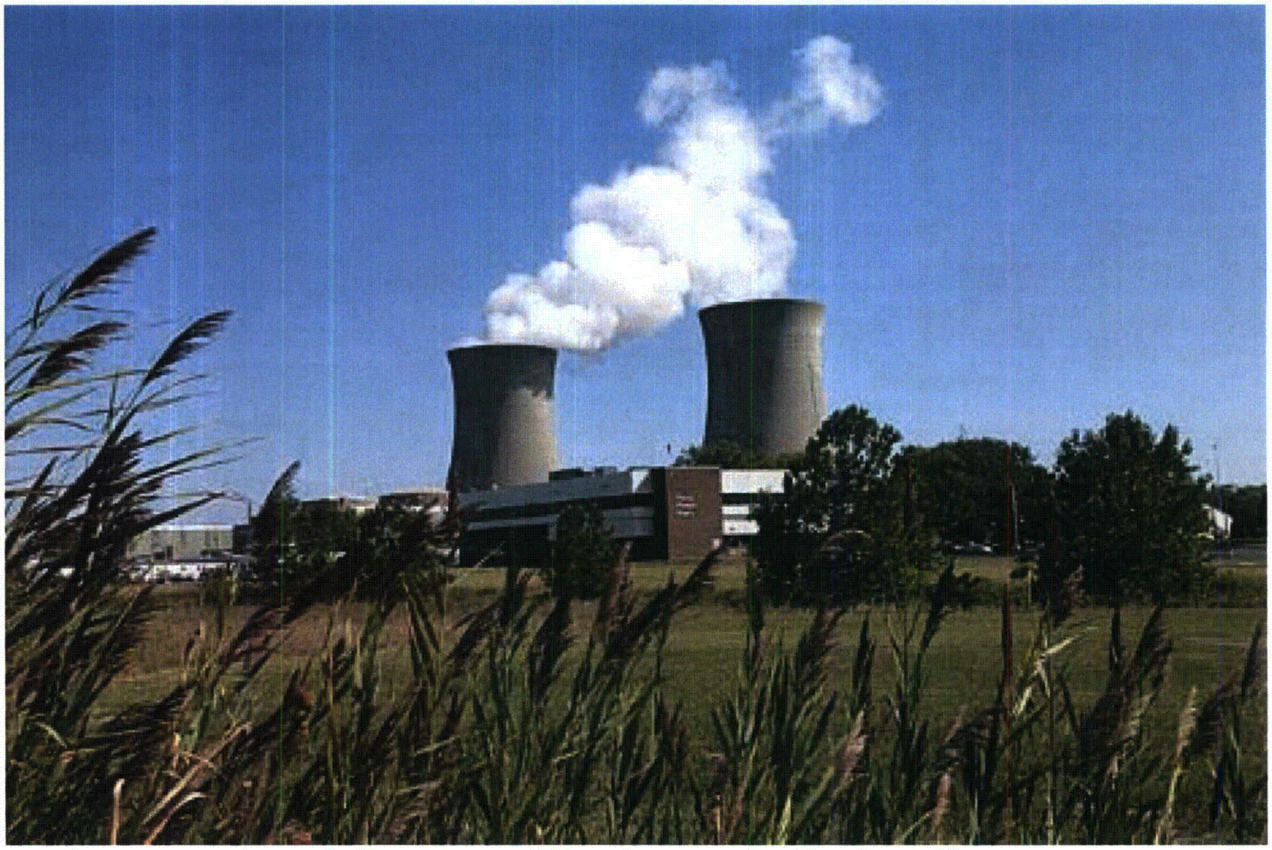
Enclosure A
L-15-143

PNPP 2014 Annual Environmental and Effluent Release Report

Perry Nuclear
Power Plant



Annual Environmental and Effluent Release Report

2014

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ANNUAL ENVIRONMENTAL
AND
EFFLUENT RELEASE
REPORT

for the
Perry Nuclear Power Plant

PREPARED BY:
CHEMISTRY SECTION
PERRY NUCLEAR POWER PLANT
FIRSTENERGY NUCLEAR OPERATING COMPANY
PERRY, OHIO
APRIL, 2015

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Appendices

EXECUTIVE SUMMARY

The Annual Environmental and Effluent Release Report (AEERR) details the results of environmental and effluent monitoring programs conducted at the Perry Nuclear Power Plant (PNPP) from January 01 through December 31, 2014. This report meets all of the requirements in PNPP Technical Specifications, the Offsite Dose Calculation Manual (ODCM), the Environmental Protection Plan (EPP), and Regulatory Guide 1.21. It incorporates the requirements of the Annual Radioactive Effluent Release Report (ARERR), the Annual Radiological Environmental Operating Report (AREOR) and the Annual Environmental Operating Report (AEOR). Report topics include radioactive effluent releases, radiological environmental monitoring, land use census, clam/mussel monitoring, herbicide use, and special reports. The results of the environmental and effluent programs for 2014 indicate that the operations of the PNPP did not result in any significant environmental impact.

RADIOACTIVE EFFLUENT RELEASES

During the normal operation of a nuclear power plant, small quantities of radioactivity are released to the environment in liquid and gaseous effluents. Radioactive material is also shipped offsite as solid waste. PNPP maintains a comprehensive program to control and monitor the release of radioactive materials from the site in accordance with Nuclear Regulatory Commission (NRC) release regulations.

The dose to the general public from the plant's liquid and gaseous effluents was below regulatory limits. The calculated maximum individual whole body dose potentially received by an individual resulting from PNPP liquid effluents was 9.00E-04 mrem (0.03% of the limit). The calculated maximum individual whole body dose potentially received by an individual resulting from PNPP gaseous effluents (excluding C-14) was 5.18E-04 mrem (0.01% of the limit).

Radioactivity released to the environment in the form of gaseous Carbon-14 (C-14) was estimated based on plant type and power production. The calculation is based on an industry initiative supported by the Nuclear Energy Institute (NEI), the Electric Power Research Institute (EPRI) and the NRC. The calculated hypothetical maximum individual whole body dose potentially received by an individual resulting from PNPP gaseous effluents including C-14 is 2.47E-01 mrem (4.9% of the limit). Refer to page 23 for additional Carbon-14 information.

The summation of the hypothetical maximum individual dose from effluents in 2014 is less than 1% of the total dose an individual living in the PNPP area receives from all sources of manmade and background radiation.

Shipments of solid waste consisted of waste generated during water treatment, radioactive material generated during normal daily operations and maintenance, and irradiated components. PNPP complied with regulations governing radioactive shipments of solid radioactive waste.

An additional section covers the groundwater monitoring program. It includes a brief history of groundwater tritium issues at the PNPP, and results from current sampling and monitoring activities.

RADIOLOGICAL ENVIRONMENTAL MONITORING

The Radiological Environmental Monitoring Program (REMP) was established in 1981 to monitor the radiological conditions in the environment around PNPP. The REMP is conducted in accordance with PNPP Technical Specifications and the ODCM. This program includes the collection and analysis of environmental samples and evaluation of results.

The REMP was established at PNPP six (6) years before the plant became operational. This pre-operational program was designed to provide data on background radiation and radioactivity normally present in the area. PNPP has continued to monitor the environment during plant operation by collecting and analyzing samples of air, milk, fish, vegetation, water and sediment, as well as by measuring radiation directly. The results of the REMP program indicate adequate control of radioactivity released from PNPP plant effluents. These results also demonstrate that PNPP complies with federal regulations.

Air samples were collected to monitor the radioactivity in the atmosphere; the results were similar to those observed for the pre-operational and operational programs from prior years.

Terrestrial monitoring included the analysis of milk and vegetation; the results indicated concentrations of radioactivity similar to that found in previous years. Analyses of vegetation samples detected only natural radioactivity similar to those observed in previous years, and indicated no build-up of radioactivity attributable to the operation of PNPP.

Aquatic monitoring included the collection and analyses of water, fish, and shoreline sediments. The analytical results for water and fish samples showed normal background radionuclide concentrations. The results of sediment sample analyses indicated that the annual average cesium radioactivity was similar to previous years for the control location. Cesium-137 activity was detected in two (2) of the seven (7) samples collected. The average cesium-137 radioactivity for all locations was 68.5 pCi/kg and is lower than the highest identified value of 864 pCi/kg established in 1981 which was due to atmospheric nuclear weapons testing.

Direct radiation measurements showed no discernible change from previous years. The indicator locations averaged 64.0 mrem/year and control locations averaged 64.7 mrem/year. In 2014, radiation dose in the area of PNPP was similar to the radiation dose measured at locations greater than ten (10) miles away from the Plant.

Based on these results, during 2014, the operation of the PNPP resulted in no significant increase in the radionuclide concentrations observed in the environment.

LAND USE CENSUS

In order to estimate radiation dose attributable to the operation of PNPP, the potential pathways through which public exposure can occur must be known. To identify these exposure pathways, an Annual Land Use Census is performed as part of the REMP. During the census, PNPP personnel travel public roads within a five (5) mile radius of the plant to locate key radiological exposure pathways. These key pathways include the nearest resident, garden, and milk animal in each of the ten meteorological land sectors that surround the plant. The information obtained from the census is entered into a computer program, which is used to assess the hypothetical dose to members of the public. The predominant land use within the census area continues to be rural and/or agricultural.

CLAM/MUSSEL MONITORING

Clam and mussel shells can clog plant piping and components that use water from Lake Erie. For this reason, sampling for clams and mussels has been conducted in Lake Erie near PNPP since 1971. The monitoring is specifically for Corbicula (Asiatic clams) since their introduction into the Great Lakes in 1981, and for Dreissena (zebra mussels) since their discovery in Lake Erie in 1989. Since no Corbicula have ever been found at PNPP, routine Corbicula monitoring will provide early detection capability if this pest species arrives at PNPP. The Dreissena program includes both monitoring and control and is directed at minimizing the mussel's impact on plant operation. As in past years, this program has successfully prevented Dreissena from causing any significant operational problems at PNPP.

HERBICIDE USE

The use of herbicides on the PNPP site is monitored to ensure compliance with Ohio Environmental Protection Agency (OEPA) requirements and to protect the site's natural areas. Based on the results of on-site herbicide applications and weekly general site inspections, herbicide use has not had a negative impact on the environment around the plant.

SPECIAL ENVIRONMENTAL REPORTS

Significant environmental events (for example, spills, releases), noncompliance with environmental regulations [e.g., OEPA discharge limits], and changes in plant design or operation that affect the environment are reported to regulatory agencies as they occur.

There were no reports submitted in 2014.

INTRODUCTION

Nuclear energy provides an alternative energy source, which is readily available and has very limited impact upon the environment. To more fully understand nuclear energy as a source of generating electricity, one must understand basic radiation concepts and its occurrence in nature.

RADIATION FUNDAMENTALS

Atoms are the basic building blocks of all matter. Simply described, atoms are made up of positively and negatively charged particles, and particles which are neutral. These particles are called protons, electrons, and neutrons, respectively. The relatively large protons and neutrons are packed together in the center of the atom called the nucleus. Orbiting around the nucleus are one or more smaller electrons. In an electrically neutral atom, the positively charged protons in the nucleus balance the negatively charged electrons. Due to their dissimilar charges, the protons and electrons have a strong attraction for each other, which helps hold the atom together. Other attractive forces between the protons and neutrons keep the densely packed protons from repelling each other, and preventing the nucleus from breaking apart.

Atoms with the same number of protons in their nuclei make up an element. The number of neutrons in the nuclei of an element may vary. Atoms with the same number of protons but different numbers of neutrons are called isotopes. All isotopes of the same element have the same chemical properties and many are stable or non-radioactive. An unstable or radioactive isotope of an element is called a radionuclide. Radionuclides contain an excess amount of energy in the nucleus, which is usually due to an excess number of neutrons.

Radioactive atoms attempt to reach a stable, non-radioactive state through a process known as radioactive decay. Radioactive decay is the release of energy from an atom's nucleus through the emission of radiation. Radionuclides vary greatly in the rate in which their atoms release radiation. The length of time an atom remains radioactive is defined in terms of its half-life. Half-life is defined as the time required for a radioactive substance to lose half its activity through the process of radioactive decay. Half-lives vary from millionths of a second to millions of years.

RADIATION AND RADIOACTIVITY

Radioactive decay is a process in which the nucleus of an unstable atom becomes more stable by spontaneously emitting energy. Radiation refers to the energy that is released when radioactive decay occurs within the nucleus. This section includes a discussion on the three (3) primary forms of radiation produced by radioactive decay.

Alpha Particles

Alpha particles consist of two protons and two neutrons and have a positive charge. Because of their charge and large size, alpha particles do not travel very far when released (less than 4 inches in air). They are unable to penetrate any solid material, such as paper or skin, to any significant depth. However, if alpha particles are released inside the body, they can damage the soft internal tissues because they deposit all their energy in a small area.

Beta Particles

Beta particles have the same characteristics as electrons but originate from the nucleus. They are much smaller than alpha particles and travel at nearly the speed of light. Thus they can travel for longer distances than alpha particles. External beta radiation primarily affects the skin. Because of their electrical charge, paper, plastic or thin metals can stop beta particles.

Gamma Rays

Gamma rays are bundles of electromagnetic energy, called photons, which behave as though they were particles. They are similar to visible light, but of a much higher energy. Gamma rays can travel long distances in air and are often released during radioactive decay, along with alpha and beta particles. Potassium-40 is an example of a naturally occurring radionuclide found in all humans that decays by emitting a gamma ray.

Interaction with Matter

When radiation interacts with other materials, it affects the atoms of those materials principally by knocking the negatively charged electrons out of orbit. This causes an atom to lose its electrical neutrality and become positively charged. An atom that is charged, either positively or negatively, is called an ion and the radiation is called ionizing radiation.

UNITS OF MEASURE

Some of the units of measure used in this report require explanation.

Activity

Activity is the number of atoms in a material that decay per unit of time. Each time an atom decays, radiation is emitted. The curie (Ci) is the unit used to describe the activity of a material and indicates the rate at which the atoms are decaying. One curie of activity indicates the decay of 37 billion atoms per second. Smaller units of the curie are often used in this report. Two common units are the microcurie (μCi), one millionth of a curie, and the picocurie (pCi), one trillionth of a curie. The mass, or weight, of radioactive material, which would result in one (1) curie of activity, depends on the disintegration rate. For example, one gram of radium-226 is equivalent to one (1) curie of activity. It would require about 1.5 million grams of natural uranium, however, to equal one (1) curie.

Dose

Biological damage due to alpha, beta, and gamma radiation may result from the ionization caused by these types of radiation. Some types of radiation, especially alpha particles, which causes dense local ionization, can result in much more biological damage for the same energy imparted than does gamma or beta radiation. Therefore, a quality factor must be applied to account for the different ionizing capabilities of various types of ionizing radiation. When the quality factor is multiplied by the absorbed dose (as measured in rads), the result is the dose equivalent, which is an estimate of the possible biological damage resulting from exposure to any type of ionizing radiation. The dose equivalent is measured in terms of the Roentgen Equivalent Man (rem). When discussing environmental radiation effects, the rem is a large unit. Therefore, a smaller unit, the millirem (mrem) is often used. One mrem is equivalent to 1/1000 of a rem.

LOWER LIMIT OF DETECTION

Sample results are often reported as below the Lower Limit of Detection (LLD). The LLD for an analysis is the smallest amount of radioactive material that will show a positive result for which there can be a 95% confidence that radioactivity is present. This statistical parameter is used as a measure of the sensitivity of a sample analysis. When a measurement is reported as less than the LLD (<LLD), it means that no radioactivity was detected. Had radioactivity been present at (or above) the stated LLD value, it statistically would have been detected. The NRC has established the required LLD values for environmental and effluent sample analyses.

OTHER SOURCES OF RADIATION DOSE TO THE U.S. POPULATION

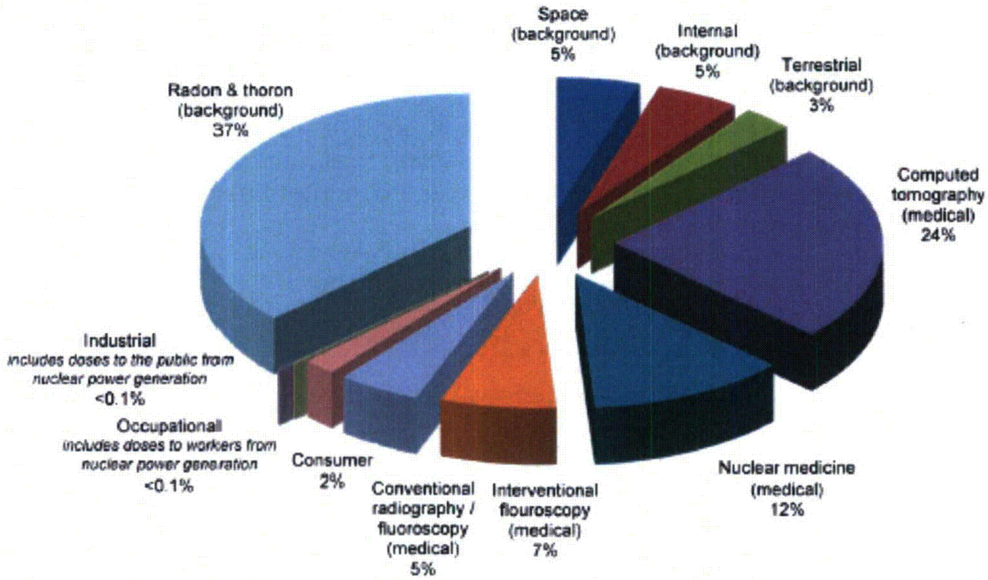
This section discusses the doses that the average American typically receives each year from naturally occurring background radiation and all other sources of radiation. With the information presented in this section, the reader can compare the doses received from a Nuclear Power Plant (NPP) effluents with the doses received from natural, medical, and other sources of radiation. This comparison provides some context to the concept of radiation dose effects.

In March 2009, the National Council on Radiation Protection and Measurements (NCRP) published Report No. 160 as an update to the 1987 NCRP Report No. 93, Ionizing Radiation Exposure of the Population of the United States (Refs. 30, 31). Report No. 160 describes the doses to the U.S. population from all sources of ionizing radiation for 2006, the most recent data available at the time the NCRP report was written. The NCRP report also includes information on the variability of those doses from one individual to another. The NCRP estimated that the average person in the United States receives about 620 mrem of radiation dose each year. NCRP Report No. 160 describes each of the sources of radiation that contribute to this dose, including:

- Naturally occurring sources (natural background) such as cosmic radiation from space, terrestrial radiation from radioactive materials in the earth, and naturally occurring radioactive materials in the food people eat and in the air people breathe;
- Medical sources from diagnosis and treatment of health disorders using radioactive pharmaceuticals and radiation-producing equipment;
- Consumer products (such as household smoke detectors);
- Industrial processes, security devices, educational tools, and research activities; and
- Exposures of workers that result from their occupations.

Figure 1

Sources of Radiation Exposure to the U.S. Population



The chart above shows the contribution of various sources of exposure to the total collective effective dose and the total effective dose per individual in the U.S. population for 2006. Values have been rounded to the nearest 1%, except for those <1 % [less than 1%]. Credit: Modification to image courtesy of National Council on Radiation Protection and Measurements.

Figure 1 is a pie chart showing the relative contributions of these sources of radiation to the dose received by the average American. Larger contributors to dose are represented by proportionally larger slices of the pie. Doses to the public from NPPs are included in the industrial category; doses to workers from nuclear power generation are included in the category of occupational dose. Doses to the public due to effluents from NPPs are less than 0.1% (one-tenth of one percent) of what the average person receives each year from all sources of radiation. Doses to workers from occupational exposures, including those received from work at NPPs, also are less than 0.1% of the average dose to a member of the public from all sources.

ENVIRONMENTAL RADIONUCLIDES

Many radionuclides are present in the environment due to sources such as cosmic radiation and fallout from nuclear weapons testing. These radionuclides are expected to be present in many of the environmental samples collected in the vicinity of PNPP. Some of the radionuclides normally present include:

Beryllium-7, present as a result of the interaction of cosmic radiation with the upper atmosphere,

Potassium-40, a naturally occurring radionuclide normally found in humans and throughout the environment, and

Radionuclides from nuclear weapons testing fallout, including tritium and cesium-137. These radionuclides may also be released in minute amounts from nuclear facilities.

Beryllium-7 and potassium-40 are especially common in REMP samples. Since they are naturally occurring and are expected to be present, positive results for these radionuclides are not discussed in the section for the 2014 Sampling Program results. These radionuclides are included; however, in Appendix A, 2014 Inter-Laboratory Cross Check Comparison Program Results.

RADIOACTIVE EFFLUENT RELEASES

INTRODUCTION

The source of radioactive material in a nuclear power plant is the generation of fission products (e.g., noble gas, iodine, and particulate) or neutron activation of water and corrosion products (e.g., tritium and cobalt). The majority of the fission products generated remain within the nuclear fuel pellet and fuel cladding. Most fission products that escape from the fuel cladding, as well as the majority of the activated corrosion products, are removed by plant processing equipment.

During the normal operation of a nuclear power plant, small amounts of radioactive material are released in the form of solids, liquids, and gases. PNPP was designed, and is operated in such a manner as to control and monitor these effluent releases. Effluents are controlled to ensure any radioactivity released to the environment is minimal and within regulatory limits. Effluent release programs include the operation of monitoring systems, in-plant sampling and analysis, quality assurance, and detailed procedures covering all aspects of effluent monitoring.

The liquid and gaseous radioactive waste treatment systems at PNPP are designed to collect and process these wastes in order to remove most of the radioactivity. Effluent monitoring systems are used to provide continuous indication of the radioactivity present and are sensitive enough to measure several orders of magnitude lower than the release limits. This monitoring equipment is equipped with alarms and indicators in the plant control room. The alarms are set to provide warnings to alert plant operators when radioactivity levels reach a small fraction of the limits. The waste streams are sampled and analyzed to identify and quantify the radionuclides being released to the environment.

Gaseous effluent release data is coupled with on-site meteorological data in order to calculate the dose to the general public. Devices are maintained at various locations around PNPP to continuously sample the air in the surrounding environment. Frequent samples of other environmental media are also taken to determine if any radioactive material deposition has occurred. The Radiological Environmental Monitoring Program (REMP) is described in detail later in this report.

Generation of solid waste is carefully monitored to identify opportunities for minimization. Limiting the amount of material taken into the plant, sorting material as radioactive or non-

radioactive waste, and incinerating waste once it is identified help to lower the volume of radioactive solid waste generated. Solid waste is shipped to a licensed burial site.

REGULATORY LIMITS

The Nuclear Regulatory Commission has established limits for liquid and gaseous effluents that comply with:

Title 10 of the Code of Federal Regulations, Part 20 (Standards for Protection Against Radiation) [10CFR20], Appendix B;

Title 10 of the Code of Federal Regulations, Part 50 (Domestic Licensing of Production and Utilization Facilities) [10CFR50], Appendix I; and

Title 40 of the Code of Federal Regulations, Part 190 (Environmental Radiation Protection Standards for Nuclear Power Plants) [40CFR190].

These limits were incorporated into the PNPP Technical Specifications, and subsequently into the PNPP ODCM. The ODCM prescribes the maximum doses and dose rates due to radioactive effluents resulting from the operation of PNPP. These limits are defined in several ways to limit the overall impact on persons living near the plant. Since there are no other fuel sources near the PNPP, the 40CFR190 limits, which are described below, were not exceeded in 2014.

The 40CFR190 limit for whole body dose is 25 mrem. For 2014, the total whole body dose to a member of the general public, considering all sectors, was 0.247 millirem. This value was determined by summing the annual whole body doses from liquid and gaseous radioactive effluents and the annual gaseous Carbon-14 dose. Since the direct radiation dose, as determined by TLD, was indistinguishable from natural background (see Figure 9), it was not included in the calculation.

LIQUID EFFLUENTS

The concentration of radioactive material released in liquid effluents to unrestricted areas shall be limited to the concentrations specified in 10CFR20, Appendix B, Table 2, Column 2 for radionuclides other than dissolved or entrained noble gases, as required by the ODCM. For dissolved or entrained noble gases, the concentration is limited to a concentration of 2.0E-04 µCi/ml. These values are the maximum effluent concentrations.

The dose or dose commitment to a member of the public from radioactive materials in liquid effluents released to unrestricted areas shall be limited to the following:

During any calendar quarter:

Less than or equal to 1.5 mrem to the whole body, and

Less than or equal to 5 mrem to any organ

During any calendar year:

Less than or equal to 3 mrem to the whole body, and

Less than or equal to 10 mrem to any organ

GASEOUS EFFLUENTS

The dose rate due to radioactive materials released in gaseous effluents from the site to areas at and beyond the site boundary shall be limited to the following as required by the ODCM:

Noble gases:

Less than or equal to 500 mrem per year to the whole body, and

Less than or equal to 3000 mrem per year to any organ

Iodine-131, Iodine-133, Tritium, and all radionuclides in particulate form with half lives greater than eight days:

Less than or equal to 1500 mrem per year to any organ

Air dose due to noble gases to areas at, and beyond the site boundary, shall be limited to the following:

During any calendar quarter:

Less than or equal to 5 mrad for gamma radiation, and

Less than or equal to 10 mrad for beta radiation

During any calendar year:

Less than or equal to 10 mrad for gamma radiation, and

Less than or equal to 20 mrad for beta radiation

- Dose to a member of the public from Iodine-131, Iodine-133, Tritium, and all radionuclides in particulate form with half-lives greater than eight days in gaseous effluents released to areas at and beyond the site boundary shall be limited to the following:

  Less than or equal to 7.5 mrem to any organ per any calendar quarter, and

  Less than or equal to 15 mrem to any organ per any calendar year

The PNPP ODCM does not contain a concentration limit for gaseous effluents. For this reason, effluent concentrations are not used to calculate maximum release rates for gaseous effluents.

RELEASE SUMMARY

Effluents are sampled and analyzed to identify both the type and quantity of radionuclides present. This information is combined with effluent path flow measurements to determine the composition, concentration, and dose contribution of the radioactive effluents.

Liquid Effluents

The PNPP liquid radioactive waste system is designed to collect and treat all radioactive liquid waste produced in the plant. The treatment process used for radioactive liquid waste depends on its physical and chemical properties. It is designed to reduce the concentration of radioactive material in the liquid by filtration to remove suspended solids and demineralization to remove dissolved solids. Normally, the effluent from the liquid radioactive waste system is returned to plant systems. To reduce the volume of water stored in plant systems; however, the processed liquid effluent may be discharged from the plant via a controlled release. In this case, effluent activity and dose calculations are performed prior to and after discharging this processed water to Lake Erie to ensure regulatory compliance and dose minimization principles are maintained.

Liquid radioactive waste system effluents may be intermittently released, which are considered to be "batch" releases. Table 1 provides information on the number and duration of these releases.

Table 1: Liquid Batch Releases

	Quarter 1	Quarter 2	Quarter 3	Quarter 4
Number of batch releases	0	0	0	8
Total time period for batch releases, min	NA	NA	NA	2.17E+03
Maximum time for a batch release, min	NA	NA	NA	3.62E+02
Average time period for a batch release, min	NA	NA	NA	2.72E+02
Minimum time for a batch release, min	NA	NA	NA	2.26E+02

Table 2 provides information on the nuclide composition for the liquid radioactive effluent system releases. If a radionuclide was not present at a level "greater than or equal to the LLD" (≥LLD), then the value is expressed as "less than the LLD" (<LLD). In each case, LLDs were met, or were below the levels required by the ODCM. Table 2a provides information specific to radioactive effluent batch releases and Table 2b provides information specific to continuous radioactive effluent releases.

Table 2: Summation of All Liquid Effluent Releases

	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Est. Total Error, (%)
Fission and Activation Products					
Total Released, Ci (excluding tritium, gases, alpha)	6.72E-04	8.75E-05	1.78E-03	8.04E-04	1.00E+01
Average Diluted Concentration, µCi/mL *	4.75E-11	4.55E-12	6.04E-11	3.91E-11	
Percent of Applicable Limit, %	1.60E-03	1.98E-04	8.43E-04	1.01E-03	
Tritium					
Total Released, Ci	5.84E-02	5.50E-03	5.63E+00	3.88E+00	1.00E+01
Average Diluted Concentration, µCi/mL	4.13E-09	2.86E-10	1.91E-07	1.81E-07	
Percent of Applicable Limit, %	4.13E-04	2.86E-05	1.91E-02	1.81E-02	
Dissolved and Entrained Gases					
Total Released, Ci	<LLD	<LLD	5.53E-06	6.24E-04	1.00E+01
Average Diluted Concentration, µCi/mL	<LLD	<LLD	1.88E-13	2.91E-11	
Percent of Applicable Limit, %	NA	NA	9.38E-08	1.45E-05	
Gross Alpha Activity, Ci	3.30E-04	<LLD	1.16E-05	<LLD	1.00E+01
Waste Volume Released, Liters (prior to dilution)	1.25E+07	1.11E+07	4.21E+06	1.79E+06	
Dilution Water Volume Used, Liters	1.41E+10	1.92E+10	2.95E+10	2.15E+10	

<LLD – Less than the lower limit of detection

*Average diluted concentrations are based on total volume of water released during quarter.

Table 2a: Summation of Batch Liquid Effluent Releases

	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Est. Total Error, (%)
A. Fission and Activation Products					
Total Released, Ci (excluding tritium, gases, alpha)	NA	NA	NA	8.29E-05	1.00E+01
B. Tritium					
Total Released, Ci	NA	NA	NA	3.88E+00	1.00E+01
C. Dissolved and Entrained Gases					
Total Released, Ci	NA	NA	NA	6.25E-04	1.00E+01
D. Gross Alpha Activity, Ci	NA	NA	NA	<LLD	1.00E+01
E. Waste Volume Released, Liters (prior to dilution)	0.00E+00	0.00E+00	0.00E+00	1.02E+06	

<LLD – Less than the lower limit of detection

Table 2b: Summation of Continuous Liquid Effluent Releases

	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Est. Total Error, (%)
A. Fission and Activation Products					
Total Released, Ci (excluding tritium, gases, alpha)	6.72E-04	8.75E-05	1.76E-03	7.56E-04	1.00E+01
B. Tritium					
Total Released, Ci	5.84E-02	5.50E-03	5.63E+00	3.04E-03	1.00E+01
C. Dissolved and Entrained Gases					
Total Released, Ci	<LLD	<LLD	3.77E-06	<LLD	1.00E+01
D. Gross Alpha Activity, Ci	3.30E-04	<LLD	1.16E-05	<LLD	1.00E+01
E. Waste Volume Released, Liters (prior to dilution)	1.25E+07	1.11E+07	4.21E+06	7.74E+05	

<LLD – Less than the lower limit of detection

Table 3 lists the total number of curies (Ci) of each radionuclide present in liquid effluent releases for each quarter. If a radionuclide was not present at a level "greater than or equal to the LLD" (≥LLD), then the value is expressed as "less than the LLD" (<LLD). In each case, the LLDs were either met, or were below the levels required by the ODCM.

Table 3 Radioactive Liquid Effluent Nuclide Composition

	Units	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Annual
Tritium	Ci	5.84E-02	5.50E-03	5.63E+00	3.88E+00	9.57E+00
Sodium-24	Ci	<LLD	<LLD	1.97E-04	<LLD	1.97E-04
Chromium-51	Ci	<LLD	<LLD	3.96E-04	4.32E-05	4.39E-04
Manganese-54	Ci	3.34E-07	<LLD	1.50E-04	1.03E-04	2.53E-04
Manganese-56	Ci	<LLD	<LLD	6.28E-05	<LLD	6.28E-05
Iron-55	Ci	<LLD	<LLD	<LLD	<LLD	<LLD
Iron-59	Ci	<LLD	<LLD	6.35E-05	1.90E-06	6.54E-05
Cobalt-58	Ci	<LLD	<LLD	6.96E-05	5.55E-05	1.25E-04
Cobalt-60	Ci	6.68E-04	7.44E-05	6.56E-04	6.23E-04	2.02E-03
Zinc-65	Ci	<LLD	<LLD	2.90E-05	9.79E-06	3.88E-05
Zinc-69m	Ci	<LLD	<LLD	2.83E-05	<LLD	2.83E-05
Strontium-89	Ci	<LLD	<LLD	<LLD	<LLD	<LLD
Strontium-90	Ci	<LLD	<LLD	<LLD	<LLD	<LLD
Strontium-91	Ci	<LLD	<LLD	1.08E-05	<LLD	1.08E-05
Strontium-92	Ci	<LLD	<LLD	1.20E-05	<LLD	1.20E-05
Yttrium-91m	Ci	<LLD	<LLD	1.59E-05	<LLD	1.59E-05
Zirconium-95	Ci	<LLD	<LLD	4.26E06	7.41E-07	5.00E-06
Niobium-95	Ci	<LLD	<LLD	9.74E-06	2.70E-06	1.24E-05
Molybdenum-99	Ci	<LLD	<LLD	<LLD	<LLD	<LLD
Technicium-99m	Ci	<LLD	<LLD	3.91E-06	<LLD	3.91E-06
Silver-110m	Ci	<LLD	<LLD	<LLD	2.46E-07	2.46E-07
Iodine-131	Ci	<LLD	<LLD	8.39E-07	<LLD	8.39E-07
Cesium-134	Ci	1.25E-06	2.19E-06	<LLD	<LLD	3.44E-06
Cesium-137	Ci	2.84E-06	1.09E-05	2.47E-07	<LLD	1.40E-05
Cerium-141	Ci	<LLD	<LLD	<LLD	<LLD	<LLD
Cerium-144	Ci	<LLD	<LLD	<LLD	<LLD	<LLD
Gold-199	Ci	<LLD	<LLD	6.55E-05	<LLD	6.55E-05
Argon-41	Ci	<LLD	<LLD	1.76E-06	<LLD	1.76E-06
Xenon-133	Ci	<LLD	<LLD	4.21E-07	5.99E-04	5.99E-04
Xenon-135	Ci	<LLD	<LLD	3.35E-06	2.58E-05	2.92E-05
Gross Alpha	Ci	3.30E-04	<LLD	1.16E-05	<LLD	3.42E-04

<LLD – Less than the lower limit of detection

Gaseous Effluents

Gaseous effluents are made up of fission and activation gases, iodine and particulate releases. Gaseous effluents from PNPP exit the plant via one of four effluent vents. Each of these four effluent vents contains radiation detectors that continuously monitor the air to ensure that the levels of radioactivity released are below regulatory limits. Samples are also collected and analyzed on a periodic basis to ensure regulatory compliance. Gaseous effluents released from PNPP are considered continuous and at ground level.

In 2013 PNPP increased the volume of air captured when sampling for tritium in gaseous effluents. This has increased the detection capability (LLD) by a factor of 20. Gaseous effluent tritium releases are now being detected where before they were too dilute to measure. This has resulted in a reported increase in tritium released over previous years. A summation of all gaseous radioactive effluent releases is given in Table 4.

Table 4: Summation of All Gaseous Effluents

	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Est. Total Error, %
A. Fission and Activation Products					
Total Released, Ci	<LLD	<LLD	<LLD	6.69E+01	1.00E+01
Average Release Rate, μCi/sec	<LLD	<LLD	<LLD	8.41E+00	
Percent of Applicable Limit, %	N/A	N/A	N/A	N/A	
B. Iodine					
Total Iodine-131 Released, Ci	<LLD	<LLD	7.65E-05	1.90E-04	1.00E+01
Average Release Rate, μCi/sec	<LLD	<LLD	9.62E-06	2.39E-05	
Percent of Applicable Limit, %	N/A	N/A	N/A	N/A	
C. Particulates with Half-Lives > 8 days					
Total Released, Ci	<LLD	4.43E-06	6.01E-06	1.45E-05	1.00E+01
Average Release Rate, μCi/sec	<LLD	5.63E-07	7.56E-07	1.83E-06	
Percent of Applicable Limit, %	N/A	N/A	N/A	N/A	
D. Alpha Activity, Ci	1.61E-06	1.03E-06	6.13E-07	1.73E-06	1.00E+01
E. Tritium					
Total Released, Ci	1.39E+00	3.07E+00	2.66E+00	2.35E+00	1.00E+01
Average Release Rate, μCi/sec	1.79E-01	3.90E-01	3.35E-01	2.96E-01	
Percent of Applicable Limit, %	N/A	N/A	N/A	N/A	
F. Carbon-14, Ci	4.56E+00	4.63E+00	4.69E+00	4.07E+00	1.00E+01

<LLD – Less than the lower limit of detection

N/A – Not Applicable, the ODCM does not have a release rate limit for gaseous effluents.

Carbon-14 activity was calculated based on power production and using the EPRI provided Spreadsheet.

The radionuclide composition of all gaseous radioactive effluents for a continuous-mode, ground-level release is given in Table 5. If a radionuclide was not present at a level "greater than or equal to the LLD" (≥LLD), then the value is expressed as "less than the LLD" (<LLD). In each case, LLDs were met or were below the levels required by the ODCM. Discussion of Carbon-14 doses is listed on page 23, Carbon-14 supplemental information.

