	0.0	0.0	0.0
Lake Louise Area, Rock R. Boat Entry, Byron, (US)	10/17/2013	Cs-137	0.0	0.0	0.0
Rock R., Just US of the Byron Cooling Water Discharge	10/17/2013	Co-58	0.0	0.0	0.0
Rock R., Just US of the Byron Cooling Water Discharge	10/17/2013	Co-60	0.0	0.0	0.0
Rock R., Just US of the Byron Cooling Water Discharge	10/17/2013	Cs-134	0.0	0.0	0.0
Rock R., Just US of the Byron Cooling Water Discharge	10/17/2013	Cs-137	0.0	0.0	0.0

Fish Samples

No fish samples were obtained from the Clinton area during calendar year 2013.

Vegetation Samples

Vegetation samples are collected from land in the vicinity of the plant, and are collected annually and are submitted for gamma spectroscopy analysis.

Vegetation samples are monitored for several radionuclides associated with nuclear power plant operations including, but not limited to, Co-58, Co-60, Cs-134 and Cs-137. Table 35 shows the results of analysis of vegetation samples taken from the Clinton Area.

No radionuclides associated with nuclear power plant operations were detected in samples collected near Clinton. Other radionuclides detected were naturally occurring.

Table 35. Vegetation Sample Results for Clinton Area
Results are in picocuries per kilogram (pCi/kg)

Location	Date	Nuclide	Result	Error	MDC
Mascoutin Recreation Area	7/24/2013	Co-58	0.0	0.0	0.0
Mascoutin Recreation Area	7/24/2013	Co-60	0.0	0.0	0.0
Mascoutin Recreation Area	7/24/2013	Cs-134	0.0	0.0	0.0
Mascoutin Recreation Area	7/24/2013	Cs-137	0.0	0.0	0.0
Weldon Springs Entrance	7/24/2013	Co-58	0.0	0.0	0.0
Weldon Springs Entrance	7/24/2013	Co-60	0.0	0.0	0.0
Weldon Springs Entrance	7/24/2013	Cs-134	0.0	0.0	0.0
Weldon Springs Entrance	7/24/2013	Cs-137	0.0	0.0	0.0

Ambient Gamma

IEMA maintains a network of 50 environmental dosimeters in a ten-mile radius around the Clinton station. Unlike the environmental samples described above, dosimeters do not provide information on what radionuclides are found in the environment. Instead, dosimeters provide a direct measurement of the total dose produced by all sources of gamma radiation, including naturally occurring radionuclides and cosmic rays. Dosimeters are exchanged and analyzed quarterly.

In 2013, measurements at all 50 locations were consistent with established background measurements. Table 36 summarizes quarterly radiation readings in millirem per day (mrem/day) for Clinton.

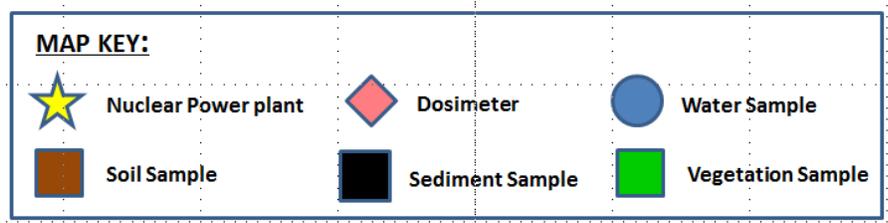
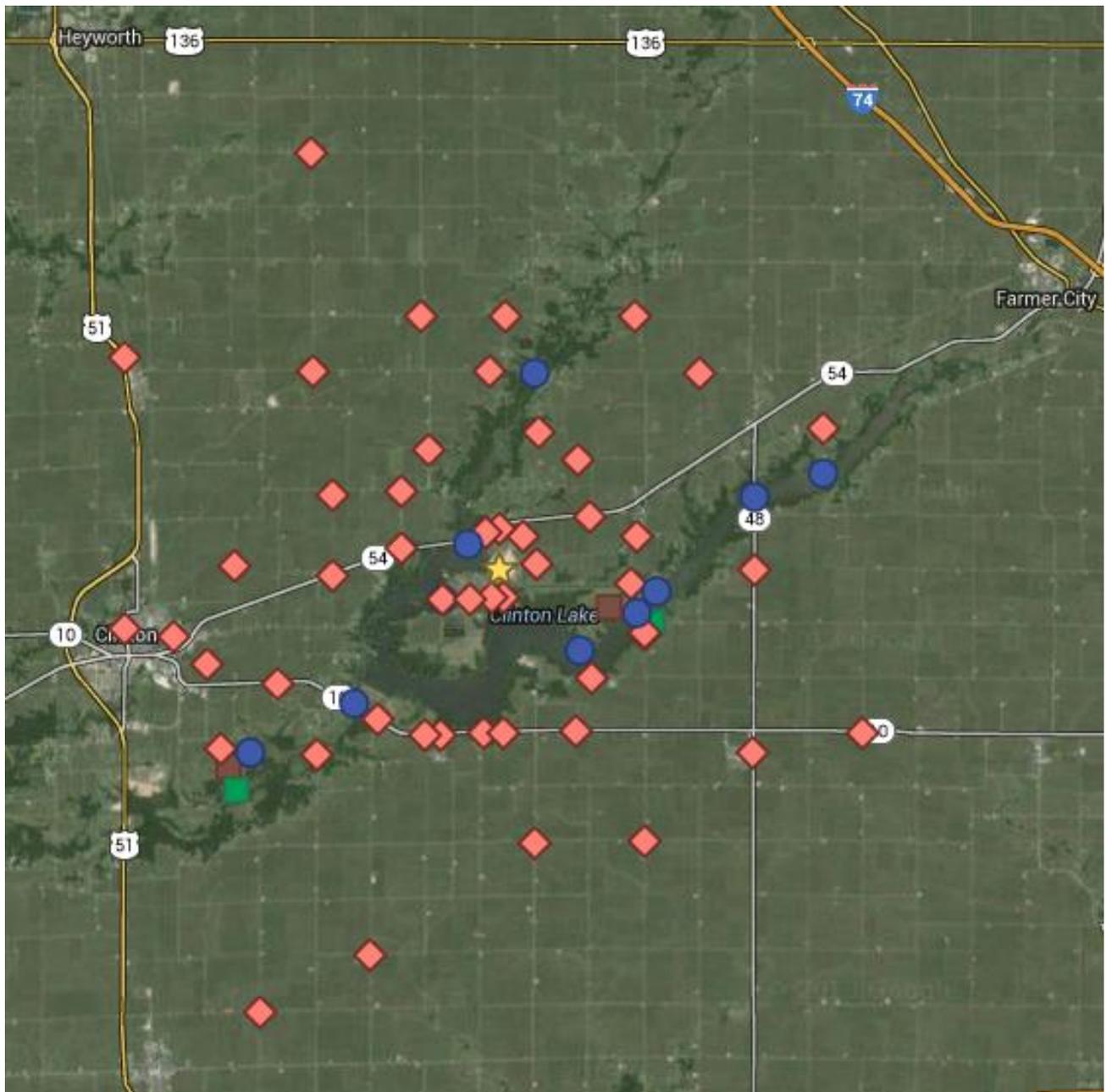
Table 36. Summary of Ambient Gamma Results for the Clinton Area

Location	Quarter 1 mrem/day	Quarter 2 mrem/day	Quarter 3 mrem/day	Quarter 4 mrem/day	Annual Dose mrem/year
CP001	0.107	0.121	0.102	0.121	41.15
CP003	0.105	0.111	0.109	0.117	40.33
CP006	0.113	0.098	0.083	0.092	35.22
CP009	0.106	0.117	0.108		40.27
CP011	0.102	0.109	0.107	0.118	39.79
CP013	0.088	0.09	0.079	0.089	31.57
CP016	0.127	0.121	0.118	0.133	45.53
CP018	0.125	0.141	0.12	0.133	47.36
CP019	0.112	0.116	0.086	0.105	38.23
CP022	0.107	0.11	0.116	0.114	40.79
CP025	0.107	0.146	0.122	0.128	45.90
CP027	0.103	0.105	0.102	0.095	36.96
CP028	0.107		0.12	0.118	41.98
CP031	0.121	0.12	0.093	0.13	42.34
CP032	0.11	0.111	0.099	0.119	40.06
CP033	0.085	0.092	0.099	0.103	34.58
CP034	0.095	0.115	0.099	0.109	38.14
CP035	0.094	0.1	0.102	0.104	36.50
CP036	0.125	0.123	0.112	0.123	44.07
CP037	0.13	0.121	0.11	0.135	45.26
CP038	0.095	0.111	0.091	0.12	38.05
CP039	0.115	0.136	0.122	0.134	46.26
CP040	0.112	0.094	0.106	0.12	39.42
CP041	0.099	0.136	0.124	0.134	44.99
CP042	0.123	0.122	0.119	0.117	43.89
CP043	0.122	0.128	0.125	0.125	45.63
CP044	0.114	0.116	0.128	0.126	44.17
CP045	0.099	0.1	0.114	0.113	38.87
CP046	0.118	0.137		0.13	46.84
CP047	0.114	0.124		0.125	44.17
CP048	0.106	0.115	0.13	0.117	42.71
CP049	0.11	0.105	0.117	0.12	41.25
CP050	0.113	0.136	0.118	0.094	42.07
CP051	0.113		0.12	0.116	42.46
CP-RSA	0.109	0.117	0.13	0.118	43.25
CP-RSB	0.107	0.113	0.107	0.111	39.97
CP-RSC	0.101	0.109	0.099	0.108	38.05
CP-RSD	0.111		0.118	0.119	42.34
CP-RSE	0.084	0.1	0.098	0.104	35.22
CP-RSF	0.096	0.122		0.088	37.23
CP-RSG	0.133	0.105	0.105	0.123	42.52
CP-RSH	0.115	0.138	0.115	0.116	44.17
CP-RSJ	0.112	0.098	0.131	0.115	41.61

Location	Quarter 1 mrem/day	Quarter 2 mrem/day	Quarter 3 mrem/day	Quarter 4 mrem/day	Annual Dose mrem/year
CP-RSK	0.115	0.103	0.125	0.108	41.15
CP-RSL	0.108	0.12	0.127	0.129	44.17
CP-RSM	0.097	0.112	0.115	0.111	39.69
CP-RSN	0.094	0.1	0.117	0.108	38.23
CP-RSP	0.123	0.121	0.138	0.13	46.72
CP-RSQ	0.109	0.129	0.123	0.116	43.53
CP-RSR	0.127	0.104	0.1	0.122	41.34

Blanks in the table indicate that dosimeters were missing at the end of the quarter.
Annual Dose column based on averages of all available data.

Figure 6. Overview of IEMA Monitoring Locations for Clinton



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LaSalle Nuclear Power Station

LaSalle Station is located in LaSalle County, near Marseilles in northern, Illinois. This station has two boiling water reactors used to generate electricity for Exelon. Unit 1 began operation in March 1982 and Unit 2 in late December of 1983.

Liquid effluents from the LaSalle Station are released to the LaSalle cooling lake and from there to the Illinois River at a point 3.5 miles north of the station. However, the discharge point is approximately 20 miles downriver of the Dresden nuclear power station. Effectively, samples taken downstream of Dresden station are upstream controls for the LaSalle station. Critical pathways for radiation exposure to the public include ingestion from water and foodstuffs, and external gamma radiation from noble gases. Environmental media sampled include: upstream and downstream surface water, milk, soil, vegetation, fish, and river sediment.



Water Samples

Water samples are collected from two locations in the Illinois River and two ground water wells. Ground water samples are collected once each quarter. For surface water samples, aliquots are collected weekly and composited for quarterly analysis. Typically, 3-4 liters are collected per quarter. Water samples are submitted for gross alpha, gross beta, tritium and gamma spectroscopy analyses.

Water samples are monitored for several radionuclides associated with nuclear power plant operations including, but not limited to, Co-58, Co-60, Cs-134, and Cs-137. None of these were detected in 2013. Gross alpha and beta analyses were consistent with background. In addition, samples were tested for the presence of H-3 (tritium).

Tritium is a normal component of the effluent stream of nuclear power plants and its release to the environment is regulated by US NRC and Illinois Environmental Protection Agency (IEPA) permitting. LaSalle monitoring points on the Illinois River are downstream from both Dresden and Braidwood nuclear power plants. Historically, detectable concentrations of tritium have been found at monitoring locations near the LaSalle station. It is instructive to compare these concentrations to the US EPA drinking water standard of 20,000 pCi/L. The highest concentration seen at any of the LaSalle monitoring sites was 1,450 pCi/L from the Illinois River which is only a fraction of the US EPA drinking water standard. Table 37 shows the results of tritium analysis of water samples around LaSalle.

Water samples are screened for gross alpha and gross beta activity. Table 38 shows the results of alpha/beta screening. Samples are also analyzed for several gamma-emitting radionuclides associated with nuclear power plant operations including, but not limited to, Co-58, Co-60, Cs-134 and Cs-137. None of these were detected in 2013. Table 39 (below) shows results for analysis of water samples taken from the LaSalle area.

Table 37. Tritium in Water Sample Results for LaSalle Area
Results are in picocuries per liter (pCi/L)

Location	Date	Result	Error	MDC
L-27; LSCS Onsite Well @ Station (quarterly grab)	1/10/2013	-19.8	99.4	168.0
L-28 Town of Marseilles (quarterly grab)	1/10/2013	-22.0	99.4	168.0
Allen Park, South Ottawa, (DS)	1/15/2013	57.0	101.0	167.0
Illinois R. at Illini State Park River Access	1/15/2013	46.1	101.0	167.0
Illinois R. near Rt. 170 Bridge	1/15/2013	-28.5	99.0	167.0
Middle East Conflicts Wall Memorial, Marseilles, (DS)	1/15/2013	-70.2	98.1	167.0
Seneca, Illinois Boat Launch (Upstream)	1/15/2013	-28.5	99.0	167.0
Starved Rock State Park, Illinois R. (DS)	1/15/2013	46.1	101.0	167.0
L-21 Illinois River, Seneca	3/31/2013	124.0	71.7	114.0
L-40 Illinois River -DS	3/31/2013	95.7	70.9	114.0
L-27; LSCS Onsite Well @ Station (quarterly grab)	4/11/2013	-52.7	68.3	118.0
L-28 Town of Marseilles (quarterly grab)	4/11/2013	-36.7	68.9	118.0
Illinois R. at Illini State Park River Access	4/24/2013	23.8	68.5	114.0
Illinois R. near Rt. 170 Bridge	4/24/2013	-33.0	99.2	168.0
Middle East Conflicts Wall Memorial, Marseilles, (DS)	4/24/2013	-57.2	98.7	168.0
Seneca, Illinois Boat Launch (Upstream)	4/24/2013	10.8	68.1	114.0
Allen Park, South Ottawa, (DS)	4/25/2013	6.5	67.9	114.0
Starved Rock State Park, Illinois R. (DS)	4/25/2013	4.4	100.0	168.0
L-28 Town of Marseilles (quarterly grab)	7/11/2013	-13.1	77.8	131.0
Illinois R. at Illini State Park River Access	7/16/2013	990.0	92.8	113.0
Illinois R. near Rt. 170 Bridge	7/16/2013	1240.0	98.2	113.0
Middle East Conflicts Wall Memorial, Marseilles, (DS)	7/16/2013	964.0	92.2	113.0
Seneca, Illinois Boat Launch (Upstream)	7/16/2013	1290.0	99.3	113.0
Allen Park, South Ottawa, (DS)	7/17/2013	1140.0	96.1	113.0
Starved Rock State Park, Illinois R. (DS)	7/17/2013	1080.0	94.8	113.0
Allen Park, South Ottawa, (DS)	10/16/2013	1190.0	105.0	131.0
Illinois R. at Illini State Park River Access	10/16/2013	1450.0	111.0	132.0
Illinois R. near Rt. 170 Bridge	10/16/2013	1350.0	109.0	132.0
Middle East Conflicts Wall Memorial, Marseilles, (DS)	10/16/2013	1220.0	106.0	132.0
Seneca, Illinois Boat Launch (Upstream)	10/16/2013	1250.0	107.0	132.0
Starved Rock State Park, Illinois R. (DS)	10/16/2013	987.0	101.0	131.0

Table 38. Sample Results for Alpha/Beta Screening of Water from the LaSalle Area
Results are in picocuries per liter (pCi/L)