Table 5: Radioactive Gaseous Effluent Nuclide Composition

	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Annual
A. Fission and Activation Products						
Tritium	Ci	1.39E+00	3.07E+00	2.66E+00	2.35E+00	9.47E+00
Argon-41	Ci	<LLD	<LLD	<LLD	<LLD	<LLD
Krypton-85m	Ci	<LLD	<LLD	<LLD	6.34E-01	6.34E-01
Krypton-85	Ci	<LLD	<LLD	<LLD	<LLD	<LLD
Krypton-87	Ci	<LLD	<LLD	<LLD	2.86E-01	2.86E-01
Krypton-88	Ci	<LLD	<LLD	<LLD	4.78E-01	4.78E-01
Xenon-133m	Ci	<LLD	<LLD	<LLD	4.04E-01	4.04E-01
Xenon-133	Ci	<LLD	<LLD	<LLD	5.32E+01	5.32E+01
Xenon-135m	Ci	<LLD	<LLD	<LLD	3.24E+00	3.24E+00
Xenon-135	Ci	<LLD	<LLD	<LLD	7.84E+00	7.84E+00
Xenon-138	Ci	<LLD	<LLD	<LLD	7.87E-01	7.87E-01
Total for Period		1.39E+00	3.07E+00	2.66E+00	6.92E+01	7.63E+01
B. Iodine						
Iodine-131	Ci	<LLD	<LLD	7.65E-05	1.90E-04	2.67E-04
Iodine-133	Ci	<LLD	<LLD	<LLD	3.41E-04	3.41E-04
Iodine-135	Ci	<LLD	<LLD	<LLD	<LLD	<LLD
Total for Period		NA	NA	7.65E-05	5.30E-04	6.07E-04
C. Particulate						
Chromium-51	Ci	<LLD	<LLD	<LLD	<LLD	<LLD
Manganese-54	Ci	<LLD	<LLD	<LLD	<LLD	<LLD
Iron-59	Ci	<LLD	<LLD	<LLD	<LLD	<LLD
Cobalt-58	Ci	<LLD	<LLD	<LLD	<LLD	<LLD
Cobalt-60	Ci	<LLD	<LLD	<LLD	<LLD	<LLD
Zinc-65	Ci	<LLD	<LLD	<LLD	<LLD	<LLD
Strontium-89	Ci	<LLD	4.43E-06	6.01E-06	1.38E-05	2.42E-05
Strontium-90	Ci	<LLD	<LLD	<LLD	7.27E-07	7.27E-07
Strontium-92	Ci	<LLD	<LLD	<LLD	<LLD	<LLD
Zirconium-95	Ci	<LLD	<LLD	<LLD	<LLD	<LLD
Molybdenum-99	Ci	<LLD	<LLD	<LLD	<LLD	<LLD
Cesium-134	Ci	<LLD	<LLD	<LLD	<LLD	<LLD
Cesium-137	Ci	<LLD	<LLD	<LLD	<LLD	<LLD
Cerium-141	Ci	<LLD	<LLD	<LLD	<LLD	<LLD
Cerium-144	Ci	<LLD	<LLD	<LLD	<LLD	<LLD
Total for Period		NA	4.43E-06	6.01E-06	1.45E-05	2.49E-05

<LLD – Less than the lower limit of detection

Solid Waste

All solid radioactive waste from PNPP was processed and combined with waste from several other utilities by intermediate vendors (Energy Solutions and Erwin Resin Solutions). This waste was ultimately sent to Clive, Utah disposal facilities for burial. The solid radioactive waste summary in Table 6 includes all PNPP shipments.

Table 6: Solid Waste Shipped Offsite for Burial or Disposal

A. Type of Solid Waste Shipped	Volume (m^3)	Activity (Ci)	Est. Total Error (%)
Resins, Filters and Evaporator Bottoms	1.39E+02	1.20E+03	+/- 25
Dry Active Waste	1.13E+03	6.31E+00	+/- 25
Irradiated components, control rods, etc.	0.00E+00	0.00E+00	+/- 25
Other Waste	0.00E+00	0.00E+00	+/- 25

B. Estimate of Major (1) Nuclide Composition (by type of waste)	Radionuclide	Abundance (%)	Est. Total Error, (%)
Resins, Filters and Evaporator Bottoms	Mn-54	4.23	+/- 25
	Fe-55	27.29	
	Co-60	61.60	
	Zn-65	3.85	
Dry Active Waste	Mn-54	2.37	+/- 25
	Fe-55	32.48	
	Co-60	62.03	
	Zn-65	1.22	
Irradiated Components, Control Rods, etc.	N/A	N/A	N/A
Other Waste	N/A	N/A	N/A

C. Disposition	Number of Shipments	Mode of Transportation	Destination
Solid Waste (2)	63	Highway Carrier	Energy Solutions, Bear Creek, TN
Solid Waste (2)	22	Highway Carrier	Erwin Resin Solutions LLC Erwin TN

N/A -- Not Applicable

(1) -- "Major" is defined as any individual radionuclide identified as >1% of the waste type abundance.

(2) -- This waste was combined with waste from other utilities and disposed of at Clive, Utah.

METEOROLOGICAL DATA

The Meteorological Monitoring System at PNPP consists of a 60-meter tower equipped with two independent systems for measuring wind speed, wind direction, and temperature at both 10-meter and 60-meter heights. The tower also has instrumentation to measure dew point and barometric pressure. Data is logged from the tower through separate data loggers, and transmitted to a common plant computer. This system compiles the data and calculates a variety of atmospheric parameters, communicates with the Meteorological Information Dose Assessment System (MIDAS), and sends data over communication links to the plant Control Room.

A detailed report of the monthly and annual operation of the PNPP Meteorological Monitoring Program is produced under separate cover. For the period of January 1, 2014 through December 31, 2014, the report substantiates the quality and quantity of meteorological data collected in accordance with applicable regulatory guidance.

DOSE ASSESSMENT

The maximum concentration for any radioactive release is controlled by the limits set forth in Title 10 of the Code of Federal Regulations, Part 20 (10CFR20). Sampling, analyzing, processing, and monitoring the effluent stream ensures compliance with these concentration limits. Dose limit compliance is verified through periodic dose assessment calculations. Some dose calculations are conservatively performed for a hypothetical individual who is assumed to reside on the site boundary at the highest potential dose location all year. This person, called the "maximum individual", would incur the maximum potential dose from direct exposure (air plus ground plus water), inhalation, and ingestion of water, milk, vegetation, and fish. Because no one actually meets these criteria, the actual dose received by a real member of the public is significantly less than what is calculated for this hypothetical individual.

Dose calculations for this maximum individual at the site boundary are performed for two cases. First, they are performed using data for a 360 degree radius around the plant site (land and water based meteorological sectors); even though some of these sectors are over Lake Erie, which has no permanent residents. The second calculation is performed considering only those sectors around the plant in which people reside (land-based meteorological sectors).

The calculated hypothetical, maximum individual dose values at the site boundary are provided in Table 7. This table considers all meteorological sectors around PNPP and provides either the whole body or worst-case, organ dose values.

Table 7: Maximum Individual Site Boundary Dose, Considering All Sectors

Type of Dose	Organ	Estimated Dose, (mrem)	Limit	% of Limit
Liquid Effluent	Whole body	9.00E-04	3.0E+00	3.0E-02
	Liver	1.03E-03	1.0E+01	1.0E-02
Noble Gas	Air Dose Gamma – mrad	2.13E-02	1.0E+01	2.1E-01
	Air Dose Beta – mrad	3.10E-02	2.0E+01	1.6E-01
Noble Gas	Whole body	1.70E-02	5.0E+00	3.4E-01
	Skin	3.52E-02	1.5E+01	2.3E-01
Particulate & Iodine	Thyroid	5.47E-03	1.5E+01	3.6E-02

The calculated hypothetical, maximum 50-mile radius population dose values at the site boundary are provided in Table 8. This table considers all meteorological sectors around PNPP and provides either the whole body or worst-case, organ dose values.

Table 8: Population Dose, Considering All Sectors out to 50 miles.

	Organ	Estimated Dose (person-rem)
Liquid Effluent	Whole body	1.5E-01
	Thyroid	1.3E-01
Gaseous Effluent	Whole body	1.9E-03
	Thyroid	2.5E-03

Table 9 provides the calculated hypothetical maximum site boundary dose values considering only the land-based sectors.

Table 9: Maximum Individual Site Boundary Dose, Considering Sectors on Land

Type of Dose	Organ	Estimated Dose, (mrem)	Limit	% of Limit
Liquid Effluent	Whole Body	9.00E-04	3.0E+00	3.0E-02
	Liver	1.03E-03	1.0E+01	1.0E-02
Noble Gas	Air Dose Gamma – mrad	2.43E-03	1.0E+01	2.4E-02
	Air Dose Beta – mrad	3.60E-03	2.0E+01	1.8E-02
Noble Gas	Whole Body	5.18E-04	5.0E+00	1.0E-02
	Skin	1.28E-03	1.5E+01	8.5E-03
Particulate & Iodine	Thyroid	5.61E-04	1.5E+01	3.7E-03
Carbon-14 *	Whole Body	2.46E-01	5.0E+00	4.9E+00

*C-14 Dose calculated at nearest garden.

Other dose calculations are performed for a hypothetical individual who is assumed to be inside the site boundary for some specified amount of time. This person would receive the maximum dose during the time spent inside site boundary. Because no one actually meets the criteria established for these conservative calculations, the actual dose received by a member of the public is significantly less than what is calculated for this hypothetical individual. This dose is assessed relative to the offsite dose, and considers dilution, dispersion, and occupancy factors.

The highest hypothetical dose from liquid effluents to a member of the public inside the site boundary is to a person who is fishing on Lake Erie from the shore on PNPP property. The calculations assume that this person will spend 60 hours per year fishing, with a liquid dilution factor of 10. The ratio of the exposure pathway to the doses calculated for offsite locations yields the dose values shown in Table 10.

Table 10: Maximum Site Dose from Liquid Effluents

	Whole Body Dose, (mrem)	Organ Dose (mrem)
First Quarter	7.1E-05	8.3E-05
Second Quarter	8.7E-06	1.0E-05
Third Quarter	4.0E-05	4.7E-05
Fourth Quarter	5.2E-05	6.2E-05
Annual	1.7E-04	2.0E-04

Although several cases were evaluated to determine the highest hypothetical dose from gaseous effluents to members of the public inside site boundary, the activity inside the site boundary with the highest dose potential is also shoreline fishing. The cases evaluated included traversing a public road within the site boundary, shoreline fishing (assuming fishing 60 hours per year), non-plant related training, car-pooling, and job interviews. The maximum on-site gaseous doses generated are shown in Table 11.

Table 11: Maximum Site Dose from Gaseous Effluents

	Whole Body Dose, (mrem)	Organ Dose (mrem)
First Quarter	6.0E-05	6.0E-05
Second Quarter	1.4E-04	1.4E-04
Third Quarter	1.3E-04	1.8E-04
Fourth Quarter	1.8E-03	4.4E-03
Annual	2.2E-03	4.8E-03

An average whole body dose to individual members of the public at or beyond the site boundary is then determined by combining the dose from gaseous and liquid radiological effluents. The dose from gaseous radiological effluents is based upon the population that lives within 50 miles of PNPP. The dose from liquid radiological effluents is determined for the population that receives drinking water from intakes within 50 miles of PNPP. The results of this calculation are provided in Table 12.

Table 12: Average Individual Whole Body Dose

	Liquid Effluents (mrem)	Gaseous Effluents (mrem)
First Quarter	4.2E-06	4.6E-08
Second Quarter	5.8E-06	1.2E-07
Third Quarter	4.2E-05	1.5E-07
Fourth Quarter	9.2E-06	3.4E-07
Annual	6.1E-05	6.6E-07

CARBON-14 SUPPLEMENTAL INFORMATION

Carbon-14 (C-14), with a half-life of 5730 years, is a naturally occurring isotope of carbon produced by cosmic ray interactions in the atmosphere. Nuclear weapons testing in the 1950s and 1960s significantly increased the amount of C-14 in the atmosphere. C-14 is also produced in commercial nuclear reactors, but the amounts produced are much less than those produced naturally or from weapons testing. C-14 is released primarily from BWRs through the off-gas system in the form of carbon dioxide (CO2). The quantity of gaseous C-14 released to the environment can be estimated using a C-14 source term scaling factor based on power generation.

The U.S. Nuclear Regulatory Commission (NRC) requires an assessment of gaseous C-14 dose impact to a member of the public resulting from routine releases in radiological effluents. Prior to 2011, the industry did not estimate the dose impact of C-14 releases. Since the dose contribution had been considered negligible compared to the dose impact from effluent releases of noble gases, tritium, particulates and radioiodines. At PNPP, improvements over the years in effluent management practices and fuel performance have resulted in a decrease in the concentration and changes in the distribution of gaseous radionuclides released to the environment.

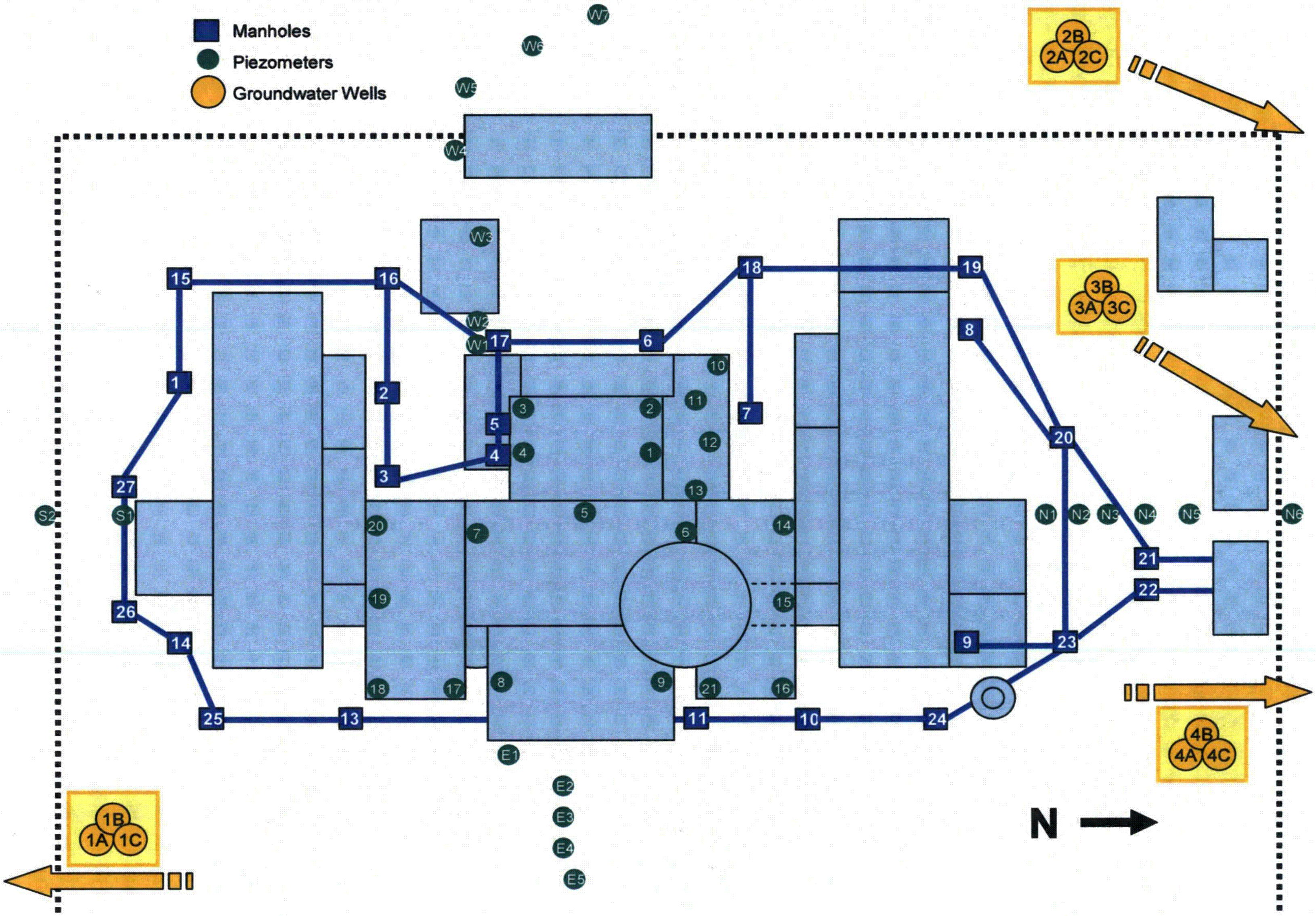
This report contains estimates of the gaseous C-14 radioactivity released in 2014 and the resulting public dose resulting from this release. This calculation is done using a spreadsheet provided by EPRI and is based on power production. This method for estimating C-14 release has been endorsed by the NRC. Because the dose contribution of C-14 from liquid radioactive waste is much less than that contributed by gaseous radioactive waste, evaluation of C-14 in liquid radioactive waste at PNPP is not required. Refer to Table 4 and Table 9 for C-14 estimated release values and doses.

GROUNDWATER MONITORING PROGRAM

Based on the ERM hydrogeology study, 12 wells were recommended for the site. Since most groundwater flow drains north towards Lake Erie, the majority of wells are drilled there. A set of control wells was drilled south of the plant, to assess what a typical groundwater profile would be.

There are 4 sets of triplet wells installed at each location. Each triplet has a shallow well (approximately 25 feet), a mid-depth well of approximately 50 feet, and a deep well of approximately 75 feet. These 3 depths are designated A, B and C, from shallowest to deepest, respectively. Refer to Figure 2 for locations of Groundwater wells 1A through 4C. These wells encompass the groundwater monitoring locations at PNPP.

Figure 2: Underdrain System and On-Site Groundwater Wells



The monitoring wells are sampled twice annually, in spring and fall. The sampling is done by personnel from FirstEnergy's BETA Laboratories. The samples are shipped to Midwest Laboratories in Illinois. Midwest analyzes the sample for gamma isotopic and tritium. Any positive result less than 500 pCi/L is considered as background activity and not due to plant operations. There was no indication of any effluent releases via groundwater.

Table 13: Summary of Onsite Groundwater Samples

Monitoring Well	Spring H-3, pCi/L	Fall H-3, pCi/L
1A	<LLD	<LLD
1B	<LLD	<LLD
1C	<LLD	<LLD
2A	<LLD	<LLD
2B	<LLD	<LLD
2C	<LLD	<LLD
3A	170	<LLD
3B	<LLD	<LLD
3C	<LLD	<LLD
4A	<LLD	<LLD
4B	<LLD	<LLD
4C	<LLD	<LLD

CORRECTIONS TO PREVIOUS ANNUAL ENVIRONMENTAL AND EFFLUENT RELEASE REPORTS

See Appendix D for description of corrections to previous Annual Environmental and Effluent Release Reports.

ABNORMAL RELEASES

See Appendix E for description of an Abnormal Release from the Nuclear Closed Cooling (NCC) system and Feedwater Venturi Leak.

ODCM NON-COMPLIANCES

See Appendix F for description of ODCM Non-Compliances.

OFFSITE DOSE CALCULATION MANUAL CHANGES

See Appendix G for description of changes to the ODCM.

PROCESS CONTROL PROGRAM CHANGES

See Appendix H for description of changes to the Process Control Program

RADIOLOGICAL ENVIRONMENTAL MONITORING

INTRODUCTION

The Radiological Environmental Monitoring Program (REMP) was established at PNPP for several reasons. First, it verifies the adequacy of plant design and operation to control radioactive materials and limit effluent releases. Second, it assesses the radiological impact, if any, that the plant has had on the surrounding environment. Third, it ensures compliance with regulatory guidelines. The REMP is conducted in accordance with the PNPP Operating License, Appendix B, Technical Specifications and the ODCM. The Nuclear Regulatory Commission (NRC) established the REMP requirements.

A variety of samples are collected as part of the PNPP REMP. The selection of sample types, locations, and collection frequency are based on many things. Potential pathways for the transfer of radionuclides through the environment to humans, sample availability, local meteorology, population characteristics, land use and NRC requirements are all factors.

To ensure that the REMP data are meaningful and useful, detailed sampling methods and procedures are followed. This ensures that samples are collected in the same manner and from the same locations each time. All samples are packaged on site, and then shipped to an independent vendor laboratory for analysis. The vendor laboratory analyzes the samples and reports results to the PNPP Chemistry Unit staff, the Lake County General Health District, and the State of Ohio Department of Health. Additionally the Lake County General Health District obtains monthly "split" samples of milk, water and vegetation. This permits an independent verification of PNPP's radiological environmental monitoring program.

SAMPLING LOCATIONS

REMP samples are collected at numerous locations, both on site and up to 20.6 miles away from the plant. Sampling locations are divided into two general categories: indicator and control. Indicator locations are those that monitor for any environmental impact due to plant operations. They are relatively close to the plant. Control locations are those that are unaffected by plant operation; they are a greater distance from the plant and in the least prevalent wind directions. Data obtained from the indicator locations are compared with data from the control locations. This comparison allows naturally occurring background radiation to be taken into account when evaluating any radiological impact PNPP may have had on the environment. Table 14, Figure 3, Figure 4 and Figure 5 identify the PNPP REMP sampling locations.

Many REMP samples are collected in addition to those required by the PNPP ODCM. The ODCM requirements for each sample type are discussed in more detail later in the report.

Table 14: REMP Sampling Locations

Location #	Description	Miles	Direction	Media (1)
1	Chapel Road	3.2	ENE	TLD, AIP
2	Kanda Garden	2.0	ENE	Food Products
3	Meteorological Tower	1.0	SE	TLD, AIP
4	Site Boundary	0.7	S	TLD, AIP
5	Quincy Substation	0.6	SW	TLD, AIP
6	Concord Service Center	11.1	SSW	TLD, AIP
7	Site Boundary	0.6	NE	TLD, AIP
8	Site Boundary	0.7	E	TLD
9	Site Boundary	0.7	ESE	TLD
10	Site Boundary	0.6	SSE	TLD
11	Parmly Rd.	0.6	SSW	TLD
12	Site Boundary	0.6	WSW	TLD
13	Madison-on-the-Lake	4.6	ENE	TLD
14	Hubbard Rd.	4.9	E	TLD
15	Eagle St. Substation	5.1	ESE	TLD
16	Eubank Garden	0.9	S	Food Products
18	Kijauskas Farm (goat)	2.6	E	Food Products, Milk
19	Goodfield Dairy	9.2	S	Milk
20	Rainbow Farms	1.9	E	Food Products
21	Hardy Rd.	5.1	WSW	TLD
23	High St. Substation	7.9	WSW	TLD
24	St. Clair Ave.	15.0	SW	TLD
25	Offshore - PNPP discharge	2.0	NNW	Sediment, Fish
28	CEI Ashtabula Plant Intake	20.6	ENE	Water
29	River Rd.	4.5	SSE	TLD
30	Lane Rd.	4.9	SSW	TLD
31	Wood and River Rd.	4.9	SE	TLD
32	Offshore - Mentor	15.8	WSW	Sediment, Fish
33	River Rd.	4.7	S	TLD
34	PNPP Intake	0.2	NW	Water

Location #	Description	Miles	Direction	Media (1)
35	Site Boundary	0.7	E	TLD, AIP
36	Lake County Water Plant	4.0	WSW	TLD, Water
37	Gerlica Farm	1.6	ENE	Food Products
41	Tuttle Farm (goat)	5.8	SSE	Milk
51	Rettger Milk Farm (cow)	9.7	S	Milk
53	Great Lakes Nuclear Services	0.7	WSW	TLD
54	Hale Rd. School	4.7	SW	TLD
55	Center Rd.	2.5	S	TLD
56	Madison High School	4.0	ESE	TLD
57	Perry High School	1.7	S	TLD
58	Antioch Rd.	0.8	ENE	TLD
59	Lake Shoreline at Green Rd.	4.0	ENE	Water
60	Lake Shoreline at Perry Park	1.0	WSW	Water
64	Northwest Drain Mouth	0.4	WNW	Sediment
66	Lake Shore, Metropolitan Park	1.4	NE	Sediment
70	H&H Farm Stand	17.1	SSW	Food Products

(1) AIP = Air, Iodine and Particulate
TLD = Thermoluminescent Dosimeter

Figure 3: REMP Sampling Locations Within Two Miles of Plant Site

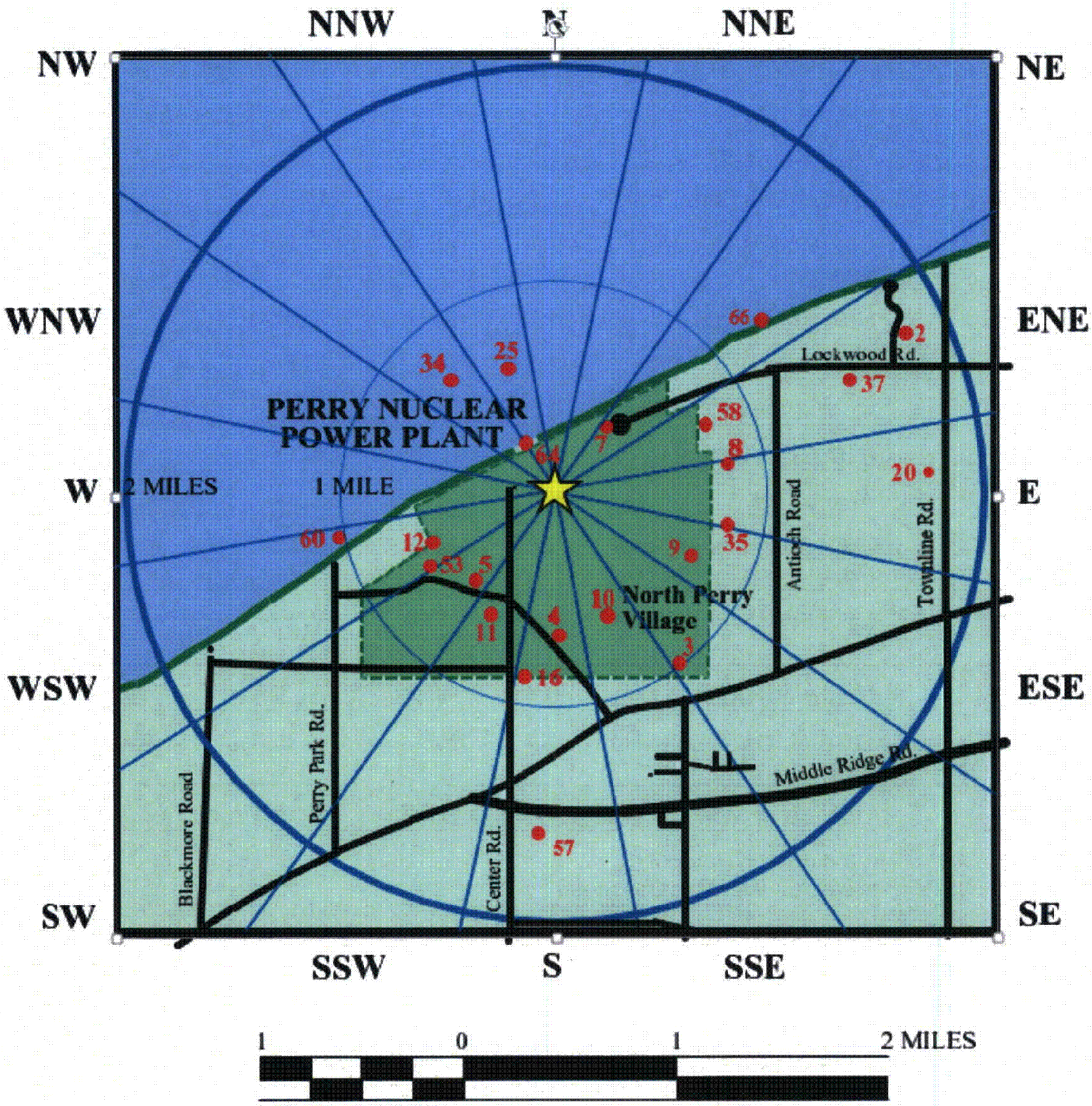


Figure 4: REMP Sampling Locations Between Two and Eight Miles of the Plant Site

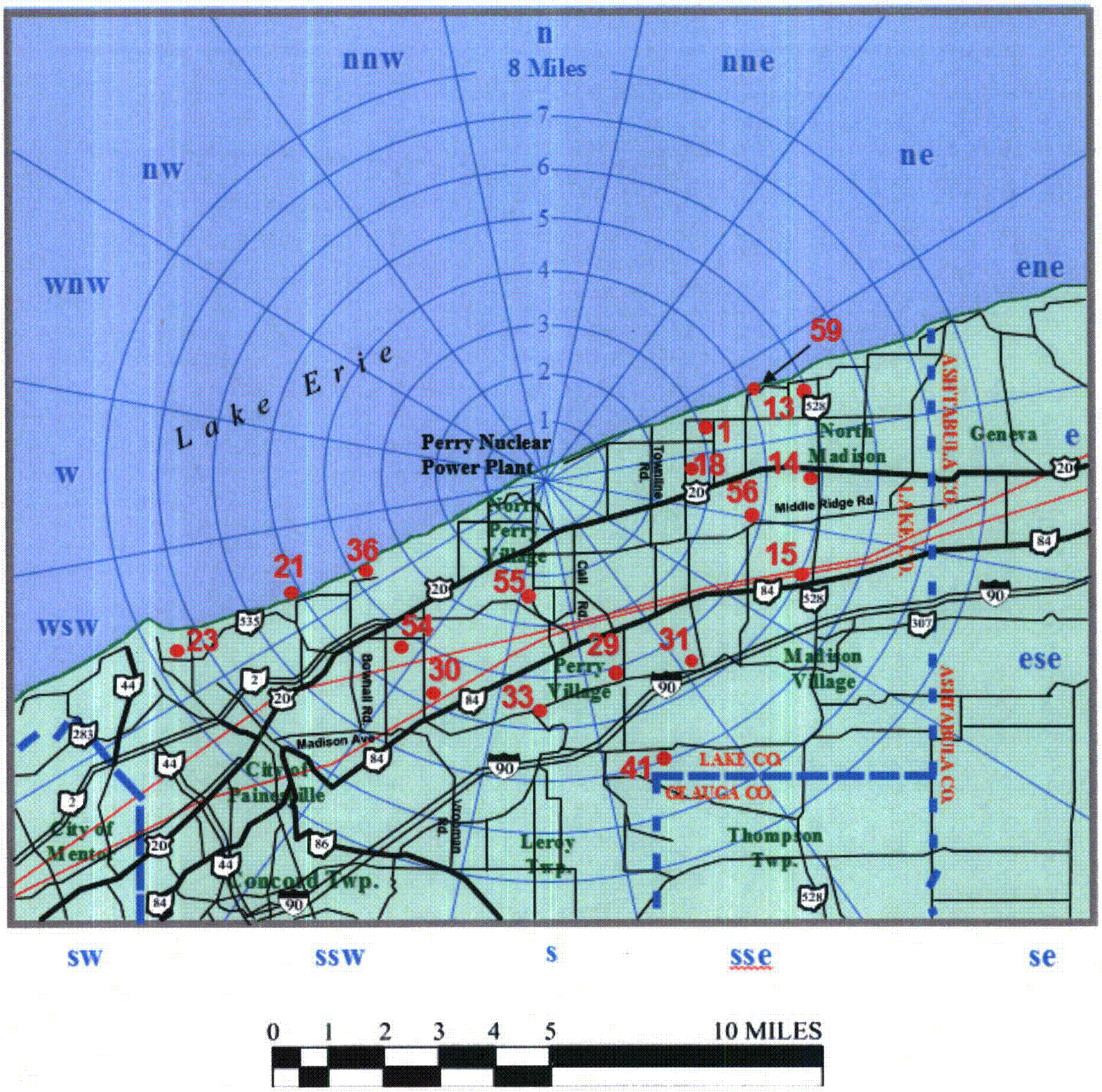
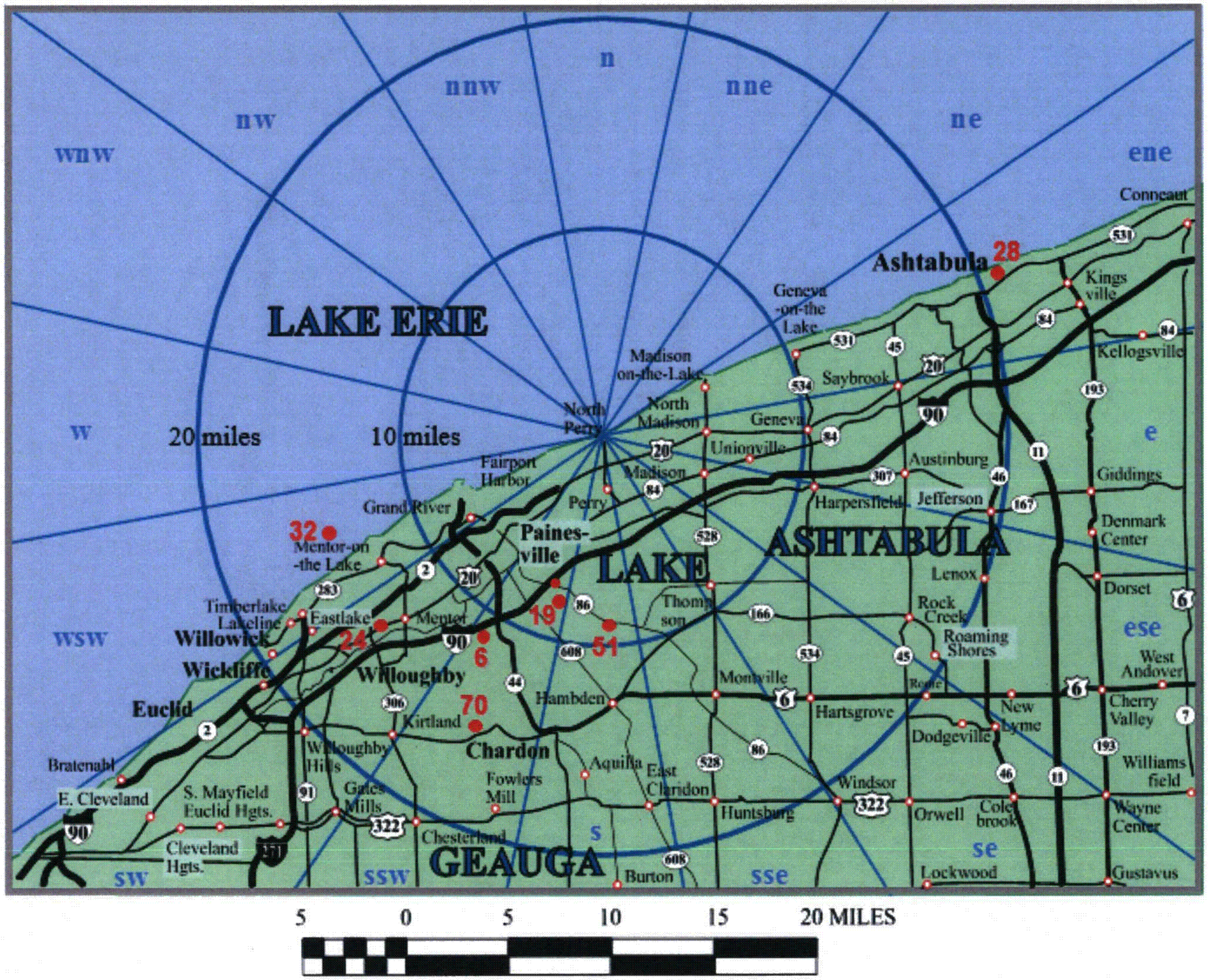


Figure 5: REMP Sampling Locations Greater Than Eight Miles from the Plant Site



SAMPLE ANALYSIS

When environmental samples are analyzed for radioactivity, several types of measurements are performed to provide information about the types of radiation and radionuclides present. The major analyses that are performed are discussed below.

Gross beta activity measures the total amount of beta-emitting radioactivity present in a sample, and acts as a tool to identify samples that may require further analysis. Beta radiation may be released by many different radionuclides. Since beta decay results in a continuous energy spectrum rather than the discrete energy levels, or "peaks", associated with gamma radiation, identification of specific beta-emitting nuclides is more difficult. Therefore, gross beta activity only indicates whether the sample contains normal or abnormal amounts of beta-emitting radioactivity; it does not specifically identify the radionuclides present.

Gamma spectral analysis provides more specific information than does the analysis for gross beta activity. Gamma spectral analysis identifies each radionuclide, and the amount of radioactivity, present in the sample emitting gamma radiation. Each radionuclide has a very specific "fingerprint" that allows for accurate identification and quantification.

Iodine activity analysis measures the amount of radioactive iodine present in a sample. Some media (for example, air sample charcoal cartridges) are analyzed directly by gamma spectral analysis. With other media (for example, milk), the radioiodines are extracted by chemical separation before being analyzed by gamma spectral analysis.

Tritium activity analysis measures the amount of the radionuclide tritium (H-3) present in a sample. Tritium is an isotope of hydrogen that emits low-energy beta particles. Tritium occurs naturally and is also man-made.

Gamma doses received by Thermoluminescent Dosimeters (TLD) while in the field are determined by a special laboratory procedure. Thermoluminescence is a process by which ionizing radiation interacts with the sensitive phosphor material in the TLD. Energy is trapped in the TLD material and can be stored for months or years. This capability provides a method to measure the dose received over long periods of time. The amount of energy that was stored in the TLD as a result of interaction with radiation is released by a controlled heating process and measured in a calibrated reading system. As the TLD is heated, the phosphor releases the stored energy as light. The amount of light is directly proportional to the amount of radiation to which the TLD was exposed. Table 15 provides a list of the analyses performed on environmental samples collected for the PNPP REMP.

Sample results are often reported as less than the lower limit of detection (< LLD), which is defined as the smallest amount of radioactive material that will show a positive result for which there can be confidence that radioactivity is present. This statistical parameter is used as a measure of the sensitivity of a sample analysis. When a measurement is reported as < LLD, it means that no radioactivity was detected. The required detection limits for samples is determined by the sample media and the radionuclide that is being analyzed for and is listed in the ODCM. The NRC has established LLD values for REMP sample analyses. The vendor laboratory for REMP sample analyses complied with those values.