Location	Quarter 1		Quarter 2		Quarter 3		Quarter 4	
	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta
Allen Park, South Ottawa, (DS)								
Results	-0.8	3.5	0.1	3.0	0.9	4.0	0.9	6.0
Error	1.3	2.1	1.2	2.3	1.2	2.4	1.5	2.6
MDC	2.2	3.4	1.9	3.7	1.9	3.9	2.3	4.3
Illinois R. at Illini State Park River Access								
Results	0.1	5.9	-0.9	5.1	2.0	3.8	1.5	5.2
Error	1.4	2.1	1.1	2.3	1.3	2.4	1.5	2.6
MDC	2.2	3.4	1.9	3.7	1.9	3.9	2.3	4.3
Illinois R. near Rt. 170 Bridge								
Results	-0.7	5.2	0.1	3.2	1.2	3.9	0.9	5.5
Error	1.3	2.1	1.2	2.3	1.2	2.4	1.5	2.6
MDC	2.2	3.4	1.9	3.7	1.9	3.9	2.3	4.3
L-21 Illinois River, Seneca								
Results	0.5	5.5			1.0	3.8		
Error	1.3	2.3			1.2	2.2		
MDC	2.0	3.7			1.8	3.5		
L-27; LSCS Onsite Well @ Station (quarterly grab)								
Results	17.2	20.9	8.7	13.8	19.9	18.0		
Error	1.9	2.5	1.5	2.6	1.9	2.5		
MDC	1.8	3.4	1.6	3.8	1.8	3.5		
L-28 Town of Marseilles (quarterly grab)								
Results	12.3	14.5	9.9	12.1	9.2	13.1		
Error	1.7	2.4	1.5	2.6	1.7	2.8		
MDC	1.8	3.4	1.6	3.8	2.1	4.2		
L-40 Illinois River -DS								
Results	1.5	4.6			0.8	5.1		
Error	1.3	2.3			1.2	2.2		
MDC	2.0	3.7			1.8	3.5		
Middle East Conflicts Wall Memorial, Marseilles, (DS)								
Results	0.7	4.8	-0.3	5.5	1.2	3.7	0.7	6.1
Error	1.4	2.1	1.2	2.3	1.2	2.4	1.5	2.7
MDC	2.2	3.4	1.9	3.7	1.9	3.9	2.3	4.3
Seneca, Illinois Boat Launch (Upstream)								
Results	-1.4	4.7	0.0	4.3	1.3	4.8	-0.2	5.1
Error	1.3	2.1	1.2	2.3	1.2	2.4	1.4	2.6
MDC	2.2	3.4	1.9	3.7	1.9	3.9	2.3	4.3
Starved Rock State Park, Illinois R. (DS)								
Results	30.1	39.9	-0.6	4.2	1.2	4.7	0.7	6.0
Error	5.1	7.0	1.1	2.3	1.2	2.4	1.5	2.7
MDC	5.8	10.2	1.9	3.7	1.9	3.9	2.3	4.3

**Table 39. Gamma Spectroscopy Sample Results for Other Radionuclides in Water
from the LaSalle Area
Results are in picocuries per liter (pCi/L)**

Location	Date	Nuclide	Result	Error	MDC
L-27; LSCS Onsite Well @ Station (quarterly grab)	1/10/2013	Co-58	-2.1	1.4	3.9
L-27; LSCS Onsite Well @ Station (quarterly grab)	1/10/2013	Co-60	1.4	1.1	3.4
L-27; LSCS Onsite Well @ Station (quarterly grab)	1/10/2013	Cs-134	1.0	1.1	3.2
L-27; LSCS Onsite Well @ Station (quarterly grab)	1/10/2013	Cs-137	0.1	1.1	3.2
L-28 Town of Marseilles (quarterly grab)	1/10/2013	Co-58	-0.5	1.3	3.7
L-28 Town of Marseilles (quarterly grab)	1/10/2013	Co-60	0.4	1.2	3.2
L-28 Town of Marseilles (quarterly grab)	1/10/2013	Cs-134	-0.9	1.2	3.2
L-28 Town of Marseilles (quarterly grab)	1/10/2013	Cs-137	1.0	1.0	3.0
Allen Park, South Ottawa, (DS)	1/15/2013	Co-58	-1.4	2.4	3.4
Allen Park, South Ottawa, (DS)	1/15/2013	Co-60	1.7	2.6	4.1
Allen Park, South Ottawa, (DS)	1/15/2013	Cs-134	1.4	2.4	3.8
Allen Park, South Ottawa, (DS)	1/15/2013	Cs-137	-0.9	2.1	3.1
Illinois R. at Illini State Park River Access	1/15/2013	Co-58	0.7	2.0	3.0
Illinois R. at Illini State Park River Access	1/15/2013	Co-60	1.8	2.0	3.3
Illinois R. at Illini State Park River Access	1/15/2013	Cs-134	-0.4	2.1	3.1
Illinois R. at Illini State Park River Access	1/15/2013	Cs-137	1.9	2.1	3.3
Illinois R. near Rt. 170 Bridge	1/15/2013	Co-58	-0.8	2.0	3.1
Illinois R. near Rt. 170 Bridge	1/15/2013	Co-60	0.8	2.3	3.6
Illinois R. near Rt. 170 Bridge	1/15/2013	Cs-134	1.4	2.1	3.5
Illinois R. near Rt. 170 Bridge	1/15/2013	Cs-137	-0.2	2.1	3.3
Middle East Conflicts Wall Memorial, Marseilles, (DS)	1/15/2013	Co-58	-0.8	3.6	2.6
Middle East Conflicts Wall Memorial, Marseilles, (DS)	1/15/2013	Co-60	-0.1	4.2	3.0
Middle East Conflicts Wall Memorial, Marseilles, (DS)	1/15/2013	Cs-134	0.1	3.7	2.8
Middle East Conflicts Wall Memorial, Marseilles, (DS)	1/15/2013	Cs-137	0.6	3.2	2.6
Seneca, Illinois Boat Launch (Upstream)	1/15/2013	Co-58	0.8	2.1	3.2
Seneca, Illinois Boat Launch (Upstream)	1/15/2013	Co-60	0.5	2.0	3.2
Seneca, Illinois Boat Launch (Upstream)	1/15/2013	Cs-134	0.3	2.4	3.6
Seneca, Illinois Boat Launch (Upstream)	1/15/2013	Cs-137	-1.5	2.0	2.9
Starved Rock State Park, Illinois R. (DS)	1/15/2013	Co-58	-2.0	2.4	3.3
Starved Rock State Park, Illinois R. (DS)	1/15/2013	Co-60	-1.8	2.9	3.8
Starved Rock State Park, Illinois R. (DS)	1/15/2013	Cs-134	-1.6	2.8	3.9
Starved Rock State Park, Illinois R. (DS)	1/15/2013	Cs-137	1.3	2.4	3.8
L-21 Illinois River, Seneca	3/31/2013	Co-58	-1.5	1.4	3.9
L-21 Illinois River, Seneca	3/31/2013	Co-60	-0.1	1.2	3.3
L-21 Illinois River, Seneca	3/31/2013	Cs-134	0.7	1.1	3.4
L-21 Illinois River, Seneca	3/31/2013	Cs-137	-2.3	1.1	3.0
L-40 Illinois River -DS	3/31/2013	Co-58	0.3	1.5	4.4
L-40 Illinois River -DS	3/31/2013	Co-60	1.1	1.0	3.2
L-40 Illinois River -DS	3/31/2013	Cs-134	-0.8	1.3	3.6
L-40 Illinois River -DS	3/31/2013	Cs-137	-1.2	1.1	3.2
L-27; LSCS Onsite Well @ Station (quarterly grab)	4/11/2013	Co-58	-2.4	2.3	3.0
L-27; LSCS Onsite Well @ Station (quarterly grab)	4/11/2013	Co-60	-1.8	2.0	2.7
L-27; LSCS Onsite Well @ Station (quarterly grab)	4/11/2013	Cs-134	-0.3	1.8	2.8
L-27; LSCS Onsite Well @ Station (quarterly grab)	4/11/2013	Cs-137	1.5	1.7	2.8
L-28 Town of Marseilles (quarterly grab)	4/11/2013	Co-58	-0.4	1.4	4.0
L-28 Town of Marseilles (quarterly grab)	4/11/2013	Co-60	1.7	1.4	4.3
L-28 Town of Marseilles (quarterly grab)	4/11/2013	Cs-134	0.2	1.4	4.0

Location	Date	Nuclide	Result	Error	MDC
L-28 Town of Marseilles (quarterly grab)	4/11/2013	Cs-137	1.0	1.1	3.5
Illinois R. at Illini State Park River Access	4/24/2013	Co-58	-2.4	2.3	3.0
Illinois R. at Illini State Park River Access	4/24/2013	Co-60	-0.7	1.8	2.5
Illinois R. at Illini State Park River Access	4/24/2013	Cs-134	-1.0	1.8	2.7
Illinois R. at Illini State Park River Access	4/24/2013	Cs-137	-0.2	1.7	2.6
Illinois R. near Rt. 170 Bridge	4/24/2013	Co-58	-0.7	1.5	4.1
Illinois R. near Rt. 170 Bridge	4/24/2013	Co-60	-1.3	1.4	3.6
Illinois R. near Rt. 170 Bridge	4/24/2013	Cs-134	1.3	1.2	3.8
Illinois R. near Rt. 170 Bridge	4/24/2013	Cs-137	2.8	1.0	3.5
Middle East Conflicts Wall Memorial, Marseilles, (DS)	4/24/2013	Co-58	0.8	2.1	3.2
Middle East Conflicts Wall Memorial, Marseilles, (DS)	4/24/2013	Co-60	-1.6	2.0	2.7
Middle East Conflicts Wall Memorial, Marseilles, (DS)	4/24/2013	Cs-134	0.1	1.8	2.9
Middle East Conflicts Wall Memorial, Marseilles, (DS)	4/24/2013	Cs-137	-0.6	1.7	2.6
Seneca, Illinois Boat Launch (Upstream)	4/24/2013	Co-58	1.5	1.2	4.0
Seneca, Illinois Boat Launch (Upstream)	4/24/2013	Co-60	2.8	1.1	3.7
Seneca, Illinois Boat Launch (Upstream)	4/24/2013	Cs-134	1.6	1.1	3.5
Seneca, Illinois Boat Launch (Upstream)	4/24/2013	Cs-137	-0.4	1.1	3.4
Allen Park, South Ottawa, (DS)	4/25/2013	Co-58	1.2	1.1	3.5
Allen Park, South Ottawa, (DS)	4/25/2013	Co-60	0.5	1.0	3.1
Allen Park, South Ottawa, (DS)	4/25/2013	Cs-134	1.6	0.9	3.1
Allen Park, South Ottawa, (DS)	4/25/2013	Cs-137	0.6	0.9	2.8
Starved Rock State Park, Illinois R. (DS)	4/25/2013	Co-58	1.2	1.3	3.8
Starved Rock State Park, Illinois R. (DS)	4/25/2013	Co-60	0.5	1.0	3.0
Starved Rock State Park, Illinois R. (DS)	4/25/2013	Cs-134	-0.2	1.1	3.1
Starved Rock State Park, Illinois R. (DS)	4/25/2013	Cs-137	-0.6	1.1	3.0
L-21 Illinois River, Seneca	6/30/2013	Co-58	-0.4	1.9	5.8
L-21 Illinois River, Seneca	6/30/2013	Co-60	1.9	1.0	3.2
L-21 Illinois River, Seneca	6/30/2013	Cs-134	0.4	1.1	3.3
L-21 Illinois River, Seneca	6/30/2013	Cs-137	1.1	1.0	3.1
L-40 Illinois River -DS	6/30/2013	Co-58	0.3	3.3	5.2
L-40 Illinois River -DS	6/30/2013	Co-60	0.0	1.9	2.8
L-40 Illinois River -DS	6/30/2013	Cs-134	0.5	1.9	3.0
L-40 Illinois River -DS	6/30/2013	Cs-137	-0.6	1.7	2.6
L-27; LSCS Onsite Well @ Station (quarterly grab)	7/11/2013	Co-58	-6.1	2.7	6.9
L-27; LSCS Onsite Well @ Station (quarterly grab)	7/11/2013	Co-60	1.4	1.3	3.9
L-27; LSCS Onsite Well @ Station (quarterly grab)	7/11/2013	Cs-134	-0.4	1.5	4.0
L-27; LSCS Onsite Well @ Station (quarterly grab)	7/11/2013	Cs-137	0.0	1.3	3.8
L-28 Town of Marseilles (quarterly grab)	7/11/2013	Co-58	-1.9	2.3	6.5
L-28 Town of Marseilles (quarterly grab)	7/11/2013	Co-60	-0.1	1.1	3.2
L-28 Town of Marseilles (quarterly grab)	7/11/2013	Cs-134	-0.5	1.3	3.6
L-28 Town of Marseilles (quarterly grab)	7/11/2013	Cs-137	0.8	1.0	3.0
Illinois R. at Illini State Park River Access	7/16/2013	Co-58	2.9	2.5	4.3
Illinois R. at Illini State Park River Access	7/16/2013	Co-60	0.9	1.8	2.8
Illinois R. at Illini State Park River Access	7/16/2013	Cs-134	-0.7	1.8	2.7
Illinois R. at Illini State Park River Access	7/16/2013	Cs-137	0.0	1.6	2.6
Illinois R. near Rt. 170 Bridge	7/16/2013	Co-58	-0.7	1.0	3.1
Illinois R. near Rt. 170 Bridge	7/16/2013	Co-60	2.1	0.9	3.1
Illinois R. near Rt. 170 Bridge	7/16/2013	Cs-134	-0.1	0.9	2.8
Illinois R. near Rt. 170 Bridge	7/16/2013	Cs-137	0.6	1.0	3.0
Middle East Conflicts Wall Memorial, Marseilles, (DS)	7/16/2013	Co-58	-0.5	1.6	4.9
Middle East Conflicts Wall Memorial, Marseilles, (DS)	7/16/2013	Co-60	1.9	1.1	3.7

Location	Date	Nuclide	Result	Error	MDC
Middle East Conflicts Wall Memorial, Marseilles, (DS)	7/16/2013	Cs-134	-0.9	1.3	3.9
Middle East Conflicts Wall Memorial, Marseilles, (DS)	7/16/2013	Cs-137	1.2	1.1	3.4
Seneca, Illinois Boat Launch (Upstream)	7/16/2013	Co-58	-1.8	1.7	4.7
Seneca, Illinois Boat Launch (Upstream)	7/16/2013	Co-60	1.8	1.0	3.4
Seneca, Illinois Boat Launch (Upstream)	7/16/2013	Cs-134	0.8	1.2	3.5
Seneca, Illinois Boat Launch (Upstream)	7/16/2013	Cs-137	1.5	1.0	3.1
Allen Park, South Ottawa, (DS)	7/17/2013	Co-58	-1.8	1.1	3.0
Allen Park, South Ottawa, (DS)	7/17/2013	Co-60	2.0	1.0	3.3
Allen Park, South Ottawa, (DS)	7/17/2013	Cs-134	-1.7	1.0	2.7
Allen Park, South Ottawa, (DS)	7/17/2013	Cs-137	0.1	0.9	2.8
Starved Rock State Park, Illinois R. (DS)	7/17/2013	Co-58	1.0	1.5	4.8
Starved Rock State Park, Illinois R. (DS)	7/17/2013	Co-60	-0.5	1.2	3.5
Starved Rock State Park, Illinois R. (DS)	7/17/2013	Cs-134	-0.6	1.2	3.7
Starved Rock State Park, Illinois R. (DS)	7/17/2013	Cs-137	1.1	1.0	3.3
L-27; LSCS Onsite Well @ Station (quarterly grab)	10/10/2013	Co-58	3.1	2.8	4.5
L-27; LSCS Onsite Well @ Station (quarterly grab)	10/10/2013	Co-60	-0.2	1.8	2.7
L-27; LSCS Onsite Well @ Station (quarterly grab)	10/10/2013	Cs-134	2.2	1.8	3.1
L-27; LSCS Onsite Well @ Station (quarterly grab)	10/10/2013	Cs-137	0.2	1.7	2.7
L-28 Town of Marseilles (quarterly grab)	10/10/2013	Co-58	2.7	1.6	5.1
L-28 Town of Marseilles (quarterly grab)	10/10/2013	Co-60	0.2	1.0	3.0
L-28 Town of Marseilles (quarterly grab)	10/10/2013	Cs-134	2.9	1.1	3.7
L-28 Town of Marseilles (quarterly grab)	10/10/2013	Cs-137	0.4	0.9	2.8
L-21 Illinois River, Seneca	10/15/2013	Co-58	1.6	3.4	5.2
L-21 Illinois River, Seneca	10/15/2013	Co-60	0.4	2.0	3.0
L-21 Illinois River, Seneca	10/15/2013	Cs-134	-0.5	1.8	2.8
L-21 Illinois River, Seneca	10/15/2013	Cs-137	0.2	1.8	2.7
L-40 Illinois River -DS	10/15/2013	Co-58	-1.4	1.6	4.6
L-40 Illinois River -DS	10/15/2013	Co-60	0.5	1.1	3.3
L-40 Illinois River -DS	10/15/2013	Cs-134	0.7	0.9	3.0
L-40 Illinois River -DS	10/15/2013	Cs-137	2.0	0.9	3.1
Allen Park, South Ottawa, (DS)	10/16/2013	Co-58	1.0	1.2	3.8
Allen Park, South Ottawa, (DS)	10/16/2013	Co-60	-0.8	1.0	2.9
Allen Park, South Ottawa, (DS)	10/16/2013	Cs-134	-0.5	1.0	3.1
Allen Park, South Ottawa, (DS)	10/16/2013	Cs-137	1.9	0.9	3.0
Illinois R. at Illini State Park River Access	10/16/2013	Co-58	1.6	1.3	4.1
Illinois R. at Illini State Park River Access	10/16/2013	Co-60	0.9	1.1	3.3
Illinois R. at Illini State Park River Access	10/16/2013	Cs-134	0.0	1.1	3.2
Illinois R. at Illini State Park River Access	10/16/2013	Cs-137	-1.1	1.0	2.9
Illinois R. near Rt. 170 Bridge	10/16/2013	Co-58	-2.1	2.8	3.8
Illinois R. near Rt. 170 Bridge	10/16/2013	Co-60	-2.4	1.8	2.2
Illinois R. near Rt. 170 Bridge	10/16/2013	Cs-134	0.4	1.8	2.8
Illinois R. near Rt. 170 Bridge	10/16/2013	Cs-137	-0.7	1.7	2.6
Middle East Conflicts Wall Memorial, Marseilles, (DS)	10/16/2013	Co-58	1.2	2.5	3.9
Middle East Conflicts Wall Memorial, Marseilles, (DS)	10/16/2013	Co-60	0.0	1.9	2.8
Middle East Conflicts Wall Memorial, Marseilles, (DS)	10/16/2013	Cs-134	-0.9	1.9	2.9
Middle East Conflicts Wall Memorial, Marseilles, (DS)	10/16/2013	Cs-137	0.7	1.7	2.7
Seneca, Illinois Boat Launch (Upstream)	10/16/2013	Co-58	-0.9	1.4	3.7
Seneca, Illinois Boat Launch (Upstream)	10/16/2013	Co-60	-0.4	0.9	2.7
Seneca, Illinois Boat Launch (Upstream)	10/16/2013	Cs-134	-0.4	1.1	3.1
Seneca, Illinois Boat Launch (Upstream)	10/16/2013	Cs-137	0.1	0.8	2.5

Location	Date	Nuclide	Result	Error	MDC
Starved Rock State Park, Illinois R. (DS)	10/16/2013	Co-58	0.9	1.4	4.1
Starved Rock State Park, Illinois R. (DS)	10/16/2013	Co-60	2.0	1.1	3.5
Starved Rock State Park, Illinois R. (DS)	10/16/2013	Cs-134	1.6	1.2	3.6
Starved Rock State Park, Illinois R. (DS)	10/16/2013	Cs-137	0.2	1.0	3.0

Milk Samples

No dairy falls within ten miles of LaSalle. In the event that milk samples were collected, the samples collected for Byron would provide a control sample.