Table 15: REMP Sample Analyses

Type	Sample	Frequency	Analysis
Atmospheric Monitoring	Airborne Particulates	Weekly & Quarterly	Gross Beta Activity & Gamma Spectral Analysis
	Airborne Radioiodine	Weekly	Iodine-131
Terrestrial Monitoring	Milk	Bi-Monthly	Gamma Spectral Analysis & Iodine-131
	Broadleaf Vegetation	Monthly during growing season	Gamma Spectral Analysis
Aquatic Monitoring	Water	Monthly	Gross Beta Activity & Gamma Spectral Analysis
		Quarterly	Tritium Activity
	Fish	Annually	Gamma Spectral Analysis
	Sediment	Biannually	Gamma Spectral Analysis
Direct Radiation Monitoring	TLD	Quarterly & Annually	Gamma Dose

SAMPLING PROGRAM

The contribution of radionuclides to the environment resulting from PNPP operation is assessed by comparing results from the environmental monitoring program with pre-operational data (i.e., data from before 1986), operational data from previous years, and control location data. The results for each sample type are discussed below and compared to historical data to determine if there are any observable trends. All results are expressed as concentrations. Refer to Appendix B, 2014 REMP Data Summary Reports for a detailed listing of these results. The NRC requires special reporting whenever sample analysis results exceed set limits. No values exceeded those limits.

PROGRAM CHANGES

Due to beach erosion sample location #65 for sediment was no longer accessible. In its place a new location, #66, was selected 1.4 miles NE of the plant. A new direct radiation (TLD) monitoring location, #57, was established at the Perry High School.

MISSED SAMPLES

On occasion, samples cannot be collected. This can be due to a variety of events, including equipment malfunction, animal husbandry practices, or lost shipments. Events may also occur which prevent a sample from being collected in the normal way, or prevent a complete sample from being collected. The drying period for goats is an annual occurrence, since unlike cows, goats do not normally produce milk year-round. Food products are weather dependent and are susceptible to excessive spring rains or summer drought that can significantly impact the garden harvest. Shoreline lake water samples are collected by grab

sample utilizing a container and scoop. During the winter months the shoreline can become inaccessible due to ice and snow buildup, preventing the safe collection of these samples. Shoreline sediment samples are collected with spoon and container. On occasion, the accessibility of these locations and sample collection may be impacted due to high lake levels, shifting lake-bottom sediment, bluff erosion and shoreline collapse. There was no impact to the program requirements as a result of any missed samples. Table 16 provides information on missed samples.

Table 16: Missed REMP Samples in 2014

Media	Location	Date	Reason
Lake Water	59, 60	Jan – Mar	Sample unavailable due to frozen shoreline
Milk	18	Jan – Mar	Drying period for goats/sample availability
	41	Jan. – Apr, Oct. – Dec	Drying period for goats/sample availability

ATMOSPHERIC MONITORING

Air

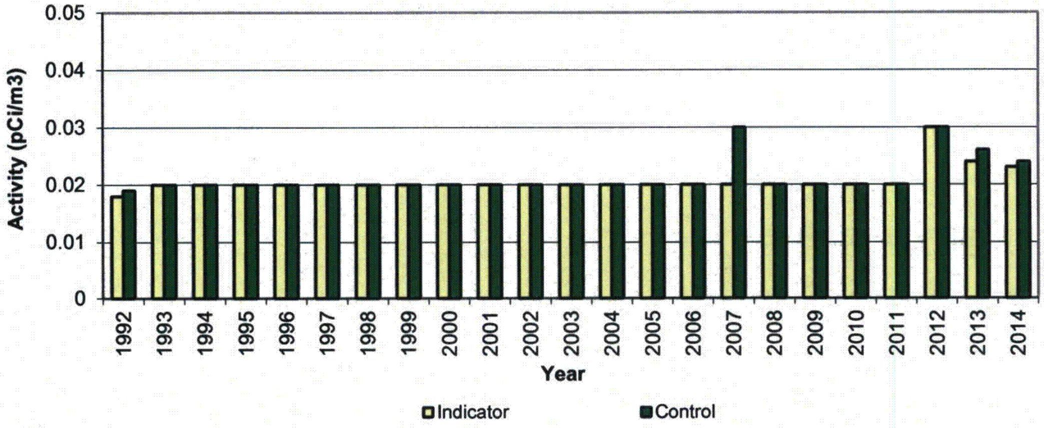
Air sampling is conducted to detect any increase in the concentration of airborne radionuclides. The PNPP REMP maintains an additional two (2) air sampling locations above the five (5) locations (four indicators and one control) required by the ODCM. Six (6) of these locations are within four miles of the plant site; the seventh is used as a control location and is eleven miles from PNPP. Air sampling pumps draw continuous samples at a rate of approximately two cubic feet per minute. The air is drawn through glass fiber filters (to collect particulate material) and a charcoal cartridge (to adsorb iodine). The samples are collected on a weekly basis, 52 weeks a year, from each of the seven (7) air sampling stations.

Air samples are analyzed weekly for gross beta activity and radioiodine activity. The air samples are also analyzed by gamma spectral analysis quarterly. A total of 364 air particulate and 364 air radioiodine samples were collected and analyzed.

Gross beta activity was detected in all the air samples and ranged up to 0.048 pCi/m3. The average gross beta activity for the indicator locations was 0.023 pCi/m3 and the controls was 0.024 pCi/m3. Historically, the concentration of gross beta in air has been essentially identical at indicator and control locations. Figure 6 reflects the average gross beta activity for 2014 and the previous years. All radioiodine samples were less than the lower limit of detection for Iodine-131.

Except for naturally occurring Beryllium-7, no radionuclides were identified in the quarterly gamma spectral analysis above the LLD values.

Figure 6: Annual Average Gross Beta Activity, in Air



TERRESTRIAL MONITORING

Collecting and analyzing samples of milk and food products provides data to assess the build-up of radionuclides that may be ingested by humans. The historical data from soil and vegetation samples provides information on the atmospheric radionuclide deposition.

Milk

Samples of milk are collected once each month from November through March, and twice each month from April through October. Sampling is increased during the summer because animals usually feed outside on pasture and not on stored feed. The PNPP REMP includes four (4) milk locations located 2.5, 5.8, 8.7 and 9.6 miles away from the plant.

Since the milk sampling locations do not meet the requirements of the ODCM (only one milk-producing animal is located within the required distance vs. two required), food product sampling (discussed below) is done. Milk is collected from the available location to augment food product sampling. If new locations that meet the ODCM requirements are identified in the future, they will be added to the program.

Milk samples are analyzed by gamma spectral analysis for radioiodines and other radionuclides. A total of sixty-four (64) milk samples were collected. With the exception of naturally occurring Potassium-40, no other radionuclides were detected.

Broadleaf Vegetation

Because there are not a sufficient number of milk sampling locations, the PNPP REMP samples broadleaf vegetation. These samples are collected monthly during the growing season from six (6) gardens in the vicinity of PNPP and one control location 16.2 miles SSW from PNPP.

Seventy-three (73) samples were collected and analyzed by gamma spectral analysis.

Four (4) vegetation types were grown and collected: mustard, collard greens, turnip greens and Swiss chard. Beryllium-7 and Potassium-40, naturally-occurring radionuclides, were found in the samples, which is expected. No other radionuclides were detected above the required LLDs.

AQUATIC MONITORING

Radionuclides may be present in Lake Erie from many sources other than the PNPP. These sources include atmospheric deposition, run-off/soil erosion, and releases of radioactivity in liquid effluents from hospitals, universities or other industrial facilities. These sources provide two forms of potential radiation exposure, external and internal. External exposure can occur from contact with water or shoreline sediments, while internal exposure can occur from either direct ingestion of radionuclides or the transfer of radionuclides through the aquatic food chain. Direct ingestion can occur from drinking the water, while the transfer via the aquatic food chain occurs from the eventual consumption of aquatic organisms, such as fish. To monitor these pathways, PNPP samples water, shoreline sediments, and fish.

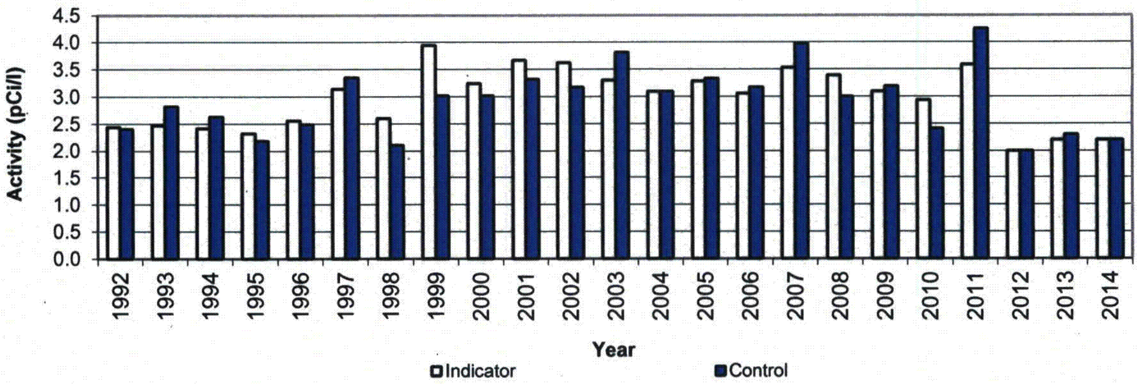
Water

Water is sampled from five (5) locations along Lake Erie in the vicinity of the PNPP as required by the PNPP ODCM. Samples from three (3) locations are collected using composite sample pumps. The pumps are designed to collect water at regular intervals and composite it in a sample container. Samples from the two (2) other locations are manually collected weekly and combined. The containers are emptied monthly and the samples shipped to the vendor laboratory for analysis.

Fifty-four (54) water samples were collected and analyzed for gross beta activity and gamma spectral analysis. From these monthly samples, eighteen (18) quarterly composite samples were analyzed for tritium activity.

Gross beta activity was detected in fifty-one (51) of the fifty-four (54) samples collected. The indicator average gross beta activity was 2.2 pCi/L and the control average gross beta activity was 2.2 pCi/L. Refer to Figure 7 for the annual average gross beta activity for both indicator and control locations. No tritium or gamma activity was detected.

Figure 7: Annual Average Gross Beta Activity, in Water



There were no tritium or radionuclides detected by gamma spectral analysis.

Sediment

Sampling lake-bottom sediments can provide an indication of the accumulation of particulate radionuclides which may lead to internal exposure to humans through the ingestion of fish, the re-suspension into drinking water, or as an external radiation source to fishermen and swimmers from shoreline exposure. Sediment was sampled from five (5) locations.

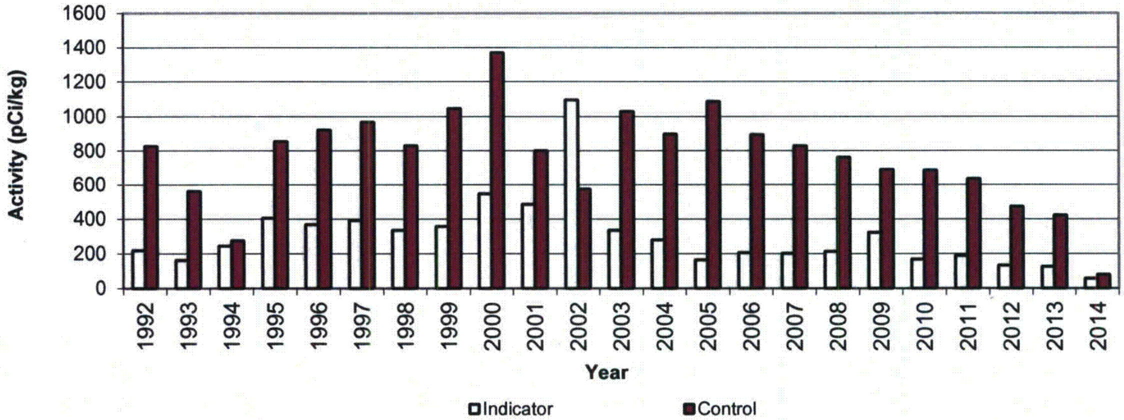
Sediment samples from offshore are collected using a hand dredge. Shoreline samples are collected using a scoop.

Seven (7) sediment samples were collected in 2014 and analyzed by gamma spectroscopy. The predominant radionuclide detected by gamma spectral analysis was naturally occurring Potassium-40.

Cesium-137 activity was detected in two (2) of the seven (7) samples collected. The indicator Cesium-137 activity was 56.5 pCi/kg and the control activity was 80.4 pCi/kg. The average Cesium-137 radioactivity for all locations was 68.5 pCi/kg and is lower than the highest identified value of 864 pCi/kg established in 1981. Year-to-year variations in lake bottom sediment sample activity is expected and beyond the control of PNPP. For example, Cesium-137 activity variations (refer to Figure 8) in the control locations from year-to-year may be contributed to:

- The movement of sediment on the lake bottom due to wave action and currents.
- Difficulty in duplicating exact location and composition of bottom sediment sample from year to year even with assistance of GPS.

Figure 8: Annual Average Cesium-137 Concentration in Sediment



Fish

Fish are analyzed primarily to quantify the dietary radionuclide intake by humans, and secondarily to serve as indicators of radioactivity in the aquatic ecosystem. Fish are collected from two (2) locations, annually during the fishing season as required by the ODCM. An important sport or commercial species is targeted, and only the fillets are sent to the laboratory for analysis. Fish sampling was performed for PNPP by a local licensed sport fisherman.

Twenty-two (22) fish samples were collected and analyzed – eleven (11) indicator and eleven (11) control. The species were smallmouth bass, white perch, walleye, redhorse sucker, gizzard shad, channel catfish and steelhead. Naturally occurring Potassium-40 was found in all samples. No other radionuclides were detected.

DIRECT RADIATION MONITORING

Thermoluminescent Dosimeter (TLD)

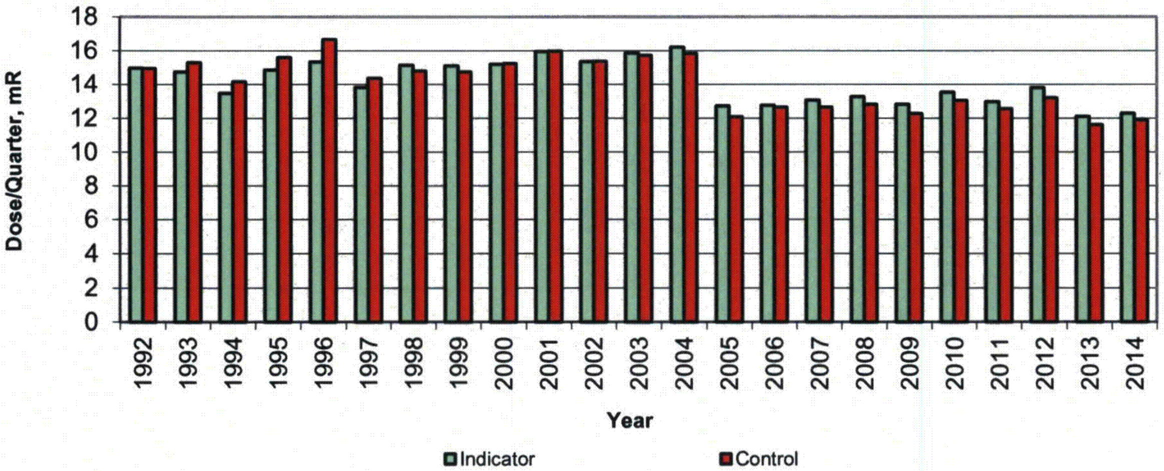
Environmental radiation is measured directly at twenty seven (27) locations around the PNPP site and two (2) control locations. The locations are positioned in two rings around the plant as well as at the site boundary. The inner ring is within a one-mile radius of the plant site; the outer ring is four miles to five miles from the plant. The control locations are over ten miles from the plant in the two least prevalent wind directions. Each location has three TLDs, two of which are changed quarterly and one is changed annually.

A total of 261 TLDs were collected and analyzed. This includes 232 collected on a quarterly basis and twenty nine (29) collected annually. Annual TLDs are not required per the ODCM and are used for supplemental data only.

The annual average dose for all indicator locations was 64.0 mrem, and 64.7 mrem for the control locations.

The average quarterly dose for the indicator locations was 12.3 mrem, and 11.9 mrem for the control locations. Refer to Figure 9.

Figure 9: Average Quarterly TLD Dose



CONCLUSION

Operation of the Perry Nuclear Power Plant is having no detectable radiological effect on the surrounding environment.

INTER-LABORATORY CROSS-CHECK COMPARISON PROGRAM

Introduction

The purpose of the Inter-laboratory Cross-Check Comparison Program is to provide an independent check on the vendor laboratory's analytical procedures. Samples with a known concentration of specific radionuclides are provided to the vendor laboratory. The vendor laboratory measures and reports the concentration of specified radionuclides. The known values are then compared to the vendor results. Results consistently outside established acceptance criteria indicate a need to check instruments or procedures. Regulatory Guide 4.15 specifically required that contractor laboratories that performed environmental measurement participate in the EPA's Environmental Radioactivity Laboratory Inter-Comparison Studies Program, or an equivalent program.

The EPA's program is no longer funded or offered. The reason that the EPA program was referenced in the regulatory guide is that the EPA standards were traceable to National Bureau of Standards (now known as National Institute Standard Technology). In response to this problem, Teledyne (PNPP vendor lab) incorporated a program offered by Environmental Resource Associates (ERA Company), which covered the same analyses in the same matrix at the same frequency as the EPA program. The ERA Company has received NIST accreditation for its program, as an equivalent program. In addition to comparison cross checks performed with the ERA Company, the vendor laboratory routinely monitors the quality of their analyses by:

Analyzing "spiked" samples (samples with a specific quantity of radioactive material present in them) and

Participating in the Department of Energy's Mixed Analyte Performance Program (MAPEP).

See Appendix A, for the vendor Inter-Laboratory Cross-Check Comparison Program Results.

LAND USE CENSUS

Introduction

Each year a Land Use Census is conducted to identify the locations of the nearest milk animal, garden (of greater than 500 square feet), and residence in each of the meteorological sectors that is over land. Information gathered during the Land Use Census is used for off-site dose assessment and to update sampling locations for the REMP. The census is conducted by traveling all roads within a five-mile radius of the plant site, and recording and mapping the location of the nearest resident, milk animal and vegetable garden. The Land Use Census was conducted on September 26th 2014. The census identified the garden, residence and milk animal locations tabulated in Tables 17, 18 and 19 and depicted in Figure 10. Note that the W, WNW, NW, NNW, N, and NNE sectors extend over Lake Erie, and are not included in the survey.

Discussions and Results

In general, the predominant land use within the census area continues to be rural/ agricultural. In recent years however, it has been noted that tracts of land once used for farming are now being developed as mini-industrial parks and residential housing tracts. This is reflected in the loss of available milking animals within a five mile radius of PNPP to support the REMP.

Table 17 identifies the nearest residences, by sector, to the PNPP. There were no changes from last year's Land Use Census.

Table 17: Nearest Residence, By Sector

Sector	Location Address	Miles from PNPP	Map Locator Number
NE	4384 Lockwood	0.7	1
ENE	4602 Lockwood	1.1	2
E	2626 Antioch	1.0	3
ESE	2836 Antioch	1.1	4
SE	4495 North Ridge	1.3	5
SSE	3119 Parmly	0.9	6
S	3121 Center	0.9	7
SSW	3850 Clark	0.9	8
SW	2997 Perry Park	1.2	9
WSW	3460 Parmly	1.0	10

Table 18 identifies the nearest milking animal by sector, to the PNPP. There were no changes from last year's LUC.

Table 18: Nearest Milk Animal, By Sector

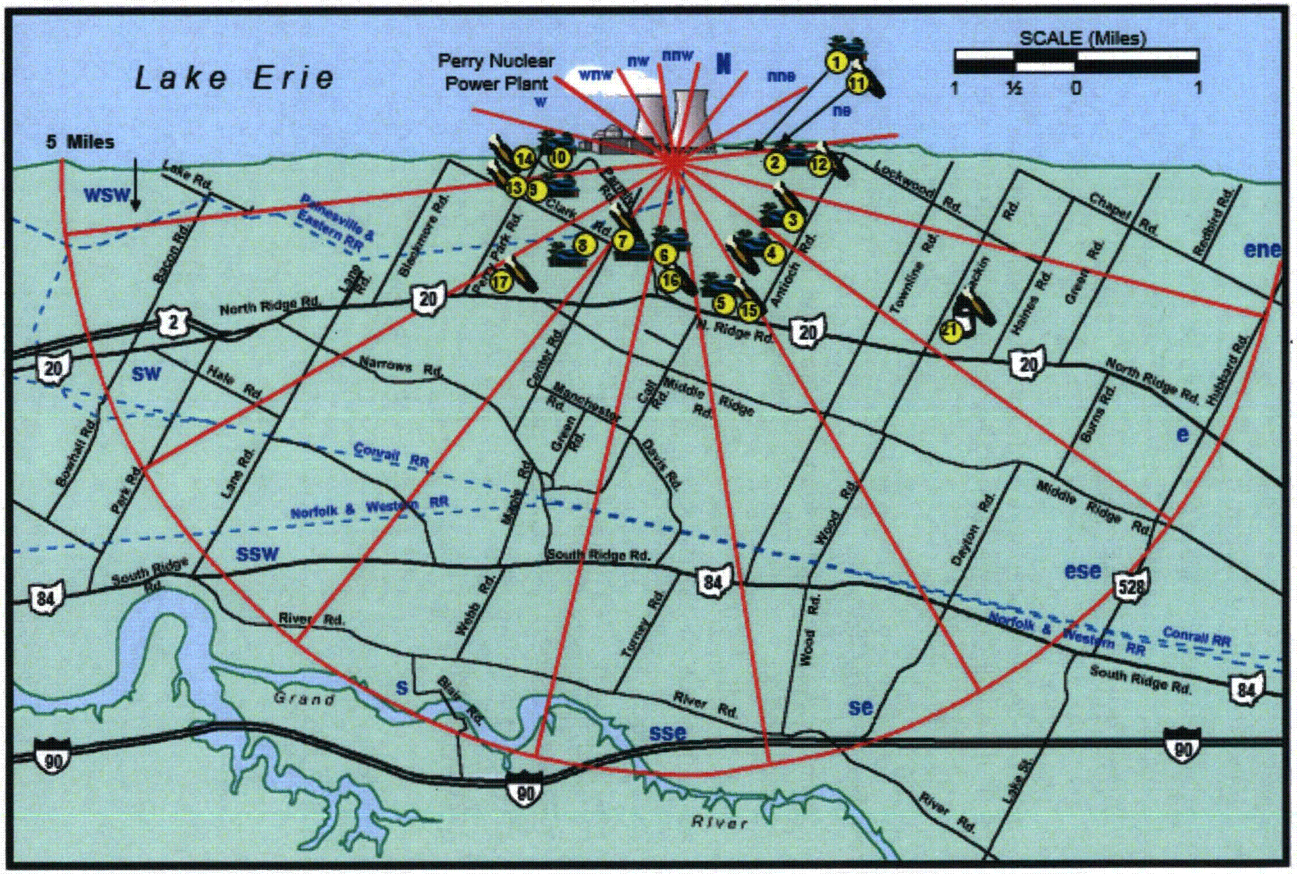
Sector	Location Address	Miles from PNPP	Map Locator Number
E	2591 McMackin Rd.	2.6	21

Table 19 lists the nearest gardens occupying at least 500 square feet identified during the Land Use Census. The only change was correcting the address listed for the garden in the SW sector.

Table 19: Nearest Garden, By Sector

Sector	Location Address	Miles from PNPP	Map Locator Number
NE	2340 Hemlock	0.9	11
ENE	4630 Lockwood	1.1	12
E	2626 Antioch	1.0	3
ESE	2836 Antioch	1.1	4
SE	4671 North Ridge	1.3	15
SSE	4225 Red Mill Valley	1.1	16
S	3121 Center Rd.	0.9	7
SSW	3431 Perry Park	1.9	17
SW	3021 Perry Park	1.3	13
WSW	3460 Parmly	1.0	14

Figure 10: Land Use Census Map



Garden Residence Milking Animal

CLAM/MUSSEL MONITORING

INTRODUCTION

Sampling for macro-invertebrates (clams and mussels) has been conducted in Lake Erie in the vicinity of PNPP, since 1971. The clam/mussel program currently focuses on two species: Corbicula fluminea (Asiatic clam) and Dreissena polymorpha (zebra mussel).

CORBICULA PROGRAM

Monitoring specifically for Corbicula was initiated in response to a NRC bulletin and concerns of the Atomic Safety and Licensing Board. The monitoring was done as part of the Environmental Protection Plan (Operating License, Appendix B). The program consists of visually inspecting the raw water systems, when they are opened for maintenance. The purpose of this program is to detect Corbicula, should it appear at PNPP.

Monitoring

Samples were collected from the Service Water (SW) and Emergency Service Water (ESW) pump houses at PNPP and examined for shells and fragments. Samples were either collected by hand scoop or scraper. In addition to sample collections, plant components that use raw water are inspected when opened for maintenance or repair. Sample collection/inspection dates are listed in Table 20.

Table 20: 2014 Corbicula Monitoring

Date	Sample Location
1/30/2014	1P54D0906 (Fire Protection) - Strainer for foam system water supply inlet
1/30/2014	1P54D0920 (Fire Protection)
4/23/2014	0P43B0001C (Nuclear Closed Cooling) – Heat Exchanger
5/02/2014	(Fire Protection) – Hydrant No. 17
5/08/2014	1N34B0001B (Lube Oil)
6/06/2014	(Fire Protection) – Fire Hydrant and Hose House
6/18/2014	1P54D1240 (Fire Protection) – Aux. Bldg. Plenum Deluge Header Strainer
6/18/2014	1P54D1240 (Fire Protection) – Aux. Bldg. Plenum Deluge Header Strainer
6/26/2014	OP54D0519 (Fire Protection)
6/27/2014	1N34B0001A (Lube oil)
8/23/2014	N43 Turbine Building Lube Oil 'Cooler "A"
10/20/2014	(Fire Protection) - Hydrant No. 37
10/30/2014	(Fire Protection) – OP54F0756 Hose Reel

Conclusions

The sample collected in June, 1987, was the only indication of Corbicula in the vicinity of PNPP. Although the presence of Corbicula was detected at the Eastlake Power Plant, it has not been demonstrated that their presence has created any operational problems there, or at PNPP. As in the past, the 2014 monitoring program did not identify Corbicula in any sample collected.

DREISSENA PROGRAM

Dreissena or zebra mussels were first discovered at PNPP in September, 1988. The initial collection of nineteen (19) mussels was made as part of the Corbicula monitoring program. The Dreissena monitoring program began in 1989, with monitoring and testing. The current control program was designed and implemented in 1990.

Monitoring

In addition to visually inspecting the plant's raw water systems when they are opened for maintenance or repair, monitoring methods include the use of commercial divers and side-stream monitors. Commercial divers monitor mussel infestation during the inspection of forebays, basins, and the intake and discharge structures. Divers have also been used to take underwater videotapes of the water basins and intake tunnel. Side-stream monitors are flow-through containers that receive water diverted from plant systems and are set up at two in-plant locations during the mussel season.

Treatment

Chemicals used for mussel control included sodium hypochlorite and a commercial molluscicide. The chlorine is intermittently injected into the plant service water, emergency service water, and circulating water systems by metering sodium hypochlorite into each system's influent. Sodium bisulfite is added at the plant discharge structure for dechlorination prior to return into Lake Erie.

The Ohio Environmental Protection Agency (OEPA) has approved the use of a commercial molluscicide. The chemical selected for use at the PNPP was alkyl-dimethyl-benzyl-ammonium chloride. Treatment was applied once in 2014. The active ingredients were detoxified by adsorption using bentonite clay, prior to discharge into Lake Erie.

Results

The effectiveness of the intermittent biocide treatment has been determined in several ways. First, visual inspections of raw water system components are conducted when systems are open during maintenance or repair. In addition, settlement monitors were inspected for new settlement. No live settlement has been found in any plant component to date.

The effectiveness of the application of the commercial molluscicide was measured by observing mortality of mussels placed in a flow-through container placed in plant service water and subjected to the chemical treatment. The observed mortality rate utilizing the flow-through container was 100%

To date, PNPP has had no significant problems related to zebra mussels.

Conclusions

PNPP has taken the approach that the best method for avoiding problems with zebra mussels is preventive treatment of plant water systems. The current program of monitoring and chemical treatment will be continued to minimize the possibility that PNPP will experience future problems due to zebra mussels.

HERBICIDE APPLICATIONS

Herbicides are used sparingly on the PNPP site. A request must be made to and approved by the PNPP Chemistry Unit prior to spraying to ensure that only approved chemicals are used, and only in approved areas.

In 2014, four (4) general and four (4) specific herbicide requests were initiated for chemical applications. Each application was in compliance with the Ohio Environmental Protection Agency's rules and regulations. There were no adverse environmental impacts observed during weekly site environmental inspections as a result of these applications. The herbicides used were Round-Up Promax, Brushmaster and a Broadleaf Weed Spray. For each application, the type of weed to be treated dictated the herbicide and concentration to be used. Table 21 provides detailed documentation for each application. The quantity represents the amount of herbicide applied, prior to any dilution.

Table 21: 2014 Herbicide Applications

Chemical	Amount (gal)
Round-Up Promax	15.6
Brushmaster	51.5
Broadleaf Weed Spray	1.2

SPECIAL REPORTS

NPDES Permit

The Ohio Environmental Protection Agency (OEPA) issues the National Pollutant Discharge Elimination System (NPDES) permit. It establishes monitoring requirements and limits for discharges from the PNPP. It also specifies the locations from which the plant is allowed to discharge.

There were no environmental violations in 2014.

ENVIRONMENTAL PROTECTION PLAN

The Environmental Protection Plan (EPP), which is Appendix B of the PNPP Operating License, requires a non-radiological environmental monitoring and reporting program be established at the PNPP.

An Environmental Evaluation was performed, along with a Design Interface Evaluation on the Minor Stream Modification. The Engineering Change Package (ECP) 13-0802 provides for modifications required to restore Minor Stream design basis capabilities.

UN-REVIEWED ENVIRONMENTAL QUESTIONS

All proposed changes to the PNPP design or operation, as well as tests or experiments, must be evaluated for potential environmental impacts in accordance with the EPP and administrative quality assurance procedures.

Appendix A
Inter-Laboratory Cross Check Comparison Program Results

ATI Environmental, Inc.
Midwest Laboratory
700 Landwehr Road • Northbrook, IL 60062-2310
phone (847) 564-0700 • fax (847) 564-4517

APPENDIX A

INTERLABORATORY COMPARISON PROGRAM RESULTS

NOTE: Environmental Inc., Midwest Laboratory participates in intercomparison studies administered by Environmental Resources Associates, and serves as a replacement for studies conducted previously by the U.S. EPA Environmental Monitoring Systems Laboratory, Las Vegas, Nevada. Results are reported in Appendix A. TLD Intercomparison results, in-house spikes, blanks, duplicates and mixed analyte performance evaluation program results are also reported. Appendix A is updated four times a year; the complete Appendix is included in March, June, September and December monthly progress reports only.

January, 2014 through December, 2014

Appendix A

Interlaboratory Comparison Program Results

Environmental, Inc., Midwest Laboratory has participated in interlaboratory comparison (crosscheck) programs since the formulation of it's quality control program in December 1971. These programs are operated by agencies which supply environmental type samples containing concentrations of radionuclides known to the issuing agency but not to participant laboratories. The purpose of such a program is to provide an independent check on a laboratory's analytical procedures and to alert it of any possible problems.

Participant laboratories measure the concentration of specified radionuclides and report them to the issuing agency. Several months later, the agency reports the known values to the participant laboratories and specifies control limits. Results consistently higher or lower than the known values or outside the control limits indicate a need to check the instruments or procedures used.

Results in Table A-1 were obtained through participation in the environmental sample crosscheck program administered by Environmental Resources Associates, serving as a replacement for studies conducted previously by the U.S. EPA Environmental Monitoring Systems Laboratory, Las Vegas, Nevada.

Table A-2 lists results for thermoluminescent dosimeters (TLDs), via International Intercomparison of Environmental Dosimeters, when available, and internal laboratory testing.

Table A-3 lists results of the analyses on in-house "spiked" samples for the past twelve months. All samples are prepared using NIST traceable sources. Data for previous years available upon request.

Table A-4 lists results of the analyses on in-house "blank" samples for the past twelve months. Data for previous years available upon request.

Table A-5 lists REMP specific analytical results from the in-house "duplicate" program for the past twelve months. Acceptance is based on the difference of the results being less than the sum of the errors. Complete analytical data for duplicate analyses is available upon request.

The results in Table A-6 were obtained through participation in the Mixed Analyte Performance Evaluation Program.

Results in Table A-7 were obtained through participation in the environmental sample crosscheck program administered by Environmental Resources Associates, serving as a replacement for studies conducted previously by the Environmental Measurement Laboratory Quality Assessment Program (EML).

Attachment A lists the laboratory precision at the 1 sigma level for various analyses. The acceptance criteria in Table A-3 is set at ± 2 sigma.

Out-of-limit results are explained directly below the result.

Attachment A

ACCEPTANCE CRITERIA FOR "SPIKED" SAMPLES

LABORATORY PRECISION: ONE STANDARD DEVIATION VALUES FOR VARIOUS ANALYSES[a]

Analysis	Level	One standard deviation for single determination
Gamma Emitters	5 to 100 pCi/liter or kg > 100 pCi/liter or kg	5.0 pCi/liter 5% of known value
Strontium-89[b]	5 to 50 pCi/liter or kg > 50 pCi/liter or kg	5.0 pCi/liter 10% of known value
Strontium-90[b]	2 to 30 pCi/liter or kg > 30 pCi/liter or kg	5.0 pCi/liter 10% of known value
Potassium-40	≥ 0.1 g/liter or kg	5% of known value
Gross alpha	≤ 20 pCi/liter > 20 pCi/liter	5.0 pCi/liter 25% of known value
Gross beta	≤ 100 pCi/liter > 100 pCi/liter	5.0 pCi/liter 5% of known value
Tritium	≤ 4,000 pCi/liter > 4,000 pCi/liter	$\pm 1\sigma = 169.85 \times (\text{known})^{0.0933}$ 10% of known value
Radium-226,-228	≥ 0.1 pCi/liter	15% of known value
Plutonium	≥ 0.1 pCi/liter, gram, or sample	10% of known value
Iodine-131, Iodine-129[b]	≤ 55 pCi/liter > 55 pCi/liter	6 pCi/liter 10% of known value
Uranium-238, Nickel-63[b] Technetium-99[b]	≤ 35 pCi/liter > 35 pCi/liter	6 pCi/liter 15% of known value
Iron-55[b]	50 to 100 pCi/liter > 100 pCi/liter	10 pCi/liter 10% of known value
Other Analyses [b]	---	20% of known value

[a] From EPA publication, "Environmental Radioactivity Laboratory Intercomparison Studies Program, Fiscal Year, 1981-1982, EPA-600/4-81-004.

[b] Laboratory limit.

TABLE A-1. Interlaboratory Comparison Crosscheck program, Environmental Resource Associates (ERA)[a].

Lab Code	Date	Analysis	Laboratory Result [b]	ERA Result [c]	Control Limits	Acceptance
		Concentration (pCi/L)				
ERW-1384	4/7/2014	Sr-89	40.29 ± 5.76	36.70	27.50 ± 43.60	Pass
ERW-1384	4/7/2014	Sr-90	24.08 ± 2.35	26.50	19.20 ± 30.90	Pass
ERW-1385	4/7/2014	Ba-133	78.23 ± 3.93	87.90	74.00 ± 96.70	Pass
ERW-1385	4/7/2014	Co-60	62.75 ± 3.53	64.20	57.80 ± 73.10	Pass
ERW-1385	4/7/2014	Cs-134	44.97 ± 3.99	44.30	35.50 ± 48.70	Pass
ERW-1385	4/7/2014	Cs-137	88.54 ± 4.93	89.10	80.20 ± 101.00	Pass
ERW-1385	4/7/2014	Zn-65	249.1 ± 10.4	235.0	212.0 - 275.0	Pass
ERW-1388	4/7/2014	Gr. Alpha	56.70 ± 2.47	61.00	31.90 ± 75.80	Pass
ERW-1388	4/7/2014	Gr. Beta	32.10 ± 1.20	33.00	21.40 ± 40.70	Pass
ERW-1391	4/7/2014	I-131	25.52 ± 1.12	25.70	21.30 ± 30.30	Pass
ERW-1394	4/7/2014	Ra-226	12.30 ± 0.61	12.40	9.26 ± 14.30	Pass
ERW-1394	4/7/2014	Ra-228	5.08 ± 1.16	4.26	2.46 ± 5.86	Pass
ERW-1394	4/7/2014	Uranium	10.76 ± 0.74	10.20	7.95 ± 11.80	Pass
ERW-1397	4/7/2014	H-3	8982 ± 279	8770	7610 - 9650	Pass
ERW-5382	10/6/2014	Sr-89	29.40 ± 5.32	31.40	22.80 ± 38.10	Pass
ERW-5382	10/6/2014	Sr-90	19.19 ± 1.85	21.80	15.60 ± 25.70	Pass
ERW-5385	10/6/2014	Ba-133	43.54 ± 4.54	49.10	40.30 ± 54.50	Pass
ERW-5385	10/6/2014	Cs-134	81.95 ± 7.49	89.80	73.70 ± 98.80	Pass
ERW-5385	10/6/2014	Cs-137	95.76 ± 5.50	98.80	88.90 ± 111.00	Pass
ERW-5385	10/6/2014	Co-60	90.25 ± 2.77	92.10	82.90 ± 104.00	Pass
ERW-5385	10/6/2014	Zn-65	327.4 ± 23.3	310.0	279.0 - 362.0	Pass
ERW-5388	10/6/2014	Gr. Alpha	30.88 ± 8.05	37.60	19.40 ± 46.10	Pass
ERW-5388	10/6/2014	G. Beta	20.47 ± 4.75	27.40	17.30 ± 35.30	Pass
ERW-5392	10/6/2014	I-131	19.58 ± 2.35	20.30	16.80 ± 24.40	Pass
ERW-5394	10/6/2014	Ra-226	15.10 ± 1.81	14.70	11.00 ± 16.90	Pass
ERW-5394	10/6/2014	Ra-228	4.42 ± 0.86	4.31	2.50 ± 5.92	Pass
ERW-5394	10/6/2014	Uranium	5.51 ± 0.37	5.80	4.34 ± 6.96	Pass
ERW-5397	10/6/2014	H-3	6876 ± 383	6880	5940 - 7570	Pass

[a] Results obtained by Environmental, Inc., Midwest Laboratory as a participant in the crosscheck program for proficiency testing in drinking water conducted by Environmental Resources Associates (ERA).