Soil Samples

Soil samples are collected from land surrounding the plant, and are collected annually. All sediments are submitted for gamma spectroscopy analysis.

Soil samples are monitored for several radionuclides associated with nuclear power plant operations including, but not limited to, Co-58, Co-60, Cs-134, and Cs-137. It should be noted that as a remnant of atmospheric nuclear weapons testing, Cs-137 is routinely observed in sediment and soil at concentrations of 0.1-0.2 pCi/g. Table 40 shows the results of analysis of sediment samples taken from the LaSalle Area.

No radionuclides associated with nuclear power plant operations were detected in samples collected near Braidwood. Other radionuclides detected were naturally occurring.

Table 40. Soil Sample Results for LaSalle Area
Results are in picocuries per gram (pCi/g)

Location	Date	Nuclide	Result	Error	MDC
Starved Rock State Park, (Upwind)	7/17/2013	Co-58	0.0	0.0	0.0
Starved Rock State Park, (Upwind)	7/17/2013	Co-60	0.0	0.0	0.0
Starved Rock State Park, (Upwind)	7/17/2013	Cs-134	0.0	0.0	0.0
Starved Rock State Park, (Upwind)	7/17/2013	Cs-137	0.0	0.0	0.0

Sediment Samples

Sediment samples are collected from the rivers downstream of the plant effluent points. Sediments are collected at least annually and are submitted for gamma spectroscopy analysis.

Sediment samples are monitored for several radionuclides associated with nuclear power plant operations including, but not limited to, Co-58, Co-60, Cs-134, and Cs-137. It should be noted that as a remnant of atmospheric nuclear weapons testing, Cs-137 is routinely observed in sediment and soil at concentrations of 0.1-0.2 pCi/g. Table 41 shows the results of analysis of sediment samples taken from the LaSalle Area.

Table 41. Sediment Sample Results for LaSalle Area
Results are in picocuries per gram (pCi/g)

Location	Date	Nuclide	Result	Error	MDC
L-41, Illinois River, Downstream	5/9/2013	Co-58	-0.1	0.1	0.3
L-41, Illinois River, Downstream	5/9/2013	Co-60	0.0	0.1	0.1
L-41, Illinois River, Downstream	5/9/2013	Cs-134	-0.1	0.0	0.1
L-41, Illinois River, Downstream	5/9/2013	Cs-137	-0.1	0.0	0.1
L-41, Illinois River, Downstream	10/3/2013	Co-58	0.0	0.0	0.1
L-41, Illinois River, Downstream	10/3/2013	Co-60	0.0	0.0	0.1
L-41, Illinois River, Downstream	10/3/2013	Cs-134	0.0	0.0	0.1
L-41, Illinois River, Downstream	10/3/2013	Cs-137	0.0	0.0	0.1
Middle East Conflicts Wall Memorial, Marseilles, (DS)	10/16/2013	Co-58	0.0	0.0	0.0
Middle East Conflicts Wall Memorial, Marseilles, (DS)	10/16/2013	Co-60	0.0	0.0	0.0
Middle East Conflicts Wall Memorial, Marseilles, (DS)	10/16/2013	Cs-134	0.0	0.0	0.0
Middle East Conflicts Wall Memorial, Marseilles, (DS)	10/16/2013	Cs-137	0.0	0.0	0.0
Seneca, Illinois Boat Launch (Upstream)	10/16/2013	Co-58	0.0	0.0	0.0
Seneca, Illinois Boat Launch (Upstream)	10/16/2013	Co-60	0.0	0.0	0.0
Seneca, Illinois Boat Launch (Upstream)	10/16/2013	Cs-134	0.0	0.0	0.0
Seneca, Illinois Boat Launch (Upstream)	10/16/2013	Cs-137	0.0	0.0	0.0

Fish Samples

Like sediments, fish are collected from rivers, typically near the plant discharge point. At each location, two different species of fish are collected at least annually, typically in October. Edible portions of the fish are harvested by technicians at Midwest Laboratory and prepared for analysis. Splits of the samples are provided to the IEMA laboratory. Fish samples are analyzed for reactor-produced radionuclides using gamma spectroscopy.

No radionuclides associated with nuclear power plant operations were detected in fish samples collected near LaSalle. Other radionuclides detected were naturally occurring. Table 42 shows results from fish sampling during 2013.

Table 42. Fish Sample Results for LaSalle Area
Results are in picocuries per kilogram (pCi/kg)

Location	Date	Nuclide	Result	Error	MDC	Comments
L-34 LaSalle Cooling Lake	5/2/2013	Co-58	-21.6	43.5	131.0	Common Carp
L-34 LaSalle Cooling Lake	5/2/2013	Co-60	-2.7	12.3	34.9	Common Carp
L-34 LaSalle Cooling Lake	5/2/2013	Cs-134	-10.2	12.7	37.8	Common Carp
L-34 LaSalle Cooling Lake	5/2/2013	Cs-137	7.3	10.4	33.0	Common Carp
L-34 LaSalle Cooling Lake	5/2/2013	Co-58	-27.0	27.3	75.7	Largemouth Bass
L-34 LaSalle Cooling Lake	5/2/2013	Co-60	-4.3	7.2	20.6	Largemouth Bass
L-34 LaSalle Cooling Lake	5/2/2013	Cs-134	15.1	8.1	25.5	Largemouth Bass
L-34 LaSalle Cooling Lake	5/2/2013	Cs-137	-3.6	6.0	18.2	Largemouth Bass
L-35 IL River, Marseilles Pool(Sector Q)	5/2/2013	Co-58	-34.0	23.5	68.1	Smallmouth Bass
L-35 IL River, Marseilles Pool(Sector Q)	5/2/2013	Co-60	0.0	7.8	23.1	Smallmouth Bass
L-35 IL River, Marseilles Pool(Sector Q)	5/2/2013	Cs-134	-5.8	8.1	24.3	Smallmouth Bass
L-35 IL River, Marseilles Pool(Sector Q)	5/2/2013	Cs-137	1.5	6.4	19.9	Smallmouth Bass

Location	Date	Nuclide	Result	Error	MDC	Comments
L-34 LaSalle Cooling Lake	10/2/2013	Co-58	-2.9	28.3	41.4	Channel Catfish
L-34 LaSalle Cooling Lake	10/2/2013	Co-60	9.6	15.6	25.2	Channel Catfish
L-34 LaSalle Cooling Lake	10/2/2013	Cs-134	8.0	15.7	25.4	Channel Catfish
L-34 LaSalle Cooling Lake	10/2/2013	Cs-137	-6.8	14.5	21.9	Channel Catfish
L-34 LaSalle Cooling Lake	10/2/2013	Co-58	-5.2	52.1	149.0	Common Carp
L-34 LaSalle Cooling Lake	10/2/2013	Co-60	-27.8	26.9	73.7	Common Carp
L-34 LaSalle Cooling Lake	10/2/2013	Cs-134	34.8	30.5	92.4	Common Carp
L-34 LaSalle Cooling Lake	10/2/2013	Cs-137	-27.1	24.6	72.4	Common Carp
L-35 IL River, Marseilles Pool(Sector Q)	10/3/2013	Co-58	3.3	10.0	31.4	Common Carp
L-35 IL River, Marseilles Pool(Sector Q)	10/3/2013	Co-60	-6.1	6.9	18.7	Common Carp
L-35 IL River, Marseilles Pool(Sector Q)	10/3/2013	Cs-134	14.8	5.8	19.8	Common Carp
L-35 IL River, Marseilles Pool(Sector Q)	10/3/2013	Cs-137	-0.5	5.8	17.5	Common Carp
L-35 IL River, Marseilles Pool(Sector Q)	10/3/2013	Co-58	0.7	13.3	38.6	Smallmouth Buffalo
L-35 IL River, Marseilles Pool(Sector Q)	10/3/2013	Co-60	2.2	7.3	22.1	Smallmouth Buffalo
L-35 IL River, Marseilles Pool(Sector Q)	10/3/2013	Cs-134	1.9	8.1	23.5	Smallmouth Buffalo
L-35 IL River, Marseilles Pool(Sector Q)	10/3/2013	Cs-137	-1.2	6.7	20.4	Smallmouth Buffalo

Vegetation Samples

Vegetation samples are collected from land in the vicinity of the plant, and are collected annually and are submitted for gamma spectroscopy analysis.

Vegetation samples are monitored for several radionuclides associated with nuclear power plant operations including, but not limited to, Co-58, Co-60, Cs-134, and Cs-137. Table 43 shows the results of analysis of vegetation samples taken from the LaSalle Area, and Table 44 shows the results of analysis if edible vegetation samples harvested September 7, 2013 from the LaSalle Area.

No radionuclides associated with nuclear power plant operations were detected in samples collected near LaSalle. Other radionuclides detected were naturally occurring.

Table 43. Vegetation Sample Results for LaSalle Area
Results are in picocuries per kilogram (pCi/kg)

Location	Date	Nuclide	Result	Error	MDC
Starved Rock State Park, (Upwind)	7/17/2013	Co-58	0.0	0.0	0.1
Starved Rock State Park, (Upwind)	7/17/2013	Co-60	0.0	0.0	0.0
Starved Rock State Park, (Upwind)	7/17/2013	Cs-134	0.0	0.0	0.0
Starved Rock State Park, (Upwind)	7/17/2013	Cs-137	0.0	0.0	0.0

Table 44. Edible Vegetation Sample Results for LaSalle Area
Results are in picocuries per kilogram (pCi/kg)

Values	LS Farm Quad 1-Celery root				LS Farm Quad 1-Kale			
	Co-58	Co-60	Cs-134	Cs-137	Co-58	Co-60	Cs-134	Cs-137
Results	15.1	-2.2	-5.0	2.2	4.1	3.6	-0.2	1.5
Error	26.2	7.6	7.8	6.6	23.1	6.9	7.0	6.0
MDC	77.5	20.8	21.6	19.2	71.5	20.8	21.0	18.5
	LS Farm Quad 2-Beets				LS Farm Quad 2-Cabbage			
	Co-58	Co-60	Cs-134	Cs-137	Co-58	Co-60	Cs-134	Cs-137
Results	-29.4	-2.9	7.0	-0.9	-4.9	-0.2	3.2	6.3
Error	23.8	5.7	5.1	4.8	21.9	6.6	5.8	5.4
MDC	64.3	16.4	16.4	14.4	66.7	19.2	17.9	17.2
	LS Farm Quad 3-Cabbage				LS Farm Quad 3-Radishes			
	Co-58	Co-60	Cs-134	Cs-137	Co-58	Co-60	Cs-134	Cs-137
Results	-33.9	10.0	20.5	-3.0	15.2	-1.5	10.6	0.4
Error	40.1	9.6	10.4	10.1	24.5	6.7	7.7	5.3
MDC	118.0	30.5	35.3	30.4	73.4	19.4	23.7	16.3
	LS Farm Quad 4-Beets				LS Farm Quad 4-Beet greens			
	Co-58	Co-60	Cs-134	Cs-137	Co-58	Co-60	Cs-134	Cs-137
Results	-10.7	4.3	2.2	-5.1	-21.5	18.4	6.5	0.7
Error	25.6	7.7	7.3	6.4	31.6	7.6	9.3	8.1
MDC	72.3	22.1	21.5	17.7	88.8	25.2	28.0	23.3

Ambient Gamma

IEMA maintains a network of 54 environmental dosimeters in a ten-mile radius around the LaSalle station. Unlike the environmental samples described above, dosimeters do not provide information on what radionuclides are found in the environment. Instead, dosimeters provide a direct measurement of the total dose produced by all sources of gamma radiation, including naturally occurring radionuclides and cosmic rays. Dosimeters are exchanged and analyzed quarterly. In 2013, measurements at all 54 locations were consistent with established background measurements. Table 45 summarizes the quarterly radiation readings in millirem per day (mrem/day) for LaSalle.

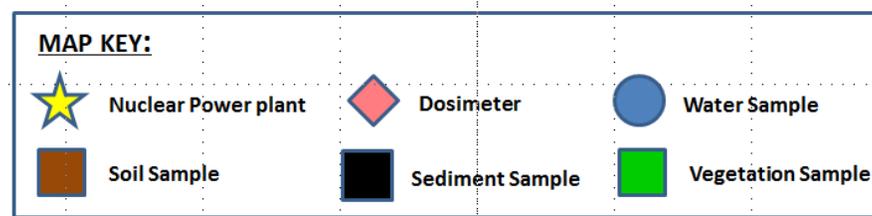
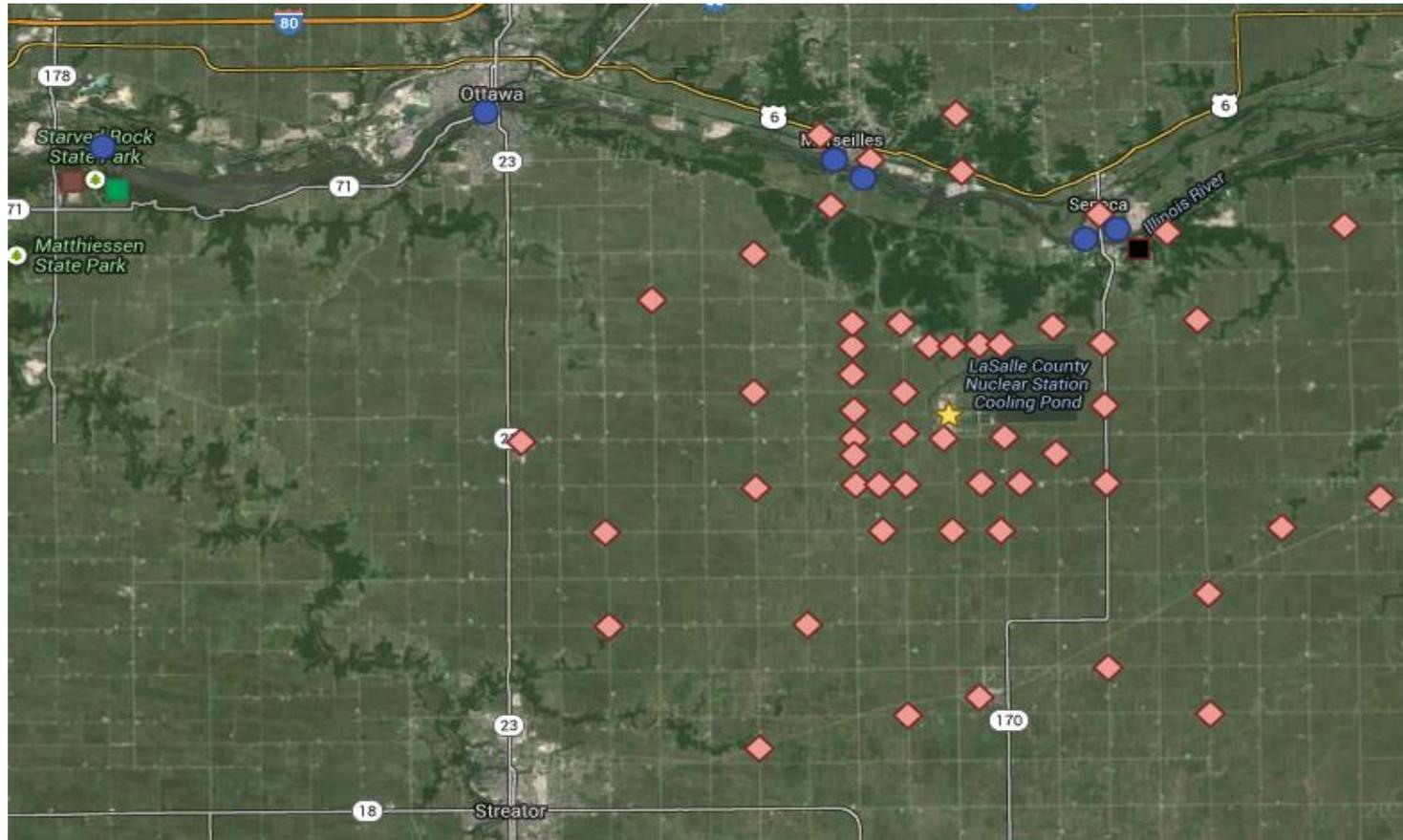
Table 45. Summary of Ambient Gamma Results for the LaSalle Area