[b] Unless otherwise indicated, the laboratory result is given as the mean ± standard deviation for three determinations.

[c] Results are presented as the known values, expected laboratory precision (1 sigma, 1 determination) and control limits as provided by ERA.

TABLE A-2. Thermoluminescent Dosimetry, (TLD, $CaSO_4$: Dy Cards).

Lab Code	Date	mR				
		Description	Known Value	Lab Result ± 2 sigma	Control Limits	Acceptance
Environmental, Inc.						
2014-1	5/15/2014	50 cm.	26.83	34.43 ± 3.76	18.78 - 34.88	Pass
2014-1	5/15/2014	60 cm.	18.63	22.20 ± 1.16	13.04 - 24.22	Pass
2014-1	5/15/2014	70 cm.	13.69	14.74 ± 0.80	9.58 - 17.80	Pass
2014-1	5/15/2014	75 cm.	11.93	12.68 ± 1.05	8.35 - 15.51	Pass
2014-1	5/15/2014	80 cm.	10.48	11.81 ± 0.91	7.34 - 13.62	Pass
2014-1	5/15/2014	90 cm.	8.28	7.72 ± 0.71	5.80 - 10.76	Pass
2014-1	5/15/2014	100 cm.	6.71	6.46 ± 0.71	4.70 - 8.72	Pass
2014-1	5/15/2014	110 cm.	5.54	5.25 ± 1.03	3.88 - 7.20	Pass
2014-1	5/15/2014	120 cm.	4.66	4.76 ± 0.48	3.26 - 6.06	Pass
2014-1	5/15/2014	135 cm.	3.68	2.87 ± 0.46	2.58 - 4.78	Pass
2014-1	5/15/2014	150 cm.	2.98	2.30 ± 0.15	2.09 - 3.87	Pass
2014-1	5/15/2014	165 cm.	2.46	2.09 ± 0.28	1.72 - 3.20	Pass
2014-1	5/15/2014	180 cm.	2.07	1.75 ± 0.21	1.45 - 2.69	Pass
Environmental, Inc.						
2014-2	12/9/2014	30 cm.	77.04	84.03 ± 8.47	53.90 - 100.20	Pass
2014-2	12/9/2014	30 cm.	77.04	83.74 ± 12.02	53.90 - 100.20	Pass
2014-2	12/9/2014	60 cm.	19.26	20.39 ± 2.37	13.50 - 25.00	Pass
2014-2	12/9/2014	60 cm.	19.26	20.33 ± 1.19	13.50 - 25.00	Pass
2014-2	12/9/2014	120 cm.	4.82	5.15 ± 0.20	3.40 - 6.30	Pass
2014-2	12/9/2014	120 cm.	4.82	5.20 ± 0.45	3.40 - 6.30	Pass
2014-2	12/9/2014	150 cm.	3.08	3.84 ± 0.61	2.20 - 4.00	Pass
2014-2	12/9/2014	150 cm.	3.08	3.17 ± 0.38	2.20 - 4.00	Pass
2014-2	12/9/2014	150 cm.	3.08	3.31 ± 0.32	2.00 - 4.00	Pass
2014-2	12/9/2014	180 cm.	2.14	2.27 ± 0.51	1.50 - 2.80	Pass
2014-2	12/9/2014	180 cm.	2.14	2.23 ± 0.12	1.50 - 2.80	Pass
2014-2	12/9/2014	180 cm.	2.14	2.74 ± 0.48	1.50 - 2.80	Pass
2014-2	12/9/2014	180 cm.	2.14	1.97 ± 0.41	1.50 - 2.80	Pass

TABLE A-3. In-House "Spiked" Samples

Lab Code [b]	Date	Analysis	Concentration (pCi/L)[a] Laboratory results 2s, n=1 [c]	Known Activity	Control Limits [d]	Acceptance
SPW-1011	1/13/2014	Ra-228	35.47 ± 2.55	30.85	21.60 - 40.11	Pass
SPAP-103	1/13/2014	Gr. Beta	43.91 ± 0.34	44.82	26.89 - 62.75	Pass
SPAP-105	1/13/2014	Cs-134	2.46 ± 0.67	2.82	1.69 - 3.95	Pass
SPAP-105	1/13/2014	Cs-137	102.4 ± 2.7	99.9	89.9 - 109.9	Pass
SPW-107	1/13/2014	H-3	62,380 ± 707	62,246	49,797 - 74,695	Pass
SPW-129	1/15/2014	Cs-134	69.90 ± 3.71	78.00	68.00 - 88.00	Pass
SPW-129	1/15/2014	Cs-137	84.36 ± 7.06	75.77	65.77 - 85.77	Pass
SPW-129	1/15/2014	Sr-90	39.48 ± 1.52	39.20	31.36 - 47.04	Pass
SPW-130	1/15/2014	Ni-63	255.8 ± 3.8	204.0	142.8 - 265.2	Pass
SPW-133	1/15/2014	C-14	3153 ± 15	4737	2842 - 6632	Pass
SPMI-135	1/15/2014	Cs-134	76.80 ± 4.04	78.00	68.00 - 88.00	Pass
SPMI-135	1/15/2014	Cs-137	80.44 ± 6.63	75.80	65.80 - 85.80	Pass
W-12014	1/20/2014	Gr. Alpha	19.69 ± 0.41	20.00	10.00 - 30.00	Pass
W-12014	1/20/2014	Gr. Beta	30.35 ± 0.33	30.90	20.90 - 40.90	Pass
SPW-297	1/29/2014	Tc-99	104.2 ± 1.7	107.8	75.5 - 140.2	Pass
SPW-657	2/25/2014	Ra-226	15.84 ± 0.45	16.70	11.69 - 21.71	Pass
SPW-1127	3/26/2014	U-238	43.28 ± 2.56	41.72	29.20 - 54.24	Pass
SPW-1917	3/28/2014	Pu-238	27.37 ± 2.13	23.80	14.28 - 33.32	Pass
SPW-1786	4/25/2014	Tc-99	531.1 ± 8.7	539.15	377.41 - 700.90	Pass
SPW-2168	5/21/2014	Cs-134	70.90 ± 5.81	69.50	59.50 - 79.50	Pass
SPW-2168	5/21/2014	Cs-137	79.72 ± 6.49	75.17	65.17 - 85.17	Pass
SPW-2168	5/21/2014	Sr-89	83.35 ± 5.05	72.85	58.28 - 87.42	Pass
SPW-2168	5/21/2014	Sr-90	33.37 ± 1.52	38.87	31.10 - 46.64	Pass
SPMI-2170	5/21/2014	Cs-134	64.15 ± 4.93	69.50	59.50 - 79.50	Pass
SPMI-2170	5/21/2014	Cs-137	76.21 ± 6.91	75.17	65.17 - 85.17	Pass
SPMI-2170	5/21/2014	Sr-89	65.82 ± 4.89	72.85	58.28 - 87.42	Pass
SPMI-2170	5/21/2014	Sr-90	40.90 ± 1.59	38.87	31.10 - 46.64	Pass
SPW-2792	6/18/2014	U-238	44.80 ± 1.54	41.70	29.19 - 54.21	Pass
SPW-2796	6/18/2014	C-14	3495 ± 9	4,737	2,842 - 6632	Pass
WW-2836	6/30/2014	Co-60	131.8 ± 6.9	140.90	126.81 - 154.99	Pass
WW-2836	6/30/2014	Cs-137	143.8 ± 9.1	145.60	131.04 - 160.16	Pass
WW-2836	6/30/2014	H-3	6220 ± 238	6,361	5,089 - 7633	Pass

TABLE A-3. In-House "Spiked" Samples

Lab Code [b]	Date	Analysis	Concentration (pCi/L)[a] Laboratory results 2s, n=1 [c]	Known Activity	Control Limits [d]	Acceptance
SPW-3486	7/17/2014	Fe-55	2211 ± 72	2319	1855 - 2783	Pass
SPW-080714	8/7/2014	Gr. Alpha	18.42 ± 0.40	20.10	10.05 - 30.15	Pass
SPW-080714	8/7/2014	Gr. Beta	31.70 ± 0.40	32.40	22.40 - 42.40	Pass
SPW-081214	8/12/2014	Pu-238	22.59 ± 2.15	22.70	18.16 - 27.24	Pass
SPW-4093	8/13/2014	I-131(G)	59.95 ± 6.17	59.62	49.62 - 69.62	Pass
SPW-4093	8/13/2014	Sr-90	39.46 ± 1.55	38.65	28.65 - 48.65	Pass
SPW-4093	8/13/2014	Sr-89	105.5 ± 4.9	115.0	92.0 - 149.5	Pass
SPMI-4095	8/13/2014	I-131(G)	59.92 ± 6.17	59.62	49.62 - 69.62	Pass
SPMI-4095	8/13/2014	I-131	60.05 ± 0.72	59.62	47.70 - 71.54	Pass
SPW-4104	8/13/2014	Ni-63	200.1 ± 3.4	203.2	142.2 - 264.1	Pass
SPW-4106	8/13/2014	H-3	59,597 ± 695	60,261	48209 - 72313	Pass
SPW-4108	8/13/2014	Cs-134	2.45 ± 0.81	2.32	0.00 - 12.32	Pass
SPW-4108	8/13/2014	Cs-137	90.20 ± 3.74	98.56	88.56 - 108.56	Pass
SPAP-4110	8/13/2014	Gr. Beta	43.65 ± 0.11	44.19	34.19 - 54.19	Pass
SPF-4112	8/13/2014	I-131	2.64 ± 0.38	2.86	0.00 - 12.86	Pass
SPF-4112	8/13/2014	Cs-134	0.91 ± 0.03	1.03	0.00 - 11.03	Pass
SPF-4112	8/13/2014	Cs-137	2.61 ± 0.06	2.39	0.00 - 12.39	Pass
SPW-081414	8/14/2014	H-3	14,663 ± 788	17,700	14160 - 21240	Pass
W081614	8/16/2014	Ra-226	14.30 ± 0.37	16.70	11.69 - 21.71	Pass
W082614	8/26/2014	Ra-228	27.18 ± 2.13	30.49	20.49 - 40.49	Pass
SPW-090414	9/4/2014	Gr. Alpha	17.85 ± 0.39	20.10	10.05 - 30.15	Pass
SPW-090414	9/4/2014	Gr. Beta	30.03 ± 0.33	30.90	20.90 - 40.90	Pass
SPW-5124	9/29/2014	Ra-228	32.93 ± 2.38	31.94	21.94 - 41.94	Pass
W100714	10/7/2014	Gr. Alpha	18.56 ± 0.40	20.10	10.05 - 30.15	Pass
W100714	10/7/2014	Gr. Beta	27.71 ± 0.32	30.90	20.90 - 40.90	Pass
W111014	11/10/2014	Gr. Alpha	17.84 ± 0.38	20.10	10.05 - 30.15	Pass
W111014	11/10/2014	Gr. Beta	30.12 ± 0.33	30.90	20.90 - 40.90	Pass
W112514	11/25/2014	Ra-226	16.63 ± 0.41	16.70	11.69 - 21.71	Pass
W120814	12/8/2014	Gr. Alpha	19.29 ± 0.41	20.10	10.05 - 30.15	Pass
W120814	12/8/2014	Gr. Beta	27.93 ± 0.32	30.90	20.90 - 40.90	Pass
SPW-7149	12/26/2014	Ni-63	217.53 ± 3.25	203.10	142.17 - 264.03	Pass

[a] Liquid sample results are reported in pCi/Liter, air filters(pCi/m3), charcoal (pCi/charcoal canister), and solid samples (pCi/kg).

[b] Laboratory codes : W (Water), MI (milk), AP (air filter), SO (soil), VE (vegetation), CH (charcoal canister), F (fish), U (urine).

[c] Results are based on single determinations.

[d] Control limits are established from the precision values listed in Attachment A of this report, adjusted to ± 2s.

NOTE: For fish, Jello is used for the spike matrix. For vegetation, cabbage is used for the spike matrix.

TABLE A-4. In-House "Blank" Samples

Lab Code	Sample Type	Date	Analysis[b]	Concentration (pCi/L)[a] Laboratory results (4.66σ) LLD	Activity[c]	Acceptance Criteria (4.66 σ)
SPW-1001	Water	1/13/2014	Ra-228	0.74	0.39 ± 0.39	2
SPAP-102	Air Particulate	1/13/2014	Gr. Beta	0.003	0.015 ± 0.003	0.01
SPAP-104	Air Particulate	1/13/2014	Cs-134	0.006	0.005 ± 0.005	0.05
SPAP-104	Air Particulate	1/13/2014	Cs-137	0.004	-0.002 ± 0.005	0.05
SPW-106	Water	1/13/2014	H-3	151.0	115.0 ± 97.0	200
SPW-128	Water	1/15/2014	Cs-134	2.85	0.59 ± 1.46	10
SPW-128	Water	1/15/2014	Cs-137	2.52	0.68 ± 1.64	10
SPW-128	Water	1/15/2014	Sr-90	0.61	0.74 ± 0.36	1
SPW-130	Water	1/15/2014	Ni-63	10.85	1.57 ± 6.60	20
SPW-133	Water	1/15/2014	C-14	13.51	3.10 ± 8.27	200
SPMI-134	Milk	1/15/2014	Cs-134	4.43	0.14 ± 2.46	10
SPMI-134	Milk	1/15/2014	Cs-137	1.92	-2.07 ± 2.48	10
W-12014	Water	1/20/2014	Gr. Alpha	0.48	-0.31 ± 0.31	2
W-12014	Water	1/20/2014	Gr. Beta	0.78	-0.24 ± 0.54	4
SPW-297	Water	1/29/2014	Tc-99	5.63	-4.42 ± 3.34	10
SPW-656	Water	2/25/2014	Ra-226	0.03	0.01 ± 0.02	1
SPW-1126	Water	3/26/2014	U-238	0.13	0.08 ± 0.12	1
SPW-1127	Water	3/26/2014	U-233/234	0.13	0.11 ± 0.13	1
SPW-1127	Water	3/26/2014	U-238	0.00	0.08 ± 0.12	1
SPW-1917	Water	3/28/2014	Pu-238	0.02	0.01 ± 0.01	1
SPW-1785	Water	4/25/2014	Tc-99	5.61	-4.33 ± 3.33	10
SPW-1831	Water	4/30/2014	I-131	0.21	0.07 ± 0.12	0.5
SPW-2167	Water	5/21/2014	Cs-134	2.29	-0.79 ± 1.35	10
SPW-2167	Water	5/21/2014	Cs-137	2.46	0.36 ± 1.48	10
SPW-2167	Water	5/21/2014	I-131(G)	2.77	0.25 ± 1.53	20
SPW-2167	Water	5/21/2014	Sr-89	0.81	0.01 ± 0.62	5
SPW-2167	Water	5/21/2014	Sr-90	0.52	0.03 ± 0.24	1
SPMI-2169	Milk	5/21/2014	Cs-134	4.45	-0.55 ± 2.39	10
SPMI-2169	Milk	5/21/2014	Cs-137	3.91	-0.52 ± 2.60	10
SPMI-2169	Milk	5/21/2014	I-131(G)	4.31	2.57 ± 2.21	20
SPMI-2169	Milk	5/21/2014	Sr-89	0.98	-0.02 ± 0.83	5
SPMI-2169	Milk	5/21/2014	Sr-90	0.61	0.35 ± 0.32	1
SPW-2793	Water	6/18/2014	U-238	0.08	0.02 ± 0.06	1

TABLE A-4. In-House "Blank" Samples

Lab Code	Sample Type	Date	Analysis[b]	Concentration (pCi/L)[a] Laboratory results (4.66σ) LLD	Activity[c]	Acceptance Criteria (4.66 σ)
SPW-3485	Water	7/17/2014	Fe-55	597.6	10.3 ± 363.3	1000
SPW-4092	Water	8/13/2014	I-131(G)	3.59	0.91 ± 1.95	20
SPW-4092	Water	8/13/2014	Cs-134	3.71	-0.31 ± 1.77	10
SPW-4092	Water	8/13/2014	Cs-137	2.71	-2.20 ± 1.98	10
SPW-4092	Water	8/13/2014	Sr-89	0.89	0.11 ± 0.63	5
SPW-4092	Water	8/13/2014	Sr-90	0.52	-0.05 ± 0.23	1
SPMI-4094	Milk	8/13/2014	I-131	0.35	0.03 ± 0.20	0.5
SPMI-4094	Milk	8/13/2014	I-131(G)	4.50	-0.41 ± 2.44	20
SPMI-4094	Milk	8/13/2014	Cs-134	4.30	-0.84 ± 2.02	10
SPMI-4094	Milk	8/13/2014	Cs-137	3.45	0.96 ± 2.51	10
SPMI-4094	Milk	8/13/2014	Sr-89	0.80	-0.19 ± 0.79	5
SPMI-4094	Milk	8/13/2014	Sr-90	0.47	0.71 ± 0.30	1
SPW-4103	Water	8/13/2014	Ni-63	0.12	0.02 ± 0.07	20
SPW-4105	Water	8/13/2014	H-3	138.1	104.1 ± 78.1	200
SPW-4107	Water	8/13/2014	I-131(G)	3.21	-3.68 ± 1.33	20
SPW-4107	Water	8/13/2014	Cs-134	2.72	-0.62 ± 1.49	10
SPW-4107	Water	8/13/2014	Cs-137	2.56	0.75 ± 1.62	10
SPAP-4109	Air Particulate	8/13/2014	Gr. Beta	0.004	-0.003 ± 0.00	0.01
SPF-4111	Fish	8/13/2014	Cs-134	0.01	0.00 ± 0.01	100
SPF-4111	Fish	8/13/2014	Cs-137	0.01	-0.01 ± 0.01	100
SPF-4111	Fish	8/13/2014	Co-60	0.01	0.00 ± 0.01	100
W-081614	Water	8/16/2014	Ra-226	0.04	0.05 ± 0.03	1
W-082614	Water	8/16/2014	Ra-228	0.62	0.29 ± 0.40	2
W-092314	Water	9/23/2014	Ra-226	0.02	0.04 ± 0.02	1
W-5123	Water	9/29/2014	Ra-228	0.70	0.43 ± 0.38	2
W-100714	Water	10/7/2014	Gr. Alpha	0.39	0.04 ± 0.28	2
W-100714	Water	10/7/2014	Gr. Beta	0.76	-0.06 ± 0.53	4
W-111014	Water	11/10/2014	Gr. Alpha	0.39	0.01 ± 0.28	2
W-111014	Water	11/10/2014	Gr. Beta	0.75	-0.25 ± 0.52	4
W-112514	Water	11/25/2014	Ra-226	0.05	0.02 ± 0.03	2
W-120814	Water	12/8/2014	Gr. Alpha	0.42	0.04 ± 0.30	2
W-120814	Water	12/8/2014	Gr. Beta	0.74	-0.42 ± 0.51	4
SPW-7148	Water	12/26/2014	Ni-63	10.80	-1.80 ± 6.50	20

[a] Liquid sample results are reported in pCi/Liter, air filters(pCi/m^3), charcoal (pCi/charcoal canister), and solid samples (pCi/kg).

[b] I-131(G); iodine-131 as analyzed by gamma spectroscopy.

[c] Activity reported is a net activity result.

TABLE A-5. In-House "Duplicate" Samples

			Concentration (pCi/L)[a]			
Lab Code	Date	Analysis	First Result	Second Result	Averaged Result	Acceptance
AP-7829, 7830	1/2/2014	Be-7	0.08 ± 0.02	0.06 ± 0.01	0.07 ± 0.01	Pass
AP-7913, 7914	1/2/2014	Be-7	0.07 ± 0.01	0.06 ± 0.01	0.06 ± 0.01	Pass
AP-7871, 7872	1/3/2014	Be-7	0.05 ± 0.02	0.06 ± 0.01	0.06 ± 0.01	Pass
S-43, 44	1/9/2014	K-40	19.28 ± 0.57	19.24 ± 0.57	19.26 ± 0.40	Pass
SG-64, 65	1/9/2014	Gr. Alpha	686.08 ± 69.97	642.46 ± 65.59	664.27 ± 47.95	Pass
SG-64, 65	1/9/2014	Ra-226	97.30 ± 9.78	92.20 ± 9.27	94.75 ± 6.74	Pass
SG-64, 65	1/9/2014	Ra-228	91.90 ± 9.30	97.10 ± 9.87	94.50 ± 6.78	Pass
S-136, 137	1/13/2014	Be-7	14.90 ± 0.39	14.88 ± 0.38	14.89 ± 0.27	Pass
S-136, 137	1/13/2014	K-40	3.29 ± 0.36	3.93 ± 0.36	3.61 ± 0.25	Pass
WW-220, 221	1/13/2014	H-3	231.85 ± 80.45	273.46 ± 82.47	252.66 ± 57.60	Pass
WW-262, 263	1/21/2014	H-3	294.80 ± 89.80	265.00 ± 88.47	279.90 ± 63.03	Pass
WW-346, 347	1/24/2014	H-3	934.97 ± 118.47	965.59 ± 119.52	950.28 ± 84.14	Pass
SWU-367, 368	1/29/2014	Gr. Beta	0.74 ± 0.38	1.31 ± 0.42	1.02 ± 0.28	Pass
F-409, 410	2/2/2014	Cs-137	0.05 ± 0.02	0.05 ± 0.02	0.05 ± 0.01	Pass
F-409, 410	2/2/2014	Gr. Beta	3.60 ± 0.07	3.72 ± 0.07	3.66 ± 0.05	Pass
AP-7829, 7830	1/2/2014	Be-7	0.08 ± 0.02	0.06 ± 0.01	0.07 ± 0.01	Pass
AP-7913, 7914	1/2/2014	Be-7	0.07 ± 0.01	0.06 ± 0.01	0.06 ± 0.01	Pass
AP-7871, 7872	1/3/2014	Be-7	0.05 ± 0.02	0.06 ± 0.01	0.06 ± 0.01	Pass
S-43, 44	1/9/2014	K-40	19.28 ± 0.57	19.24 ± 0.57	19.26 ± 0.40	Pass
SG-64, 65	1/9/2014	Gr. Alpha	686.08 ± 69.97	642.46 ± 65.59	664.27 ± 47.95	Pass
SG-64, 65	1/9/2014	Ra-226	97.30 ± 9.78	92.20 ± 9.27	94.75 ± 6.74	Pass
SG-64, 65	1/9/2014	Ra-228	91.90 ± 9.30	97.10 ± 9.87	94.50 ± 6.78	Pass
S-136, 137	1/13/2014	Be-7	14.90 ± 0.39	14.88 ± 0.38	14.89 ± 0.27	Pass
S-136, 137	1/13/2014	K-40	3.29 ± 0.36	3.93 ± 0.36	3.61 ± 0.25	Pass
WW-220, 221	1/13/2014	H-3	231.85 ± 80.45	273.46 ± 82.47	252.66 ± 57.60	Pass
WW-262, 263	1/21/2014	H-3	294.80 ± 89.80	265.00 ± 88.47	279.90 ± 63.03	Pass
WW-346, 347	1/24/2014	H-3	934.97 ± 118.47	965.59 ± 119.52	950.28 ± 84.14	Pass
SWU-367, 368	1/29/2014	Gr. Beta	0.74 ± 0.38	1.31 ± 0.42	1.02 ± 0.28	Pass
F-409, 410	2/2/2014	Cs-137	0.05 ± 0.02	0.05 ± 0.02	0.05 ± 0.01	Pass
F-409, 410	2/2/2014	Gr. Beta	3.60 ± 0.07	3.72 ± 0.07	3.66 ± 0.05	Pass
WW-491, 492	2/6/2014	H-3	474.00 ± 101.10	583.10 ± 105.30	528.55 ± 72.99	Pass
WW-575, 576	2/13/2014	H-3	196.69 ± 82.94	154.68 ± 80.89	175.69 ± 57.93	Pass
W-617, 618	2/14/2014	H-3	526.29 ± 97.65	579.51 ± 99.77	552.90 ± 69.80	Pass
SWU-743, 744	2/25/2014	Gr. Beta	1.61 ± 0.65	1.73 ± 0.71	1.67 ± 0.48	Pass
S-700, 701	2/26/2014	K-40	21.32 ± 0.64	21.15 ± 0.59	21.24 ± 0.44	Pass
S-806, 807	3/4/2014	K-40	24.79 ± 0.57	24.17 ± 0.59	24.48 ± 0.41	Pass
SG-928, 929	3/11/2014	Ac-228	6.78 ± 0.34	6.94 ± 0.35	6.86 ± 0.24	Pass
SG-928, 929	3/11/2014	Bi-214	5.32 ± 0.20	5.34 ± 0.22	5.33 ± 0.15	Pass
SG-928, 929	3/11/2014	K-40	4.79 ± 0.80	6.24 ± 1.01	5.52 ± 0.64	Pass
SG-928, 929	3/11/2014	Pb-212	2.70 ± 0.09	2.75 ± 0.09	2.73 ± 0.06	Pass
SG-928, 929	3/11/2014	Pb-214	5.39 ± 0.17	5.53 ± 0.17	5.46 ± 0.12	Pass
SG-928, 929	3/11/2014	Th-228	6.10 ± 2.07	4.76 ± 1.93	5.43 ± 1.42	Pass
SG-928, 929	3/11/2014	Tl-208	0.92 ± 0.06	0.91 ± 0.06	0.92 ± 0.04	Pass

TABLE A-5. In-House "Duplicate" Samples

			Concentration (pCi/L)[a]			
Lab Code	Date	Analysis	First Result	Second Result	Averaged Result	Acceptance
S-2119, 2120	3/12/2014	Ac-228	0.76 ± 0.20	0.73 ± 0.21	0.75 ± 0.15	Pass
S-2119, 2120	3/12/2014	Cs-137	0.13 ± 0.05	0.11 ± 0.05	0.12 ± 0.04	Pass
S-2119, 2120	3/12/2014	K-40	17.48 ± 1.48	18.39 ± 1.53	17.94 ± 1.06	Pass
S-2119, 2120	3/12/2014	Pb-214	0.73 ± 0.18	0.63 ± 0.12	0.68 ± 0.11	Pass
F-1594, 1595	3/16/2014	Cs-137	0.02 ± 0.01	0.03 ± 0.02	0.03 ± 0.01	Pass
SO-1115, 1116	3/18/2014	Cs-137	0.06 ± 0.01	0.06 ± 0.00	0.06 ± 0.00	Pass
SO-1115, 1116	3/18/2014	Gr. Beta	23.30 ± 2.10	24.40 ± 2.20	23.85 ± 1.52	Pass
SO-1115, 1116	3/18/2014	K-40	12.63 ± 0.18	12.84 ± 0.15	12.74 ± 0.12	Pass
SO-1115, 1116	3/18/2014	U-233/4	0.11 ± 0.02	0.12 ± 0.02	0.12 ± 0.01	Pass
SO-1115, 1116	3/18/2014	U-238	0.13 ± 0.02	0.14 ± 0.02	0.14 ± 0.01	Pass
S-1033, 1034	3/19/2014	Ac-228	0.99 ± 0.20	1.13 ± 0.26	1.06 ± 0.16	Pass
S-1033, 1034	3/19/2014	Bi-214	1.02 ± 0.18	0.98 ± 0.16	1.00 ± 0.12	Pass
S-1033, 1034	3/19/2014	Cs-137	0.15 ± 0.04	0.14 ± 0.04	0.15 ± 0.03	Pass
S-1033, 1034	3/19/2014	K-40	15.39 ± 1.19	15.13 ± 1.19	15.26 ± 0.84	Pass
S-1033, 1034	3/19/2014	Pb-214	1.09 ± 0.13	0.88 ± 0.17	0.99 ± 0.11	Pass
S-1033, 1034	3/19/2014	Tl-208	0.36 ± 0.05	0.31 ± 0.05	0.34 ± 0.04	Pass
W-1094, 1095	3/23/2014	Ra-226	0.30 ± 0.20	0.70 ± 0.20	0.50 ± 0.14	Pass
W-1094, 1095	3/23/2014	Ra-228	1.10 ± 0.79	1.13 ± 0.86	1.12 ± 0.58	Pass
AP-1197, 1198	3/27/2014	Be-7	0.17 ± 0.08	0.14 ± 0.08	0.15 ± 0.05	Pass
AP-1698, 1699	3/31/2014	Be-7	0.06 ± 0.02	0.07 ± 0.02	0.07 ± 0.01	Pass
E-1218, 1219	4/1/2014	Gr. Beta	1.57 ± 0.04	1.57 ± 0.04	1.57 ± 0.03	Pass
E-1218, 1219	4/1/2014	K-40	1.26 ± 0.14	1.31 ± 0.18	1.29 ± 0.11	Pass
SWU-1260, 1261	4/1/2014	Gr. Beta	2.81 ± 0.51	2.94 ± 0.50	2.88 ± 0.36	Pass
AP-1615, 1616	4/1/2014	Be-7	0.07 ± 0.01	0.07 ± 0.02	0.07 ± 0.01	Pass
AP-1657, 1658	4/2/2014	Be-7	0.07 ± 0.01	0.08 ± 0.01	0.07 ± 0.01	Pass
AP-1804, 1805	4/3/2014	Be-7	0.05 ± 0.02	0.06 ± 0.01	0.06 ± 0.01	Pass
P-1489, 1490	4/7/2014	H-3	582.31 ± 101.85	505.07 ± 98.72	543.69 ± 70.92	Pass
BS-1531, 1532	4/16/2014	K-40	0.51 ± 0.19	0.58 ± 0.23	0.54 ± 0.15	Pass
S-1909, 1910	4/22/2014	K-40	14.71 ± 0.54	14.78 ± 0.53	14.75 ± 0.38	Pass
SWU-1867, 1868	4/29/2014	Gr. Beta	2.28 ± 0.40	1.67 ± 0.35	1.98 ± 0.27	Pass
AP-1930, 1931	5/1/2014	Be-7	0.16 ± 0.09	0.19 ± 0.11	0.17 ± 0.07	Pass
SL-1888, 1889	5/1/2014	Be-7	0.80 ± 0.04	0.76 ± 0.08	0.78 ± 0.05	Pass
SL-1888, 1889	5/1/2014	Cs-137	0.01 ± 0.00	0.01 ± 0.00	0.01 ± 0.00	Pass
SL-1888, 1889	5/1/2014	Gr. Beta	11.57 ± 0.72	12.67 ± 0.78	12.12 ± 0.53	Pass
SL-1888, 1889	5/1/2014	K-40	1.04 ± 0.05	1.00 ± 0.09	1.02 ± 0.05	Pass
SO-1972, 1973	5/1/2014	Cs-137	0.12 ± 0.03	0.10 ± 0.02	0.11 ± 0.02	Pass
SO-1972, 1973	5/1/2014	Gr. Alpha	7.51 ± 3.24	9.09 ± 3.63	8.30 ± 2.43	Pass
SO-1972, 1973	5/1/2014	Gr. Beta	29.89 ± 3.25	31.42 ± 3.04	30.66 ± 2.23	Pass
SO-1972, 1973	5/1/2014	K-40	20.45 ± 0.85	20.88 ± 0.76	20.66 ± 0.57	Pass
W-617, 618	5/8/2014	H-3	175.13 ± 83.82	177.17 ± 83.92	176.15 ± 59.31	Pass
AP-2077, 2078	5/8/2014	Be-7	0.23 ± 0.11	0.18 ± 0.11	0.20 ± 0.08	Pass

TABLE A-5. In-House "Duplicate" Samples

			Concentration (pCi/L)[a]			
Lab Code	Date	Analysis	First Result	Second Result	Averaged Result	Acceptance
S-2205, 2206	5/15/2014	Be-7	0.50 ± 0.19	0.70 ± 0.18	0.60 ± 0.13	Pass
S-2205, 2206	5/15/2014	K-40	33.60 ± 0.79	33.52 ± 0.70	33.56 ± 0.53	Pass
VE-2184, 2185	5/19/2014	Be-7	0.62 ± 0.18	0.53 ± 0.17	0.58 ± 0.12	Pass
VE-2184, 2185	5/19/2014	K-40	5.30 ± 0.44	5.14 ± 0.44	5.22 ± 0.31	Pass
DW-50102, 50103	5/20/2014	Ra-226	7.07 ± 0.76	8.31 ± 0.90	7.69 ± 0.59	Pass
DW-50102, 50103	5/20/2014	Ra-228	5.44 ± 0.85	6.02 ± 0.67	5.73 ± 0.54	Pass
SW-2226, 2227	5/21/2014	H-3	14318.00 ± 347.00	14350.00 ± 347.00	14334.00 ± 245.37	Pass
DW-50087, 50088	5/21/2014	Gr. Alpha	1.76 ± 1.09	2.67 ± 1.01	2.22 ± 0.74	Pass
DW-50090, 50091	5/21/2014	Ra-226	0.61 ± 0.09	0.47 ± 0.09	0.54 ± 0.06	Pass
DW-50090, 50091	5/21/2014	Ra-228	0.97 ± 0.41	1.26 ± 0.52	1.12 ± 0.33	Pass
DW-50098, 50099	5/21/2014	Gr. Alpha	13.04 ± 1.36	10.76 ± 1.26	11.90 ± 0.93	Pass
AP-2289, 2290	5/22/2014	Be-7	0.14 ± 0.08	0.24 ± 0.10	0.19 ± 0.06	Pass
PM-3174, 3175	5/28/2014	K-40	30.68 ± 1.30	32.64 ± 1.24	31.66 ± 0.90	Pass
G-2415, 2416	6/2/2014	Be-7	0.73 ± 0.16	0.62 ± 0.28	0.68 ± 0.16	Pass
G-2415, 2416	6/2/2014	Gr. Beta	5.89 ± 0.09	5.90 ± 0.09	5.89 ± 0.06	Pass
G-2415, 2416	6/2/2014	K-40	5.30 ± 0.49	5.19 ± 0.65	5.25 ± 0.41	Pass
WW-2541, 2542	6/4/2014	H-3	5107.00 ± 223.00	5029.00 ± 222.00	5068.00 ± 157.33	Pass
SW-2817, 2818	6/16/2014	H-3	13303.00 ± 336.00	13130.00 ± 334.00	13216.50 ± 236.88	Pass
SS-2943, 2944	6/24/2014	K-40	11.49 ± 0.79	11.81 ± 0.70	11.65 ± 0.53	Pass
S-3048, 3049	6/27/2014	K-40	42.51 ± 1.31	40.04 ± 1.39	41.28 ± 0.95	Pass
SWT-3216, 3217	7/1/2014	Gr. Beta	2.27 ± 0.94	2.53 ± 1.05	2.40 ± 0.70	Pass
AP-3699,3700	7/3/2014	Be-7	0.06 ± 0.01	0.07 ± 0.02	0.07 ± 0.01	Pass
S-3300, 3301	7/8/2014	K-40	4.85 ± 0.97	5.91 ± 1.17	5.38 ± 0.76	Pass
S-3300, 3301	7/8/2014	Ac-228	10.23 ± 0.43	10.18 ± 0.32	10.21 ± 0.27	Pass
S-3300, 3301	7/8/2014	Ra-226	70.14 ± 2.37	72.01 ± 2.38	71.08 ± 1.68	Pass
VE-3237,3238	7/8/2014	K-40	2.54 ± 0.27	2.63 ± 0.24	2.59 ± 0.18	Pass
CF-3384,3385	7/14/2014	K-40	11.10 ± 0.58	10.69 ± 0.60	10.90 ± 0.42	Pass
S-3447,3448	7/16/2014	K-40	19.63 ± 0.64	21.03 ± 0.96	20.33 ± 0.58	Pass
WW-3573,3574	7/18/2014	H-3	381.58 ± 85.76	401.30 ± 86.67	391.44 ± 60.96	Pass
VE-3594,3595	7/22/2014	K-40	3.04 ± 0.19	3.21 ± 0.15	3.13 ± 0.12	Pass
WW-3762,3763	7/25/2014	H-3	315.47 ± 87.02	327.30 ± 87.56	321.39 ± 61.72	Pass
SWT-3867, 3868	7/29/2014	Gr. Beta	1.10 ± 0.53	1.51 ± 0.58	1.31 ± 0.39	Pass
S-3804, 3805	7/30/2014	Ac-228	0.67 ± 0.11	0.61 ± 0.10	0.64 ± 0.07	Pass
S-3804, 3805	7/30/2014	Pb-214	0.56 ± 0.05	0.51 ± 0.04	0.54 ± 0.03	Pass
LW-3931, 3932	7/31/2014	Gr. Beta	1.04 ± 0.40	0.95 ± 0.41	1.00 ± 0.29	Pass

TABLE A-5. In-House "Duplicate" Samples

			Concentration (pCi/L)[a]			
Lab Code	Date	Analysis	First Result	Second Result	Averaged Result	Acceptance
G-3952,3953	8/4/2014	K-40	5.42 ± 0.42	5.35 ± 0.34	5.38 ± 0.27	Pass
G-3952,3953	8/4/2014	Be-7	1.29 ± 0.19	1.24 ± 0.16	1.27 ± 0.13	Pass
G-3952,3953	8/4/2014	Gr. Beta	8.53 ± 0.20	8.63 ± 0.20	8.58 ± 0.14	Pass
G-3952,3953	8/4/2014	H-3	140.16 ± 93.50	127.25 ± 92.99	133.70 ± 65.94	Pass
WW-4036, 4037	8/5/2014	H-3	190.60 ± 82.60	164.70 ± 81.30	177.65 ± 57.95	Pass
VE-4204,4205	8/11/2014	K-40	6.28 ± 0.38	6.60 ± 0.37	6.44 ± 0.27	Pass
WW-4394,4395	8/13/2014	H-3	1540.26 ± 136.52	1499.15 ± 135.43	1519.71 ± 96.15	Pass
VE-4183,4184	8/14/2014	K-40	5.70 ± 0.41	5.73 ± 0.34	5.72 ± 0.27	Pass
AV-4455, 4456	8/22/2014	Be-7	286.67 ± 102.30	251.99 ± 98.94	269.33 ± 71.16	Pass
AV-4455, 4456	8/22/2014	K-40	2547.90 ± 255.70	2201.40 ± 203.90	2374.65 ± 163.52	Pass
WW-4500, 4501	8/26/2014	H-3	347.00 ± 100.00	321.00 ± 98.00	334.00 ± 70.01	Pass
AP-090214A/B	9/2/2014	Gr. Beta	0.03 ± 0.04	0.03 ± 0.04	0.03 ± 0.00	Pass
SG-5089, 5090	9/19/2014	Ac-228	8.26 ± 0.63	9.48 ± 0.68	8.87 ± 0.46	Pass
SG-5089, 5090	9/19/2014	Bi-214	4.71 ± 0.29	4.41 ± 0.31	4.56 ± 0.21	Pass
SG-5194,5	10/1/2014	Gr. Alpha	276.20 ± 9.51	258.60 ± 9.26	267.40 ± 6.64	Pass
SG-5194,5	10/1/2014	Pb-214	43.56 ± 0.73	43.94 ± 0.78	43.75 ± 0.53	Pass
SG-5194,5	10/1/2014	Ac-228	59.90 ± 1.37	62.80 ± 1.73	61.35 ± 1.10	Pass
S-5632,3	10/8/2014	K-40	19.28 ± 0.88	17.94 ± 0.89	18.61 ± 0.63	Pass
S-5632,3	10/8/2014	Cs-137	0.15 ± 0.03	0.13 ± 0.03	0.14 ± 0.02	Pass
S-5632,3	10/8/2014	Tl-208	0.32 ± 0.03	0.34 ± 0.03	0.33 ± 0.02	Pass
S-5632,3	10/8/2014	Pb-212	0.92 ± 0.05	0.92 ± 0.05	0.92 ± 0.03	Pass
S-5632,3	10/8/2014	Pb-214	1.25 ± 0.08	1.09 ± 0.09	1.17 ± 0.06	Pass
S-5632,3	10/8/2014	Bi-212	1.25 ± 0.29	1.34 ± 0.47	1.29 ± 0.27	Pass
S-5632,3	10/8/2014	Ac-228	1.08 ± 0.14	1.10 ± 0.14	1.09 ± 0.10	Pass
DW-50243,4	10/13/2014	Gr. Alpha	2.99 ± 0.94	4.98 ± 1.17	3.99 ± 0.75	Pass
AP-101414A/B	10/14/2014	Gr. Beta	0.02 ± 0.00	0.02 ± 0.00	0.02 ± 0.00	Pass
SG-5590,1	10/15/2014	Pb-214	80.30 ± 8.08	73.40 ± 7.51	76.85 ± 5.52	Pass
SG-5590,1	10/15/2014	Ac-228	64.50 ± 1.87	62.80 ± 1.15	63.65 ± 1.10	Pass
DW-50251,2	10/16/2014	Ra-226	0.55 ± 0.13	0.32 ± 0.10	0.44 ± 0.08	Pass
U-5842,3	10/20/2014	H-3	7376 ± 949	7342 ± 947	7359 ± 670	Pass
CF-6074,5	10/21/2014	H-3	7509 ± 283	7969 ± 291	7739 ± 203	Pass
CF-6074,5	10/21/2014	K-40	3.09 ± 0.31	3.30 ± 0.38	3.20 ± 0.25	Pass

TABLE A-5. In-House "Duplicate" Samples

			Concentration (pCi/L)[a]			
Lab Code	Date	Analysis	First Result	Second Result	Averaged Result	Acceptance
VE-6269,70	11/3/2014	K-40	6.25 ± 0.54	6.56 ± 0.49	6.41 ± 0.36	Pass
VE-6269,70	11/3/2014	Be-7	0.81 ± 0.28	0.74 ± 0.18	0.77 ± 0.17	Pass
SO-6500,1	11/5/2014	Sr-90	0.07 ± 0.03	0.07 ± 0.02	0.07 ± 0.02	Pass
SO-6500,1	11/5/2014	Gr. Alpha	11.77 ± 1.73	12.18 ± 1.62	11.98 ± 1.19	Pass
SO-6500,1	11/5/2014	Gr. Beta	26.69 ± 1.62	24.19 ± 1.13	25.44 ± 0.99	Pass
SO-6500,1	11/5/2014	U-233/4	0.14 ± 0.04	0.14 ± 0.05	0.14 ± 0.03	Pass
SO-6500,1	11/5/2014	U-238	0.18 ± 0.05	0.13 ± 0.04	0.15 ± 0.03	Pass
SO-6500,1	11/5/2014	Th-228	0.47 ± 0.11	0.34 ± 0.06	0.41 ± 0.06	Pass
SO-6500,1	11/5/2014	Th-230	0.38 ± 0.07	0.29 ± 0.05	0.34 ± 0.04	Pass
SO-6500,1	11/5/2014	Th-232	0.41 ± 0.08	0.41 ± 0.06	0.41 ± 0.05	Pass
SO-6500,1	11/5/2014	Bi-214	0.75 ± 0.02	0.78 ± 0.02	0.77 ± 0.01	Pass
SO-6500,1	11/5/2014	Pb-214	0.78 ± 0.08	0.86 ± 0.09	0.82 ± 0.06	Pass
SO-6500,1	11/5/2014	Ac-228	1.02 ± 0.11	1.13 ± 0.13	1.08 ± 0.09	Pass
SO-6500,1	11/5/2014	Cs-137	0.40 ± 0.01	0.39 ± 0.01	0.39 ± 0.01	Pass
DW-50262,3	11/10/2014	Gr. Alpha	8.95 ± 1.26	7.84 ± 1.24	8.40 ± 0.88	Pass
DW-50264,5	11/10/2014	Ra-226	3.89 ± 0.24	3.71 ± 0.20	3.80 ± 0.16	Pass
DW-50264,5	11/10/2014	Ra-228	2.96 ± 0.63	2.33 ± 0.59	2.65 ± 0.43	Pass
AP-120214A/B	12/2/2014	Gr. Beta	0.03 ± 0.00	0.03 ± 0.00	0.03 ± 0.00	Pass
AP-120814A/B	12/8/2014	Gr. Beta	0.03 ± 0.01	0.03 ± 0.01	0.03 ± 0.00	Pass
SG-7068,9	12/19/2014	Pb-214	4.27 ± 0.23	4.38 ± 0.33	4.33 ± 0.20	Pass
SG-7068,9	12/19/2014	Ac-228	2.72 ± 0.36	3.27 ± 0.49	3.00 ± 0.30	Pass
S-7152,3	12/25/2014	K-40	20.83 ± 0.88	20.16 ± 0.62	20.49 ± 0.54	Pass

TABLE A-6. Department of Energy's Mixed Analyte Performance Evaluation Program (MAPEP).

Lab Code [b]	Date	Analysis	Laboratory result	Concentration [a] Known Activity	Control Limits [c]	Acceptance
MAW-1140	2/1/2014	Gr. Alpha	0.77 ± 0.06	0.85	0.26 - 1.44	Pass
MAW-1140	2/1/2014	Gr. Beta	4.31 ± 0.08	4.19	2.10 - 6.29	Pass
MAW-1142	2/1/2014	I-129	-0.01 ± 8.00	0.00	NA	Pass
MAW-1184	2/1/2014	Fe-55	0.40 ± 3.20	0.00	-0.01 - 2.00	Pass
MAW-1184	2/1/2014	H-3	345.10 ± 10.60	321.00	225.00 - 417.00	Pass
MAW-1184	2/1/2014	Ni-63	32.40 ± 3.20	34.00	23.80 - 44.20	Pass
MAW-1184 [e]	2/1/2014	Pu-238	1.28 ± 0.12	0.83	0.58 - 1.08	Fail
MAW-1184 [e]	2/1/2014	Pu-239/240	0.91 ± 0.10	0.68	0.47 - 0.88	Fail
MAW-1184	2/1/2014	Sr-90	7.00 ± 0.70	8.51	5.96 - 11.06	Pass
MAW-1184	2/1/2014	Tc-99	8.10 ± 0.60	10.30	7.20 - 13.40	Pass
MAW-1184	2/1/2014	U-233/234	0.20 ± 0.07	0.23	0.16 - 0.29	Pass
MAW-1184	2/1/2014	U-238	1.25 ± 0.18	1.45	1.02 - 1.89	Pass
MAW-1184	2/1/2014	Co-57	27.86 ± 0.38	27.50	19.30 - 35.80	Pass
MAW-1184	2/1/2014	Co-60	15.99 ± 0.27	16.00	11.20 - 20.80	Pass
MAW-1184	2/1/2014	Cs-134	21.85 ± 0.54	23.10	16.20 - 30.00	Pass
MAW-1184	2/1/2014	Cs-137	28.74 ± 0.49	28.90	20.20 - 37.60	Pass
MAW-1184	2/1/2014	K-40	1.80 ± 2.00	0.00	0.00 - 10.00	Pass
MAW-1184	2/1/2014	Mn-54	14.06 ± 0.40	13.90	9.70 - 18.10	Pass
MAW-1184	2/1/2014	Zn-65	0.00 ± 0.19	0.00	-0.01 - 0.00	Pass
MAVE-1148	2/1/2014	Co-57	11.63 ± 0.19	10.10	7.10 - 13.10	Pass
MAVE-1148	2/1/2014	Co-60	7.28 ± 0.18	6.93	4.85 - 9.01	Pass
MAVE-1148	2/1/2014	Cs-134	6.29 ± 0.29	6.04	4.23 - 7.85	Pass
MAVE-1148	2/1/2014	Cs-137	5.18 ± 0.20	4.74	3.32 - 6.16	Pass
MAVE-1148	2/1/2014	Mn-54	9.22 ± 0.26	8.62	6.03 - 11.21	Pass
MAVE-1148	2/1/2014	Zn-65	8.59 ± 0.40	7.86	5.50 - 10.22	Pass
MAAP-1151	2/1/2014	Am-241	0.09 ± 0.02	0.09	0.06 - 0.12	Pass
MAAP-1151 [d]	2/1/2014	Co-57	1.60 ± 0.05	0.00	NA	Fail
MAAP-1151	2/1/2014	Co-60	1.38 ± 0.08	1.39	0.97 - 1.81	Pass
MAAP-1151	2/1/2014	Cs-134	1.75 ± 0.11	1.91	1.34 - 2.48	Pass
MAAP-1151	2/1/2014	Cs-137	1.81 ± 0.10	1.76	1.23 - 2.29	Pass
MAAP-1151	2/1/2014	Mn-54	0.01 ± 0.03	0.00	NA	Pass
MAAP-1151 [e]	2/1/2014	Pu-238	0.08 ± 0.02	0.00	NA	Fail
MAAP-1151	2/1/2014	Pu-239/240	0.10 ± 0.02	0.08	0.05 - 0.10	Pass
MAAP-1151	2/1/2014	Zn-65	-0.24 ± 0.09	0.00	-0.50 - 1.00	Pass

TABLE A-6. Department of Energy's Mixed Analyte Performance Evaluation Program (MAPEP).

			Concentration [a]			
Lab Code [b]	Date	Analysis	Laboratory result	Known Activity	Control Limits [c]	Acceptance
MAAP-1151	2/1/2014	U-233/234	0.03 ± 0.01	0.02	0.01 - 0.03	Pass
MAAP-1151	2/1/2014	U-238	0.13 ± 0.02	0.13	0.09 - 0.17	Pass
MAAP-1151	2/1/2014	Sr-90	1.11 ± 0.14	1.18	0.83 - 1.53	Pass
MAAP-1154	2/1/2014	Gr. Alpha	0.56 ± 0.06	1.77	0.53 - 3.01	Pass
MAAP-1154	2/1/2014	Gr. Beta	0.98 ± 0.06	0.77	0.39 - 1.16	Pass
MASO-1146	2/1/2014	Co-57	1064.50 ± 3.60	966.00	676.00 - 1256.00	Pass
MASO-1146	2/1/2014	Co-60	1.70 ± 0.50	1.22	NA [d]	Pass
MASO-1146 [f]	2/1/2014	Cs-134	6.10 ± 1.80	0.00	NA	Fail
MASO-1146	2/1/2014	Cs-137	1364.30 ± 5.30	1238.00	867.00 - 1609.00	Pass
MASO-1146	2/1/2014	K-40	728.90 ± 15.90	622.00	435.00 - 809.00	Pass
MASO-1146	2/1/2014	Mn-54	1588.00 ± 6.00	1430.00	1001.00 - 1859.00	Pass
MASO-1146	2/1/2014	Zn-65	763.50 ± 6.80	695.00	487.00 - 904.00	Pass
MASO-1146	2/1/2014	Am-241	68.20 ± 9.00	68.00	47.60 - 88.40	Pass
MASO-1146	2/1/2014	Ni-63	4.80 ± 15.30	0.00	NA	Pass
MASO-1146 [e]	2/1/2014	Pu-238	140.60 ± 15.50	96.00	67.00 - 125.00	Fail
MASO-1146 [e]	2/1/2014	Pu-239/240	102.00 ± 13.10	76.80	53.80 - 99.80	Fail
MASO-1146	2/1/2014	Sr-90	1.23 ± 1.37	0.00	NA	Pass
MASO-1146	2/1/2014	Tc-99	-0.30 ± 12.00	0.00	NA	Pass
MASO-1146 [g]	2/1/2014	U-233/234	22.90 ± 3.00	81.00	57.00 - 105.00	Fail
MASO-1146 [g]	2/1/2014	U-238	32.00 ± 3.60	83.00	58.00 - 108.00	Fail
MASO-4439	8/1/2014	Am-241	65.90 ± 6.70	85.50	59.90 - 111.20	Pass
MASO-4439	8/1/2014	Ni-63	771.62 ± 23.29	980.00	686.00 - 1274.00	Pass
MASO-4439	8/1/2014	Pu-239/240	55.63 ± 5.81	58.60	41.00 - 76.20	Pass
MASO-4439	8/1/2014	Sr-90	778.34 ± 17.82	858.00	601.00 - 1115.00	Pass
MASO-4439	8/1/2014	Tc-99	458.20 ± 9.20	589.00	412.00 - 766.00	Pass
MASO-4439	8/1/2014	Cs-134	520.60 ± 7.09	622.00	435.00 - 809.00	Pass
MASO-4439	8/1/2014	Co-57	1135.00 ± 7.40	1116.00	781.00 - 1451.00	Pass
MASO-4439	8/1/2014	Co-60	768.20 ± 7.70	779.00	545.00 - 1013.00	Pass
MASO-4439	8/1/2014	Mn-54	1050.70 ± 12.60	1009.00	706.00 - 1312.00	Pass
MASO-4439	8/1/2014	Zn-65	407.89 ± 15.03	541.00	379.00 - 703.00	Pass
MAW-4431	8/1/2014	Am-241	0.79 ± 0.08	0.88	0.62 - 1.14	Pass
MAW-4431	8/1/2014	Cs-137	18.62 ± 0.54	18.40	12.90 - 23.90	Pass
MAW-4431	8/1/2014	Co-57	24.85 ± 0.42	24.70	17.30 - 32.10	Pass
MAW-4431	8/1/2014	Co-60	12.27 ± 0.38	12.40	8.70 - 16.10	Pass
MAW-4431	8/1/2014	H-3	207.20 ± 10.60	208.00	146.00 - 270.00	Pass
MAW-4431 [h]	8/1/2014	Fe-55	55.10 ± 14.80	31.50	22.10 - 41.00	Fail
MAW-4431	8/1/2014	Mn-54	14.36 ± 0.53	14.00	9.80 - 18.20	Pass
MAW-4431	8/1/2014	Zn-65	11.46 ± 0.78	10.90	7.60 - 14.20	Pass

TABLE A-6. Department of Energy's Mixed Analyte Performance Evaluation Program (MAPEP).

			Concentration [a]			
Lab Code [b]	Date	Analysis	Laboratory result	Known Activity	Control Limits [c]	Acceptance
MAW-4431	8/1/2014	Tc-99	6.10 ± 0.50	6.99	4.89 - 9.09	Pass
MAW-4431	8/1/2014	Pu-238	0.59 ± 0.07	0.62	0.43 - 0.80	Pass
MAW-4431	8/1/2014	U-233/234	0.22 ± 0.04	0.21	0.14 - 0.27	Pass
MAW-4431	8/1/2014	U-238	1.25 ± 0.10	1.42	0.99 - 1.85	Pass
MAW-4493	8/1/2014	Gr. Alpha	0.93 ± 0.07	1.40	0.42 - 2.38	Pass
MAW-4493	8/1/2014	Gr. Beta	6.31 ± 1.35	6.50	3.25 - 9.75	Pass
MAAP-4433	8/1/2014	Am-241	0.06 ± 0.02	0.07	0.05 - 0.09	Pass
MAAP-4433	8/1/2014	Pu-238	0.10 ± 0.03	0.11	0.08 - 0.14	Pass
MAAP-4433	8/1/2014	Pu-239/240	0.04 ± 0.02	0.05	0.03 - 0.06	Pass
MAAP-4433	8/1/2014	Sr-90	0.74 ± 0.10	0.70	0.49 - 0.91	Pass
MAAP-4433	8/1/2014	U-233/234	0.03 ± 0.01	0.04	0.03 - 0.05	Pass
MAAP-4433	8/1/2014	U-238	0.21 ± 0.03	0.25	0.18 - 0.33	Pass
MAAP-4444	8/1/2014	Sr-89	7.82 ± 0.52	9.40	6.60 - 12.20	Pass
MAAP-4444	8/1/2014	Sr-90	0.76 ± 0.10	0.76	0.53 - 0.99	Pass
MAVE-4436	8/1/2014	Cs-134	7.49 ± 0.18	7.38	5.17 - 9.59	Pass
MAVE-4436	8/1/2014	Co-57	11.20 ± 0.19	9.20	6.40 - 12.00	Pass
MAVE-4436	8/1/2014	Co-60	6.84 ± 0.17	6.11	4.28 - 7.94	Pass
MAVE-4436	8/1/2014	Mn-54	8.11 ± 0.26	7.11	4.97 - 9.23	Pass
MAVE-4436	8/1/2014	Zn-65	7.76 ± 0.43	6.42	4.49 - 8.35	Pass

[a] Results are reported in units of Bq/kg (soil), Bq/L (water) or Bq/total sample (filters, vegetation).

[b] Laboratory codes as follows: MAW (water), MAAP (air filter), MASO (soil), MAVE (vegetation).

[c] MAPEP results are presented as the known values and expected laboratory precision (1 sigma, 1 determination) and control limits as defined by the MAPEP. A known value of "zero" indicates an analysis was included in the testing series as a "false positive". MAPEP does not provide control limits.

[d] Interference from Eu-152 resulted in misidentification of Co-57.

[e] The high bias on the plutonium crosscheck samples was traced to contamination from a newly purchased standard.

The results of reanalysis with replacement tracer purchased from NIST:

MAW-1184	Pu-238	0.68 ± 0.10	Bq / L
MAW-1184	Pu-239/240	0.66 ± 0.10	Bq / L
MASO-1146	Pu-238	95.15 ± 8.98	Bq / kg
MASO-1146	Pu-239/240	67.21 ± 7.54	Bq / kg

Insufficient sample remained to reanalyze the Air filter sample(MAAP-1151). High bias results due to same contaminated tracer

[f] Cs-134 was positively identified in both library peaks, calculation on the second peak; 2.78 ± 0.93 Bq/kg.

[g] 80% of participating laboratories were outside the acceptable range.

Parallel reanalysis was run on ERA spiked sample with acceptable results.

[h] Result of reanalysis Fe-55 32.63 ± 16.30 Bq / L

TABLE A-7. Interlaboratory Comparison Crosscheck program, Environmental Resource Associates (ERA)[a].

Lab Code [b]	Date	Analysis	Concentration (pCi/L) [b] Laboratory Result [c]	ERA Result [d]	Control Limits	Acceptance
ERAP-1044	3/17/2014	Am-241	54.2 ± 3.0	59.7	36.8 - 80.8	Pass
ERAP-1044	3/17/2014	Co-60	1177.9 ± 14.3	1120.0	867.0 - 1400.0	Pass
ERAP-1044	3/17/2014	Cs-134	1010.5 ± 15.8	1010.0	643.0 - 1250.0	Pass
ERAP-1044	3/17/2014	Cs-137	938.3 ± 45.7	828.0	622.0 - 1090.0	Pass
ERAP-1044	3/17/2014	Fe-55	142.3 ± 87.3	240.0	74.4 - 469.0	Pass
ERAP-1044	3/17/2014	Gr. Alpha	52.3 ± 0.5	46.0	15.4 - 71.4	Pass
ERAP-1044	3/17/2014	Gr. Beta	64.4 ± 2.6	53.8	34.0 - 78.4	Pass
ERAP-1044	3/17/2014	Mn-54	< 4.9	0.0	NA	Pass
ERAP-1044	3/17/2014	Pu-238	63.0 ± 2.6	56.3	38.6 - 74.0	Pass
ERAP-1044	3/17/2014	Pu-239/240	52.8 ± 1.9	48.6	35.2 - 63.5	Pass
ERAP-1044	3/17/2014	Sr-90	81.4 ± 1.6	78.9	38.6 - 118.0	Pass
ERAP-1044	3/17/2014	U-233/234	30.4 ± 1.7	36.4	22.6 - 54.9	Pass
ERAP-1044	3/17/2014	U-238	30.4 ± 1.4	36.1	23.3 - 49.9	Pass
ERAP-1044	3/17/2014	Uranium	62.0 ± 3.5	74.3	41.1 - 113.0	Pass
ERAP-1044	3/17/2014	Zn-65	852.2 ± 26.1	667.0	478.0 - 921.0	Pass
ERSO-1050	3/17/2014	Am-241	426.6 ± 155.5	399.0	233.0 - 518.0	Pass
ERSO-1050	3/17/2014	Ac-228	1260.0 ± 107.0	1240.0	795.0 - 1720.0	Pass
ERSO-1050	3/17/2014	Bi-212	1331.9 ± 309.7	1240.0	330.0 - 1820.0	Pass
ERSO-1050	3/17/2014	Bi-214	1804.5 ± 50.4	1960.0	1180.0 - 2820.0	Pass
ERSO-1050	3/17/2014	Co-60	6738.8 ± 167.6	6830.0	4620.0 - 9400.0	Pass
ERSO-1050	3/17/2014	Cs-134	3262.9 ± 108.8	3390.0	2220.0 - 4070.0	Pass
ERSO-1050	3/17/2014	Cs-137	8538.6 ± 55.0	8490.0	6510.0 - 10900.0	Pass
ERSO-1050	3/17/2014	K-40	11241.3 ± 296.6	10500.0	7660.0 - 14100.0	Pass
ERSO-1050	3/17/2014	Mn-54	< 21.6	0.0	NA	Pass
ERSO-1050	3/17/2014	Pb-212	1119.6 ± 26.1	1240.0	812.0 - 1730.0	Pass
ERSO-1050	3/17/2014	Pb-214	1861.7 ± 54.9	2070.0	1210.0 - 3090.0	Pass
ERSO-1050 [e]	3/17/2014	Pu-238	1085.5 ± 167.7	578.0	348.0 - 797.0	Fail
ERSO-1050 [e]	3/17/2014	Pu-239/240	681.6 ± 128.6	471.0	308.0 - 651.0	Fail
ERSO-1050	3/17/2014	Sr-90	2338.0 ± 144.0	2780.0	1060.0 - 4390.0	Pass
ERSO-1050	3/17/2014	Th-234	3474.9 ± 226.0	3360.0	1060.0 - 6320.0	Pass
ERSO-1050	3/17/2014	U-233/234	3319.5 ± 250.2	2780.0	1060.0 - 4390.0	Pass
ERSO-1050	3/17/2014	U-238	3375.6 ± 252.6	3360.0	2080.0 - 4260.0	Pass
ERSO-1050	3/17/2014	Uranium	6810.6 ± 551.1	6910.0	3750.0 - 9120.0	Pass
ERSO-1050	3/17/2014	Zn-65	5968.0 ± 226.1	5400.0	4300.0 - 7180.0	Pass

TABLE A-7. Interlaboratory Comparison Crosscheck program, Environmental Resource Associates (ERA)[a].

			Concentration (pCi/L) [b]			
Lab Code [b]	Date	Analysis	Laboratory Result [c]	ERA Result [d]	Control Limits	Acceptance
ERVE-1051	3/17/2014	Am-241	1532.0 ± 149.5	1490.0	911.0 - 1980.0	Pass
ERVE-1051	3/17/2014	Cm-244	519.8 ± 94.6	516.0	253.0 - 804.0	Pass
ERVE-1051	3/17/2014	Co-60	981.2 ± 41.8	926.0	639.0 - 1290.0	Pass
ERVE-1051	3/17/2014	Cs-134	701.4 ± 58.6	646.0	415.0 - 839.0	Pass
ERVE-1051	3/17/2014	Cs-137	961.9 ± 46.3	880.0	638.0 - 1220.0	Pass
ERVE-1051	3/17/2014	K-40	32789.7 ± 758.2	31900.0	23000.0 - 44800.0	Pass
ERVE-1051	3/17/2014	Mn-54	< 25.9	0.0	NA	Pass
ERVE-1051	3/17/2014	Pu-238	2724.1 ± 259.4	2110.0	1260.0 - 2890.0	Pass
ERVE-1051	3/17/2014	Pu-239/240	4361.4 ± 323.4	3740.0	2300.0 - 5150.0	Pass
ERVE-1051	3/17/2014	Sr-90	2405.7 ± 263.2	2580.0	1470.0 - 3420.0	Pass
ERVE-1051	3/17/2014	U-233/234	1612.2 ± 162.0	1760.0	1160.0 - 2260.0	Pass
ERVE-1051	3/17/2014	U-238	1574.3 ± 159.6	1750.0	1170.0 - 2220.0	Pass
ERVE-1051	3/17/2014	Uranium	3255.4 ± 356.7	3580.0	2430.0 - 4460.0	Pass
ERVE-1051	3/17/2014	Zn-65	1124.1 ± 101.2	919.0	663.0 - 1290.0	Pass
ERW-1054	3/17/2014	Am-241	104.6 ± 3.4	114.0	76.8 - 153.0	Pass
ERW-1054	3/17/2014	Co-60	1195.2 ± 18.9	1270.0	1100.0 - 1490.0	Pass
ERW-1054	3/17/2014	Cs-134	1474.9 ± 47.5	1660.0	1220.0 - 1910.0	Pass
ERW-1054	3/17/2014	Cs-137	2591.0 ± 23.4	2690.0	2280.0 - 3220.0	Pass
ERW-1054	3/17/2014	Mn-54	< 4.3	0.0	NA	Pass
ERW-1054	3/17/2014	Pu-238	54.1 ± 3.6	44.1	32.6 - 54.9	Pass
ERW-1054	3/17/2014	Pu-239/240	185.9 ± 17.6	160.0	124.0 - 202.0	Pass
ERW-1054	3/17/2014	U-233/234	74.8 ± 6.3	82.4	61.9 - 106.0	Pass
ERW-1054	3/17/2014	U-238	76.4 ± 7.8	81.8	62.4 - 100.0	Pass
ERW-1054	3/17/2014	Uranium	154.3 ± 14.6	168.0	123.0 - 217.0	Pass
ERW-1054	3/17/2014	Zn-65	1818.5 ± 56.4	1800.0	1500.0 - 2270.0	Pass
ERW-1055 [f]	3/17/2014	Fe-55	636.3 ± 176.0	1200.0	716.0 - 1630.0	Fail
ERW-1055	3/17/2014	Gr. Alpha	120.9 ± 3.5	133.0	47.2 - 206.0	Pass
ERW-1055	3/17/2014	Gr. Beta	141.6 ± 2.3	174.0	99.6 - 258.0	Pass
ERW-1055	3/17/2014	Sr-90	873.9 ± 56.9	890.0	580.0 - 1180.0	Pass
ERW-1060	3/17/2014	H-3	5818.0 ± 230.0	5580.0	3740.0 - 7960.0	Pass

[a] Results obtained by Environmental, Inc., Midwest Laboratory as a participant in the crosscheck program for proficiency testing administered by Environmental Resources Associates, serving as a replacement for studies conducted previously by the Environmental Measurements Laboratory Quality Assessment Program (EML).

[b] Laboratory codes as follows: ERW (water), ERAP (air filter), ERSO (soil), ERVE (vegetation). Results are reported in units of pCi/L, except for air filters (pCi/Filter), vegetation and soil (pCi/kg).

[c] Unless otherwise indicated, the laboratory result is given as the mean ± standard deviation for three determinations.

[d] Results are presented as the known values, expected laboratory precision (1 sigma, 1 determination) and control limits as provided by ERA. A known value of "zero" indicates an analysis was included in the testing series as a "false positive". Control limits are not provided.

[e] The high bias on the plutonium crosscheck samples was traced to contamination from a newly purchased standard. The results of reanalysis with replacement tracer purchased from NIST:

ERSO-1050	Pu-238	634.7 ± 98.50	Bq / kg
ERSO-1050	Pu-239/240	451.8 ± 82.80	Bq / kg

[f] An error in the efficiency calculation was found. The result of recalculation was 932 pCi/L. The sample was repeated, result of reanalysis, 1066 pCi/L.

Appendix B
2014 REMP Data Summary Reports

Environmental Radiological Monitoring Program Annual Summary
Perry Nuclear Power Plant Docket Number 50-440/50-441
Lake County, Ohio Reporting Period: 2014

Pathway Sampled Units	Type and Total Number of Analyses Performed	Lower Limit of Detection (LLD)	Mean for All Locations Detected/Collected Range	Mean for Indicator Locations Detected/Collected Range	Location with Highest Annual Mean		Mean for Control Locations Detected/Collected Range
					Location # Distance & Direction	Mean Detected/Collected Range	
Air pCi/m3	Be-7 28	N/A	0.058 28 / 28 0.044 – 0.069	0.058 24 / 24 0.044 – 0.069	5 0.8 S	0.064 4 / 4 0.061 – 0.069	0.06 4 / 4 0.057 – 0.066
Air pCi/m3	Co-58 28	N/A	< LLD 0 / 28 —	< LLD 0 / 24 —	—	—	< LLD 0 / 4 —
Air pCi/m3	Co-60 28	N/A	< LLD 0 / 28 —	< LLD 0 / 24 —	—	—	< LLD 0 / 4 —
Air pCi/m3	Cs-134 28	0.037	< LLD 0 / 28 —	< LLD 0 / 24 —	—	—	< LLD 0 / 4 —
Air pCi/m3	Cs-137 28	0.045	< LLD 0 / 28 —	< LLD 0 / 24 —	—	—	< LLD 0 / 4 —
Air pCi/m3	Gross Beta 364	0.0075	0.023 364 / 364 0.010 – 0.048	0.023 312 / 312 0.010 – 0.048	5 0.06 SW	0.024 52 / 52 0.014 – 0.043	0.024 52 / 52 0.012 – 0.041
Air pCi/m3	I-131 364	0.05	<LLD 0 / 364 —	<LLD 0 / 312 —	—	—	<LLD 0 / 52 —

Environmental Radiological Monitoring Program Annual Summary
Perry Nuclear Power Plant Docket Number 50-440/50-441
Lake County, Ohio Reporting Period: 2014

Pathway Sampled Units	Type and Total Number of Analyses Performed	Lower Limit of Detection (LLD)	Mean for All Locations Detected/Collected Range	Mean for Indicator Locations Detected/Collected Range	Location with Highest Annual Mean		Mean for Control Locations Detected/Collected Range
					Location # Distance & Direction	Mean Detected/Collected Range	
Fish pCi/gm wet	K-40 22	N/A	1479.3 22 / 22 630 - 2284	1592.2 11 / 11 630 - 2138	25 2.0 NNW	1592.2 11 / 11 630 - 2138	1366.4 11 / 11 728 – 2284
Fish pCi/gm wet	Mn-54 22	94	< LLD 0 / 22 —	< LLD 0 / 11 —	—	—	< LLD 0 / 11 —
Fish pCi/gm wet	Fe-59 22	195	< LLD 0 / 22 —	< LLD 0 / 11 —	—	—	< LLD 0 / 11 —
Fish pCi/gm wet	Co-58 22	97	< LLD 0 / 22 —	< LLD 0 / 11 —	—	—	< LLD 0 / 11 —
Fish pCi/gm wet	Co-60 22	97	< LLD 0 / 22 —	< LLD 0 / 11 —	—	—	< LLD 0 / 11 —
Fish pCi/gm wet	Zn-65 22	195	< LLD 0 / 22 —	< LLD 0 / 11 —	—	—	< LLD 0 / 11 —
Fish pCi/gm wet	Cs-134 22	97	< LLD 0 / 22 —	< LLD 0 / 11 —	—	—	< LLD 0 / 11 —

Environmental Radiological Monitoring Program Annual Summary
Perry Nuclear Power Plant Docket Number 50-440/50-441
Lake County, Ohio Reporting Period: 2014

Pathway Sampled Units	Type and Total Number of Analyses Performed	Lower Limit of Detection (LLD)	Mean for All Locations Detected/Collected Range	Mean for Indicator Locations Detected/Collected Range	Location with Highest Annual Mean Location # Distance & Direction	Location with Highest Annual Mean Mean Detected/Collected Range	Mean for Control Locations Detected/Collected Range
Fish pCi/gm wet	Cs-137 22	112	< LLD 0 / 22 —	< LLD 0 / 11 —	—	—	< LLD 0 / 11 —
Broadleaf Vegetation pCi/Kg wet	Be-7 73	N/A	398.2 61 / 73 117 – 838	372.5 48 / 58 117 – 838	2 2.0 ENE	519.8 12 / 13 188 – 838	493.3 13 / 15 154 – 775
Broadleaf Vegetation pCi/Kg wet	K-40 73	N/A	4328.3 73 / 73 2582 – 6643	4298.2 58 / 58 2582 – 6643	20 1.9 E	4762.7 15 / 15 2792 – 6643	4444.9 15 / 15 2821 – 6523
Broadleaf Vegetation pCi/Kg wet	Co-58 73	N/A	< LLD 0 / 73 —	< LLD 0 / 58 —	—	—	< LLD 0 / 15 —
Broadleaf Vegetation pCi/Kg wet	Co-60 73	N/A	< LLD 0 / 73 —	< LLD 0 / 58 —	—	—	< LLD 0 / 15 —
Broadleaf Vegetation pCi/Kg wet	I-131 73	45	< LLD 0 / 73 —	< LLD 0 / 58 —	—	—	< LLD 0 / 15 —
Broadleaf Vegetation pCi/Kg wet	Cs-134 73	45	< LLD 0 / 73 —	< LLD 0 / 58 —	—	—	< LLD 0 / 15 —

Environmental Radiological Monitoring Program Annual Summary
Perry Nuclear Power Plant   Docket Number 50-440/50-441
Lake County, Ohio   Reporting Period: 2014

Pathway Sampled Units	Type and Total Number of Analyses Performed	Lower Limit of Detection (LLD)	Mean for All Locations Detected/Collected Range	Mean for Indicator Locations Detected/Collected Range	Location with Highest Annual Mean: Location # Distance & Direction	Location with Highest Annual Mean: Mean Detected/Collected Range	Mean for Control Locations Detected/Collected Range
Broadleaf Vegetation pCi/Kg wet	Cs-137 73	60	< LLD 0 / 73 —	< LLD 0 / 58 —	—	—	< LLD 0 / 15 —
Milk pCi/L	K-40 64	N/A	1463.4 64 / 64 1107 – 2009	1514.6 45 / 45 1107 – 2009	18 2.6 E	1689.3 16 / 16 1397 – 1887	1341.9 19 / 19 1202 – 1442
Milk pCi/L	I-131 64	0.8	< LLD 0 / 64 —	< LLD 0 / 45 —	—	—	< LLD 0 / 19 —
Milk pCi/L	Cs-134 64	11	< LLD 0 / 64 —	< LLD 0 / 45 —	—	—	< LLD 0 / 19 —
Milk pCi/L	Cs-137 64	13	< LLD 0 / 64 —	< LLD 0 / 45 —	—	—	< LLD 0 / 19 —
Milk pCi/L	Ba-140 64	45	< LLD 0 / 64 —	< LLD 0 / 45 —	—	—	< LLD 0 / 19 —
Milk pCi/L	La-140 64	11	< LLD 0 / 64 —	< LLD 0 / 45 —	—	—	< LLD 0 / 19 —

Environmental Radiological Monitoring Program Annual Summary
Perry Nuclear Power Plant Docket Number 50-440/50-441
Lake County, Ohio Reporting Period: 2014

Pathway Sampled Units	Type and Total Number of Analyses Performed	Lower Limit of Detection (LLD)	Mean for All Locations Detected/Collected Range	Mean for Indicator Locations Detected/Collected Range	Location with Highest Annual Mean: Location # Distance & Direction	Location with Highest Annual Mean: Mean Detected/Collected Range	Mean for Control Locations Detected/Collected Range
Sediment pCi/kg wet	K-40 7	N/A	8617.0 7 / 7 6125 – 13532	7797.8 6 / 6 6125 – 10765	32 15.8 WSW	13532.0 1 / 1 13532 – 13532	13532.0 1 / 1 13532 – 13532
Sediment pCi/kg wet	Co-58 7	50	< LLD 0 / 7 —	< LLD 0 / 6 —	—	—	< LLD 0 / 1 —
Sediment pCi/kg wet	Co-60 7	40	< LLD 0 / 7 —	< LLD 0 / 6 —	—	—	< LLD 0 / 1 —
Sediment pCi/kg wet	Cs-134 7	112	< LLD 0 / 7 —	< LLD 0 / 6 —	—	—	< LLD 0 / 1 —
Sediment pCi/kg wet	Cs-137 7	135	68.5 2 / 7 56.5 – 80.4	56.5 1 / 6 56.5 – 56.5	32 15.8 WSW	80.4 1 / 1 80.4 – 80.4	80.4 1 / 1 80.4 – 80.4
TLD mR/91 days	Direct 116	1.0	12.5 115 / 116 7.1 – 19.1	12.5 107 / 108 7.1 –19.1	33 4.7 S	18.2 4 / 4 17.5 – 19.1	11.5 8 / 8 9.7 – 14.0
TLD mR/91 days	Direct 116	1.0	12.0 116 / 116 7.3 – 19.2	12.0 108 / 108 7.3 – 19.2	31 4.9 SE	15.9 4 / 4 15.5 – 16.4	12.3 8 / 8 10.5 – 15.5

Environmental Radiological Monitoring Program Annual Summary
Perry Nuclear Power Plant Docket Number 50-440/50-441
Lake County, Ohio Reporting Period: 2014

Pathway Sampled Units	Type and Total Number of Analyses Performed	Lower Limit of Detection (LLD)	Mean for All Locations Detected/Collected Range	Mean for Indicator Locations Detected/Collected Range	Location with Highest Annual Mean Location # Distance & Direction	Location with Highest Annual Mean Mean Detected/Collected Range	Mean for Control Locations Detected/Collected Range
TLD mR/365 days	Direct 29	1.0	64.1 29 / 29 50.1 – 83.2	64.0 27 / 27 50.1 – 83.2	31 4.9 SE	83.2 1 / 1 83.2 – 83.2	64.7 2 / 2 61.6 – 67.8
Water pCi/L	Gross Beta 54	3.0	2.2 51 / 54 1.0 – 4.5	2.2 40 – 42 1.0 – 4.5	60 1.0 WSW	2.8 9 / 9 1.5 – 4.5	2.2 11 / 12 1.0 – 3.2
Water pCi/L	H-3 18	1500	< LLD 0 / 18 —	< LLD 0 / 14 —	—	—	< LLD 0 / 4 —
Water pCi/L	Mn-54 54	11	< LLD 0 / 54 —	< LLD 0 / 42 —	—	—	< LLD 0 / 12 —
Water pCi/L	Fe-59 54	22	< LLD 0 / 54 —	< LLD 0 / 42 —	—	—	< LLD 0 / 12 —
Water pCi/L	Co-58 54	11	< LLD 0 / 54 —	< LLD 0 / 42 —	—	—	< LLD 0 / 12 —
Water pCi/L	Co-60 54	11	< LLD 0 / 54 —	< LLD 0 / 42 —	—	—	< LLD 0 / 12 —

Environmental Radiological Monitoring Program Annual Summary
Perry Nuclear Power Plant Docket Number 50-440/50-441
Lake County, Ohio Reporting Period: 2014

Pathway Sampled Units	Type and Total Number of Analyses Performed	Lower Limit of Detection (LLD)	Mean for All Locations Detected/Collected Range	Mean for Indicator Locations Detected/Collected Range	Location with Highest Annual Mean Location # Distance & Direction	Location with Highest Annual Mean Mean Detected/Collected Range	Mean for Control Locations Detected/Collected Range
Water pCi/L	Zn-65 54	22	< LLD 0 / 54 —	< LLD 0 / 42 —	—	—	< LLD 0 / 12 —
Water pCi/L	Zr-95 54	22	< LLD 0 / 54 —	< LLD 0 / 42 —	—	—	< LLD 0 / 12 —
Water pCi/L	Nb-95 54	11	< LLD 0 / 54 —	< LLD 0 / 42 —	—	—	< LLD 0 / 12 —
Water pCi/L	Cs-134 54	11	< LLD 0 / 54 —	< LLD 0 / 42 —	—	—	< LLD 0 / 12 —
Water pCi/L	Cs-137 54	13	< LLD 0 / 54 —	< LLD 0 / 42 —	—	—	< LLD 0 / 12 —
Water pCi/L	Ba-140 54	45	< LLD 0 / 54 —	< LLD 0 / 42 —	—	—	< LLD 0 / 12 —
Water pCi/L	La-140 54	11	< LLD 0 / 54 —	< LLD 0 / 42 —	—	—	< LLD 0 / 12 —

Appendix C
2014 REMP Detailed Data Report

ATI Environmental, Inc.
Midwest Laboratory
700 Landwehr Road • Northbrook, IL 60062-2310
ph. (847) 564-0700 • fax (847) 564-4517

MONTHLY PROGRESS REPORT
to
FIRST ENERGY CORPORATION

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM (REMP)
FOR THE
PERRY NUCLEAR POWER PLANT

Reporting Period: January-December, 2014

Prepared and Submitted by
ENVIRONMENTAL, INC.,
MIDWEST LABORATORY

Project Number: 8033

Reviewed and
Approved ______________________ Date ______________
B. Grob, M.S.
Laboratory Manager

Distribution: J. Burnett
R. Leidy, Ohio Department of Health
J. Lucia, Lake County Health Department

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1.0 INTRODUCTION

The following constitutes the current 2014 Monthly Progress Report for the Radiological Environmental Monitoring Program conducted at the Perry Nuclear Power Plant in Perry, Ohio. Results of completed analyses are presented in the attached tables.