Location	Quarter 1 mrem/day	Quarter 2 mrem/day	Quarter 3 mrem/day	Quarter 4 mrem/day	Annual Dose mrem/year
LS001	0.106	0.09	0.123	0.115	39.60
LS002	0.098	0.099	0.127	0.118	40.33
LS003	0.11	0.099	0.11	0.105	38.69
LS004	0.119	0.106	0.127	0.118	42.89
LS005	0.088	0.09	0.118	0.102	36.32
LS007	0.1	0.095	0.125	0.117	39.88
LS009	0.087	0.078	0.084	0.096	31.48
LS011	0.101	0.087	0.103	0.11	36.59
LS012	0.094	0.074	0.104	0.098	33.76

Location	Quarter 1 mrem/day	Quarter 2 mrem/day	Quarter 3 mrem/day	Quarter 4 mrem/day	Annual Dose mrem/year
LS014	0.088		0.103		34.86
LS015	0.131	0.094	0.128	0.138	44.80
LS016	0.084	0.076	0.097	0.084	31.12
LS017	0.116	0.128	0.125	0.121	44.71
LS018	0.107	0.1	0.135	0.109	41.15
LS019	0.089	0.089	0.109	0.1	35.31
LS021	0.087		0.086	0.093	32.36
LS022	0.101	0.104	0.123	0.112	40.15
LS023	0.116	0.082	0.109	0.109	37.96
LS024	0.093	0.095	0.12	0.114	38.51
LS025	0.103	0.098	0.131	0.11	40.33
LS027	0.094	0.085	0.091	0.096	33.40
LS030	0.108	0.097	0.121	0.11	39.79
LS031	0.097	0.064	0.101	0.094	32.49
LS034	0.077	0.057	0.079	0.086	27.28
LS035	0.087	0.072	0.1	0.099	32.67
LS036	0.11	0.131	0.124	0.114	43.71
LS037	0.112	0.077	0.108	0.126	38.60
LS038	0.116	0.096	0.121	0.116	40.97
LS039	0.088	0.092	0.085	0.087	32.12
LS040	0.102	0.082	0.094	0.099	34.40
LS041	0.115	0.112	0.111	0.107	40.61
LS042	0.131	0.103	0.146	0.109	44.62
LS043	0.121	0.1	0.12	0.125	42.52
LS044	0.085	0.074		0.098	31.27
LS045	0.092		0.101	0.094	34.92
LS046	0.126	0.099	0.119	0.113	41.70
LS047	0.097	0.104	0.111	0.115	38.96
LS048	0.105	0.087	0.114	0.114	38.33
LS-RSA	0.094	0.087	0.124	0.114	38.23
LS-RSB	0.112	0.094	0.103	0.113	38.51
LS-RSC	0.105	0.089	0.129	0.123	40.70
LS-RSD	0.118	0.083	0.11	0.107	38.14
LS-RSE	0.099	0.07	0.105	0.097	33.85
LS-RSF	0.106	0.1	0.131	0.111	40.88
LS-RSG	0.084	0.081	0.106	0.097	33.58
LS-RSH	0.101	0.092	0.115	0.107	37.87
LS-RSJ	0.103	0.079	0.115	0.098	36.04
LS-RSK	0.107	0.101	0.111	0.117	39.79
LS-RSL	0.108	0.095	0.131	0.112	40.70
LS-RSM	0.135	0.116	0.14	0.144	48.82
LS-RSN	0.104	0.09	0.105	0.112	37.50
LS-RSP	0.118	0.093	0.118	0.123	41.25
LS-RSQ	0.092	0.096	0.116	0.093	36.23
LS-RSR	0.113	0.101	0.127	0.094	39.69

Blanks in the table indicate that dosimeters were missing at the end of the quarter.
Annual Dose column is based on averages of all available data.

Figure 7. Overview of IEMA Monitoring Locations for LaSalle



Quad Cities Nuclear Power Station

Quad Cities Station is located in Rock Island County in northwestern Illinois, approximately twenty miles northeast of Moline, Illinois. This station utilizes two boiling water reactors to generate electricity for Exelon.

Liquid effluents from the Quad Cities Station are released to the adjacent Mississippi River. Critical pathways for radiation exposure to the public include I-131 in milk, ingestion from drinking water and foodstuffs, and external gamma radiation from noble gases. Samples collected include: downstream surface and public drinking waters, milk from a local dairy farm, fish, local vegetables and river sediments from the Mississippi River.



Water Samples

Water samples are collected from two points in the Mississippi River and two ground water wells. Ground water samples are collected once each quarter. For surface water samples, aliquots are collected weekly and composited for quarterly analysis. Typically, 3-4 liters are collected per quarter. Water samples are submitted for gross alpha, gross beta, tritium and gamma spectroscopy analyses.

Water samples are monitored for several radionuclides associated with nuclear power plant operations including, but not limited to, Co-58, Co-60, Cs-134, and Cs-137. None of these were detected in 2013. Gross alpha and beta analyses were consistent with background. In addition, samples were tested for the presence of H-3 (tritium).

Tritium is a normal component of the effluent stream of nuclear power plants and its release to the environment is regulated by US NRC and Illinois Environmental Protection Agency (IEPA) permitting. It is instructive to compare these concentrations to the US EPA drinking

water standard of 20,000 pCi/L. Although Quad Cities station does release tritium to the Mississippi River, no tritium has ever been detected in the river. Table 46 shows the results of tritium analysis of water samples around Quad Cities.

Water samples are screened for gross alpha and gross beta activity. Table 47 shows the results of alpha/beta screening. Samples are also monitored for several gamma-emitting radionuclides associated with nuclear power plant operations including, but not limited to, Co-58, Co-60, Cs-134 and Cs-137. None of these were detected in 2013. Table 48 shows results for analysis of water samples taken from the Quad Cities area.

Table 46. Tritium in Water Sample Results for Quad Cities Area
Results are in picocuries per liter (pCi/L)

Location	Date	Result	Error	MDC
Q-35; M. Residence Well	1/11/2013	-70.3	98.3	168.0
Q-36 Cordova Well	1/11/2013	-4.6	69.9	118.0
Mississippi R. Downstream @ Port Byron	2/6/2013	-41.8	99.0	168.0
Q-33 Miss Riv @ Cordova, sector K, 3.3mi SSW	3/31/2013	-35.3	99.3	168.0
Q-34 Miss Riv @ Comanche, sector C, 4.4 mi N	3/31/2013	-96.9	98.0	168.0
Q-35; M. Residence Well	4/12/2013	-20.6	69.4	118.0
Q-36 Cordova Well	4/12/2013	73.3	72.3	118.0
Mississippi R. at Cordova (reference Q-33)	6/11/2013	0.0	70.0	118.0
Mississippi R. Downstream @ Port Byron	6/11/2013	-2.3	69.9	118.0
Mississippi R. Upstream @ Albany	6/11/2013	29.8	70.9	118.0
Mississippi R. Downstream @ Lock&Dam 14	6/12/2013	38.9	71.2	118.0
Mississippi R. Downstream @ Rapids City	6/12/2013	22.9	70.7	118.0
Q-33 Miss Riv @ Cordova, sector K, 3.3mi SSW	6/30/2013	57.0	79.8	132.0
Q-35; M. Residence Well	7/12/2013	-26.2	77.4	131.0
Mississippi R. at Cordova (reference Q-33)	8/7/2013	76.3	79.9	131.0
Mississippi R. Downstream @ Lock&Dam 14	8/7/2013	-37.1	76.9	131.0
Mississippi R. Downstream @ Port Byron	8/7/2013	-2.2	77.8	131.0
Mississippi R. Downstream @ Rapids City	8/7/2013	45.8	79.1	131.0
Mississippi R. Upstream @ Albany	8/8/2013	-9.2	109.0	184.0
Mississippi R. at Cordova (reference Q-33)	11/7/2013	-22.9	109.0	184.0
Mississippi R. Downstream @ Lock&Dam 14	11/7/2013	-59.7	108.0	184.0
Mississippi R. Downstream @ Port Byron	11/7/2013	-2.3	110.0	184.0
Mississippi R. Downstream @ Rapids City	11/7/2013	91.8	111.0	184.0
Mississippi R. Upstream @ Albany	11/7/2013	17.5	78.5	131.0

Table 47. Sample Results for Alpha/Beta Screening of Water from the Quad Cities Area
Results are in picocuries per liter (pCi/L)

Location	Quarter 1		Quarter 2		Quarter 3		Quarter 4	
	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta
Mississippi R. at Cordova (reference Q-33)								
Results			-1.0	4.4	-0.3	2.1	0.0	4.2
Error			1.3	2.2	1.3	2.4	1.4	2.6
MDC			2.2	3.6	2.2	4.0	2.3	4.3

Location	Quarter 1		Quarter 2		Quarter 3		Quarter 4	
	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta
Mississippi R. Downstream @ Lock&Dam 14								
Results			-1.4	5.9	0.0	2.1		
Error			1.3	2.3	1.3	2.4		
MDC			2.2	3.6	2.2	4.0		
Mississippi R. Downstream @ Port Byron								
Results	-0.3	3.2	-1.0	4.5	-0.5	1.8	-0.3	2.8
Error	1.1	2.1	1.3	2.3	1.3	2.4	1.4	2.6
MDC	1.7	3.4	2.2	3.6	2.2	4.0	2.3	4.3
Mississippi R. Downstream @ Rapids City								
Results			-1.5	4.5	-0.1	1.7	-1.2	4.8
Error			1.3	2.3	1.3	2.4	1.4	2.6
MDC			2.2	3.6	2.2	4.0	2.3	4.3
Mississippi R. Upstream @ Albany								
Results			-0.8	2.0	-0.1	2.2	0.1	4.9
Error			1.1	2.2	1.3	2.4	1.4	2.6
MDC			1.8	3.7	2.2	4.0	2.3	4.3
Q-33 Miss Riv @ Cordova, sector K, 3.3mi SSW								
Results					-1.3	4.8		
Error					1.2	2.6		
MDC					2.1	4.2		
Q-34 Miss Riv @ Comanche, sector C, 4.4 mi N								
Results					-0.3	1.9		
Error					1.1	2.1		
MDC					1.8	3.5		
Q-35; M.Residence Well								
Results			0.2	1.8	-1.3	1.5		
Error			1.0	2.3	1.2	2.5		
MDC			1.6	3.8	2.1	4.2		
Q-35; McMillan Well								
Results	-0.3	3.0						
Error	1.1	2.1						
MDC	1.8	3.4						
Q-36 Cordova Well								
Results	0.1	1.0	1.6	3.8	1.1	0.1		
Error	1.1	2.0	1.1	2.3	1.2	2.1		
MDC	1.8	3.4	1.6	3.8	1.8	3.5		

**Table 48. Gamma Spectroscopy Sample Results for Other Radionuclides in Water
from the Quad Cities Area
Results are in picocuries per liter (pCi/L)**

Location	Date	Nuclide	Result	Error	MDC
Q-35; M.Residence Well	1/11/2013	Co-58	-1.7	1.6	4.2
Q-35; M.Residence Well	1/11/2013	Co-60	-0.9	1.2	3.4
Q-35; M.Residence Well	1/11/2013	Cs-134	1.9	1.3	3.8
Q-35; M.Residence Well	1/11/2013	Cs-137	-1.0	1.1	3.1
Q-36 Cordova Well	1/11/2013	Co-58	1.3	1.6	4.7
Q-36 Cordova Well	1/11/2013	Co-60	-0.2	1.3	3.4
Q-36 Cordova Well	1/11/2013	Cs-134	0.5	1.4	4.2
Q-36 Cordova Well	1/11/2013	Cs-137	-0.6	1.3	3.6
Mississippi R. Downstream @ Port Byron	2/6/2013	Co-58	0.7	1.4	4.4
Mississippi R. Downstream @ Port Byron	2/6/2013	Co-60	1.3	1.1	3.4
Mississippi R. Downstream @ Port Byron	2/6/2013	Cs-134	0.5	1.2	3.7
Mississippi R. Downstream @ Port Byron	2/6/2013	Cs-137	-1.6	1.0	3.0
Q-33 Miss Riv @ Cordova, sector K, 3.3mi SSW	3/31/2013	Co-58	-1.6	2.7	3.8
Q-33 Miss Riv @ Cordova, sector K, 3.3mi SSW	3/31/2013	Co-60	1.6	1.8	3.0
Q-33 Miss Riv @ Cordova, sector K, 3.3mi SSW	3/31/2013	Cs-134	1.9	1.7	3.0
Q-33 Miss Riv @ Cordova, sector K, 3.3mi SSW	3/31/2013	Cs-137	-1.6	1.8	2.5
Q-34 Miss Riv @ Comanche, sector C, 4.4 mi N	3/31/2013	Co-58	-0.3	1.7	4.8
Q-34 Miss Riv @ Comanche, sector C, 4.4 mi N	3/31/2013	Co-60	2.3	1.2	3.9
Q-34 Miss Riv @ Comanche, sector C, 4.4 mi N	3/31/2013	Cs-134	0.5	1.5	4.2
Q-34 Miss Riv @ Comanche, sector C, 4.4 mi N	3/31/2013	Cs-137	-1.0	1.3	3.6
Q-35; M.Residence Well	4/12/2013	Co-58	-0.5	1.3	3.8
Q-35; M.Residence Well	4/12/2013	Co-60	-0.2	1.4	3.7
Q-35; M.Residence Well	4/12/2013	Cs-134	-0.4	1.5	4.2
Q-35; M.Residence Well	4/12/2013	Cs-137	-0.6	1.3	3.8
Q-36 Cordova Well	4/12/2013	Co-58	-0.1	1.3	3.9
Q-36 Cordova Well	4/12/2013	Co-60	-0.2	1.2	3.6
Q-36 Cordova Well	4/12/2013	Cs-134	3.1	1.1	3.9
Q-36 Cordova Well	4/12/2013	Cs-137	0.7	1.0	3.3
Mississippi R. at Cordova (reference Q-33)	6/11/2013	Co-58	-1.3	2.1	5.9
Mississippi R. at Cordova (reference Q-33)	6/11/2013	Co-60	1.3	1.2	3.8
Mississippi R. at Cordova (reference Q-33)	6/11/2013	Cs-134	3.1	1.3	4.2
Mississippi R. at Cordova (reference Q-33)	6/11/2013	Cs-137	-0.6	1.3	3.6
Mississippi R. Downstream @ Port Byron	6/11/2013	Co-58	-0.4	1.9	5.3
Mississippi R. Downstream @ Port Byron	6/11/2013	Co-60	-0.5	1.5	4.0
Mississippi R. Downstream @ Port Byron	6/11/2013	Cs-134	-1.4	1.4	3.9
Mississippi R. Downstream @ Port Byron	6/11/2013	Cs-137	-0.3	1.3	3.6
Mississippi R. Upstream @ Albany	6/11/2013	Co-58	-1.0	1.6	4.7
Mississippi R. Upstream @ Albany	6/11/2013	Co-60	0.0	1.2	3.6
Mississippi R. Upstream @ Albany	6/11/2013	Cs-134	0.8	1.1	3.5
Mississippi R. Upstream @ Albany	6/11/2013	Cs-137	0.1	1.1	3.3
Mississippi R. Downstream @ Lock&Dam 14	6/12/2013	Co-58	0.4	1.7	5.2
Mississippi R. Downstream @ Lock&Dam 14	6/12/2013	Co-60	-1.0	1.2	3.3
Mississippi R. Downstream @ Lock&Dam 14	6/12/2013	Cs-134	-0.1	1.1	3.5
Mississippi R. Downstream @ Lock&Dam 14	6/12/2013	Cs-137	1.5	1.1	3.4
Mississippi R. Downstream @ Rapids City	6/12/2013	Co-58	0.5	1.7	4.9
Mississippi R. Downstream @ Rapids City	6/12/2013	Co-60	1.6	1.0	3.3
Mississippi R. Downstream @ Rapids City	6/12/2013	Cs-134	1.7	1.2	3.6