The data obtained in the program were within ranges previously encountered and to be expected in the environmental media sampled.

All concentrations, except gross beta, are decay corrected to the time of collection. Airborne iodine is decay corrected to the midpoint of the collection period.

All samples were collected within the scheduled period, unless noted otherwise in Table 2.0, Listing of Missed Samples.

Table 1. Direct Radiation (TLDs), Quarterly Exposure.
Units: mR/91 days

	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
Date Placed	01-13-14	04-01-14	07-02-14	10-15-14
Date Removed	04-01-14	07-02-14	10-10-14	01-12-15
E-1	12.0 ± 1.6	12.2 ± 0.9	11.4 ± 1.2	12.7 ± 1.5
E-3	12.3 ± 0.6	9.4 ± 1.1	10.5 ± 0.8	12.1 ± 1.2
E-4	14.5 ± 0.7	11.7 ± 0.6	11.5 ± 0.7	12.8 ± 1.0
E-5	13.4 ± 0.8	8.3 ± 0.6	11.8 ± 0.9	8.0 ± 0.8
E-6	14.0 ± 1.4	9.7 ± 0.7	13.6 ± 1.0	9.7 ± 0.9
E-7	13.3 ± 1.0	10.7 ± 0.8	13.2 ± 0.9	11.0 ± 1.1
E-8	13.1 ± 0.7	9.8 ± 0.7	12.6 ± 0.7	9.7 ± 1.1
E-9	10.8 ± 0.6	9.5 ± 0.6	10.8 ± 0.7	11.8 ± 1.0
E-10	10.8 ± 1.0	11.4 ± 0.8	11.9 ± 0.8	11.2 ± 0.9
E-11	14.6 ± 0.9	10.0 ± 0.7	15.4 ± 1.0	9.8 ± 1.1
E-12	14.7 ± 1.1	9.8 ± 1.0	11.8 ± 0.8	15.1 ± 1.8
E-13	13.4 ± 1.0	10.9 ± 0.8	12.6 ± 0.9	11.1 ± 1.0
E-14	10.1 ± 0.7	10.7 ± 0.7	10.1 ± 1.1	10.2 ± 0.9
E-15	7.8 ± 0.7	11.3 ± 1.0	7.9 ± 0.8	7.1 ± 0.8
E-21	13.4 ± 0.8	12.0 ± 0.7	16.3 ± 0.7	17.0 ± 0.9
E-23	16.4 ± 1.0	12.6 ± 0.8	13.2 ± 0.8	17.0 ± 1.1
E-24	12.9 ± 0.9	10.5 ± 0.9	10.8 ± 0.7	10.6 ± 1.2
E-29	15.5 ± 0.8	14.9 ± 1.0	15.3 ± 0.7	17.6 ± 1.4
E-30	14.6 ± 1.7	14.0 ± 0.7	13.9 ± 0.7	14.1 ± 1.2
E-31	14.9 ± 0.9	12.6 ± 1.0	14.8 ± 0.9	11.5 ± 1.2
E-33	18.3 ± 1.0	17.5 ± 1.2	19.1 ± 0.9	17.9 ± 0.9
E-35	12.6 ± 0.6	9.9 ± 0.7	11.9 ± 0.8	9.5 ± 0.9
E-36	16.5 ± 0.7	11.9 ± 0.6	16.0 ± 0.7	11.3 ± 1.0
E-53	13.1 ± 0.7	11.1 ± 0.9	14.4 ± 0.8	10.4 ± 1.0
E-54	17.1 ± 1.3	10.6 ± 0.6	12.7 ± 0.8	10.0 ± 0.7
E-55	16.5 ± 1.3	11.9 ± 1.1	14.3 ± 1.4	13.3 ± 1.3
E-56	14.6 ± 0.6	12.7 ± 0.7	13.2 ± 0.6	12.0 ± 0.9
E-57	ND [a]	13.0 ± 1.0	10.3 ± 0.7	13.3 ± 1.2
E-58	11.9 ± 0.7	9.0 ± 0.7	10.2 ± 0.6	10.8 ± 0.8
Mean ± s.d.	13.7 ± 2.3	11.4 ± 1.9	12.8 ± 2.3	12.0 ± 2.8
E-Control 1	8.5 ± 1.6	8.1 ± 0.7	7.6 ± 1.0	8.7 ± 1.0
E-Control 2	5.8 ± 0.8	5.9 ± 0.6	6.4 ± 0.7	6.1 ± 0.7

[a] Not enough counts above background for calculation. Placed 3/17/14, removed 4/1/14.

Table 1. Direct Radiation (TLDs), Quarterly Exposure.
Units: mR/91 days

	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
Date Placed	01-13-14	04-01-14	07-02-14	10-15-14
Date Removed	04-01-14	07-02-14	10-10-14	01-12-15
Q-1	13.1 ± 1.5	11.1 ± 1.4	9.0 ± 0.8	13.8 ± 1.9
Q-3	11.2 ± 1.2	7.3 ± 1.2	10.0 ± 0.5	8.7 ± 1.5
Q-4	13.3 ± 0.8	10.7 ± 1.1	11.9 ± 0.6	14.1 ± 1.9
Q-5	7.9 ± 0.7	9.7 ± 1.2	7.8 ± 0.4	13.7 ± 1.7
Q-6	12.7 ± 0.8	11.2 ± 1.2	12.1 ± 0.8	15.5 ± 1.5
Q-7	11.9 ± 0.6	11.4 ± 1.1	12.9 ± 0.4	15.9 ± 1.4
Q-8	8.6 ± 0.7	8.7 ± 1.1	8.8 ± 0.5	10.4 ± 1.3
Q-9	12.1 ± 0.7	8.3 ± 1.1	10.5 ± 1.1	11.5 ± 1.3
Q-10	10.5 ± 0.7	11.7 ± 1.1	11.5 ± 0.5	12.2 ± 1.2
Q-11	11.6 ± 0.7	13.1 ± 1.1	11.4 ± 0.5	13.7 ± 1.3
Q-12	13.2 ± 0.5	10.7 ± 1.1	12.4 ± 0.4	11.2 ± 1.5
Q-13	9.0 ± 0.5	10.5 ± 1.3	9.0 ± 0.4	10.5 ± 1.5
Q-14	11.1 ± 0.5	10.3 ± 1.2	11.0 ± 0.6	15.1 ± 1.4
Q-15	11.4 ± 0.7	10.3 ± 1.3	8.9 ± 0.7	10.1 ± 1.3
Q-21	11.1 ± 0.5	11.2 ± 1.2	11.4 ± 0.5	11.3 ± 1.4
Q-23	11.1 ± 0.9	14.3 ± 1.5	11.2 ± 0.8	14.6 ± 1.7
Q-24	13.3 ± 1.9	11.5 ± 1.1	11.9 ± 1.1	10.5 ± 1.2
Q-29	16.1 ± 0.7	15.1 ± 1.4	14.6 ± 0.7	15.9 ± 1.5
Q-30	14.7 ± 0.8	11.2 ± 1.0	13.8 ± 0.6	11.5 ± 1.3
Q-31	15.9 ± 1.3	15.6 ± 1.1	15.5 ± 0.6	16.4 ± 1.2
Q-33	13.4 ± 0.7	16.8 ± 1.2	13.5 ± 0.5	19.2 ± 1.5
Q-35	13.5 ± 0.6	8.9 ± 1.1	11.2 ± 0.5	8.6 ± 1.2
Q-36	17.9 ± 0.5	13.5 ± 1.2	14.8 ± 0.5	13.2 ± 1.3
Q-53	13.1 ± 0.4	12.1 ± 1.1	12.4 ± 0.5	12.8 ± 1.4
Q-54	13.8 ± 0.8	13.1 ± 1.1	12.6 ± 0.6	13.0 ± 1.3
Q-55	14.1 ± 0.7	10.3 ± 1.5	12.6 ± 0.5	10.1 ± 1.4
Q-56	14.1 ± 0.7	12.7 ± 1.2	12.2 ± 0.5	14.7 ± 1.8
Q-57	13.1 ± 5.0 [a]	11.4 ± 1.2	13.3 ± 1.2	11.1 ± 1.3
Q-58	8.0 ± 0.8	8.9 ± 1.1	7.7 ± 0.6	9.7 ± 1.2
Mean ± s.d.	12.4 ± 2.3	11.4 ± 2.2	11.6 ± 2.0	12.7 ± 2.6
Q-Control 1	8.3 ± 0.5	5.5 ± 1.1	7.9 ± 0.4	5.7 ± 1.3
Q-Control 2	6.8 ± 0.5	6.4 ± 1.1	6.6 ± 0.4	6.9 ± 1.2

[a] Placed 3/17/14, removed 4/1/14.

Table 1. Direct Radiation (TLDs), Annual Exposure.
Units: mR/365 days

	2014
Date Placed	01-13-14
Date Removed	01-12-15
A-1	58.8 ± 4.0
A-3	56.2 ± 2.5
A-4	62.4 ± 2.6
A-5	59.0 ± 2.5
A-6	67.8 ± 2.6
A-7	59.3 ± 3.6
A-8	61.8 ± 3.5
A-9	50.1 ± 3.0
A-10	63.0 ± 2.4
A-11	65.8 ± 2.6
A-12	63.7 ± 3.0
A-13	64.5 ± 2.6
A-14	55.1 ± 2.8
A-15	53.4 ± 2.4
A-21	70.9 ± 4.8
A-23	57.0 ± 2.4
A-24	61.6 ± 3.3
A-29	78.7 ± 3.9
A-30	63.0 ± 3.1
A-31	79.6 ± 4.3
A-33	81.7 ± 2.4
A-35	52.7 ± 1.7
A-36	83.2 ± 2.1
A-53	67.1 ± 2.8
A-54	67.9 ± 2.3
A-55	68.4 ± 2.6
A-56	66.0 ± 2.4
A-57	64.8 ± 4.6 [a]
A-58	55.0 ± 2.7
Mean ± s.d.	64.1 ± 8.6
A-Control 1	26.3 ± 1.8
A-Control 2	26.5 ± 1.4

[a] Placed 03-17-14; removed 01-12-15.

Table 2. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131.

Location: P-1

Units: pCi/m^3

Collection: Continuous, weekly exchange.

Date Collected	Volume (m^3)	Gross Beta	I-131	Date Collected	Volume (m^3)	Gross Beta	I-131
Required LLD		0.0075	0.050			0.0075	0.050
01-08-14	454	0.030 ± 0.004	< 0.011	07-10-14	558	0.018 ± 0.003	< 0.010
01-15-14	558	0.034 ± 0.003	< 0.006	07-17-14	538	0.018 ± 0.003	< 0.005
01-22-14	538	0.028 ± 0.003	< 0.005	07-23-14	482	0.023 ± 0.003	< 0.005
01-30-14	617	0.018 ± 0.002	< 0.009	07-31-14	630	0.016 ± 0.002	< 0.006
02-06-14	551	0.029 ± 0.003	< 0.011	08-07-14	536	0.026 ± 0.003	< 0.007
02-13-14	542	0.034 ± 0.003	< 0.005	08-14-14	560	0.020 ± 0.003	< 0.011
02-20-14	532	0.037 ± 0.003	< 0.012	08-21-14	554	0.019 ± 0.003	< 0.009
02-27-14	522	0.032 ± 0.003	< 0.008	08-28-14	516	0.021 ± 0.003	< 0.013
03-05-14	452	0.038 ± 0.004	< 0.005	09-04-14	561	0.021 ± 0.003	< 0.007
03-13-14	224	0.037 ± 0.006	< 0.022	09-11-14	546	0.022 ± 0.003	< 0.007
03-19-14	448	0.020 ± 0.003	< 0.007	09-18-14	537	0.015 ± 0.003	< 0.005
03-27-14	611	0.028 ± 0.003	< 0.010	09-25-14	531	0.026 ± 0.003	< 0.007
04-03-14	542	0.024 ± 0.003	< 0.010	10-02-14	552	0.026 ± 0.003	< 0.007
1Q 2014	Mean ± s.d.	0.030 ± 0.006	< 0.022	3Q 2014	Mean ± s.d.	0.021 ± 0.004	< 0.013
04-09-14	455	0.017 ± 0.003	< 0.010	10-09-14	532	0.023 ± 0.003	< 0.012
04-17-14	608	0.026 ± 0.003	< 0.011	10-16-14	545	0.018 ± 0.003	< 0.009
04-24-14	532	0.030 ± 0.003	< 0.008	10-23-14	544	0.014 ± 0.003	< 0.011
05-01-14	547	0.016 ± 0.003	< 0.011	10-30-14	532	0.026 ± 0.003	< 0.007
05-08-14	534	0.015 ± 0.003	< 0.006	11-06-14	616	0.020 ± 0.002	< 0.010
05-15-14	566	0.019 ± 0.003	< 0.011	11-13-14	608	0.020 ± 0.002	< 0.007
05-21-14	505	0.020 ± 0.003	< 0.008	11-20-14	585	0.024 ± 0.003	< 0.007
05-28-14	571	0.014 ± 0.003	< 0.006	11-26-14	503	0.031 ± 0.003	< 0.011
06-05-14	657	0.016 ± 0.002	< 0.006	12-04-14	727	0.030 ± 0.002	< 0.005
06-12-14	556	0.015 ± 0.003	< 0.005	12-10-14	504	0.033 ± 0.003	< 0.012
06-19-14	557	0.014 ± 0.003	< 0.012	12-18-14	680	0.039 ± 0.003	< 0.004
06-26-14	562	0.013 ± 0.003	< 0.011	12-25-14	586	0.016 ± 0.003	< 0.008
07-03-14	548	0.018 ± 0.003	< 0.013	12-31-14	514	0.025 ± 0.003	< 0.013
2Q 2014	Mean ± s.d.	0.018 ± 0.005	< 0.013	4Q 2014	Mean ± s.d.	0.025 ± 0.007	< 0.013
				Cumulative Average		0.023	

Table 2. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131.

Location: P-3

Units: pCi/m^3

Collection: Continuous, weekly exchange.

Date Collected	Volume (m^3)	Gross Beta	I-131	Date Collected	Volume (m^3)	Gross Beta	I-131
Required LLD		0.0075	0.050			0.0075	0.050
01-08-14	472	0.028 ± 0.003	< 0.010	07-10-14	627	0.018 ± 0.002	< 0.009
01-15-14	593	0.034 ± 0.003	< 0.006	07-17-14	572	0.019 ± 0.003	< 0.005
01-22-14	548	0.028 ± 0.003	< 0.005	07-23-14	528	0.021 ± 0.003	< 0.005
01-30-14	639	0.024 ± 0.003	< 0.008	07-31-14	665	0.016 ± 0.002	< 0.006
02-06-14	544	0.031 ± 0.003	< 0.011	08-07-14	628	0.022 ± 0.003	< 0.006
02-13-14	548	0.033 ± 0.003	< 0.005	08-14-14	578	0.019 ± 0.003	< 0.011
02-20-14	543	0.036 ± 0.003	< 0.011	08-21-14	606	0.015 ± 0.003	< 0.008
02-27-14	520	0.030 ± 0.003	< 0.008	08-28-14	562	0.021 ± 0.003	< 0.012
03-05-14	463	0.039 ± 0.004	< 0.005	09-04-14	608	0.021 ± 0.003	< 0.006
03-13-14	222	0.035 ± 0.006	< 0.032	09-11-14	587	0.018 ± 0.003	< 0.006
03-19-14	460	0.016 ± 0.003	< 0.007	09-18-14	586	0.015 ± 0.002	< 0.004
03-27-14	620	0.025 ± 0.003	< 0.010	09-25-14	580	0.023 ± 0.003	< 0.006
04-03-14	546	0.021 ± 0.003	< 0.010	10-02-14	589	0.026 ± 0.003	< 0.006
1Q 2014	Mean ± s.d.	0.029 ± 0.006	< 0.032	3Q 2014	Mean ± s.d.	0.020 ± 0.003	< 0.012
04-09-14	451	0.020 ± 0.003	< 0.010	10-09-14	559	0.024 ± 0.003	< 0.011
04-17-14	610	0.022 ± 0.003	< 0.011	10-16-14	598	0.017 ± 0.003	< 0.008
04-24-14	534	0.029 ± 0.003	< 0.008	10-23-14	573	0.015 ± 0.002	< 0.010
05-01-14	544	0.012 ± 0.003	< 0.011	10-30-14	601	0.026 ± 0.003	< 0.006
05-08-14	523	0.013 ± 0.003	< 0.006	11-06-14	670	0.021 ± 0.002	< 0.009
05-15-14	611	0.020 ± 0.003	< 0.010	11-13-14	682	0.019 ± 0.002	< 0.007
05-21-14	501	0.018 ± 0.003	< 0.008	11-20-14	678	0.023 ± 0.002	< 0.006
05-28-14	579	0.016 ± 0.003	< 0.006	11-26-14	587	0.034 ± 0.003	< 0.010
06-05-14	681	0.015 ± 0.002	< 0.006	12-04-14	800	0.027 ± 0.002	< 0.005
06-12-14	607	0.017 ± 0.003	< 0.005	12-10-14	585	0.030 ± 0.003	< 0.010
06-19-14	607	0.014 ± 0.002	< 0.011	12-18-14	790	0.037 ± 0.002	< 0.004
06-26-14	603	0.015 ± 0.003	< 0.010	12-25-14	678	0.016 ± 0.002	< 0.007
07-03-14	590	0.018 ± 0.003	< 0.012	12-31-14	573	0.025 ± 0.003	< 0.012
2Q 2014	Mean ± s.d.	0.018 ± 0.005	< 0.012	4Q 2014	Mean ± s.d.	0.024 ± 0.007	< 0.012
				Cumulative Average		0.023	

Table 2. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131.

Location: P-4

Units: pCi/m^3

Collection: Continuous, weekly exchange.

Date Collected	Volume (m^3)	Gross Beta	I-131	Date Collected	Volume (m^3)	Gross Beta	I-131
Required LLD		0.0075	0.050			0.0075	0.050
01-08-14	456	0.028 ± 0.003	< 0.011	07-10-14	493	0.017 ± 0.003	< 0.011
01-15-14	552	0.032 ± 0.003	< 0.006	07-17-14	476	0.019 ± 0.003	< 0.006
01-22-14	535	0.031 ± 0.003	< 0.005	07-23-14	469	0.020 ± 0.003	< 0.006
01-30-14	621	0.021 ± 0.003	< 0.008	07-31-14	613	0.018 ± 0.002	< 0.006
02-06-14	529	0.033 ± 0.003	< 0.011	08-07-14	565	0.027 ± 0.003	< 0.007
02-13-14	537	0.035 ± 0.003	< 0.005	08-14-14	539	0.021 ± 0.003	< 0.012
02-20-14	525	0.037 ± 0.003	< 0.012	08-21-14	558	0.020 ± 0.003	< 0.009
02-27-14	509	0.029 ± 0.003	< 0.009	08-28-14	512	0.021 ± 0.003	< 0.013
03-05-14	448	0.043 ± 0.004	< 0.005	09-04-14	564	0.023 ± 0.003	< 0.007
03-13-14	210	0.032 ± 0.007	< 0.020	09-11-14	540	0.018 ± 0.003	< 0.007
03-19-14	445	0.019 ± 0.003	< 0.007	09-18-14	489	0.017 ± 0.003	< 0.005
03-27-14	604	0.024 ± 0.003	< 0.010	09-25-14	294	0.040 ± 0.005	< 0.012
04-03-14	529	0.024 ± 0.003	< 0.010	10-02-14	533	0.025 ± 0.003	< 0.007
1Q 2014	Mean ± s.d.	0.030 ± 0.007	< 0.020	3Q 2014	Mean ± s.d.	0.022 ± 0.006	< 0.013
04-09-14	430	0.019 ± 0.003	< 0.010	10-09-14	493	0.025 ± 0.003	< 0.013
04-17-14	594	0.024 ± 0.003	< 0.012	10-16-14	544	0.018 ± 0.003	< 0.009
04-24-14	505	0.026 ± 0.003	< 0.008	10-23-14	517	0.013 ± 0.003	< 0.011
05-01-14	524	0.014 ± 0.003	< 0.011	10-30-14	513	0.027 ± 0.003	< 0.007
05-08-14	507	0.012 ± 0.003	< 0.007	11-06-14	564	0.017 ± 0.003	< 0.011
05-15-14	526	0.022 ± 0.003	< 0.011	11-13-14	539	0.017 ± 0.003	< 0.008
05-21-14	461	0.020 ± 0.003	< 0.009	11-20-14	528	0.023 ± 0.003	< 0.008
05-28-14	535	0.016 ± 0.003	< 0.006	11-26-14	442	0.030 ± 0.004	< 0.013
06-05-14	620	0.015 ± 0.002	< 0.006	12-04-14	620	0.028 ± 0.003	< 0.006
06-12-14	519	0.016 ± 0.003	< 0.006	12-10-14	444	0.030 ± 0.004	< 0.013
06-19-14	338	0.022 ± 0.004	< 0.020	12-18-14	590	0.038 ± 0.003	< 0.005
06-26-14	547	0.015 ± 0.003	< 0.011	12-25-14	529	0.016 ± 0.003	< 0.009
07-03-14	550	0.017 ± 0.003	< 0.013	12-31-14	438	0.027 ± 0.003	< 0.016
2Q 2014	Mean ± s.d.	0.018 ± 0.004	< 0.020	4Q 2014	Mean ± s.d.	0.024 ± 0.007	< 0.016
				Cumulative Average		0.023	

Table 2. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131.

Location: P-5

Units: pCi/m^3

Collection: Continuous, weekly exchange.

Date Collected	Volume (m^3)	Gross Beta	I-131	Date Collected	Volume (m^3)	Gross Beta	I-131
Required LLD		0.0075	0.050			0.0075	0.050
01-08-14	446	0.025 ± 0.003	< 0.011	07-10-14	547	0.018 ± 0.003	< 0.010
01-15-14	547	0.034 ± 0.003	< 0.006	07-17-14	525	0.021 ± 0.003	< 0.005
01-22-14	527	0.030 ± 0.003	< 0.005	07-23-14	439	0.026 ± 0.004	< 0.006
01-30-14	613	0.022 ± 0.003	< 0.009	07-31-14	558	0.020 ± 0.003	< 0.007
02-06-14	511	0.031 ± 0.003	< 0.012	08-07-14	509	0.030 ± 0.003	< 0.007
02-13-14	551	0.029 ± 0.003	< 0.005	08-14-14	466	0.021 ± 0.003	< 0.014
02-20-14	509	0.034 ± 0.003	< 0.012	08-21-14	498	0.021 ± 0.003	< 0.010
02-27-14	503	0.028 ± 0.003	< 0.009	08-28-14	443	0.027 ± 0.003	< 0.015
03-05-14	420	0.043 ± 0.004	< 0.006	09-04-14	498	0.027 ± 0.003	< 0.008
03-13-14	208	0.040 ± 0.007	< 0.018	09-11-14	463	0.026 ± 0.003	< 0.008
03-19-14	420	0.019 ± 0.004	< 0.008	09-18-14	458	0.016 ± 0.003	< 0.005
03-27-14	596	0.023 ± 0.003	< 0.011	09-25-14	464	0.028 ± 0.003	< 0.008
04-03-14	510	0.025 ± 0.003	< 0.010	10-02-14	470	0.029 ± 0.003	< 0.008
1Q 2014	Mean ± s.d.	0.029 ± 0.007	< 0.018	3Q 2014	Mean ± s.d.	0.024 ± 0.005	< 0.015
04-09-14	411	0.018 ± 0.004	< 0.011	10-09-14	432	0.032 ± 0.004	< 0.015
04-17-14	562	0.022 ± 0.003	< 0.012	10-16-14	464	0.021 ± 0.003	< 0.011
04-24-14	497	0.029 ± 0.003	< 0.008	10-23-14	445	0.015 ± 0.003	< 0.013
05-01-14	490	0.014 ± 0.003	< 0.012	10-30-14	425	0.031 ± 0.004	< 0.009
05-08-14	495	0.014 ± 0.003	< 0.007	11-06-14	590	0.020 ± 0.003	< 0.010
05-15-14	573	0.022 ± 0.003	< 0.010	11-13-14	584	0.020 ± 0.003	< 0.008
05-21-14	495	0.019 ± 0.003	< 0.008	11-20-14	594	0.024 ± 0.003	< 0.007
05-28-14	559	0.016 ± 0.003	< 0.006	11-26-14	493	0.032 ± 0.003	< 0.011
06-05-14	626	0.017 ± 0.002	< 0.006	12-04-14	680	0.028 ± 0.003	< 0.005
06-12-14	536	0.015 ± 0.003	< 0.006	12-10-14	508	0.036 ± 0.003	< 0.012
06-19-14	541	0.015 ± 0.003	< 0.012	12-18-14	648	0.038 ± 0.003	< 0.005
06-26-14	549	0.014 ± 0.003	< 0.011	12-25-14	584	0.017 ± 0.003	< 0.008
07-03-14	552	0.019 ± 0.003	< 0.013	12-31-14	493	0.024 ± 0.003	< 0.014
2Q 2014	Mean ± s.d.	0.018 ± 0.004	< 0.013	4Q 2014	Mean ± s.d.	0.026 ± 0.007	< 0.015
				Cumulative Average		0.024	

Table 2. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131.

Location: P-6

Units: pCi/m^3

Collection: Continuous, weekly exchange.

Date Collected	Volume (m^3)	Gross Beta	I-131	Date Collected	Volume (m^3)	Gross Beta	I-131
Required LLD		0.0075	0.050			0.0075	0.050
01-08-14	464	0.028 ± 0.003	< 0.011	07-10-14	536	0.017 ± 0.003	< 0.010
01-15-14	566	0.033 ± 0.003	< 0.006	07-17-14	533	0.021 ± 0.003	< 0.005
01-22-14	544	0.028 ± 0.003	< 0.005	07-23-14	463	0.026 ± 0.003	< 0.006
01-30-14	619	0.023 ± 0.003	< 0.009	07-31-14	612	0.016 ± 0.002	< 0.006
02-06-14	549	0.031 ± 0.003	< 0.011	08-07-14	537	0.026 ± 0.003	< 0.007
02-13-14	555	0.032 ± 0.003	< 0.005	08-14-14	540	0.017 ± 0.003	< 0.012
02-20-14	531	0.038 ± 0.003	< 0.012	08-21-14	554	0.018 ± 0.003	< 0.009
02-27-14	528	0.030 ± 0.003	< 0.008	08-28-14	505	0.026 ± 0.003	< 0.014
03-05-14	467	0.041 ± 0.004	< 0.005	09-04-14	549	0.023 ± 0.003	< 0.007
03-13-14	635	0.029 ± 0.003	< 0.006	09-11-14	531	0.022 ± 0.003	< 0.007
03-19-14	443	0.021 ± 0.003	< 0.007	09-18-14	524	0.014 ± 0.003	< 0.005
03-27-14	611	0.026 ± 0.003	< 0.010	09-25-14	520	0.025 ± 0.003	< 0.007
04-03-14	546	0.023 ± 0.003	< 0.010	10-02-14	544	0.024 ± 0.003	< 0.007
1Q 2014	Mean ± s.d.	0.029 ± 0.006	< 0.012	3Q 2014	Mean ± s.d.	0.021 ± 0.004	< 0.014
04-09-14	444	0.020 ± 0.003	< 0.010	10-09-14	307	0.041 ± 0.005	< 0.020
04-17-14	607	0.026 ± 0.003	< 0.011	10-16-14	531	0.018 ± 0.003	< 0.010
04-24-14	533	0.025 ± 0.003	< 0.008	10-23-14	528	0.012 ± 0.003	< 0.011
05-01-14	404	0.019 ± 0.004	< 0.014	10-30-14	495	0.023 ± 0.003	< 0.007
05-08-14	521	0.013 ± 0.003	< 0.006	11-06-14	455	0.018 ± 0.003	< 0.013
05-15-14	546	0.024 ± 0.003	< 0.011	11-13-14	532	0.022 ± 0.003	< 0.008
05-21-14	482	0.022 ± 0.003	< 0.008	11-20-14	594	0.027 ± 0.003	< 0.007
05-28-14	547	0.016 ± 0.003	< 0.006	11-26-14	502	0.034 ± 0.003	< 0.011
06-05-14	615	0.017 ± 0.003	< 0.006	12-04-14	677	0.030 ± 0.003	< 0.005
06-12-14	533	0.017 ± 0.003	< 0.006	12-10-14	509	0.037 ± 0.003	< 0.012
06-19-14	526	0.015 ± 0.003	< 0.013	12-18-14	655	0.039 ± 0.003	< 0.004
06-26-14	558	0.014 ± 0.003	< 0.011	12-25-14	579	0.020 ± 0.003	< 0.008
07-03-14	531	0.019 ± 0.003	< 0.014	12-31-14	518	0.026 ± 0.003	< 0.013
2Q 2014	Mean ± s.d.	0.019 ± 0.004	< 0.014	4Q 2014	Mean ± s.d.	0.027 ± 0.009	< 0.020
				Cumulative Average		0.024	

Table 2. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131.

Location: P-7

Units: pCi/m^3

Collection: Continuous, weekly exchange.

Date Collected	Volume (m^3)	Gross Beta	I-131	Date Collected	Volume (m^3)	Gross Beta	I-131
Required LLD		0.0075	0.050			0.0075	0.050
01-08-14	444	0.027 ± 0.003	< 0.011	07-10-14	576	0.019 ± 0.003	< 0.010
01-15-14	547	0.030 ± 0.003	< 0.006	07-17-14	540	0.022 ± 0.003	< 0.005
01-22-14	530	0.027 ± 0.003	< 0.005	07-23-14	505	0.023 ± 0.003	< 0.005
01-30-14	611	0.021 ± 0.003	< 0.009	07-31-14	645	0.018 ± 0.002	< 0.006
02-06-14	531	0.028 ± 0.003	< 0.011	08-07-14	557	0.030 ± 0.003	< 0.007
02-13-14	543	0.030 ± 0.003	< 0.005	08-14-14	573	0.019 ± 0.003	< 0.011
02-20-14	575	0.027 ± 0.003	< 0.011	08-21-14	562	0.019 ± 0.003	< 0.009
02-27-14	568	0.026 ± 0.003	< 0.008	08-28-14	531	0.020 ± 0.003	< 0.013
03-05-14	458	0.033 ± 0.004	< 0.005	09-04-14	565	0.026 ± 0.003	< 0.007
03-13-14	636	0.026 ± 0.003	< 0.008	09-11-14	549	0.022 ± 0.003	< 0.007
03-19-14	495	0.014 ± 0.003	< 0.007	09-18-14	533	0.015 ± 0.003	< 0.005
03-27-14	656	0.020 ± 0.002	< 0.010	09-25-14	546	0.025 ± 0.003	< 0.007
04-03-14	588	0.022 ± 0.003	< 0.009	10-02-14	561	0.028 ± 0.003	< 0.007
1Q 2014	Mean ± s.d.	0.025 ± 0.005	< 0.011	3Q 2014	Mean ± s.d.	0.022 ± 0.004	< 0.013
04-09-14	493	0.016 ± 0.003	< 0.009	10-09-14	536	0.027 ± 0.003	< 0.012
04-17-14	650	0.024 ± 0.003	< 0.011	10-16-14	547	0.020 ± 0.003	< 0.009
04-24-14	573	0.023 ± 0.003	< 0.007	10-23-14	548	0.013 ± 0.003	< 0.011
05-01-14	582	0.014 ± 0.002	< 0.010	10-30-14	527	0.027 ± 0.003	< 0.007
05-08-14	561	0.013 ± 0.002	< 0.006	11-06-14	584	0.023 ± 0.003	< 0.010
05-15-14	571	0.019 ± 0.003	< 0.010	11-13-14	554	0.020 ± 0.003	< 0.008
05-21-14	503	0.019 ± 0.003	< 0.008	11-20-14	544	0.030 ± 0.003	< 0.008
05-28-14	574	0.019 ± 0.003	< 0.006	11-26-14	465	0.035 ± 0.004	< 0.012
06-05-14	650	0.016 ± 0.002	< 0.006	12-04-14	666	0.030 ± 0.003	< 0.006
06-12-14	562	0.016 ± 0.003	< 0.005	12-10-14	468	0.040 ± 0.004	< 0.013
06-19-14	568	0.010 ± 0.003	< 0.012	12-18-14	620	0.048 ± 0.003	< 0.005
06-26-14	577	0.013 ± 0.003	< 0.011	12-25-14	534	0.021 ± 0.003	< 0.009
07-03-14	566	0.022 ± 0.003	< 0.013	12-31-14	462	0.027 ± 0.003	< 0.015
2Q 2014	Mean ± s.d.	0.017 ± 0.004	< 0.013	4Q 2014	Mean ± s.d.	0.028 ± 0.009	< 0.015
				Cumulative Average		0.023	

Table 2. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131.

Location: P-35

Units: pCi/m^3

Collection: Continuous, weekly exchange.

Date Collected	Volume (m^3)	Gross Beta	I-131	Date Collected	Volume (m^3)	Gross Beta	I-131
Required LLD		0.0075	0.050			0.0075	0.050
01-08-14	460	0.027 ± 0.003	< 0.022	07-10-14	644	0.015 ± 0.002	< 0.009
01-15-14	558	0.039 ± 0.003	< 0.009	07-17-14	601	0.018 ± 0.003	< 0.009
01-22-14	543	0.027 ± 0.003	< 0.013	07-23-14	542	0.022 ± 0.003	< 0.009
01-30-14	632	0.021 ± 0.003	< 0.007	07-31-14	724	0.016 ± 0.002	< 0.009
02-06-14	543	0.030 ± 0.003	< 0.008	08-07-14	611	0.022 ± 0.003	< 0.010
02-13-14	560	0.031 ± 0.003	< 0.011	08-14-14	636	0.018 ± 0.002	< 0.011
02-20-14	547	0.035 ± 0.003	< 0.007	08-21-14	635	0.018 ± 0.003	< 0.010
02-27-14	530	0.031 ± 0.003	< 0.011	08-28-14	584	0.022 ± 0.003	< 0.012
03-05-14	457	0.039 ± 0.004	< 0.008	09-04-14	642	0.024 ± 0.003	< 0.016
03-13-14	228	0.033 ± 0.006	< 0.017	09-11-14	626	0.019 ± 0.002	< 0.010
03-19-14	468	0.019 ± 0.003	< 0.017	09-18-14	603	0.012 ± 0.002	< 0.014
03-27-14	621	0.024 ± 0.003	< 0.009	09-25-14	618	0.022 ± 0.003	< 0.010
04-03-14	548	0.023 ± 0.003	< 0.010	10-02-14	639	0.022 ± 0.002	< 0.011
1Q 2014	Mean ± s.d.	0.029 ± 0.006	< 0.022	3Q 2014	Mean ± s.d.	0.019 ± 0.003	< 0.016
04-09-14	459	0.017 ± 0.003	< 0.006	10-09-14	612	0.024 ± 0.003	< 0.009
04-17-14	615	0.025 ± 0.003	< 0.015	10-16-14	622	0.016 ± 0.002	< 0.005
04-24-14	531	0.029 ± 0.003	< 0.023	10-23-14	629	0.011 ± 0.002	< 0.004
05-01-14	551	0.012 ± 0.003	< 0.009	10-30-14	602	0.023 ± 0.003	< 0.011
05-08-14	538	0.014 ± 0.003	< 0.014	11-06-14	621	0.019 ± 0.002	< 0.005
05-15-14	593	0.022 ± 0.003	< 0.013	11-13-14	616	0.019 ± 0.002	< 0.008
05-21-14	538	0.019 ± 0.003	< 0.016	11-20-14	589	0.024 ± 0.003	< 0.010
05-28-14	560	0.017 ± 0.003	< 0.013	11-26-14	508	0.033 ± 0.003	< 0.012
06-05-14	650	0.015 ± 0.002	< 0.009	12-04-14	696	0.030 ± 0.003	< 0.009
06-12-14	573	0.015 ± 0.003	< 0.007	12-10-14	505	0.033 ± 0.003	< 0.009
06-19-14	574	0.013 ± 0.003	< 0.012	12-18-14	658	0.040 ± 0.003	< 0.004
06-26-14	548	0.013 ± 0.003	< 0.017	12-25-14	583	0.017 ± 0.003	< 0.013
07-03-14	605	0.019 ± 0.002	< 0.010	12-31-14	507	0.027 ± 0.003	< 0.012
2Q 2014	Mean ± s.d.	0.018 ± 0.005	< 0.023	4Q 2014	Mean ± s.d.	0.024 ± 0.008	< 0.013
				Cumulative Average		0.023	

Table 3. Airborne particulates, analyses for gamma-emitting isotopes.
Collection: Quarterly Composite
Units: pCi/m^3

Location	PE-1				
Quarter	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	Req. LLD
Lab Code	PEAP- 1809	PEAP- 3783	PEAP- 5999	PEAP- 7466	
Vol. (m^3)	6591	7198	7101	7477	
Be-7	0.061 ± 0.010	0.060 ± 0.010	0.054 ± 0.009	0.045 ± 0.008	-
Co-58	< 0.0004	< 0.0002	< 0.0004	< 0.0004	-
Co-60	< 0.0002	< 0.0004	< 0.0004	< 0.0002	-
Cs-134	< 0.0005	< 0.0004	< 0.0004	< 0.0005	0.037
Cs-137	< 0.0003	< 0.0003	< 0.0004	< 0.0004	0.045

Location	PE-3				
Lab Code	PEAP- 1810	PEAP- 3785	PEAP- 6000	PEAP- 7467	
Vol. (m^3)	6718	7443	7719	8376	
Be-7	0.058 ± 0.011	0.058 ± 0.008	0.051 ± 0.009	0.051 ± 0.008	-
Co-58	< 0.0004	< 0.0003	< 0.0003	< 0.0004	-
Co-60	< 0.0002	< 0.0003	< 0.0003	< 0.0004	-
Cs-134	< 0.0005	< 0.0004	< 0.0004	< 0.0003	0.037
Cs-137	< 0.0003	< 0.0003	< 0.0004	< 0.0003	0.045

Location	PE-4				
Lab Code	PEAP- 1811	PEAP- 3786	PEAP- 6001	PEAP- 7468	
Vol. (m^3)	6500	6555	6644	6761	
Be-7	0.058 ± 0.009	0.069 ± 0.011	0.061 ± 0.010	0.056 ± 0.010	-
Co-58	< 0.0003	< 0.0004	< 0.0003	< 0.0004	-
Co-60	< 0.0002	< 0.0004	< 0.0004	< 0.0004	-
Cs-134	< 0.0006	< 0.0004	< 0.0006	< 0.0005	0.037
Cs-137	< 0.0003	< 0.0003	< 0.0005	< 0.0003	0.045

Location	PE-5				
Lab Code	PEAP- 1812	PEAP- 3787	PEAP- 6002	PEAP- 7469	
Vol. (m^3)	6361	6887	6338	6940	
Be-7	0.065 ± 0.012	0.069 ± 0.009	0.061 ± 0.010	0.061 ± 0.008	-
Co-58	< 0.0004	< 0.0003	< 0.0005	< 0.0004	-
Co-60	< 0.0002	< 0.0004	< 0.0002	< 0.0004	-
Cs-134	< 0.0004	< 0.0005	< 0.0004	< 0.0003	0.037
Cs-137	< 0.0004	< 0.0006	< 0.0005	< 0.0003	0.045

Table 3. Airborne particulates, analyses for gamma-emitting isotopes.
Collection: Quarterly Composite
Units: pCi/m^3

Location	PE-6				
Quarter	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	Req. LLD
Lab Code	PEAP- 1813	PEAP- 3788	PEAP- 6003	PEAP- 7471	
Vol. (m^3)	7058	6845	6947	6993	
Be-7	0.057 ± 0.008	0.066 ± 0.011	0.059 ± 0.008	0.057 ± 0.008	-
Co-58	< 0.0004	< 0.0003	< 0.0001	< 0.0003	-
Co-60	< 0.0003	< 0.0004	< 0.0004	< 0.0004	-
Cs-134	< 0.0004	< 0.0005	< 0.0003	< 0.0005	0.037
Cs-137	< 0.0004	< 0.0003	< 0.0002	< 0.0004	0.045

Location	PE-7				
Lab Code	PEAP- 1814	PEAP- 3789	PEAP- 6004	PEAP- 7472	
Vol. (m^3)	7182	7431	7243	7055	
Be-7	0.054 ± 0.007	0.057 ± 0.009	0.060 ± 0.010	0.057 ± 0.009	-
Co-58	< 0.0003	< 0.0003	< 0.0005	< 0.0003	-
Co-60	< 0.0003	< 0.0003	< 0.0004	< 0.0003	-
Cs-134	< 0.0004	< 0.0005	< 0.0005	< 0.0004	0.037
Cs-137	< 0.0003	< 0.0004	< 0.0003	< 0.0003	0.045

Location	PE-35				
Lab Code	PEAP- 1815	PEAP- 3790	PEAP- 6005	PEAP- 7473	
Vol. (m^3)	6695	7338	8106	7747	
Be-7	0.057 ± 0.012	0.064 ± 0.010	0.058 ± 0.010	0.044 ± 0.007	-
Co-58	< 0.0009	< 0.0003	< 0.0002	< 0.0004	-
Co-60	< 0.0007	< 0.0004	< 0.0004	< 0.0002	-
Cs-134	< 0.0007	< 0.0005	< 0.0005	< 0.0003	0.037
Cs-137	< 0.0006	< 0.0003	< 0.0003	< 0.0004	0.045

Table 4. Lake water, analyses for gross beta and gamma emitting isotopes.

Location: P-28 Collection: Monthly composites Units: pCi/L

Lab Code	PELW- 354	PELW- 760 [a]	PELW- 1210	PELW- 1749	
Start Date	12-23-13	02-27-14	02-27-14	03-27-14	Req. LLD
End Date	01-30-14	02-27-14	03-27-14	04-24-14	
Gross beta	< 1.9	2.5 ± 0.8	2.3 ± 0.8	2.5 ± 0.9	3.0
Mn-54	< 3.2	< 2.6	< 2.1	< 1.9	11
Fe-59	< 8.9	< 5.8	< 4.4	< 3.5	22
Co-58	< 3.4	< 2.8	< 2.4	< 1.8	11
Co-60	< 4.9	< 2.0	< 1.5	< 2.0	11
Zn-65	< 8.2	< 1.5	< 1.9	< 2.1	22
Zr-95	< 8.7	< 3.5	< 5.2	< 4.1	22
Nb-95	< 6.9	< 3.0	< 2.3	< 2.5	11
Cs-134	< 4.7	< 2.8	< 2.2	< 2.4	11
Cs-137	< 4.0	< 1.9	< 2.6	< 2.5	13
Ba-140	< 27.7	< 18.8	< 16.3	< 12.2	45
La-140	< 6.6	< 3.1	< 2.3	< 4.1	11

Lab Code	PELW- 2396	PELW- 3105	PELW- 3930	PELW- 4561	
Start Date	04-24-14	05-27-14	06-30-14	07-31-14	Req. LLD
End Date	05-27-14	06-30-14	07-31-14	08-28-14	
Gross beta	1.5 ± 0.4	3.2 ± 1.1	1.0 ± 0.4	2.5 ± 0.8	3.0
Mn-54	< 2.1	< 2.2	< 2.1	< 2.5	11
Fe-59	< 5.2	< 2.3	< 4.0	< 5.6	22
Co-58	< 2.8	< 1.3	< 1.6	< 2.2	11
Co-60	< 2.0	< 2.3	< 2.3	< 2.3	11
Zn-65	< 2.2	< 4.7	< 2.5	< 4.8	22
Zr-95	< 5.3	< 3.8	< 2.8	< 4.5	22
Nb-95	< 3.6	< 4.6	< 1.5	< 2.4	11
Cs-134	< 2.4	< 3.9	< 2.5	< 3.1	11
Cs-137	< 2.9	< 2.9	< 1.5	< 2.8	13
Ba-140	< 19.0	< 13.5	< 22.3	< 29.4	45
La-140	< 2.8	< 4.6	< 5.1	< 6.5	11

Lab Code	PELW- 5172	PELW- 6244	PELW- 6811	PELW- 7253	
Start Date	08-28-14	09-25-14	10-30-14	11-26-14	Req. LLD
End Date	09-25-14	10-30-14	11-26-14	12-29-14	
Gross beta	1.5 ± 0.6	2.6 ± 0.9	2.6 ± 0.8	1.6 ± 0.8	3.0
Mn-54	< 1.2	< 2.2	< 1.6	< 1.8	11
Fe-59	< 4.5	< 3.9	< 4.8	< 5.4	22
Co-58	< 2.3	< 3.0	< 2.6	< 3.5	11
Co-60	< 1.7	< 1.9	< 1.2	< 2.0	11
Zn-65	< 4.1	< 6.0	< 2.1	< 2.8	22
Zr-95	< 3.7	< 4.7	< 2.5	< 6.0	22
Nb-95	< 3.3	< 5.0	< 2.8	< 4.0	11
Cs-134	< 3.0	< 3.2	< 2.6	< 3.0	11
Cs-137	< 3.6	< 2.4	< 3.7	< 2.3	13
Ba-140	< 15.7	< 27.0	< 18.5	< 20.5	45
La-140	< 3.3	< 4.3	< 4.0	< 4.9	11

[a] Grab sample.

Table 4. Lake water, analyses for gross beta and gamma emitting isotopes.

Location: P-34 Collection: Monthly composites Units: pCi/L

Lab Code	PELW- 355	PELW- 761	PELW- 1211	PELW- 1750	
Start Date	12-23-13	01-30-14	02-27-14	03-27-14	Req. LLD
End Date	01-30-14	02-27-14	03-27-14	04-24-14	
Gross beta	3.0 ± 1.0	2.3 ± 0.8	< 1.0	2.2 ± 0.8	3.0
Mn-54	< 2.8	< 1.8	< 3.2	< 2.3	11
Fe-59	< 3.8	< 5.0	< 3.1	< 2.0	22
Co-58	< 2.5	< 2.1	< 2.6	< 1.9	11
Co-60	< 2.5	< 2.2	< 1.4	< 2.1	11
Zn-65	< 3.5	< 4.2	< 4.8	< 2.5	22
Zr-95	< 4.2	< 4.9	< 5.0	< 4.2	22
Nb-95	< 2.5	< 3.2	< 3.3	< 2.4	11
Cs-134	< 2.3	< 2.5	< 3.1	< 2.5	11
Cs-137	< 3.3	< 2.1	< 3.2	< 2.2	13
Ba-140	< 13.3	< 13.8	< 10.2	< 14.6	45
La-140	< 4.4	< 3.6	< 2.1	< 1.5	11

Lab Code	PELW- 2397	PELW- 3106	PELW- 3931	PELW- 4562	
Start Date	04-24-14	05-27-14	06-30-14	07-31-14	Req. LLD
End Date	05-27-14	06-30-14	07-31-14	08-28-14	
Gross beta	1.7 ± 0.4	2.0 ± 0.9	1.0 ± 0.4	2.1 ± 0.7	3.0
Mn-54	< 2.9	< 2.2	< 2.1	< 2.1	11
Fe-59	< 4.3	< 4.4	< 5.0	< 7.0	22
Co-58	< 1.5	< 2.0	< 1.6	< 2.2	11
Co-60	< 1.9	< 2.2	< 1.8	< 2.7	11
Zn-65	< 3.4	< 5.0	< 2.8	< 5.0	22
Zr-95	< 3.7	< 4.4	< 4.3	< 5.2	22
Nb-95	< 1.7	< 2.6	< 3.5	< 3.6	11
Cs-134	< 2.7	< 2.8	< 3.0	< 3.0	11
Cs-137	< 2.6	< 3.1	< 2.9	< 3.0	13
Ba-140	< 14.4	< 16.2	< 18.8	< 32.2	45
La-140	< 3.7	< 3.6	< 2.8	< 4.0	11

Lab Code	PELW- 5173	PELW- 6245	PELW- 6812	PELW- 7254	
Start Date	08-28-14	09-25-14	10-30-14	11-26-14	Req. LLD
End Date	09-25-14	10-30-14	11-26-14	12-29-14	
Gross beta	1.9 ± 0.6	2.4 ± 0.8	2.3 ± 0.7	2.5 ± 0.7	3.0
Mn-54	< 3.6	< 3.0	< 1.3	< 1.6	11
Fe-59	< 5.4	< 5.0	< 4.9	< 3.3	22
Co-58	< 1.9	< 2.9	< 2.4	< 2.0	11
Co-60	< 1.9	< 1.5	< 1.1	< 1.9	11
Zn-65	< 2.4	< 3.3	< 4.7	< 3.7	22
Zr-95	< 4.1	< 4.5	< 3.5	< 4.8	22
Nb-95	< 3.5	< 2.7	< 2.6	< 2.7	11
Cs-134	< 3.9	< 2.3	< 2.5	< 2.1	11
Cs-137	< 2.0	< 2.9	< 2.9	< 1.7	13
Ba-140	< 17.4	< 29.6	< 21.0	< 23.2	45
La-140	< 2.2	< 3.5	< 3.2	< 4.2	11

Table 4. Lake water, analyses for gross beta and gamma emitting isotopes.

Location: P-36 Collection: Monthly composites Units: pCi/L

Lab Code	PELW- 356	PELW- 762	PELW- 1212	PELW- 1751	
Start Date	12-23-13	01-30-14	02-27-14	03-27-14	Req. LLD
End Date	01-30-14	02-27-14	03-27-14	04-24-14	
Gross beta	< 1.8	1.6 ± 0.8	2.0 ± 0.7	1.8 ± 0.8	3.0
Mn-54	< 2.3	< 1.5	< 2.3	< 2.4	11
Fe-59	< 2.8	< 3.1	< 3.7	< 2.0	22
Co-58	< 2.8	< 2.1	< 2.7	< 3.1	11
Co-60	< 2.2	< 2.1	< 1.9	< 1.3	11
Zn-65	< 3.2	< 5.1	< 1.6	< 2.6	22
Zr-95	< 4.5	< 4.0	< 4.9	< 4.1	22
Nb-95	< 2.3	< 3.0	< 2.6	< 2.7	11
Cs-134	< 2.7	< 2.5	< 2.6	< 2.7	11
Cs-137	< 3.5	< 2.4	< 2.5	< 3.3	13
Ba-140	< 18.0	< 17.6	< 13.5	< 16.1	45
La-140	< 2.1	< 3.8	< 4.7	< 4.8	11

Lab Code	PELW- 2398	PELW- 3107	PELW- 3933	PELW- 4563	
Start Date	04-24-14	05-27-14	06-30-14	07-31-14	Req. LLD
End Date	05-27-14	06-30-14	07-31-14	08-28-14	
Gross beta	1.3 ± 0.4	2.2 ± 1.0	1.1 ± 0.4	2.0 ± 0.8	3.0
Mn-54	< 2.6	< 2.7	< 2.4	< 2.4	11
Fe-59	< 2.9	< 4.0	< 4.5	< 5.7	22
Co-58	< 1.6	< 3.1	< 1.3	< 2.2	11
Co-60	< 1.9	< 2.1	< 1.8	< 2.9	11
Zn-65	< 2.9	< 3.5	< 3.0	< 2.6	22
Zr-95	< 5.0	< 5.2	< 4.1	< 4.1	22
Nb-95	< 3.6	< 1.3	< 2.5	< 2.1	11
Cs-134	< 2.5	< 2.8	< 1.9	< 2.6	11
Cs-137	< 2.9	< 1.6	< 2.0	< 1.9	13
Ba-140	< 19.4	< 16.0	< 33.8	< 17.6	45
La-140	< 4.3	< 2.8	< 5.2	< 4.2	11

Lab Code	PELW- 5175	PELW- 6246	PELW- 6813	PELW- 7255	
Start Date	08-28-14	09-25-14	10-30-14	11-26-14	Req. LLD
End Date	09-25-14	10-30-14	11-26-14	12-29-14	
Gross beta	1.0 ± 0.5	2.2 ± 0.8	3.0 ± 0.8	2.2 ± 0.8	3.0
Mn-54	< 2.6	< 2.7	< 2.2	< 2.0	11
Fe-59	< 8.5	< 5.3	< 3.1	< 3.7	22
Co-58	< 2.8	< 1.4	< 1.3	< 2.8	11
Co-60	< 2.4	< 1.9	< 2.0	< 1.3	11
Zn-65	< 4.3	< 2.0	< 5.2	< 3.0	22
Zr-95	< 7.6	< 4.0	< 3.1	< 2.9	22
Nb-95	< 3.5	< 2.9	< 3.0	< 2.4	11
Cs-134	< 4.2	< 2.6	< 2.6	< 2.3	11
Cs-137	< 2.7	< 2.9	< 2.6	< 2.6	13
Ba-140	< 15.5	< 20.4	< 23.7	< 15.6	45
La-140	< 2.9	< 7.5	< 4.9	< 3.5	11

Table 4. Lake water, analyses for gross beta and gamma emitting isotopes.

Location: P-59 Collection: Monthly composites Units: pCi/L

Lab Code	NS [a]	NS [a]	NS [a]	PELW- 1752	
Start Date	-	-	-	-	Req. LLD
End Date	01-30-14	02-27-14	03-27-14	04-24-14	
Gross beta	-	-	-	2.6 ± 0.8	3.0
Mn-54	-	-	-	< 3.0	11
Fe-59	-	-	-	< 2.8	22
Co-58	-	-	-	< 1.5	11
Co-60	-	-	-	< 1.4	11
Zn-65	-	-	-	< 4.3	22
Zr-95	-	-	-	< 3.6	22
Nb-95	-	-	-	< 2.4	11
Cs-134	-	-	-	< 3.1	11
Cs-137	-	-	-	< 3.0	13
Ba-140	-	-	-	< 11.3	45
La-140	-	-	-	< 1.8	11

Lab Code	PELW- 2399	PELW- 3108	PELW- 3934	PELW- 4565	
Start Date	04-24-14	05-27-14	06-30-14	07-31-14	Req. LLD
End Date	05-27-14	06-30-14	07-31-14	08-28-14	
Gross beta	1.5 ± 0.4	2.4 ± 0.9	1.2 ± 0.4	2.5 ± 0.7	3.0
Mn-54	< 3.2	< 2.6	< 1.7	< 2.2	11
Fe-59	< 2.9	< 3.1	< 5.5	< 2.5	22
Co-58	< 2.3	< 1.5	< 1.8	< 1.5	11
Co-60	< 1.8	< 3.1	< 1.5	< 1.8	11
Zn-65	< 4.5	< 2.0	< 2.6	< 3.2	22
Zr-95	< 3.9	< 5.4	< 2.9	< 3.8	22
Nb-95	< 3.4	< 2.4	< 2.5	< 3.5	11
Cs-134	< 3.4	< 2.9	< 2.0	< 2.4	11
Cs-137	< 2.8	< 2.8	< 1.5	< 2.9	13
Ba-140	< 23.3	< 11.4	< 29.4	< 20.5	45
La-140	< 4.4	< 3.2	< 6.0	< 4.3	11

Lab Code	PELW- 5176	PELW- 6247	PELW- 6814	PELW- 7256	
Start Date	08-28-14	09-25-14	10-30-14	11-26-14	Req. LLD
End Date	09-25-14	10-30-14	11-26-14	12-29-14	
Gross beta	1.0 ± 0.5	3.4 ± 0.8	2.6 ± 0.7	1.6 ± 0.7	3.0
Mn-54	< 2.3	< 3.3	< 1.7	< 2.2	11
Fe-59	< 5.9	< 8.7	< 3.7	< 5.1	22
Co-58	< 1.7	< 3.8	< 2.2	< 2.2	11
Co-60	< 2.8	< 5.8	< 1.6	< 1.4	11
Zn-65	< 2.6	< 6.6	< 1.7	< 5.3	22
Zr-95	< 4.1	< 7.8	< 3.9	< 3.4	22
Nb-95	< 3.4	< 5.0	< 3.9	< 3.2	11
Cs-134	< 2.4	< 5.2	< 2.4	< 3.1	11
Cs-137	< 3.4	< 3.4	< 2.9	< 3.0	13
Ba-140	< 13.5	< 25.2	< 20.9	< 25.2	45
La-140	< 4.0	< 3.7	< 2.1	< 5.2	11

[a] No sample available, shoreline inaccessible.

Table 4. Lake water, analyses for gross beta and gamma emitting isotopes.

Location: P-60 Collection: Monthly composites Units: pCi/L

Lab Code	NS [a]	NS [a]	NS [a]	PELW- 1753	
Start Date	-	-	-	-	Req. LLD
End Date	01-30-14	02-27-14	03-27-14	04-24-14	
Gross beta	-	-	-	2.2 ± 0.8	3.0
Mn-54	-	-	-	< 1.7	11
Fe-59	-	-	-	< 3.9	22
Co-58	-	-	-	< 1.6	11
Co-60	-	-	-	< 2.3	11
Zn-65	-	-	-	< 3.3	22
Zr-95	-	-	-	< 4.6	22
Nb-95	-	-	-	< 2.8	11
Cs-134	-	-	-	< 2.6	11
Cs-137	-	-	-	< 1.6	13
Ba-140	-	-	-	< 18.8	45
La-140	-	-	-	< 4.7	11

Lab Code	PELW- 2400	PELW- 3109	PELW- 3935	PELW- 4566	
Start Date	04-24-14	05-27-14	06-30-14	07-31-14	Req. LLD
End Date	05-27-14	06-30-14	07-31-14	08-28-14	
Gross beta	1.5 ± 0.5	2.9 ± 1.0	2.2 ± 0.5	4.5 ± 0.9	3.0
Mn-54	< 1.5	< 1.8	< 2.8	< 2.5	11
Fe-59	< 8.0	< 3.7	< 3.9	< 5.2	22
Co-58	< 1.6	< 1.7	< 2.3	< 2.4	11
Co-60	< 3.0	< 2.4	< 1.6	< 2.4	11
Zn-65	< 3.3	< 3.7	< 2.8	< 3.0	22
Zr-95	< 4.1	< 3.9	< 2.9	< 3.8	22
Nb-95	< 2.5	< 3.2	< 3.0	< 3.1	11
Cs-134	< 3.7	< 3.1	< 3.0	< 2.5	11
Cs-137	< 3.6	< 3.0	< 2.8	< 2.6	13
Ba-140	< 19.4	< 21.0	< 33.7	< 26.8	45
La-140	< 3.8	< 4.9	< 7.9	< 5.2	11

Lab Code	PELW- 5177	PELW- 6249	PELW- 6815	PELW- 7258	
Start Date	08-28-14	09-25-14	10-30-14	11-26-14	Req. LLD
End Date	09-25-14	10-30-14	11-26-14	12-29-14	
Gross beta	2.3 ± 0.8	2.5 ± 0.8	3.4 ± 0.8	3.6 ± 0.8	3.0
Mn-54	< 2.5	< 2.1	< 2.6	< 3.1	11
Fe-59	< 5.9	< 5.3	< 3.9	< 3.3	22
Co-58	< 2.1	< 2.2	< 2.5	< 2.7	11
Co-60	< 1.5	< 2.4	< 1.7	< 2.8	11
Zn-65	< 4.3	< 3.0	< 2.5	< 4.6	22
Zr-95	< 5.1	< 3.6	< 4.8	< 2.7	22
Nb-95	< 3.6	< 3.2	< 3.4	< 3.1	11
Cs-134	< 2.8	< 2.7	< 2.8	< 2.7	11
Cs-137	< 2.3	< 2.7	< 2.4	< 3.1	13
Ba-140	< 19.4	< 13.9	< 26.0	< 21.4	45
La-140	< 2.7	< 3.0	< 6.0	< 5.9	11

[a] No sample available, shoreline inaccessible.

Table 4. Lake Water, analysis for tritium.
Collection: Quarterly composites of monthly collections.
Units: pCi/L

Required limit of detection: 1500 pCi/L

Location		P-28		
Period	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
Lab Code	PELW- 1352	PELW- 3328	PELW- 5441	PELW- 7315
H-3	< 149	< 137	< 158	< 177

Location		P-34		
Period	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
Lab Code	PELW- 1353	PELW- 3329	PELW- 5442	PELW- 7316
H-3	< 149	< 137	< 158	< 177

Location		P-36		
Period	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
Lab Code	PELW- 1354	PELW- 3330	PELW- 5443	PELW- 7317
H-3	< 149	< 137	< 158	< 177

Location		P-59		
Period	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
Lab Code	NA [a]	PELW- 3331	PELW- 5445	PELW- 7318
H-3		< 137	< 158	< 177

Location		P-60		
Period	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
Lab Code	NA [a]	PELW- 3332	PELW- 5444	PELW- 7319
H-3		< 137	< 158	< 177

[a] No sample available, shoreline frozen.

Table 5. Milk, analyses for iodine-131 and gamma-emitting isotopes.
Collection: Semimonthly during grazing season, monthly at other times.

Collection	Lab	Concentration (pCi/L)					
Date	Code	I-131	Cs-134	Cs-137	Ba-140	La-140	K-40
Required LLD	(pCi/L)	0.8	11	13	45	11	-
P-18							
01-06-14	ND[a]	-	-	-	-	-	-
02-03-14	ND[a]	-	-	-	-	-	-
03-03-14	ND[a]	-	-	-	-	-	-
04-07-14	PEMI- 1410	< 0.4	< 4.1	< 4.4	< 20.5	< 2.6	1822 ± 126
04-21-14	PEMI- 1633	< 0.3	< 3.6	< 4.0	< 20.9	< 1.9	1840 ± 125
05-05-14	PEMI- 1997	< 0.2	< 4.1	< 4.0	< 31.7	< 5.5	1864 ± 120
05-19-14	PEMI- 2190	< 0.3	< 5.8	< 7.2	< 17.3	< 6.4	1632 ± 176
06-03-14	PEMI- 2510 [b]	< 0.3	< 2.8	< 2.7	< 57.4	< 13.1	1408 ± 89
06-16-14	PEMI- 2855	< 0.5	< 2.9	< 3.7	< 13.8	< 2.7	1887 ± 112
07-07-14	PEMI- 3247	< 0.4	< 4.4	< 4.3	< 26.1	< 5.0	1785 ± 126
07-22-14	PEMI- 3739	< 0.4	< 2.7	< 2.6	< 32.0	< 5.3	1772 ± 97
08-04-14	PEMI- 4030	< 0.3	< 3.8	< 3.9	< 16.8	< 3.6	1676 ± 110
08-18-14	PEMI- 4352	< 0.5	< 3.2	< 3.8	< 20.3	< 2.2	1860 ± 124
09-02-14	PEMI- 4639	< 0.4	< 3.6	< 3.6	< 21.4	< 2.5	1731 ± 124
09-15-14	PEMI- 4878	< 0.3	< 3.2	< 3.2	< 21.3	< 3.3	1750 ± 109
10-06-14	PEMI- 5379	< 0.4	< 2.8	< 3.8	< 17.3	< 3.7	1658 ± 113
10-20-14	PEMI- 5876	< 0.3	< 3.2	< 3.6	< 28.1	< 3.1	1454 ± 100
11-03-14	PEMI- 6275	< 0.5	< 11.4	< 4.2	< 17.0	< 2.1	1493 ± 111
12-01-14	PEMI- 6808	< 0.3	< 3.7	< 3.7	< 28.7	< 2.3	1397 ± 107
P-19							
01-05-14	PEMI- 72	< 0.4	< 3.0	< 3.1	< 16.5	< 3.6	1376 ± 110
02-03-14	PEMI- 432	< 0.5	< 2.9	< 3.3	< 19.0	< 3.3	1397 ± 101
03-03-14	PEMI- 823	< 0.3	< 2.7	< 3.5	< 16.6	< 3.5	1232 ± 91
04-07-14	PEMI- 1411	< 0.4	< 4.2	< 4.2	< 16.0	< 2.7	1322 ± 110
04-21-14	PEMI- 1634	< 0.4	< 4.2	< 4.3	< 22.5	< 3.5	1224 ± 107
05-05-14	PEMI- 1998	< 0.2	< 3.6	< 3.7	< 19.1	< 3.3	1238 ± 96
05-19-14	PEMI- 2191	< 0.3	< 3.6	< 4.9	< 18.0	< 2.3	1107 ± 105
06-03-14	PEMI- 2511	< 0.3	< 3.3	< 3.5	< 27.4	< 3.6	1361 ± 110
06-16-14	PEMI- 2856	< 0.4	< 2.9	< 2.7	< 17.1	< 3.4	1376 ± 93
07-07-14	PEMI- 3248	< 0.2	< 4.6	< 4.5	< 21.0	< 3.5	1222 ± 122
07-22-14	PEMI- 3740	< 0.3	< 2.9	< 3.0	< 25.1	< 5.2	1247 ± 88
08-04-14	PEMI- 4031	< 0.4	< 4.3	< 4.6	< 31.3	< 8.3	1206 ± 108
08-18-14	PEMI- 4354	< 0.4	< 2.8	< 3.6	< 31.7	< 4.3	1255 ± 112
09-02-14	PEMI- 4640	< 0.3	< 3.4	< 3.6	< 17.9	< 1.9	1336 ± 116
09-15-14	PEMI- 4879	< 0.4	< 2.6	< 2.2	< 16.5	< 2.8	1272 ± 82
10-06-14	PEMI- 5380	< 0.5	< 3.0	< 2.8	< 23.7	< 3.9	1246 ± 100
10-20-14	PEMI- 5877	< 0.3	< 2.8	< 3.5	< 24.5	< 3.8	1350 ± 101
11-03-14	PEMI- 6276	< 0.3	< 2.9	< 3.1	< 14.3	< 3.0	1254 ± 93
12-01-14	PEMI- 6809	< 0.4	< 3.8	< 4.7	< 23.1	< 5.4	1300 ± 105

[a] ND = No data, no milk available.

[b] MDA for Ba-140 and La-140 not reached due to delay in counting.

Table 5. Milk, analyses for iodine-131 and gamma-emitting isotopes (continued).
Collection: Semimonthly during grazing season, monthly at other times.

Collection	Lab	Concentration (pCi/L)					
Date	Code	I-131	Cs-134	Cs-137	Ba-140	La-140	K-40
Required LLD (pCi/L)		0.8	11	13	45	11	-
P-41							
01-06-14	ND[a]	-	-	-	-	-	-
02-03-14	ND	-	-	-	-	-	-
03-03-14	ND	-	-	-	-	-	-
04-07-14	ND	-	-	-	-	-	-
04-21-14	ND	-	-	-	-	-	-
05-06-14	PEMI- 1999	< 0.2	< 3.9	< 3.7	< 35.5	< 3.7	1704 ± 114
05-19-14	PEMI- 2192	< 0.3	< 5.1	< 4.7	< 15.0	< 2.7	2009 ± 142
06-03-14	PEMI- 2512	< 0.4	< 3.0	< 2.7	< 24.4	< 3.8	1679 ± 105
06-16-14	PEMI- 2857	< 0.4	< 3.7	< 3.0	< 17.4	< 3.3	1490 ± 100
07-07-14	PEMI- 3249	< 0.2	< 3.7	< 3.2	< 30.9	< 6.2	1727 ± 120
07-22-14	PEMI- 3741	< 0.4	< 2.7	< 3.3	< 26.4	< 4.9	1535 ± 88
08-05-14	PEMI- 4032	< 0.4	< 4.0	< 2.2	< 31.6	< 5.5	1667 ± 107
08-18-14	PEMI- 4355	< 0.4	< 3.1	< 3.7	< 30.8	< 3.9	1863 ± 117
09-02-14	PEMI- 4641	< 0.3	< 4.4	< 3.5	< 20.0	< 2.2	1656 ± 126
09-15-14	PEMI- 4881	< 0.3	< 2.5	< 3.5	< 17.4	< 3.6	1479 ± 90
10-06-14	ND	-	-	-	-	-	-
10-20-14	ND	-	-	-	-	-	-
11-03-14	ND	-	-	-	-	-	-
12-01-14	ND	-	-	-	-	-	-
P-51							
01-05-14	PEMI- 73	< 0.4	< 2.7	< 3.1	< 19.4	< 2.0	1397 ± 94
02-03-14	PEMI- 433	< 0.4	< 3.2	< 3.3	< 13.1	< 4.2	1428 ± 105
03-03-14	PEMI- 824	< 0.4	< 2.7	< 2.9	< 16.4	< 2.4	1365 ± 91
04-07-14	PEMI- 1412	< 0.2	< 3.7	< 4.2	< 21.0	< 3.5	1298 ± 115
04-21-14	PEMI- 1635	< 0.2	< 3.3	< 3.3	< 19.7	< 2.9	1380 ± 120
05-05-14	PEMI- 2000	< 0.2	< 3.2	< 3.3	< 24.5	< 3.8	1334 ± 97
05-19-14	PEMI- 2193	< 0.3	< 3.1	< 3.9	< 20.7	< 3.8	1305 ± 97
06-03-14	PEMI- 2513	< 0.3	< 3.5	< 3.9	< 27.8	< 3.7	1366 ± 114
06-16-14	PEMI- 2858	< 0.5	< 4.1	< 3.9	< 28.1	< 1.8	1383 ± 123
07-07-14	PEMI- 3250	< 0.4	< 4.0	< 2.4	< 33.5	< 4.2	1296 ± 102
07-22-14	PEMI- 3743	< 0.3	< 3.0	< 3.1	< 29.0	< 7.1	1238 ± 75
08-04-14	PEMI- 4033	< 0.3	< 3.6	< 3.4	< 12.7	< 2.7	1345 ± 100
08-18-14	PEMI- 4356	< 0.5	< 3.0	< 3.6	< 29.8	< 4.9	1442 ± 108
09-02-14	PEMI- 4642	< 0.3	< 3.4	< 2.7	< 16.6	< 3.3	1361 ± 108
09-15-14	PEMI- 4882	< 0.3	< 2.4	< 2.8	< 17.0	< 2.7	1347 ± 80
10-06-14	PEMI- 5381	< 0.3	< 2.8	< 3.0	< 17.1	< 3.0	1289 ± 98
10-20-14	PEMI- 5878	< 0.4	< 3.1	< 4.4	< 37.2	< 6.2	1351 ± 105
11-03-14	PEMI- 6277	< 0.5	< 3.1	< 4.1	< 18.8	< 3.1	1202 ± 103
12-01-14	PEMI- 6810	< 0.4	< 3.1	< 3.8	< 18.0	< 4.3	1370 ± 97

[a] ND = No data, no milk available.