Location	Date	Nuclide	Result	Error	MDC
Mississippi R. Downstream @ Rapids City	6/12/2013	Cs-137	-0.1	1.0	3.1
Q-33 Miss Riv @ Cordova, sector K, 3.3mi SSW	6/30/2013	Co-58	1.1	2.2	6.5
Q-33 Miss Riv @ Cordova, sector K, 3.3mi SSW	6/30/2013	Co-60	-1.3	0.9	2.6
Q-33 Miss Riv @ Cordova, sector K, 3.3mi SSW	6/30/2013	Cs-134	0.6	1.1	3.2
Q-33 Miss Riv @ Cordova, sector K, 3.3mi SSW	6/30/2013	Cs-137	0.1	0.9	2.8
Q-34 Miss Riv @ Comanche, sector C, 4.4 mi N	6/30/2013	Co-58	-2.5	1.6	4.6
Q-34 Miss Riv @ Comanche, sector C, 4.4 mi N	6/30/2013	Co-60	-0.3	1.0	2.8
Q-34 Miss Riv @ Comanche, sector C, 4.4 mi N	6/30/2013	Cs-134	-1.9	0.9	2.5
Q-34 Miss Riv @ Comanche, sector C, 4.4 mi N	6/30/2013	Cs-137	0.5	0.8	2.5
Q-35; M.Residence Well	7/12/2013	Co-58	-1.6	2.2	6.3
Q-35; M.Residence Well	7/12/2013	Co-60	0.4	1.1	3.3
Q-35; M.Residence Well	7/12/2013	Cs-134	0.1	1.0	3.1
Q-35; M.Residence Well	7/12/2013	Cs-137	-0.6	1.0	2.9
Mississippi R. at Cordova (reference Q-33)	8/7/2013	Co-58	-2.6	1.6	4.5
Mississippi R. at Cordova (reference Q-33)	8/7/2013	Co-60	1.0	0.9	3.0
Mississippi R. at Cordova (reference Q-33)	8/7/2013	Cs-134	-0.3	1.0	3.1
Mississippi R. at Cordova (reference Q-33)	8/7/2013	Cs-137	-0.3	1.0	2.9
Mississippi R. Downstream @ Lock&Dam 14	8/7/2013	Co-58	1.8	1.5	4.6
Mississippi R. Downstream @ Lock&Dam 14	8/7/2013	Co-60	0.9	0.9	2.7
Mississippi R. Downstream @ Lock&Dam 14	8/7/2013	Cs-134	-0.4	1.1	3.0
Mississippi R. Downstream @ Lock&Dam 14	8/7/2013	Cs-137	0.3	0.8	2.6
Mississippi R. Downstream @ Port Byron	8/7/2013	Co-58	-1.0	2.7	4.0
Mississippi R. Downstream @ Port Byron	8/7/2013	Co-60	-0.5	1.9	2.8
Mississippi R. Downstream @ Port Byron	8/7/2013	Cs-134	1.4	1.7	2.8
Mississippi R. Downstream @ Port Byron	8/7/2013	Cs-137	3.0	1.5	2.8
Mississippi R. Downstream @ Rapids City	8/7/2013	Co-58	0.0	1.8	5.5
Mississippi R. Downstream @ Rapids City	8/7/2013	Co-60	-0.2	1.2	3.6
Mississippi R. Downstream @ Rapids City	8/7/2013	Cs-134	1.8	1.3	4.1
Mississippi R. Downstream @ Rapids City	8/7/2013	Cs-137	-2.1	1.1	3.0
Mississippi R. Upstream @ Albany	8/8/2013	Co-58	-0.3	1.4	4.4
Mississippi R. Upstream @ Albany	8/8/2013	Co-60	0.4	1.1	3.3
Mississippi R. Upstream @ Albany	8/8/2013	Cs-134	0.7	0.9	3.0
Mississippi R. Upstream @ Albany	8/8/2013	Cs-137	-0.1	0.9	2.8
Q-35; M.Residence Well	10/11/2013	Co-58	-1.8	1.9	5.3
Q-35; M.Residence Well	10/11/2013	Co-60	0.8	1.4	4.0
Q-35; M.Residence Well	10/11/2013	Cs-134	-1.1	1.2	3.4
Q-35; M.Residence Well	10/11/2013	Cs-137	2.0	0.9	3.1
Q-36 Cordova Well	10/11/2013	Co-58	-2.4	3.1	4.3
Q-36 Cordova Well	10/11/2013	Co-60	2.5	1.7	3.0
Q-36 Cordova Well	10/11/2013	Cs-134	-0.4	1.7	2.7
Q-36 Cordova Well	10/11/2013	Cs-137	0.9	1.6	2.7
Q-33 Miss Riv @ Cordova, sector K, 3.3mi SSW	10/15/2013	Co-58	-2.4	2.4	6.4
Q-33 Miss Riv @ Cordova, sector K, 3.3mi SSW	10/15/2013	Co-60	-0.2	1.4	3.8
Q-33 Miss Riv @ Cordova, sector K, 3.3mi SSW	10/15/2013	Cs-134	-0.2	1.5	4.2
Q-33 Miss Riv @ Cordova, sector K, 3.3mi SSW	10/15/2013	Cs-137	-1.0	1.3	3.7
Q-34 Miss Riv @ Comanche, sector C, 4.4 mi N	10/15/2013	Co-58	-0.3	1.9	5.9
Q-34 Miss Riv @ Comanche, sector C, 4.4 mi N	10/15/2013	Co-60	1.1	1.1	3.5
Q-34 Miss Riv @ Comanche, sector C, 4.4 mi N	10/15/2013	Cs-134	-2.2	1.3	3.5
Q-34 Miss Riv @ Comanche, sector C, 4.4 mi N	10/15/2013	Cs-137	-1.7	1.1	3.1
Mississippi R. at Cordova (reference Q-33)	11/7/2013	Co-58	-2.7	1.6	4.6
Mississippi R. at Cordova (reference Q-33)	11/7/2013	Co-60	-1.0	1.2	3.3
Mississippi R. at Cordova (reference Q-33)	11/7/2013	Cs-134	0.5	1.2	3.7

Location	Date	Nuclide	Result	Error	MDC
Mississippi R. at Cordova (reference Q-33)	11/7/2013	Cs-137	-2.1	1.1	3.1
Mississippi R. Downstream @ Port Byron	11/7/2013	Co-58	-3.9	1.9	4.8
Mississippi R. Downstream @ Port Byron	11/7/2013	Co-60	-0.9	1.5	3.8
Mississippi R. Downstream @ Port Byron	11/7/2013	Cs-134	-0.4	1.3	3.8
Mississippi R. Downstream @ Port Byron	11/7/2013	Cs-137	-1.8	1.3	3.4
Mississippi R. Downstream @ Rapids City	11/7/2013	Co-58	-1.9	1.8	4.9
Mississippi R. Downstream @ Rapids City	11/7/2013	Co-60	-0.6	1.3	3.5
Mississippi R. Downstream @ Rapids City	11/7/2013	Cs-134	1.0	1.3	3.9
Mississippi R. Downstream @ Rapids City	11/7/2013	Cs-137	-2.4	1.0	2.9
Mississippi R. Upstream @ Albany	11/7/2013	Co-58	-3.5	1.5	3.8
Mississippi R. Upstream @ Albany	11/7/2013	Co-60	0.5	0.8	2.5
Mississippi R. Upstream @ Albany	11/7/2013	Cs-134	-0.1	1.0	3.0
Mississippi R. Upstream @ Albany	11/7/2013	Cs-137	-0.9	0.9	2.5

Milk Samples

Milk samples are collected from a local dairy. Each month, and twice a month May through October, approximately four liters of milk are collected and are mailed directly to the IEMA laboratory. Samples are analyzed within five days of sampling by gamma spectroscopy, specifically for short-lived iodine isotopes.

No radionuclides associated with nuclear power plant operations were detected in milk samples collected near Quad Cities. Only naturally occurring K-40 was detected, and it was within the range typical of established background (1,266 to 14,700 pCi/L). See Table 49 (below) for Iodine-131 results from milk samples taken from Quad Cities-area dairies.

Table 49. Iodine-131 in Milk Sample Results for Quad Cities Area
Results are in picocuries per liter (pCi/L)

DATE	Q-26 Dairy Farm S		
	Error	Result	MDC
1/4/2013	-2.41	4.27	3.17
2/1/2013	-1.18	1.65	4.86
3/1/2013	1.12	1.01	3.37
4/5/2013	-1.34	1.24	3.64
5/3/2013	-0.18	1.21	3.63
5/17/2013	-0.19	1.23	3.69
5/31/2013	-0.46	2.72	4.16
6/14/2013	-3.76	7.82	23.35
6/28/2013	0.52	1.31	4.00
7/12/2013	-0.10	1.40	4.21
8/10/2013	-1.85	1.12	3.25
8/23/2013	1.56	0.89	3.00
9/6/2013	2.58	1.21	3.82
9/21/2013	0.52	1.09	3.31
10/4/2013	0.93	2.20	3.44
10/18/2013	1.08	1.52	4.68
11/1/2013	-0.21	1.22	3.64

Soil Samples

Soil samples are collected from land surrounding the plant, and are collected annually. All sediments are submitted for gamma spectroscopy analysis. Soil samples are monitored for several radionuclides associated with nuclear power plant operations including, but not to, Co-58, Co-60, Cs-134, and Cs-137. It should be noted that as a remnant of atmospheric nuclear weapons testing, Cs-137 is routinely observed in sediment and soil at concentrations of 0.1-0.2 pCi/g. Table 50 shows the results of analysis of sediment samples taken from the Quad Cities Area. No radionuclides associated with nuclear power plant operations were detected in samples collected near Quad Cities. Other radionuclides detected were naturally occurring.

Table 50. Soil Sample Results for Quad Cities Area
Results are in picocuries per gram (pCi/g)

Location	Date	Nuclide	Result	Error	MDC
Upwind @ Lock&Dam 14	8/7/2013	Co-58	0.0	0.0	0.0
Upwind @ Lock&Dam 14	8/7/2013	Co-60	0.0	0.0	0.0
Upwind @ Lock&Dam 14	8/7/2013	Cs-134	0.0	0.0	0.0
Upwind @ Lock&Dam 14	8/7/2013	Cs-137	0.1	0.0	0.0
Downwind @ Albany	8/8/2013	Co-58	0.0	0.0	0.0
Downwind @ Albany	8/8/2013	Co-60	0.0	0.0	0.0
Downwind @ Albany	8/8/2013	Cs-134	0.0	0.0	0.0
Downwind @ Albany	8/8/2013	Cs-137	0.1	0.0	0.0

Sediment Samples

Sediment samples are collected from the Mississippi River at a point downstream of the plant effluent stream. Sediments are collected at least annually and are submitted for gamma spectroscopy analysis.

Sediment samples are monitored for several radionuclides associated with nuclear power plant operations including, but not to, Co-58, Co-60, Cs-134, and Cs-137. It should be noted that as a remnant of atmospheric nuclear weapons testing, Cs-137 is routinely observed in sediment and soil at concentrations of 0.1-0.2 pCi/g. Table 51 shows the results of analysis of sediment samples taken from the Quad Cities Area.

Table 51. Sediment Sample Results for Quad Cities Area
Results are in picocuries per gram (pCi/g)

Location	Date	Nuclide	Result	Error	MDC
Q-39, Cordova, D.S. on Miss. River	5/30/2013	Co-58	-0.1	0.1	0.2
Q-39, Cordova, D.S. on Miss. River	5/30/2013	Co-60	0.0	0.0	0.2
Q-39, Cordova, D.S. on Miss. River	5/30/2013	Cs-134	0.0	0.0	0.1
Q-39, Cordova, D.S. on Miss. River	5/30/2013	Cs-137	0.1	0.0	0.1
Mississippi R. downstream @ Rapid City	11/7/2013	Co-58	0.0	0.0	0.0
Mississippi R. downstream @ Rapid City	11/7/2013	Co-60	0.0	0.0	0.0
Mississippi R. downstream @ Rapid City	11/7/2013	Cs-134	0.0	0.0	0.0

Location	Date	Nuclide	Result	Error	MDC
Mississippi R. downstream @ Rapid City	11/7/2013	Cs-137	0.0	0.0	0.0
Mississippi River @ Cordova (downstream)	11/7/2013	Co-58	0.0	0.0	0.0
Mississippi River @ Cordova (downstream)	11/7/2013	Co-60	0.0	0.0	0.0
Mississippi River @ Cordova (downstream)	11/7/2013	Cs-134	0.0	0.0	0.0
Mississippi River @ Cordova (downstream)	11/7/2013	Cs-137	0.1	0.0	0.0

Fish Samples

Like sediments, fish are collected from rivers, typically near the plant discharge point. At each location, two different species of fish are collected annually, typically in October. Edible portions of the fish are harvested by technicians at Midwest Laboratory and prepared for analysis. Splits of the samples are provided to the IEMA laboratory. Fish samples are analyzed for reactor-produced radionuclides using gamma spectroscopy.

No radionuclides associated with nuclear power plant operations were detected in fish samples collected near Quad Cities. Other radionuclides detected were naturally occurring. Table 52 shows results from fish sampling during 2013.

Table 52. Fish Sample Results for Quad Cities Area
Results are in picocuries per kilogram (pCi/kg)

Location	Date	Nuclide	Result	Error	MDC	Comments
Q-24 Miss. River, Pool #14 (Sector L)	5/7/2013	Co-58	-87.9	47.7	135.0	Freshwater Drum
Q-24 Miss. River, Pool #14 (Sector L)	5/7/2013	Co-60	-4.6	14.4	41.6	Freshwater Drum
Q-24 Miss. River, Pool #14 (Sector L)	5/7/2013	Cs-134	4.6	14.1	44.2	Freshwater Drum
Q-24 Miss. River, Pool #14 (Sector L)	5/7/2013	Cs-137	2.4	11.8	36.3	Freshwater Drum
Q-24 Miss. River, Pool #14 (Sector L)	5/7/2013	Co-58	38.3	154.0	246.0	Walleye
Q-24 Miss. River, Pool #14 (Sector L)	5/7/2013	Co-60	-2.9	39.4	58.8	Walleye
Q-24 Miss. River, Pool #14 (Sector L)	5/7/2013	Cs-134	4.4	45.4	72.1	Walleye
Q-24 Miss. River, Pool #14 (Sector L)	5/7/2013	Cs-137	-11.4	38.0	58.4	Walleye
Q-24 Miss. River, Pool #14 (Sector L)	10/2/2013	Co-58	-12.6	9.4	27.3	Common Carp
Q-24 Miss. River, Pool #14 (Sector L)	10/2/2013	Co-60	9.2	5.6	18.0	Common Carp
Q-24 Miss. River, Pool #14 (Sector L)	10/2/2013	Cs-134	1.4	5.5	17.1	Common Carp
Q-24 Miss. River, Pool #14 (Sector L)	10/2/2013	Cs-137	-1.4	4.8	14.6	Common Carp

Vegetation Samples

Vegetation samples are collected from land in the vicinity of the plant, and are collected annually and are submitted for gamma spectroscopy analysis.

Vegetation samples are analyzed for several radionuclides associated with nuclear power plant operations including, but not to, Co-58, Co-60, Cs-134, and Cs-137. Table 53 shows the results of analysis of vegetation samples taken from the Quad Cities, and Table 54 shows the results of analysis if edible vegetation samples harvested July 29, 2013 from the Quad Cities Area.

No radionuclides associated with nuclear power plant operations were detected in samples collected near Quad Cities. Other radionuclides detected were naturally occurring.

Table 53. Vegetation Sample Results for Quad Cities Area
Results are in picocuries per kilogram (pCi/kg)

Location	Date	Nuclide	Result	Error	MDC
Upwind @ Lock&Dam 14	8/7/2013	Co-58	0.0	0.0	0.0
Upwind @ Lock&Dam 14	8/7/2013	Co-60	0.0	0.0	0.0
Upwind @ Lock&Dam 14	8/7/2013	Cs-134	0.0	0.0	0.0
Upwind @ Lock&Dam 14	8/7/2013	Cs-137	0.0	0.0	0.0
Downwind @ Albany	8/8/2013	Co-58	0.0	0.0	0.0
Downwind @ Albany	8/8/2013	Co-60	0.0	0.0	0.0
Downwind @ Albany	8/8/2013	Cs-134	0.0	0.0	0.0
Downwind @ Albany	8/8/2013	Cs-137	0.0	0.0	0.0

Table 54. Edible Vegetation Sample Results for Quad Cities Area
Results are in picocuries per kilogram (pCi/kg)

Values	QC Farm Quad 1-Cabbage				QC Farm Quad 1-Potatoes			
	Co-58	Co-60	Cs-134	Cs-137	Co-58	Co-60	Cs-134	Cs-137
Result	-38.9	8.1	4.9	0.3	161.0	23.6	2.9	-12.7
Error	32.8	6.7	6.6	5.8	77.3	15.2	16.9	14.3
MDC	95.8	20.9	20.9	17.7	261.0	49.2	52.6	41.5
	QC Farm Quad 2-Potatoes				QC Farm Quad 2-Zucchini leaves			
	Co-58	Co-60	Cs-134	Cs-137	Co-58	Co-60	Cs-134	Cs-137
Result	12.8	4.2	5.6	-7.3	50.7	10.5	14.3	0.1
Error	46.6	8.9	9.4	8.0	32.4	6.3	6.8	5.8
MDC	137.0	25.8	27.8	22.3	105.0	20.2	22.5	17.6
	QC Farm Quad 3-Beets				QC Farm Quad 3-Cabbage			
	Co-58	Co-60	Cs-134	Cs-137	Co-58	Co-60	Cs-134	Cs-137
Result	7.1	-2.1	24.4	13.6	-6.3	6.1	-4.0	-2.0
Error	54.5	10.3	10.4	9.1	34.3	6.8	6.4	5.4
MDC	168.0	29.8	35.5	29.6	104.0	20.2	19.4	16.4
	QC Farm Quad 4-Potatoes				QC Farm Quad 4-Rhubarb leaves			
	Co-58	Co-60	Cs-134	Cs-137	Co-58	Co-60	Cs-134	Cs-137
Result	-67.2	17.8	7.3	2.5	103.0	10.9	-9.0	5.7
Error	44.2	6.3	8.1	6.5	52.9	9.9	10.8	8.5
MDC	119.0	21.4	24.1	19.0	176.0	31.2	32.2	26.4

Ambient Gamma

IEMA maintains a network of 66 environmental dosimeters in a ten-mile radius around the Quad Cities station. Unlike the environmental samples described above, dosimeters do not provide information on what radionuclides are found in the environment. Instead, dosimeters provide a direct measurement of the total dose produced by all sources of gamma radiation, including naturally occurring radionuclides and cosmic rays. Dosimeters are exchanged and analyzed quarterly. In 2013, measurements at all 66 locations were consistent with established background measurements.

Table 55 summarizes the quarterly radiation readings in millirem per day (mrem/day) for Quad Cities.

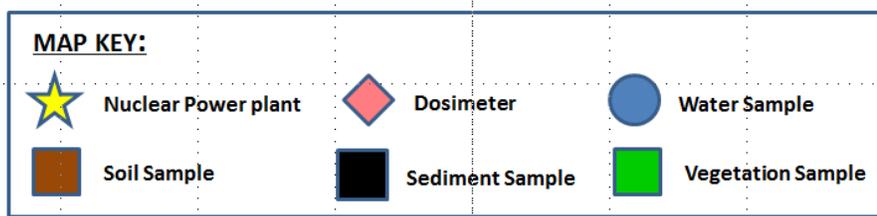
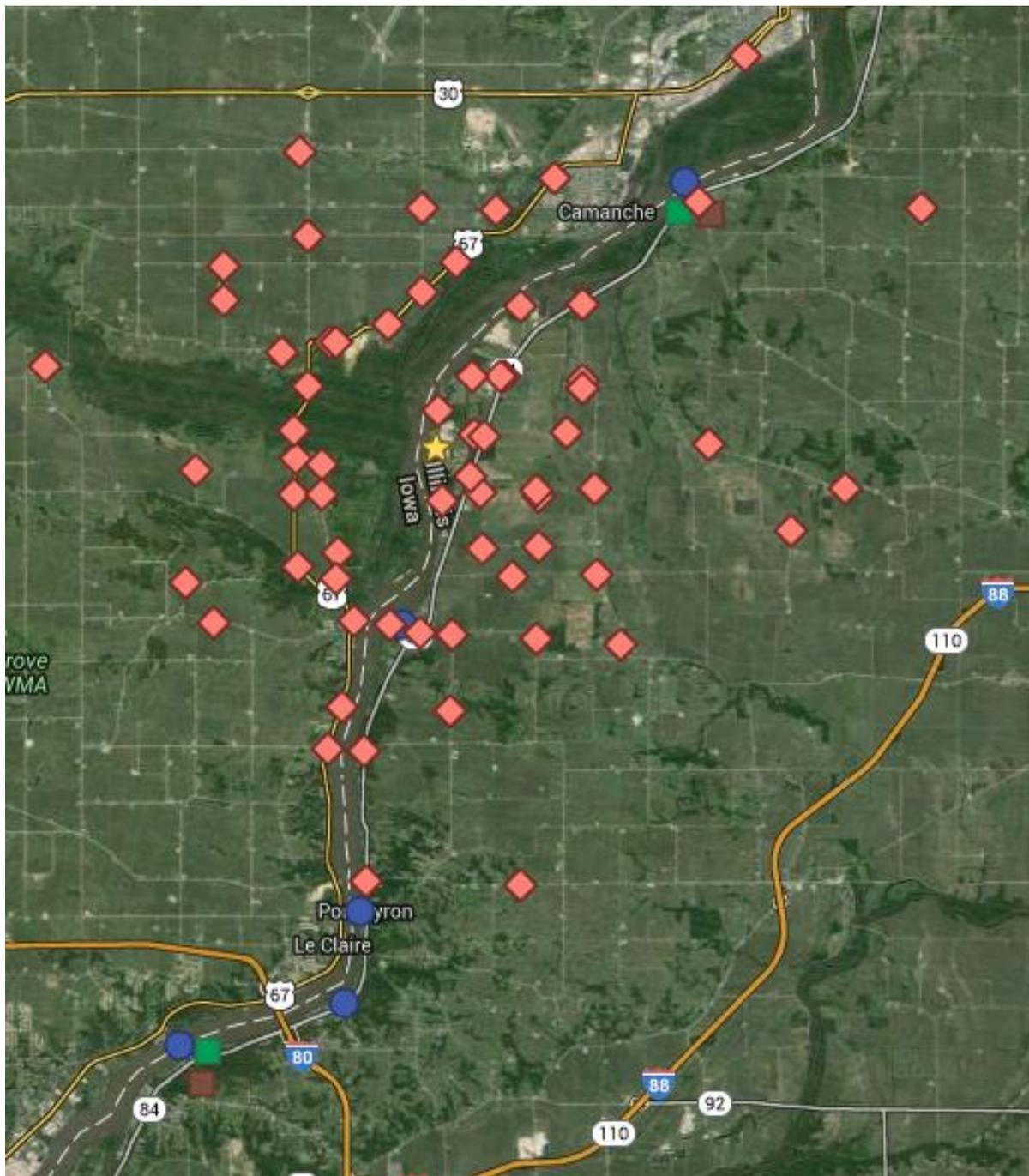
Table 55. Summary of Ambient Gamma Results for the Quad Cities Area

Location	Quarter 1 mrem/day	Quarter 2 mrem/day	Quarter 3 mrem/day	Quarter 4 mrem/day	Annual Dose mrem/year
QC001	0.114	0.108	0.109	0.087	38.14
QC004	0.095	0.101	0.102	0.077	34.22
QC007	0.085	0.124	0.093	0.08	34.86
QC009	0.086	0.121	0.092	0.085	35.04
QC010	0.065	0.097	0.066	0.064	26.65
QC011	0.061	0.077	0.057	0.064	23.63
QC012	0.064	0.094	0.063	0.069	26.46
QC014	0.067	0.089	0.06	0.039	23.27
QC016	0.059	0.082	0.065	0.066	24.82
QC018	0.116	0.14	0.12	0.123	45.53
QC025	0.101	0.112	0.106	0.081	36.50
QC026	0.083	0.112	0.083	0.075	32.21
QC027	0.119	0.115	0.096	0.08	37.41
QC028	0.086	0.123	0.092		36.62
QC029	0.102	0.099	0.095	0.072	33.58
QC030	0.069	0.082	0.078	0.062	26.55
QC031	0.084	0.081	0.087	0.053	27.83
QC032	0.088	0.097	0.08	0.074	30.93
QC033	0.085	0.102	0.086	0.09	33.12
QC034	0.073	0.096	0.082	0.077	29.93
QC035	0.075	0.105	0.082	0.074	30.66
QC036	0.095	0.127	0.083	0.073	34.49
QC037	0.073	0.082	0.079	0.06	26.83
QC038	0.081	0.087	0.09	0.082	31.03
QC039	0.081	0.091	0.074	0.068	28.65
QC040	0.105	0.118	0.091	0.104	38.14
QC041	0.091	0.114	0.085	0.078	33.58
QC042	0.094	0.114	0.087	0.101	36.14
QC043	0.091	0.134	0.111		40.88
QC044	0.076	0.125	0.086	0.071	32.67
QC045	0.095	0.106	0.099	0.075	34.22
QC046	0.103	0.113	0.097	0.078	35.31
QC048	0.09	0.117	0.096	0.084	35.31
QC049		0.103	0.092	0.084	25.46
QC050	0.094	0.1	0.088	0.081	33.12
QC051	0.081	0.081	0.095	0.075	30.30

Location	Quarter 1 mrem/day	Quarter 2 mrem/day	Quarter 3 mrem/day	Quarter 4 mrem/day	Annual Dose mrem/year
QC052	0.106	0.122	0.111	0.09	39.15
QC053	0.066	0.082	0.065		25.92
QC054	0.094	0.115	0.102		37.84
QC055	0.089	0.081	0.09	0.077	30.75
QC056	0.065	0.088	0.073	0.071	27.10
QC057	0.068	0.11	0.071	0.079	29.93
QC058	0.08	0.1	0.1	0.066	31.57
QC059	0.094	0.091	0.109	0.098	35.77
QC060	0.091	0.118	0.096	0.091	36.14
QC061	0.088	0.098	0.089	0.072	31.66
QC062	0.11	0.137	0.128	0.098	43.16
QC063	0.098	0.107	0.099	0.089	35.86
QC064	0.072	0.108	0.076	0.067	29.47
QC-RSA	0.099	0.121	0.102	0.093	37.87
QC-RSB	0.084	0.084	0.088	0.064	29.20
QC-RSC	0.076	0.087	0.073	0.081	28.93
QC-RSD	0.085	0.115	0.087	0.083	33.76
QC-RSE	0.097	0.115	0.101	0.103	37.96
QC-RSF	0.071	0.092	0.082	0.068	28.56
QC-RSG	0.08	0.096	0.081		31.27
QC-RSH	0.103	0.139	0.106	0.085	39.51
QC-RSJ	0.088	0.102	0.09	0.076	32.49
QC-RSK	0.079	0.107	0.083	0.074	31.30
QC-RSL	0.104	0.129	0.114	0.087	39.60
QC-RSM	0.095	0.121	0.115	0.089	38.33
QC-RSN	0.089	0.092	0.084	0.086	32.03
QC-RSP	0.108	0.126	0.114	0.091	40.06
QC-RSQ	0.114	0.122	0.106	0.084	38.87
QC-RSR	0.075	0.112	0.099	0.073	32.76

Blanks in the table indicate that dosimeters were missing at the end of the quarter.
Annual Dose column based on averages of all available data.

Figure 8. Overview of IEMA Monitoring Locations for Quad Cities



Zion Nuclear Power Station

Zion Station is located next to Lake Michigan in Zion, Illinois, approximately forty miles north of Chicago. Prior to 1998, the station utilized two pressurized water reactors to generate electricity. The plant ceased operation permanently in February 1998 and was defueled soon thereafter. In September of 2010, the facility license was transferred from Exelon to ZionSolutions for the express purpose of expediting the decommissioning of the site. In 2013, the plant remained in SAFSTOR status allowing the facility to be safely stored, decontaminated, and decommissioned to levels that permit release for unrestricted use. In December 2013, ZionSolutons began the process of transferring spent fuel assemblies from the fuel pool into dry cask storage at the on-site the Independent Spent Fuel Storage Installation (ISFSI).

Liquid effluents from the Zion Station are released to Lake Michigan at a point near Zion Beach. Critical pathways for radiation exposure to the public include ingestion from drinking water and foodstuffs. Because of decay, iodine-131 is no longer present. Samples collected include: public drinking waters in Illinois and Wisconsin, soil, vegetation and air samples, as well as sediment from Lake Michigan.



Water Samples

Water samples are collected from four public water systems which draw their water from Lake Michigan near Zion station: Lake County, Waukegan, Kenosha and Lake Forest. At each water supply, aliquots are collected weekly and combined to make a single quarterly composite sample for each community. Typically, 3-4 liters are collected per quarter. Water samples are submitted for gross alpha, gross beta, tritium, and gamma spectroscopy analyses.

Although tritium (H-3) is a normal component of the effluent stream of nuclear power plants, because the fuel has been removed from the reactor, it is unlikely that significant amounts of tritium would be released.

Water samples are monitored for several radionuclides associated with nuclear power plant operations including, but not limited to, Co-58, Co-60, Cs-134, and Cs-137. None of these were detected in 2013. Gross alpha and beta analyses were consistent with background. In addition, samples were tested for the presence of H-3 (tritium).

Tritium is a normal component of the effluent stream of nuclear power plants and its release to the environment is regulated by US NRC and Illinois Environmental Protection Agency (IEPA) permitting. It is instructive to compare these concentrations to the US EPA drinking water standard of 20,000 pCi/L. Table 56 shows the results of tritium analysis of water samples around Zion.

Water samples are screened for gross alpha and gross beta activity. Table 57 shows the results of alpha/beta screening. Samples are also analyzed for several gamma-emitting radionuclides associated with nuclear power plant operations including, but not limited to, Co-58, Co-60, Cs-134 and Cs-137. None of these were detected in 2013. Table 58 shows results for analysis of water samples taken from the Zion area.

**Table 56. Tritium in Water Sample Results for Zion Area
Results are in picocuries per liter (pCi/L)**

Location	Date	Result	Error	MDC
Lake Michigan N. of Zion site	1/15/2013	13.7	70.4	118.0
Lake Michigan S. of Zion site	1/16/2013	-6.9	69.7	118.0
Z-14 Kenosha PWS	3/31/2013	-50.7	99.0	168.0
Z-15 Lake County PWS	3/31/2013	41.9	101.0	168.0
Z-16 Waukegan PWS	3/31/2013	-2.2	100.0	168.0
Z-18 Lake Forest PWS	3/31/2013	96.6	73.3	118.0
Lake Michigan N. of Zion site	4/23/2013	68.6	72.0	118.0
Lake Michigan S. of Zion site	4/23/2013	10.8	67.9	114.0
Z-25 LakeMichigan Sector J @ State Park	4/23/2013	-56.4	66.0	114.0
Z-14 Kenosha PWS	6/30/2013	-67.9	76.4	132.0
Z-15 Lake County PWS	6/30/2013	2.2	78.3	132.0
Z-16 Waukegan PWS	6/30/2013	2.2	78.3	132.0
Z-18 Lake Forest PWS	6/30/2013	76.7	80.3	132.0
Lake Michigan N. of Zion site	7/22/2013	17.5	78.5	131.0
Lake Michigan S. of Zion site	7/22/2013	-2.2	78.0	131.0
Z-25 LakeMichigan Sector J @ State Park	7/22/2013	13.1	78.4	131.0
Lake Michigan N. of Zion site	10/15/2013	15.3	78.6	131.0
Lake Michigan S. of Zion site	10/15/2013	13.1	78.5	131.0
Z-25 LakeMichigan Sector J @ State Park	10/15/2013	13.1	78.5	131.0

Table 57. Sample Results for Alpha/Beta Screening of Water from the Zion Area
Results are in picocuries per liter (pCi/L)

Location	Quarter 1		Quarter 2		Quarter 3		Quarter 4	
	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta
Lake Michigan N. of Zion site								
Results	0.2	0.6	1.1	3.4	-0.3	4.2	1.2	2.0
Error	1.1	2.0	1.1	2.3	1.3	2.4	1.5	2.6
MDC	1.7	3.4	1.6	3.8	2.2	4.0	2.3	4.3
Lake Michigan S. of Zion site								
Results	0.4	-0.8	2.1	4.6	0.0	2.9	0.9	2.4
Error	1.1	1.9	1.1	2.4	1.4	2.4	1.5	2.6
MDC	1.7	3.4	1.6	3.8	2.2	4.0	2.3	4.3
Z-14 Kenosha PWS								
Results	1.2	3.6			-0.2	-0.4		
Error	1.1	2.3			1.3	2.5		
MDC	1.6	3.8			2.1	4.2		
Z-15 Lake County PWS								
Results	0.7	3.0			1.0	2.2		
Error	1.1	2.3			1.3	2.5		
MDC	1.6	3.8			2.1	4.2		
Z-16 Waukegan PWS								
Results	0.5	3.5			1.1	0.4		
Error	1.1	2.3			1.2	2.1		
MDC	1.6	3.8			1.8	3.5		
Z-18 Lake Forest PWS								
Results	0.5	3.6			-0.2	2.3		
Error	1.3	2.2			1.3	2.5		
MDC	2.0	3.7			2.1	4.2		
Z-25 LakeMichigan Sector J @ State Park								
Results			-2.2	3.8	-2.0	3.4	-0.1	5.7
Error			1.1	2.3	1.3	2.4	1.4	2.6
MDC			1.9	3.7	2.2	4.0	2.3	4.3

Table 58. Gamma Spectroscopy Sample Results for Other Radionuclides in Water from the Zion Area
Results are in picocuries per liter (pCi/L)

Location	Date	Nuclide	Result	Error	MDC
Lake Michigan N. of Zion site	1/15/2013	Co-58	2.8	2.0	3.4
Lake Michigan N. of Zion site	1/15/2013	Co-60	0.0	2.1	2.9
Lake Michigan N. of Zion site	1/15/2013	Cs-134	2.9	1.8	3.1
Lake Michigan N. of Zion site	1/15/2013	Cs-137	-0.1	1.7	2.6
Lake Michigan S. of Zion site	1/16/2013	Co-58	-1.2	2.1	3.0
Lake Michigan S. of Zion site	1/16/2013	Co-60	0.7	2.2	3.2
Lake Michigan S. of Zion site	1/16/2013	Cs-134	0.2	2.0	3.0
Lake Michigan S. of Zion site	1/16/2013	Cs-137	0.6	1.7	2.7
Z-14 Kenosha PWS	3/31/2013	Co-58	-0.8	1.5	4.3
Z-14 Kenosha PWS	3/31/2013	Co-60	0.3	1.1	3.4

Location	Date	Nuclide	Result	Error	MDC
Z-14 Kenosha PWS	3/31/2013	Cs-134	1.0	1.2	3.6
Z-14 Kenosha PWS	3/31/2013	Cs-137	0.0	1.0	3.1
Z-15 Lake County PWS	3/31/2013	Co-58	-0.4	1.2	3.5
Z-15 Lake County PWS	3/31/2013	Co-60	-0.5	1.0	2.8
Z-15 Lake County PWS	3/31/2013	Cs-134	0.0	1.0	3.0
Z-15 Lake County PWS	3/31/2013	Cs-137	2.1	0.9	3.1
Z-16 Waukegan PWS	3/31/2013	Co-58	-1.4	1.7	4.6
Z-16 Waukegan PWS	3/31/2013	Co-60	-0.8	1.4	3.8
Z-16 Waukegan PWS	3/31/2013	Cs-134	-0.3	1.3	3.7
Z-16 Waukegan PWS	3/31/2013	Cs-137	0.3	1.1	3.3
Z-18 Lake Forest PWS	3/31/2013	Co-58	1.2	1.5	4.4
Z-18 Lake Forest PWS	3/31/2013	Co-60	0.4	1.1	3.4
Z-18 Lake Forest PWS	3/31/2013	Cs-134	-0.5	1.3	3.8
Z-18 Lake Forest PWS	3/31/2013	Cs-137	-3.6	1.1	2.9
Lake Michigan N. of Zion site	4/23/2013	Co-58	-0.1	0.9	2.8
Lake Michigan N. of Zion site	4/23/2013	Co-60	0.2	1.0	3.1
Lake Michigan N. of Zion site	4/23/2013	Cs-134	1.5	0.9	3.0
Lake Michigan N. of Zion site	4/23/2013	Cs-137	0.1	1.0	2.9
Lake Michigan S. of Zion site	4/23/2013	Co-58	-0.2	1.2	3.6
Lake Michigan S. of Zion site	4/23/2013	Co-60	0.0	1.5	4.1
Lake Michigan S. of Zion site	4/23/2013	Cs-134	2.2	1.2	3.8
Lake Michigan S. of Zion site	4/23/2013	Cs-137	0.9	1.1	3.5
Z-25 LakeMichigan Sector J @ State Park	4/23/2013	Co-58	-1.4	1.1	3.1
Z-25 LakeMichigan Sector J @ State Park	4/23/2013	Co-60	-0.5	1.1	3.0
Z-25 LakeMichigan Sector J @ State Park	4/23/2013	Cs-134	-1.1	1.0	2.8
Z-25 LakeMichigan Sector J @ State Park	4/23/2013	Cs-137	-0.5	0.9	2.8
Z-14 Kenosha PWS	6/30/2013	Co-58	-2.0	2.3	6.8
Z-14 Kenosha PWS	6/30/2013	Co-60	-0.5	1.3	3.6
Z-14 Kenosha PWS	6/30/2013	Cs-134	0.4	1.2	3.7
Z-14 Kenosha PWS	6/30/2013	Cs-137	1.0	1.1	3.4
Z-15 Lake County PWS	6/30/2013	Co-58	2.3	2.4	7.7
Z-15 Lake County PWS	6/30/2013	Co-60	2.0	1.1	3.6
Z-15 Lake County PWS	6/30/2013	Cs-134	1.2	1.0	3.3
Z-15 Lake County PWS	6/30/2013	Cs-137	0.3	0.9	2.8
Z-16 Waukegan PWS	6/30/2013	Co-58	4.4	2.4	8.1
Z-16 Waukegan PWS	6/30/2013	Co-60	-0.7	1.2	3.4
Z-16 Waukegan PWS	6/30/2013	Cs-134	1.1	1.2	3.9
Z-16 Waukegan PWS	6/30/2013	Cs-137	-0.3	1.1	3.2
Z-18 Lake Forest PWS	6/30/2013	Co-58	1.1	3.0	8.8
Z-18 Lake Forest PWS	6/30/2013	Co-60	-0.1	1.5	4.1
Z-18 Lake Forest PWS	6/30/2013	Cs-134	-0.5	1.4	4.1
Z-18 Lake Forest PWS	6/30/2013	Cs-137	-1.2	1.3	3.6
Lake Michigan N. of Zion site	7/22/2013	Co-58	1.0	2.4	7.0
Lake Michigan N. of Zion site	7/22/2013	Co-60	0.2	1.1	3.1
Lake Michigan N. of Zion site	7/22/2013	Cs-134	0.8	1.3	3.7
Lake Michigan N. of Zion site	7/22/2013	Cs-137	-0.8	1.0	3.1
Lake Michigan S. of Zion site	7/22/2013	Co-58	-0.4	3.4	5.2
Lake Michigan S. of Zion site	7/22/2013	Co-60	0.9	1.9	2.9
Lake Michigan S. of Zion site	7/22/2013	Cs-134	0.1	1.8	2.8
Lake Michigan S. of Zion site	7/22/2013	Cs-137	-0.1	1.6	2.5

Location	Date	Nuclide	Result	Error	MDC
Z-25 LakeMichigan Sector J @ State Park	7/22/2013	Co-58	0.1	2.7	7.6
Z-25 LakeMichigan Sector J @ State Park	7/22/2013	Co-60	0.2	1.5	4.2
Z-25 LakeMichigan Sector J @ State Park	7/22/2013	Cs-134	1.0	1.5	4.4
Z-25 LakeMichigan Sector J @ State Park	7/22/2013	Cs-137	0.1	1.2	3.6
Lake Michigan N. of Zion site	10/15/2013	Co-58	-1.6	1.4	4.1
Lake Michigan N. of Zion site	10/15/2013	Co-60	-1.2	1.3	3.5
Lake Michigan N. of Zion site	10/15/2013	Cs-134	-1.6	1.2	3.3
Lake Michigan N. of Zion site	10/15/2013	Cs-137	0.7	1.1	3.4
Lake Michigan S. of Zion site	10/15/2013	Co-58	1.6	1.2	3.8
Lake Michigan S. of Zion site	10/15/2013	Co-60	0.7	0.8	2.6
Lake Michigan S. of Zion site	10/15/2013	Cs-134	-0.7	1.1	3.1
Lake Michigan S. of Zion site	10/15/2013	Cs-137	-0.1	0.9	2.8
Z-14 Kenosha PWS	10/15/2013	Co-58	-0.9	1.7	4.8
Z-14 Kenosha PWS	10/15/2013	Co-60	0.6	0.9	2.7
Z-14 Kenosha PWS	10/15/2013	Cs-134	2.1	1.1	3.3
Z-14 Kenosha PWS	10/15/2013	Cs-137	0.8	0.9	2.7
Z-15 Lake County PWS	10/15/2013	Co-58	-0.1	1.0	2.8
Z-15 Lake County PWS	10/15/2013	Co-60	-1.2	1.1	3.0
Z-15 Lake County PWS	10/15/2013	Cs-134	-0.5	1.2	3.4
Z-15 Lake County PWS	10/15/2013	Cs-137	1.1	0.9	3.0
Z-16 Waukegan PWS	10/15/2013	Co-58	-0.1	3.0	4.5
Z-16 Waukegan PWS	10/15/2013	Co-60	1.0	1.8	2.9
Z-16 Waukegan PWS	10/15/2013	Cs-134	-0.2	1.9	2.9
Z-16 Waukegan PWS	10/15/2013	Cs-137	1.6	1.6	2.7
Z-18 Lake Forest PWS	10/15/2013	Co-58	0.5	2.1	6.3
Z-18 Lake Forest PWS	10/15/2013	Co-60	0.2	1.4	4.1
Z-18 Lake Forest PWS	10/15/2013	Cs-134	-0.5	1.3	3.7
Z-18 Lake Forest PWS	10/15/2013	Cs-137	0.8	1.0	3.2
Z-25 LakeMichigan Sector J @ State Park	10/15/2013	Co-58	-0.8	1.7	4.7
Z-25 LakeMichigan Sector J @ State Park	10/15/2013	Co-60	-0.2	1.4	4.0
Z-25 LakeMichigan Sector J @ State Park	10/15/2013	Cs-134	2.7	1.3	4.3
Z-25 LakeMichigan Sector J @ State Park	10/15/2013	Cs-137	-1.6	1.3	3.5

Milk Samples

No dairy falls within ten miles of Zion. In the event that milk samples were collected, the samples collected for Braidwood would provide a control sample.

Soil Samples

Soil samples are collected from land surrounding the plant, and are collected annually and are submitted for gamma spectroscopy analysis.

Soil samples are analyzed for several radionuclides associated with nuclear power plant operations including, but not to, Co-58, Co-60, Cs-134, and Cs-137. It should be noted that as a remnant of atmospheric nuclear weapons testing, Cs-137 is routinely observed in sediment and soil at concentrations of 0.1-0.2 pCi/g. Table 59 shows the results of analysis of sediment samples taken from the Zion Area.

No radionuclides associated with nuclear power plant operations were detected in samples collected near Braidwood. Other radionuclides detected were naturally occurring.

Table 59. Soil Sample Results for Zion Area
Results are in picocuries per gram (pCi/g)

Location	Date	Nuclide	Result	Error	MDC
Directly W. of Zion Site	7/30/2013	Co-58	0.0	0.0	0.0
Directly W. of Zion Site	7/30/2013	Co-60	0.0	0.0	0.0
Directly W. of Zion Site	7/30/2013	Cs-134	0.0	0.0	0.0
Directly W. of Zion Site	7/30/2013	Cs-137	0.2	0.0	0.0

Sediment Samples

Sediment samples are collected from Lake Michigan near Illinois Beach State Park. Sediments are collected semi-annually in the Spring and Fall. All sediments are submitted for gamma spectroscopy analysis.

Sediment samples are analyzed for several radionuclides associated with nuclear power plant operations including, but not to, Co-58, Co-60, Cs-134, and Cs-137. It should be noted that as a remnant of atmospheric nuclear weapons testing, Cs-137 is routinely observed in sediment and soil at concentrations of 0.1-0.2 pCi/g. Table 60 shows the results of analyses of sediment samples taken from the Zion Area.

Table 60. Sediment Sample Results for Zion Area
Results are in picocuries per gram (pCi/g)

Location	Date	Nuclide	Result	Error	MDC
Lake Michigan N. of Zion Site	4/23/2013	Co-58	0.0	0.0	0.0
Lake Michigan N. of Zion Site	4/23/2013	Co-60	0.0	0.0	0.0
Lake Michigan N. of Zion Site	4/23/2013	Cs-134	0.0	0.0	0.0
Lake Michigan N. of Zion Site	4/23/2013	Cs-137	0.0	0.0	0.0
Lake Michigan S. of Zion site	4/23/2013	Co-58	0.0	0.0	0.0
Lake Michigan S. of Zion site	4/23/2013	Co-60	0.0	0.0	0.0
Lake Michigan S. of Zion site	4/23/2013	Cs-134	0.0	0.0	0.0
Lake Michigan S. of Zion site	4/23/2013	Cs-137	0.0	0.0	0.0
Z-25 LakeMichigan Sector J @ State Park	4/23/2013	Co-58	0.0	0.0	0.0
Z-25 LakeMichigan Sector J @ State Park	4/23/2013	Co-60	0.0	0.0	0.0
Z-25 LakeMichigan Sector J @ State Park	4/23/2013	Cs-134	0.0	0.0	0.0
Z-25 LakeMichigan Sector J @ State Park	4/23/2013	Cs-137	0.1	0.0	0.0
Z-25 LakeMichigan Sector J @ State Park	5/8/2013	Co-58	0.0	0.1	0.4
Z-25 LakeMichigan Sector J @ State Park	5/8/2013	Co-60	0.0	0.1	0.2
Z-25 LakeMichigan Sector J @ State Park	5/8/2013	Cs-134	0.0	0.0	0.1
Z-25 LakeMichigan Sector J @ State Park	5/8/2013	Cs-137	0.0	0.1	0.2
Lake Michigan N. of Zion Site	10/15/2013	Co-58	0.0	0.0	0.0
Lake Michigan N. of Zion Site	10/15/2013	Co-60	0.0	0.0	0.0
Lake Michigan N. of Zion Site	10/15/2013	Cs-134	0.0	0.0	0.0
Lake Michigan N. of Zion Site	10/15/2013	Cs-137	0.0	0.0	0.0
Lake Michigan S. of Zion site	10/15/2013	Co-58	0.0	0.0	0.0
Lake Michigan S. of Zion site	10/15/2013	Co-60	0.0	0.0	0.0

Location	Date	Nuclide	Result	Error	MDC
Lake Michigan S. of Zion site	10/15/2013	Cs-134	0.0	0.0	0.0
Lake Michigan S. of Zion site	10/15/2013	Cs-137	0.0	0.0	0.0
Z-25 LakeMichigan Sector J @ State Park	10/16/2013	Co-58	0.0	0.0	0.1
Z-25 LakeMichigan Sector J @ State Park	10/16/2013	Co-60	0.0	0.0	0.1
Z-25 LakeMichigan Sector J @ State Park	10/16/2013	Cs-134	0.0	0.0	0.0
Z-25 LakeMichigan Sector J @ State Park	10/16/2013	Cs-137	0.0	0.0	0.1

Fish Samples

No fish samples were obtained from the Zion area during calendar year 2013.

Air Samples

As stated at the beginning of this Section, the Zion Nuclear Power Plant permanently ceased operation in February of 1998, and has been storing spent fuel on site. Due to decommissioning activities, IEMA maintains a network of air monitoring stations around the Zion Station. After Exelon decided to move the spent fuel from the storage pool to ISFSI, IEMA added an additional air sampling station north of the plant entrance near the railroad tracks in July. Air samples are collected continuously, with the air filters being changed and analyzed weekly. The air filters are analyzed for gross alpha and beta through gas proportional counting. Table 61 shows the results of the air filter analysis for 2013.

Table 61. Alpha / Beta Screening Results for Air Samples in the Zion Area
Results are in picocuries per liter (pCi/L)

DATE	Air Pump North of Plant Entrance by RR						North of Site (Reuter-Stokes E)					
	ALPHA			BETA			ALPHA			BETA		
	Results	Error	MDC	Results	Error	MDC	Results	Error	MDC	Results	Error	MDC
1/2/2013							1.2	0.4	0.7	39.3	1.7	1.6
1/8/2013							1.4	0.9	1.5	68.4	3.7	4.1
1/16/2013							2.2	0.8	1.3	39.7	2.6	3.2
1/22/2013							1.5	1.3	2.3	33.6	2.9	3.7
1/29/2013							1.9	0.9	1.3	37.9	2.9	3.6
2/5/2013							1.6	0.8	1.3	42.8	2.8	3.4
2/13/2013							1.1	0.7	1.1	29.2	2.4	3.2
2/19/2013							2.2	0.9	1.4	32.0	2.9	3.9
2/26/2013							1.4	0.7	1.1	19.7	2.2	3.3
3/5/2013							1.0	0.7	1.3	20.0	2.4	3.5
3/12/2013							2.1	0.8	1.1	15.5	1.8	2.5
3/20/2013							4.4	0.9	1.1	30.3	2.3	3.2
3/25/2013							2.5	1.1	1.7	15.9	3.0	5.0
4/2/2013							1.9	0.7	1.1	17.6	2.0	3.1
4/9/2013							2.0	0.8	1.3	24.2	2.5	3.7
4/17/2013							2.1	0.7	1.0	9.5	1.9	3.2
4/30/2013												

DATE	Air Pump North of Plant Entrance by RR						North of Site (Reuter-Stokes E)					
	ALPHA			BETA			ALPHA			BETA		
	Results	Error	MDC	Results	Error	MDC	Results	Error	MDC	Results	Error	MDC
5/7/2013							1.6	0.7	1.1	20.6	2.4	3.5
5/14/2013							0.7	0.7	1.3	17.0	2.3	3.5
5/21/2013							2.2	0.8	1.1	23.9	2.4	3.4
5/28/2013							1.0	0.6	1.0	14.8	2.1	3.2
6/3/2013							1.2	0.8	1.3	15.3	2.6	4.3
6/11/2013							0.6	0.6	1.0	22.7	2.2	3.0
6/17/2013							1.7	0.8	1.2	18.0	2.6	4.1
6/25/2013							0.2	0.5	1.0	20.6	2.1	2.9
7/10/2013							0.6	0.6	0.9	23.6	2.2	3.0
7/16/2013							0.6	0.8	1.4	20.4	2.7	4.0
7/22/2013							0.6	0.8	1.4	23.4	2.8	4.1
7/30/2013	0.6	0.5	1.0	12.3	1.9	3.1	0.6	0.5	0.9	10.7	1.8	3.0
8/6/2013	0.6	0.7	1.3	23.0	2.4	3.6	0.7	0.7	1.3	21.8	2.4	3.6
8/13/2013	1.1	0.7	1.3	27.0	2.5	3.5	1.5	0.8	1.3	28.2	2.5	3.6
8/19/2013	1.6	0.9	1.4	26.8	2.8	4.1	0.9	0.8	1.5	22.3	2.7	4.2
8/27/2013	0.6	0.6	1.2	41.0	2.6	3.1	1.1	0.7	1.2	37.4	2.5	3.2
9/3/2013	0.6	0.7	1.4	22.2	2.4	3.6	1.2	0.8	1.4	25.4	2.5	3.6
9/10/2013	1.4	0.8	1.4	37.9	2.8	3.6	1.0	0.8	1.4	38.1	2.8	3.6
9/16/2013	0.6	0.8	1.5	26.3	2.7	4.0	0.3	0.7	1.5	29.1	2.7	3.9
9/24/2013	-0.1	0.5	1.2	17.6	2.1	3.3	0.7	0.6	1.1	22.0	2.2	3.2
10/1/2013	-0.5	0.6	1.4	23.2	2.4	3.7	0.1	0.7	1.4	28.7	2.6	3.7
10/15/2013	-0.1	0.7	1.4	30.7	2.5	3.5	1.3	0.8	1.4	34.7	2.6	3.5
10/22/2013	0.9	0.7	1.3	17.7	2.3	3.7	0.7	0.7	1.3	20.5	2.4	3.6
10/29/2013	1.2	0.7	1.3	13.5	2.1	3.5	0.8	0.7	1.3	13.2	2.1	3.4
11/5/2013	1.0	0.8	1.4	33.6	2.5	3.3	1.2	0.8	1.4	32.1	2.5	3.3
11/12/2013	2.9	0.8	1.1	22.6	1.9	2.3	1.7	0.9	1.3	24.9	2.3	3.2
11/19/2013	1.9	0.9	1.5	22.2	2.2	3.3	2.1	0.9	1.5	23.8	2.2	3.3
11/25/2013	-0.3	0.6	1.5	0.2	1.4	3.3	2.1	1.0	1.7	22.2	2.4	3.7
12/2/2013	2.5	0.8	1.2	36.6	2.5	3.2	1.4	0.7	1.2	15.9	2.0	3.2
12/10/2013	2.8	0.8	1.0	37.3	2.1	1.9	3.3	0.8	1.1	39.0	2.2	2.1
12/17/2013	3.3	0.9	1.2	36.1	2.3	2.4	3.3	0.9	1.2	37.1	2.3	2.4
12/24/2013	2.3	1.0	1.5	25.8	2.3	3.3	1.8	0.9	1.4	28.7	2.3	3.2

DATE	South of Site (Reuter-Stokes J)						West of Site (Reuter-Stokes F)					
	ALPHA			BETA			ALPHA			BETA		
	Results	Error	MDC	Results	Error	MDC	Results	Error	MDC	Results	Error	MDC
1/2/2013	1.4	0.45	0.64	40.6	1.68	1.58	0.9	0.4	0.7	38.2	1.7	1.6
1/8/2013	1.8	0.9	1.5	71.7	3.8	4.1	1.7	0.9	1.5	71.8	3.8	4.2
1/16/2013	2.8	0.9	1.3	39.9	2.6	3.2	1.7	0.8	1.3	38.0	2.6	3.2
1/22/2013	1.2	1.2	2.3	33.9	2.9	3.7	0.2	1.2	2.3	30.1	2.8	3.7
1/29/2013	1.4	0.8	1.3	39.8	2.9	3.6	2.0	0.9	1.3	38.6	2.9	3.6
2/5/2013	2.3	0.8	1.3	43.4	2.8	3.4	2.4	0.9	1.3	43.4	2.8	3.4
2/13/2013	1.8	0.7	1.1	30.5	2.4	3.2	1.4	0.7	1.1	28.3	2.4	3.2
2/19/2013	1.3	0.8	1.3	34.7	2.9	3.9	2.5	1.0	1.4	32.7	2.9	3.9
2/26/2013	1.0	0.6	1.1	15.5	2.0	3.2	1.3	0.7	1.1	16.7	2.1	3.2
3/5/2013	0.6	0.7	1.3	19.2	2.4	3.7	1.2	0.8	1.3	19.6	2.4	3.7
3/12/2013	2.1	0.8	1.1	16.3	1.8	2.5	2.4	0.8	1.1	12.2	1.7	2.5
3/20/2013	3.9	0.9	1.1	32.7	2.4	3.1	3.7	0.9	1.1	29.7	2.3	3.2

DATE	South of Site (Reuter-Stokes J)						West of Site (Reuter-Stokes F)					
	ALPHA			BETA			ALPHA			BETA		
	Results	Error	MDC	Results	Error	MDC	Results	Error	MDC	Results	Error	MDC
3/25/2013	2.2	1.1	1.7	17.5	3.1	5.0	2.2	1.1	1.7	18.4	3.1	5.0
4/2/2013	2.3	0.8	1.1	13.2	1.9	3.1	1.4	0.7	1.1	15.5	2.0	3.1
4/9/2013	2.9	0.9	1.3	26.1	2.6	3.7	2.4	0.9	1.3	22.7	2.5	3.7
4/17/2013	1.2	0.7	1.0	12.3	2.0	3.2	1.5	0.7	1.1	10.1	2.0	3.3
4/30/2013	1.6	0.8	1.2	32.9	2.6	3.4	2.1	0.8	1.2	30.5	2.6	3.4
5/7/2013	2.0	0.8	1.1	21.7	2.4	3.5	1.7	0.7	1.1	22.9	2.4	3.5
5/14/2013	0.9	0.8	1.3	16.7	2.3	3.5	0.9	0.8	1.3	17.6	2.3	3.5
5/21/2013	1.7	0.7	1.1	23.7	2.4	3.4	2.2	0.8	1.1	25.5	2.5	3.5
5/28/2013	0.7	0.6	1.0	15.8	2.1	3.3	1.2	0.7	1.1	14.5	2.1	3.3
6/3/2013	1.0	0.8	1.3	16.8	2.6	4.1	0.7	0.8	1.4	18.3	2.8	4.4
6/11/2013	0.8	0.6	1.0	20.5	2.1	3.1	0.7	0.6	1.0	22.9	2.2	3.1
6/17/2013	1.3	0.8	1.2	22.3	2.7	4.0	1.6	0.8	1.2	20.0	2.7	4.1
6/25/2013	0.3	0.5	1.0	20.2	2.0	2.9	0.5	0.6	1.0	18.6	2.0	2.9
7/10/2013	1.0	0.6	1.0	26.7	2.3	3.1	0.5	0.5	0.9	28.9	2.3	3.0
7/16/2013	0.8	0.8	1.4	17.8	2.5	4.0	0.8	0.8	1.4	21.1	2.7	4.0
7/22/2013	-0.1	0.7	1.4	20.9	2.7	4.0	0.6	0.8	1.4	21.0	2.7	4.1
7/30/2013	0.3	0.5	0.9	11.4	1.8	3.0	0.4	0.5	0.9	11.6	1.8	3.0
8/6/2013	0.9	0.7	1.3	25.3	2.5	3.6	1.5	0.8	1.3	24.1	2.5	3.6
8/13/2013	1.7	0.8	1.3	32.1	2.6	3.5	1.4	0.8	1.3	31.9	2.6	3.5
8/19/2013	0.4	0.7	1.5	27.2	2.8	4.2	0.5	0.7	1.5	28.1	2.8	4.2
8/27/2013	0.7	0.7	1.2	43.9	2.7	3.2	1.3	0.7	1.2	42.7	2.7	3.2
9/3/2013	0.3	0.7	1.4	23.9	2.5	3.7	0.4	0.7	1.4	24.8	2.5	3.7
9/10/2013	0.8	0.8	1.4	42.0	2.8	3.6	0.6	0.7	1.4	40.1	2.8	3.6
9/16/2013	0.6	0.8	1.5	27.1	2.7	4.0	0.7	0.8	1.5	28.8	2.8	4.1
9/24/2013	0.5	0.6	1.1	20.6	2.1	3.2	0.6	0.6	1.1	19.9	2.1	3.2
10/1/2013	0.7	0.8	1.4	26.1	2.5	3.7	0.2	0.7	1.5	23.3	2.5	3.7
10/15/2013	1.2	0.8	1.4	33.1	2.6	3.5	1.7	0.9	1.5	32.9	2.6	3.6
10/22/2013	0.9	0.7	1.3	22.0	2.4	3.7	0.7	0.7	1.3	19.0	2.3	3.7
10/29/2013	0.5	0.7	1.3	12.7	2.1	3.5	0.9	0.7	1.3	15.3	2.1	3.4
11/5/2013	0.1	0.7	1.4	34.4	2.5	3.3	1.1	0.8	1.5	33.4	2.6	3.5
11/12/2013	3.8	0.9	1.1	25.7	2.0	2.3	2.3	0.9	1.3	27.9	2.4	3.1
11/19/2013	2.4	1.0	1.5	22.5	2.2	3.3	2.1	0.9	1.5	22.8	2.2	3.3
11/25/2013	2.5	1.0	1.7	20.3	2.3	3.7	1.7	1.0	1.6	22.6	2.4	3.6
12/2/2013	2.3	0.8	1.3	40.7	2.6	3.3	2.4	0.8	1.2	42.1	2.6	3.2
12/10/2013	3.9	0.8	1.0	46.0	2.2	1.9	3.7	0.8	1.0	42.3	2.2	1.9
12/17/2013	3.1	0.9	1.2	37.4	2.3	2.3	3.2	0.9	1.2	37.9	2.3	2.4
12/24/2013	2.0	0.9	1.4	27.0	2.3	3.2	2.3	0.9	1.4	28.1	2.3	3.2

Vegetation Samples

Vegetation samples are collected from land in the vicinity of the plant, and are collected annually. All vegetation samples are submitted for gamma spectroscopy analysis.

Vegetation samples are analyzed for several radionuclides associated with nuclear power plant operations including, but not to, Co-58, Co-60, Cs-134, and Cs-137. Table 62 shows the results of analysis of vegetation samples taken from the Braidwood Area.

No radionuclides associated with nuclear power plant operations were detected in samples collected near Braidwood. Other radionuclides detected were naturally occurring.

Table 62. Vegetation Sample Results for Zion Area
Results are in picocuries per kilogram (pCi/kg)

Location	Date	Nuclide	Result	Error	MDC
Directly W of Zion Site	7/22/2013	Co-58	-5.6E-09	5.7E-09	1.6E-08
Directly W of Zion Site	7/22/2013	Co-60	-4.4E-09	3.2E-09	8.6E-09
Directly W of Zion Site	7/22/2013	Cs-134	-2.0E-10	3.6E-09	1.0E-08
Directly W of Zion Site	7/22/2013	Cs-137	1.9E-08	3.3E-09	1.0E-08

Ambient Gamma

IEMA maintains a network of 24 environmental dosimeters in a ten-mile radius around the Zion station. Unlike the environmental samples described above, dosimeters do not provide information on what radionuclides are found in the environment. Instead, dosimeters provide a direct measurement of the total dose produced by all sources of gamma radiation including naturally occurring radionuclides and cosmic rays. Dosimeters are exchanged and analyzed quarterly.

In 2013, measurements at all 24 locations were consistent with established background measurements. Table 63 summarizes the quarterly radiation readings in millirem per day (mrem/day) for Zion.

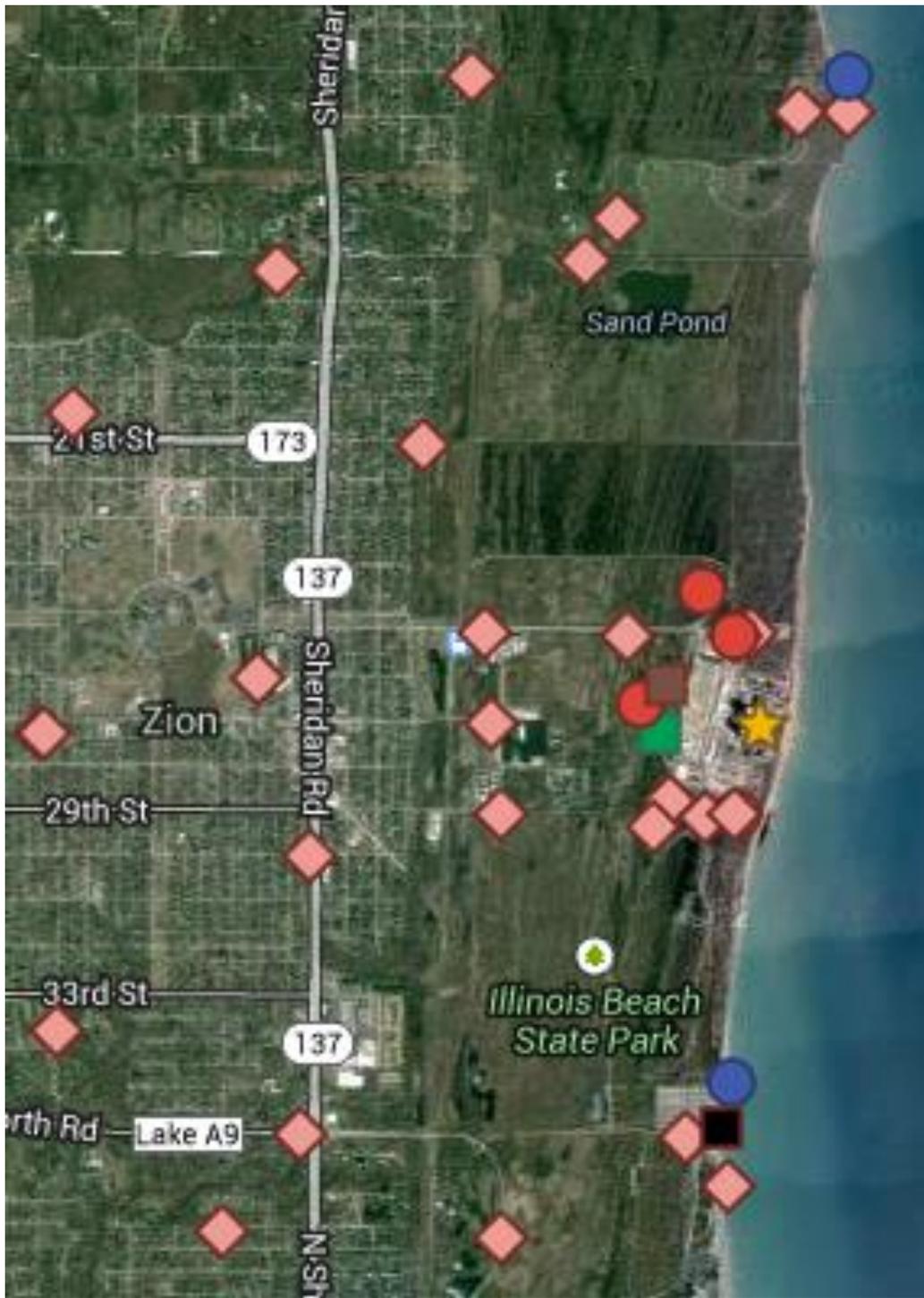
Table 61. Summary of Ambient Gamma Results for the Zion Area

Location	Quarter 1 mrem/day	Quarter 2 mrem/day	Quarter 3 mrem/day	Quarter 4 mrem/day	Annual Dose mrem/year
ZN039	0.062	0.067	0.09	0.071	26.46
ZN040	0.064	0.081	0.084	0.09	29.11
ZN045	0.055		0.071	0.074	24.36
ZN065	0.054	0.078	0.085	0.07	26.19
ZN066	0.086	0.098	0.108	0.083	34.22
ZN067	0.039	0.07	0.059	0.055	20.35
ZN068	0.069	0.076	0.1	0.078	29.47
ZN069	0.068	0.082	0.086	0.079	28.74
ZN070	0.058	0.059	0.082	0.067	24.27
ZN071	0.094	0.095	0.104	0.1	35.86
ZN072	0.045	0.07	0.066	0.066	22.54
ZN073	0.067	0.068	0.064	0.063	23.91
ZN074	0.06	0.053	0.069	0.063	22.36
ZN075	0.084	0.104	0.122	0.113	38.60
ZN076	0.07	0.092	0.088	0.087	30.75

Location	Quarter 1 mrem/day	Quarter 2 mrem/day	Quarter 3 mrem/day	Quarter 4 mrem/day	Annual Dose mrem/year
ZN077	0.088	0.098	0.108	0.095	35.50
ZN078	0.063	0.095	0.1	0.1	32.67
ZN079	0.083	0.094	0.11	0.082	33.67
ZN080	0.078	0.088	0.098	0.096	32.85
ZN081	0.11	0.102	0.109	0.101	38.51
ZN082	0.053	0.073	0.07	0.054	22.81
ZN-RSJC	0.107	0.064	0.118	0.083	33.95
ZN-RSNC	0.057	0.05	0.064	0.067	21.72
ZN-RSRC	0.039	0.062	0.06	0.049	19.16

Blanks in the table indicate that dosimeters were missing at the end of the quarter.
Annual Dose column based on averages of all available data.

Figure 9. Overview of IEMA Monitoring Locations for Zion



MAP KEY:			
	Nuclear Power plant		Dosimeter
	Soil Sample		Water Sample
	Sediment Sample		Air Sample
			Vegetation Sample