Table 7. Food Products, analyses for gamma emitting isotopes.

Collection: Monthly — Units: pCi/kg wet

Location: P-2

Lab Code	PEVE- 3838	PEVE- 3839	PEVE- 3840	PEVE- 4400	
Date Collected	07-28-14	07-28-14	07-28-14	08-21-14	Req. LLD
Sample Type	Mustard	Collard Greens	Turnips	Collard Greens	
Be-7	378 ± 129	< 86	457 ± 85	188 ± 81	-
K-40	4006 ± 321	2796 ± 247	2802 ± 213	3423 ± 256	-
Co-58	< 11.7	< 10.8	< 4.2	< 5.5	-
Co-60	< 6.9	< 10.4	< 5.7	< 6.9	-
I-131	< 24.9	< 19.6	< 17.2	< 26.1	45
Cs-134	< 8.6	< 7.4	< 6.2	< 7.7	45
Cs-137	< 10.3	< 7.8	< 7.5	< 8.6	60

Lab Code	PEVE- 4401	PEVE- 4402	PEVE- 4403	PEVE- 5037	
Date Collected	08-21-14	08-21-14	08-21-14	09-18-14	Req. LLD
Sample Type	Turnips	Swiss Chard	Mustard	Swiss Chard	
Be-7	627 ± 91	686 ± 135	267 ± 75	614 ± 134	-
K-40	5161 ± 267	5829 ± 366	3491 ± 196	5533 ± 371	-
Co-58	< 7.8	< 9.8	< 6.5	< 11.4	-
Co-60	< 8.1	< 12.0	< 4.0	< 8.3	-
I-131	< 18.3	< 26.2	< 21.8	< 21.0	45
Cs-134	< 6.2	< 9.7	< 6.6	< 9.5	45
Cs-137	< 7.8	< 13.4	< 7.8	< 12.5	60

Lab Code	PEVE- 5038	PEVE- 5039	PEVE- 5415	PEVE- 5416	
Date Collected	09-18-14	09-18-14	10-07-14	10-07-14	Req. LLD
Sample Type	Collard Greens	Mustard Greens	Turnip Greens	Mustard Greens	
Be-7	325 ± 87	799 ± 155	669 ± 141	838 ± 134	-
K-40	3676 ± 262	4307 ± 317	5571 ± 357	5243 ± 370	-
Co-58	< 5.3	< 8.0	< 9.7	< 9.7	-
Co-60	< 7.4	< 4.9	< 10.4	< 11.2	-
I-131	< 16.5	< 40.1	< 33.3	< 26.9	45
Cs-134	< 6.5	< 12.1	< 12.3	< 10.1	45
Cs-137	< 8.3	< 11.5	< 9.4	< 11.3	60

Lab Code	PEVE- 5417	
Date Collected	10-07-14	Req. LLD
Sample Type	Collard Greens	
Be-7	389 ± 119	-
K-40	3461 ± 272	-
Co-58	< 8.0	-
Co-60	< 5.0	-
I-131	< 25.0	45
Cs-134	< 10.0	45
Cs-137	< 6.0	60

Table 7. Food Products, analyses for gamma emitting isotopes.

Collection: Monthly | Units: pCi/kg wet

Location: P-16

Lab Code	PEVE- 3841	PEVE- 3842	PEVE- 3843	PEVE- 3844	
Date Collected	07-28-14	07-28-14	07-28-14	07-28-14	Req. LLD
Sample Type	Collard Greens	Mustard	Turnips	Swiss Chard	
Be-7	178 ± 85	390 ± 111	374 ± 103	283 ± 110	-
K-40	4195 ± 311	3509 ± 260	3631 ± 274	4670 ± 345	-
Co-58	< 6.7	< 7.5	< 9.9	< 9.9	-
Co-60	< 9.4	< 8.5	< 8.4	< 9.5	-
I-131	< 21.9	< 16.0	< 16.8	< 25.7	45
Cs-134	< 6.9	< 7.1	< 8.3	< 10.7	45
Cs-137	< 6.5	< 9.7	< 9.2	< 10.3	60

Lab Code	PEVE- 4404	PEVE- 4405	PEVE- 4406	PEVE- 4407	
Date Collected	08-21-14	08-21-14	08-21-14	08-21-14	Req. LLD
Sample Type	Swiss Chard	Collard Greens	Mustard	Turnips	
Be-7	< 79	< 136	340 ± 95	359 ± 109	-
K-40	2594 ± 213	3645 ± 311	2773 ± 214	4172 ± 278	-
Co-58	< 7.2	< 7.1	< 8.8	< 6.3	-
Co-60	< 4.8	< 6.8	< 8.3	< 9.6	-
I-131	< 18.8	< 32.8	< 15.5	< 18.9	45
Cs-134	< 7.2	< 10.1	< 7.4	< 9.5	45
Cs-137	< 6.6	< 11.2	< 6.1	< 10.4	60

Lab Code	PEVE- 5040	PEVE- 5041	PEVE- 5042	PEVE- 5418	
Date Collected	09-18-14	09-18-14	09-18-14	10-07-14	Req. LLD
Sample Type	Swiss Chard	Mustard Greens	Collard Greens	Swiss Chard	
Be-7	566 ± 125	419 ± 105	117 ± 57	288 ± 117	-
K-40	3680 ± 299	5345 ± 317	3588 ± 198	4889 ± 333	-
Co-58	< 12.9	< 10.1	< 6.7	< 8.8	-
Co-60	< 9.3	< 10.0	< 4.9	< 5.9	-
I-131	< 25.5	< 25.3	< 12.8	< 15.6	45
Cs-134	< 10.5	< 9.0	< 5.6	< 11.7	45
Cs-137	< 13.3	< 8.4	< 5.2	< 10.5	60

Lab Code	PEVE- 5419	PEVE- 5420	
Date Collected	10-07-14	10-07-14	Req. LLD
Sample Type	Mustard Greens	Collard Greens	
Be-7	361 ± 91	159 ± 84	-
K-40	5100 ± 268	4276 ± 293	-
Co-58	< 5.5	< 5.2	-
Co-60	< 9.5	< 9.6	-
I-131	< 21.0	< 18.2	45
Cs-134	< 8.8	< 9.5	45
Cs-137	< 8.5	< 10.1	60

Table 7. Food Products, analyses for gamma emitting isotopes.

Collection: Monthly | Units: pCi/kg wet

Location: P-18

Lab Code	PEVE- 3845	PEVE- 3846	PEVE- 4408	PEVE- 4409	
Date Collected	07-28-14	07-28-14	08-21-14	08-21-14	Req. LLD
Sample Type	Mustard	Turnips	Turnips	Collard Greens	
Be-7	334 ± 117	266 ± 90	275 ± 85	240 ± 129	-
K-40	2964 ± 246	2582 ± 236	4251 ± 295	4288 ± 376	-
Co-58	< 5.9	< 5.8	< 6.4	< 10.6	-
Co-60	< 4.9	< 5.0	< 5.3	< 10.3	-
I-131	< 17.6	< 20.3	< 17.9	< 40.9	45
Cs-134	< 7.5	< 7.8	< 6.7	< 11.8	45
Cs-137	< 6.3	< 8.8	< 5.7	< 10.3	60

Table 7. Food Products, analyses for gamma emitting isotopes.

Collection: Monthly   Units: pCi/kg wet

Location: P-20

Lab Code	PEVE- 3848	PEVE- 3849	PEVE- 3850	PEVE- 3851	
Date Collected	07-28-14	07-28-14	07-28-14	07-28-14	Req. LLD
Sample Type	Collard Greens	Mustard	Turnips	Swiss Chard	
Be-7	< 115	120 ± 69	319 ± 99	360 ± 134	-
K-40	4059 ± 322	2792 ± 244	4719 ± 315	3774 ± 285	-
Co-58	< 10.3	< 9.8	< 5.5	< 9.7	-
Co-60	< 7.4	< 7.4	< 10.6	< 7.9	-
I-131	< 16.8	< 16.9	< 22.5	< 21.5	45
Cs-134	< 8.8	< 6.5	< 8.5	< 6.9	45
Cs-137	< 10.7	< 8.3	< 6.5	< 10.6	60

Lab Code	PEVE- 4410	PEVE- 4411	PEVE- 4412	PEVE- 4413	
Date Collected	08-21-14	08-21-14	08-21-14	08-21-14	Req. LLD
Sample Type	Collard Greens	Turnip Greens	Mustard	Swiss Chard	
Be-7	< 130	< 109	219 ± 68	370 ± 86	-
K-40	4234 ± 341	4604 ± 297	3820 ± 234	5327 ± 296	-
Co-58	< 9.6	< 10.7	< 8.6	< 8.2	-
Co-60	< 8.6	< 9.4	< 5.4	< 6.6	-
I-131	< 26.5	< 35.4	< 24.5	< 22.8	45
Cs-134	< 12.2	< 9.6	< 8.0	< 7.2	45
Cs-137	< 7.6	< 9.7	< 4.8	< 5.1	60

Lab Code	PEVE- 5043	PEVE- 5044	PEVE- 5045	PEVE- 5046	
Date Collected	09-18-14	09-18-14	09-18-14	09-18-14	Req. LLD
Sample Type	Swiss Chard	Collard Greens	Mustard Greens	Turnip Greens	
Be-7	588 ± 138	222 ± 99	302 ± 117	371 ± 111	-
K-40	6643 ± 395	4778 ± 300	5244 ± 329	4712 ± 327	-
Co-58	< 11.5	< 8.0	< 5.3	< 9.5	-
Co-60	< 5.4	< 9.4	< 9.7	< 13.8	-
I-131	< 21.7	< 22.7	< 29.9	< 32.2	45
Cs-134	< 10.3	< 8.2	< 9.1	< 9.1	45
Cs-137	< 12.3	< 5.1	< 7.7	< 8.9	60

Lab Code	PEVE- 5421	PEVE- 5422	PEVE- 5424		
Date Collected	10-07-14	10-07-14	10-07-14		Req. LLD
Sample Type	Swiss Chard	Collard Greens	Mustard Greens		
Be-7	467 ± 115	316 ± 101	362 ± 103		-
K-40	6233 ± 389	4631 ± 287	5871 ± 331		-
Co-58	< 8.1	< 8.6	< 8.9		-
Co-60	< 10.7	< 8.3	< 8.1		-
I-131	< 21.8	< 20.2	< 21.3		45
Cs-134	< 10.3	< 8.6	< 8.4		45
Cs-137	< 10.0	< 9.0	< 7.9		60

Table 7. Food Products, analyses for gamma emitting isotopes.

Collection: Monthly — Units: pCi/kg wet

Location: P-37

Lab Code	PEVE- 3442	PEVE- 3443	PEVE- 4414	PEVE- 4415	
Date Collected	07-15-14	07-15-14	08-21-14	08-21-14	Req. LLD
Sample Type	Collard Greens	Mustard Greens	Swiss Chard	Mustard	
Be-7	< 139	177 ± 81	318 ± 103	312 ± 122	-
K-40	5091 ± 423	4938 ± 318	2747 ± 232	3877 ± 280	-
Co-58	< 14.2	< 7.4	< 8.1	< 6.5	-
Co-60	< 10.6	< 9.9	< 5.9	< 6.5	-
I-131	< 23.5	< 16.2	< 26.2	< 28.6	45
Cs-134	< 13.6	< 8.7	< 8.1	< 9.5	45
Cs-137	< 17.1	< 11.2	< 8.8	< 9.0	60

Lab Code	PEVE- 4417	PEVE- 4418	PEVE- 5048	PEVE- 5049	
Date Collected	08-21-14	08-21-14	09-18-14	09-18-14	Req. LLD
Sample Type	Turnip Greens	Collard Greens	Swiss Chard	Turnip Greens	
Be-7	170 ± 73	< 135	471 ± 101	274 ± 84	-
K-40	3331 ± 249	4835 ± 368	3777 ± 231	4472 ± 236	-
Co-58	< 7.2	< 9.3	< 4.6	< 7.6	-
Co-60	< 6.6	< 14.1	< 3.7	< 4.8	-
I-131	< 24.6	< 42.1	< 19.8	< 17.1	45
Cs-134	< 6.5	< 10.8	< 7.7	< 6.9	45
Cs-137	< 7.7	< 11.7	< 8.7	< 7.6	60

Lab Code	PEVE- 5050	PEVE- 5425	PEVE- 5426	PEVE- 5427	
Date Collected	09-18-14	10-07-14	10-07-14	10-07-14	Req. LLD
Sample Type	Collard Greens	Collard Greens	Mustard Greens	Swiss Chard	
Be-7	< 78	< 110	362 ± 101	594 ± 126	-
K-40	4339 ± 136	4732 ± 314	6181 ± 349	4084 ± 315	-
Co-58	< 4.0	< 8.9	< 8.2	< 11.2	-
Co-60	< 4.7	< 5.2	< 9.2	< 6.6	-
I-131	< 21.4	< 35.7	< 23.8	< 29.4	45
Cs-134	< 6.9	< 9.6	< 9.9	< 10.1	45
Cs-137	< 6.4	< 10.3	< 9.7	< 8.2	60

Table 7. Food Products, analyses for gamma emitting isotopes.

Collection: Monthly — Units: pCi/kg wet

Location: P-70

Lab Code	PEVE- 3853	PEVE- 3854	PEVE- 3855	PEVE- 4419	
Date Collected	07-28-14	07-28-14	07-28-14	08-21-14	Req. LLD
Sample Type	Mustard	Turnips	Swiss Chard	Collard Greens	
Be-7	366 ± 102	462 ± 101	415 ± 161	< 82	-
K-40	2821 ± 229	3695 ± 260	3019 ± 273	3972 ± 297	-
Co-58	< 5.0	< 5.7	< 10.1	< 8.9	-
Co-60	< 6.3	< 9.2	< 8.2	< 8.6	-
I-131	< 18.8	< 18.1	< 24.0	< 19.8	45
Cs-134	< 6.8	< 6.8	< 9.9	< 8.7	45
Cs-137	< 8.8	< 5.5	< 5.2	< 7.1	60

Lab Code	PEVE- 4420	PEVE- 4421	PEVE- 4422	PEVE- 5051	
Date Collected	08-21-14	08-21-14	08-21-14	09-18-14	Req. LLD
Sample Type	Turnip Greens	Mustard	Swiss Chard	Swiss Chard	
Be-7	527 ± 153	536 ± 136	513 ± 137	655 ± 111	-
K-40	4525 ± 331	3775 ± 317	5214 ± 383	6523 ± 352	-
Co-58	< 10.6	< 10.0	< 11.0	< 4.8	-
Co-60	< 9.2	< 8.2	< 9.4	< 7.2	-
I-131	< 34.7	< 35.3	< 27.0	< 31.6	45
Cs-134	< 10.6	< 10.7	< 11.2	< 8.0	45
Cs-137	< 7.2	< 10.2	< 11.9	< 9.4	60

Lab Code	PEVE- 5052	PEVE- 5053	PEVE- 5054	PEVE- 5428	
Date Collected	09-18-14	09-18-14	09-18-14	10-07-14	Req. LLD
Sample Type	Collard Greens	Mustard Greens	Turnip Greens	Collard Greens	
Be-7	< 88	775 ± 160	638 ± 147	154 ± 70	-
K-40	3339 ± 247	5217 ± 390	4655 ± 354	3347 ± 239	-
Co-58	< 7.5	< 5.9	< 8.3	< 5.1	-
Co-60	< 5.8	< 11.5	< 12.4	< 6.6	-
I-131	< 16.3	< 32.6	< 33.1	< 16.1	45
Cs-134	< 6.1	< 10.3	< 11.8	< 8.2	45
Cs-137	< 6.4	< 7.9	< 8.0	< 9.7	60

Lab Code	PEVE- 5429	PEVE- 5430	PEVE- 5431	
Date Collected	10-07-14	10-07-14	10-07-14	Req. LLD
Sample Type	Mustard Greens	Swiss Chard	Turnip Greens	
Be-7	505 ± 101	487 ± 111	380 ± 110	-
K-40	5907 ± 292	5974 ± 317	4690 ± 323	-
Co-58	< 9.5	< 7.3	< 10.6	-
Co-60	< 5.7	< 7.2	< 8.6	-
I-131	< 20.2	< 18.1	< 23.5	45
Cs-134	< 8.3	< 10.0	< 9.9	45
Cs-137	< 6.2	< 6.7	< 10.0	60

Table 9. Fish, analyses for gamma emitting isotopes.

Collection: Annually | Units: pCi/kg wet

Location	P-25				
Lab Code	PEF- 4906	PEF- 4907	PEF- 4908	PEF- 4909	
Date Collected	09-16-14	09-16-14	09-16-14	09-16-14	Req. LLD
Sample Type	Smallmouth Bass	White Perch	Walleye	Redhorse Sucker	
K-40	1754 ± 339	630 ± 274	1533 ± 314	1957 ± 323	-
Mn-54	< 11.4	< 21.2	< 16.3	< 14.1	94
Fe-59	< 52.3	< 115.1	< 48.5	< 36.3	195
Co-58	< 18.5	< 33.3	< 17.0	< 13.9	97
Co-60	< 14.0	< 22.2	< 13.8	< 17.9	97
Zn-65	< 16.8	< 34.3	< 41.1	< 36.7	195
Cs-134	< 16.2	< 26.5	< 19.2	< 18.5	97
Cs-137	< 16.2	< 23.5	< 15.1	< 17.7	112

Location	P-25				
Lab Code	PEF- 4910	PEF- 4911	PEF- 5409	PEF- 5410	
Date Collected	09-16-14	09-16-14	10-02-14	10-02-14	Req. LLD
Sample Type	Gizzard Shad	Channel Catfish	White Perch	Gizzard Shad	
K-40	2012 ± 347	1442 ± 303	887 ± 284	1979 ± 335	-
Mn-54	< 17.5	< 9.9	< 19.6	< 11.5	94
Fe-59	< 55.0	< 37.4	< 55.9	< 16.7	195
Co-58	< 20.2	< 15.7	< 20.5	< 17.0	97
Co-60	< 9.3	< 13.7	< 23.9	< 7.6	97
Zn-65	< 18.2	< 10.1	< 39.3	< 17.3	195
Cs-134	< 17.4	< 14.3	< 18.1	< 16.1	97
Cs-137	< 18.3	< 13.0	< 11.7	< 16.8	112

Location	P-25			
Lab Code	PEF- 5411	PEF- 5621	PEF- 5622	
Date Collected	10-02-14	10-02-14	10-02-14	Req. LLD
Sample Type	Walleye	Smallmouth Bass	Redhorse Sucker	
K-40	1677 ± 314	1505 ± 281	2138 ± 353	-
Mn-54	< 8.9	< 21.0	< 16.3	94
Fe-59	< 80.9	< 44.4	< 51.3	195
Co-58	< 25.9	< 16.0	< 24.5	97
Co-60	< 13.4	< 13.5	< 16.5	97
Zn-65	< 27.3	< 18.9	< 37.8	195
Cs-134	< 15.9	< 15.9	< 15.0	97
Cs-137	< 17.8	< 18.0	< 10.2	112

Location			P-32		
Lab Code	PEF- 4912	PEF- 4913	PEF- 4914	PEF- 4915	
Date Collected	09-16-14	09-16-14	09-16-14	09-16-14	Req. LLD
Sample Type	White Perch	Walleye	Redhorse Sucker	Channel Catfish	
K-40	1104 ± 317	801 ± 463	1401 ± 296	1115 ± 307	-
Mn-54	< 18.4	< 22.7	< 19.5	< 15.8	94
Fe-59	< 55.6	< 117.2	< 58.8	< 63.8	195
Co-58	< 20.0	< 50.7	< 27.8	< 18.4	97
Co-60	< 8.9	< 9.5	< 11.3	< 8.5	97
Zn-65	< 30.8	< 44.8	< 29.6	< 31.3	195
Cs-134	< 17.5	< 36.8	< 18.3	< 17.6	97
Cs-137	< 25.4	< 35.6	< 20.6	< 14.8	112

Location			P-32		
Lab Code	PEF- 4916	PEF- 5412	PEF- 5413	PEF- 5414	
Date Collected	09-16-14	10-02-14	10-02-14	10-02-14	Req. LLD
Sample Type	Gizzard Shad	Steelhead	White Bass	Walleye	
K-40	1527 ± 303	2284 ± 375	943 ± 272	2100 ± 343	-
Mn-54	< 13.3	< 17.5	< 12.2	< 18.9	94
Fe-59	< 21.2	< 46.6	< 40.8	< 58.3	195
Co-58	< 22.0	< 23.8	< 21.7	< 26.5	97
Co-60	< 13.0	< 4.5	< 3.9	< 19.9	97
Zn-65	< 26.5	< 28.9	< 28.2	< 24.3	195
Cs-134	< 15.8	< 16.8	< 13.8	< 18.8	97
Cs-137	< 14.7	< 15.4	< 15.2	< 14.4	112

Location			P-32		
Lab Code	PEF- 5623	PEF- 5624	PEF- 5625		
Date Collected	10-02-14	10-02-14	10-02-14		Req. LLD
Sample Type	Smallmouth Bass	White Perch	Channel Catfish		
K-40	728 ± 263	866 ± 293	2161 ± 374		-
Mn-54	< 11.2	< 13.8	< 19.3		94
Fe-59	< 69.4	< 65.3	< 32.7		195
Co-58	< 20.8	< 17.4	< 21.4		97
Co-60	< 12.3	< 12.1	< 10.9		97
Zn-65	< 24.2	< 35.3	< 19.6		195
Cs-134	< 17.8	< 17.3	< 16.7		97
Cs-137	< 16.0	< 11.0	< 15.3		112

Table 11. Sediments, analyses for gamma emitting isotopes.

Collection: Semiannually — Units: pCi/kg dry

Location	P-25	
Lab Code	PEBS- 4917	
Date Collected	09-15-14	Req. LLD
K-40	10765 ± 564	-
Co-58	< 17.6	50
Co-60	< 11.7	40
Cs-134	< 17.2	112
Cs-137	56.5 ± 27.0	135

Location	P-26	
Lab Code		
Date Collected		Req. LLD
K-40		-
Co-58		50
Co-60		40
Cs-134		112
Cs-137		135

Location	P-27	
Lab Code		
Date Collected		Req. LLD
K-40		-
Co-58		50
Co-60		40
Cs-134		112
Cs-137		135

Location	P-32	
Lab Code	PEBS- 4918	
Date Collected	09-15-14	Req. LLD
K-40	13532 ± 666	-
Co-58	< 21.8	50
Co-60	< 13.2	40
Cs-134	< 16.7	112
Cs-137	80.4 ± 24.6	135

Table 11. Sediments, analyses for gamma emitting isotopes.

Collection: Semiannually | Units: pCi/kg dry

Location	P-64		
Lab Code	PEBS- 3745	PEBS- 4858	
Date Collected	07-22-14	09-11-14	Req. LLD
K-40	6125 ± 281	7020 ± 396	-
Co-58	< 8.0	< 13.6	50
Co-60	< 5.7	< 11.1	40
Cs-134	< 6.4	< 9.2	112
Cs-137	< 10.1	< 7.4	135

Location	P-65		
Lab Code	PEBS- 3746		
Date Collected	07-22-14		Req. LLD
K-40	6194 ± 364		-
Co-58	< 10.4		50
Co-60	< 8.8		40
Cs-134	< 11.6		112
Cs-137	< 9.1		135

Location	P-66		
Lab Code	PEBS- 4860	PEBS- 5068	
Date Collected	09-15-14	09-15-14	Req. LLD
K-40	7242 ± 459	9441 ± 482	-
Co-58	< 15.8	< 16.2	50
Co-60	< 6.4	< 6.2	40
Cs-134	< 13.2	< 10.1	112
Cs-137	< 15.1	< 15.3	135

Appendix D
Corrections to Previous Annual Environmental and Effluent Release Reports

APPENDIX D

Corrections to previous Annual Environmental and Effluent Release Reports:

None

Appendix E
Abnormal releases

APPENDIX E

Abnormal Releases

In November 2011, radioactivity was detected in the Nuclear Closed Cooling (NCC) system. The source of this activity is the Primary Coolant. There is some leakage from the NCC system to Service Water and from there to the environment. The activity released from NCC has been included in the total radioactivity released. Feed and bleed evolutions have occurred throughout the year to reduce the radioactive concentration in NCC and thus reduced the activity released to the environment.

	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Annual
A. Fission and Activation Products (Ci)					
Na-24	<LLD	<LLD	1.97E-04	<LLD	1.97E-04
Cr-51	<LLD	<LLD	3.96E-04	4.32E-05	4.39E-04
Mn-54	3.34E-07	<LLD	1.50E-04	1.03E-04	2.53E-04
Mn-56	<LLD	<LLD	6.28E-05	<LLD	6.28E-05
Co-58	<LLD	<LLD	6.96E-05	5.54E-05	1.25E-04
Fe-59	<LLD	<LLD	6.35E-05	1.90E-06	6.54E-05
Co-60	6.68E-04	7.44E-05	6.56E-04	5.40E-04	1.94E-03
Zn-65	<LLD	<LLD	2.90E-05	9.79E-06	3.88E-05
Zn-69m	<LLD	<LLD	2.83E-05	<LLD	2.83E-05
Sr-91	<LLD	<LLD	1.08E-05	<LLD	1.08E-05
Y-91m	<LLD	<LLD	1.59E-05	<LLD	1.59E-05
Sr-92	<LLD	<LLD	1.20E-05	<LLD	1.20E-05
Nb-95	<LLD	<LLD	9.74E-06	2.70E-06	1.24E-05
Zr-95	<LLD	<LLD	4.26E-06	7.41E-07	5.00E-06
Tc-99m	<LLD	<LLD	3.91E-06	<LLD	3.91E-06
Ag-110m	<LLD	<LLD	<LLD	2.46E-07	2.46E-07
I-133	<LLD	<LLD	8.39E-07	<LLD	8.39E-07
Cs-134	1.25E-06	2.19E-06	<LLD	<LLD	3.43E-06
Cs-137	2.84E-06	1.09E-05	2.47E-07	<LLD	1.40E-05
Au-199	<LLD	<LLD	6.55E-05	<LLD	6.55E-05

B. Tritium (Ci)	1.87E-02	2.95E-02	1.54E-02	3.04E-03	6.66E-02
C. Noble Gases (Ci)					
Ar-41	<LLD	<LLD	1.76E-06	<LLD	1.76E-06
Xe-133	<LLD	<LLD	4.21E-07	<LLD	4.21E-07
Xe-135	<LLD	<LLD	3.35E-06	<LLD	3.35E-06
D. Gross Alpha (Ci)	1.03E-05	<LLD	<LLD	<LLD	1.03E-05

Appendix F
ODCM Non-Compliances

APPENDIX F

ODCM Non-Compliances

The ODCM requires an operable Service Water Flow Monitor. However this monitor was out of service from 11/14/14 to the end of the year. The delay in returning the monitor to service is due to age of the monitor (cannot obtain spare parts) and need to procure a new one.

A shoreline sediment sample is required twice per year. However a sample was not obtained in the first half of the year. This issue was captured in the PNPP corrective action program.

Appendix G
ODCM Changes

APPENDIX G
ODCM Changes

There were no changes to the ODCM during this reporting period.

Appendix H
Changes to Process Control Program

APPENDIX H

Changes to the Process Control Program

There were no changes to the Process Control Program.

REGULATORY CORRESPONDENCE REVIEW FORM

NOP-LP-4007-01 Rev. 03

(1) LETTER NUMBER: L-15-143	(2) LETTER SUBJECT: Submittal of the Perry 2014 Annual Environmental and Effluent Release Report (AEERR)
(3) SUBMITTAL DUE: **4/30/15**	(4) PREPARER Name: J. Burnett PHONE NO.:5158

(5) POSTING REQUIRED BY 10CFR19.11 ☐ YES ☒ NO	(6) LICENSING BASIS DOCUMENT CHANGE REQUIRED: ☐ YES ☒ NO	(7) OATH OR AFFIRMATION REQUIRED ☐ YES ☒ NO

(8) PREPARER COMMENTS, SPECIAL INSTRUCTIONS: None

(9) LICENSING, TECHNICAL STAFF AND MANAGEMENT REVIEW

Signature indicates that the review is complete in accordance with NOP-LP-4007, and to the best of the reviewer's knowledge, the submittal is accurate and complete, and no significant information has been presented in or excluded from the submittal such that the reader could be misled. Management reviewers' signatures also indicate that the level of review provided by their respective organization is acceptable. Where commitment ownership is indicated, signature indicates acceptance of responsibility for completion of the identified commitment. Where Enclosure Verification is indicated, signature indicates that the content of the identified enclosure has been verified to be complete and accurate by the assigned organization.

Name & Organization	Commitment Ownership	Enclosure Verification	Signature	Date	No Comments	Comments Provided
Preparer J. Burnett, PYCH	N/A	N/A	[signature]	4/13/15	N/A	N/A
Peer Reviewer K. Gehring-Ohrablo	N/A	N/A	[signature]	4/15/15	☒	☐
Supervisor ~~R. Killing~~ 4/22/15 D. Henslee	N/A	N/A	[signature]	4/22/15	☒	☐
C. Elliot, RP Manager (Acting)	N/A	N/A	[signature] Elliott	4/23/15	☒	☐
T. Brown, Director PI	N/A	N/A	[signature]	4/23/15	☒	☐
D. Hamilton, DSO	N/A	N/A	[signature]	4.29.2015	☒	☐
N. Conicella, PYRC Manager	N/A	N/A	[signature] for N. Conicella	4/29/15	☒	☐
D. Lockwood	N/A	N/A	[signature]	4-10-15	☒	☐
					☐	☐
					☐	☐
					☐	☐
					☐	☐
					☐	☐
					☐	☐
					☐	☐

(10) RECOMMENDATION FOR SIGNATURE

Name & Organization	Commitment Ownership	Enclosure Verification	Signature	Date	No Comments	Comments Provided
T. Veitch, Manager PYCH	N/A	N/A	[signature]	4/29/15	☐	☒*

(11) REVIEWER COMMENTS – NO RESPONSE REQUIRED (Provide comments requiring response on Form NOP-LP-4007-03):

*Comments resolved

REGULATORY CORRESPONDENCE REVIEW FORM - INSTRUCTIONS

NOP-LP-4007-01 Rev. 03

TITLE BLOCK	**Page ___ of ___** – Prior to forwarding for review, Preparer enters page information as indicated. This INSTRUCTION sheet is not considered part of the form, and does not need to be included in the documentation package.
BLOCK 1	**LETTER NUMBER** – Preparer enters sequential number.
BLOCK 2	**LETTER SUBJECT** – Preparer enters the subject of the correspondence.
BLOCK 3	**SUBMITTAL DUE** – Preparer enters the date the correspondence is due.
BLOCK 4	**PREPARER** – Preparer enters appropriate contact information.
BLOCK 5	**POSTING REQUIRED BY 10 CFR 19.11** – Preparer indicates whether posting of the correspondence to the NRC is required by 10 CFR 19.11.
BLOCK 6	**LICENSING BASIS DOCUMENT REVIEW COMPLETED** – Preparer indicates whether a licensing basis change is required (YES or NO). (See NOP-LP-4007 Section 4.1.10)
BLOCK 7	**OATH OR AFFIRMATION REQUIRED** – Preparer indicates the need for an oath or affirmation statement.
BLOCK 8	**PREPARER COMMENTS, SPECIAL INSTRUCTIONS** – Preparer enters any desired additional remarks or instructions regarding the subject correspondence.
BLOCK 9	**LICENSING, TECHNICAL STAFF AND MANAGEMENT REVIEW** – Preparer identifies the desired reviewers and their organization. Reviewers should include organizations that provided input to the correspondence, organizations potentially affected by regulatory decisions, and other knowledgeable technical organizations. If correspondence includes Regulatory Commitments, preparer identifies manager-level commitment owners and lists the commitment numbers. If correspondence includes enclosures not verified through the correspondence development process, preparer identifies manager responsible for the completeness and accuracy of each identified enclosure. Reviewers sign and date the appropriate fields, and indicate whether or not comments are provided. **Signature indicates that, to the best of the reviewer's knowledge, the submittal is accurate and complete, and that no significant information has been presented in or excluded from the submittal such that the reader could be misled. Management reviewers' signatures also indicate that the level of review provided by their respective organization is acceptable. For reviewers with identified Commitment Ownership indicated, signature indicates acceptance of responsibility for commitment completion, and will result in assignment of the commitment to that organization. For reviewers with Enclosure Verification indicated, signature indicates that the indicated enclosure or attachment has been verified to be complete and accurate.**
BLOCK 10	**RECOMMENDATION FOR SIGNATURE** – The cognizant Manager determines whether the correspondence has received an adequate review and is therefore recommended for final signature and release, signs and dates where appropriate, and indicates whether comments are provided. Additional reviews for signature recommendation may be obtained at management discretion.
BLOCK 11	**REVIEWER COMMENTS – NO RESPONSE REQUIRED** – As an alternative to using the REGULATORY DOCUMENTATION COMMENT FORM (Form NOP-LP-4007-03) reviewers may use this space to provide brief comments that do not require response from preparer. Extensive comments or comments requiring documented response must be provided on Form NOP-LP-4007-03.

REGULATORY CORRESPONDENCE CHECKLIST

Letter Number/Subject: L-15-143

The reviewers of this correspondence signify the review of the items on the checklist by placing initials in the boxes below. As necessary, explain deviations, exceptions and non-applicable items in the Comments sections provided.

A. Peer Review:

No.	Item Checked	Initials
1.	Correct organizations are listed on the review and routing forms, including organizations providing statements of fact.	KGO
2.	References to Codes and Standards are accurate and in sufficient detail.	KGO
3.	Subject line of an NRC cover letter references the NRC TAC number, if applicable.	N/A
4.	The letter number has been entered on the letter and subsequent pages.	KGO
5.	Format and presentation are consistent with NORM-LP-4003 and any deviations justified.	KGO
6.	Pages containing information pursuant to 10 CFR 2.390 are appropriately marked.	N/A
7.	Oath or affirmation (if required) – unsworn declaration is present.	N/A
8.	Dates are correct and consistent throughout the submittal.	KGO
9.	Grammar, spelling and editorial presentation have been verified to be correct.	KGO
10.	All applicable parts of the submittal are present (e.g. letter, enclosures, attachments, affidavits).	KGO
11.	If Regulatory Commitments are included in NRC correspondence, the regulatory commitments are re-stated on an attachment (Regulatory Commitment List) to the submittal and identified for ownership on the Regulatory Correspondence Review Form (NOP-LP-4007-01). If no regulatory commitments are included in NRC correspondence, a statement to that effect is provided in the correspondence. For non-NRC correspondence, no statement regarding regulatory commitments is necessary.	KGO
12.	The letter content is factually complete, is presented logically and supports conclusions reached.	KGO
13.	Enclosures and attachments are appropriately identified and contain all the necessary information to support conclusion of the submittal without the need to obtain other reference material.	KGO
14.	If action is requested of the NRC, the requested action date has been included with appropriate justification.	KGO
15.	If the letter is in response to NRC requests, there is a clear tie between each question/request and the associated response, and each question/request is completely and clearly answered in the response.	KGO
16.	References listed have been reviewed, are available, and support the information contained in the correspondence.	KGO
17.	Statements of fact have been verified to be accurate.	KGO
18.	Actions stated as being complete have been verified to be complete.	KGO
19.	Submittal does not contain information that has a material effect on information previously submitted to the NRC in response to a Notice of Violation or other enforcement action (e.g., Davis-Besse head event) or may significantly affect the NRC's understanding of plant activities. If it does, expedited communication paths with the NRC have been determined.	KGO

Review Performed By (Print Name and Sign): Kristine Gehring-Ohrablo Date: 4/21/15

Comments:
No information pursuant to 10 CFR 2.390; no oaths or affirmations necessary.

REGULATORY CORRESPONDENCE CHECKLIST

Letter Number/Subject: L-15-143

B. Cognizant Manager Review (Final Submittal Review Prior to Signature Authority):

No.	Item Checked	Initials
1.	Comments obtained during the review cycle have been resolved and incorporated within the applicable sections of the submittal. The submittal remains factual and complete.	[initials]
2.	Review signatures, or equivalent, have been obtained on Correspondence Review Forms (NOP-LP-4007-01).	[initials]
3.	The correspondence has been reviewed for regulatory commitments, licensing positions, prudency, appropriate wording, and potential regulatory impact.	[initials]
4.	If the letter is in response to NRC questions or requests, there is a clear and complete response to each question or request and all questions have been satisfactorily addressed. AEERR Annual report	[initials]

Review Performed By (Print Name and Sign): Thomas P. Veitch [signature] Date: 4/29/15

Comments:

C. Responsible Organization Review (Administrative Support Follow-up):

No.	Item Checked	Initials
1.	Date is on the letter and the letter has been put on the appropriate company letterhead.	BB
2.	Submittal cover letter is signed correctly.	BB
3.	Oath or Affirmation (if required) – unsworn declaration is present. If a notarized statement is requested by the signature authority, the statement page is signed and notarized.	BB
4.	When appropriate, initial notification and copy of submittal has been provided to the NRC via electronic mail.	BB
5.	Submittal has been mailed, or provided electronically (in accordance with NRC guidance on electronic submittals) to all appropriate recipients, with appropriate enclosures, attachments, etc.	BB
6.	Internal FENOC distribution is complete.	BB
7.	Regulatory Commitments have been documented in accordance with FENOC commitment management procedures.	BB
8.	Additional FENOC actions have been documented, as necessary, in appropriate activity tracking systems.	BB
9.	Correspondence documentation package is complete, and ready for future referral.	BB

Review Performed By (Print Name and Sign): Belinda Bradbeer Belinda Bradbeer Date: 4-30-15

Comments: