pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Report

Fukushima Dai-ichi Nuclear Accident

Department of Environmental Protection's Response and Findings Regarding Air and Water Resources and Public Health and Safety within the Commonwealth

2900-MN-DEP4346 10/2011

INTRODUCTION

This report has been prepared to comply with the Pennsylvania Radiation Protection Act (Act 1984-147, amended Act 2007-31), Section 301(d), which states:

> *Whenever the department, in the course of its powers and duties as set forth in subsection (c), determines that levels of radiation exceed the normal range of radioactivity in a given area, the department shall immediately notify the Governor, the agency and the NRC and shall also report its findings to the public, and it shall subsequently submit a detailed report on the occurrence to both the Governor and the NRC and shall make such report public.*

This report focuses only on the actions of the Commonwealth of Pennsylvania as a result of the Fukushima Dai-ichi accident. Internet website addresses to organizations with additional information can be found in the Resources section of this report.

THE EVENT

On March 11, 2011, at 2:46 PM local Japanese time, a magnitude 9.0 earthquake struck off the east coast of Japan and triggered a tsunami that hit the island several minutes later. As a result of the earthquake, many Japanese nuclear power reactors automatically shut down; however, the tsunami exceeded the height of the seawall of the Fukushima Dai-ichi nuclear power plant, flooding the facility and disabling key emergency backup power systems. The six reactors at Fukushima Dai-ichi are boiling water reactors and are owned and operated by Tokyo Electric Power Company.

Backup battery power was available for several hours and emergency response activities began immediately, but efforts were severely hampered by the damaged infrastructure. Eventually, the inability to keep multiple reactors and fuel pools cool resulted in fuel damage and the release of significant amounts of hydrogen. By March 15, the hydrogen buildup had led to explosions in four of the six reactor buildings. Additionally, there were reports of damage to nuclear fuel stored in onsite pools.

With all containment barriers damaged, radioactive contamination was released into the environment. The radioactive fission products released included iodine-131 (I-131), cesium-137, and cesium-134. I-131 is generated in a reactor and does not occur naturally in the environment. It can also be intentionally produced in a controlled setting for use in medical procedures. As with most radioactive material, in high concentrations, I-131 is intensely radioactive. It has a specific activity of 124,000 curies per gram and a half-life of eight days. After ten half-lives (80 days), 99.9 percent of the I-131 present at a given time will have decayed to stable xenon-131. Because of its chemical volatility, iodine has the ability to travel over much greater distances than cesium and other fission product radionuclides.

Given the anticipated release of radioactive material into the atmosphere from these damaged Japanese reactors, on March 14 the Pennsylvania Department of Environmental Protection's (DEP or department) Bureau of Radiation Protection (BRP) enhanced its normal review of environmental monitoring data and prepared to respond.

Trace amounts of I-131 in air sample results were first identified on March 22, as a result of laboratory analysis of air samples collected during the week of March 14-21. Trace amounts of I-131 in the atmosphere were further confirmed on March 24 through an analysis of precipitation that fell on March 23. The DEP Secretary and the Governor were briefed on the findings on Friday, March 25, at which time DEP staff were directed to collect samples of finished drinking water from six public water suppliers throughout the state for analysis.

On Saturday, March 26, those six samples, plus one raw water sample, were delivered to the DEP laboratory in Harrisburg. DEP staff worked throughout the weekend subjecting the samples to 100 minute and 1,000 minute testing protocols to ensure the quality and accuracy of the analysis. The analysis completed on Sunday, March 27, indicated that there was no detectable amount of I-131 found in the six finished drinking water samples. The one raw water sample was at the detectable limit of two picocuries per liter (pCi/L) which is below the EPA drinking water standard of three pCi/L. On Monday, March 28, Governor Corbett held a press conference to inform the public of the findings, confirm there was no threat to public health and safety or the environment, and assure the public that DEP would continue to monitor the situation.

Over the next several weeks DEP along with its partners continued and increased its sampling and monitoring efforts to include surface waters, additional drinking water supplies, precipitation, and milk samples at various locations across the commonwealth. As this report indicates I-131 was only detected in trace amounts for a very short period in our atmosphere and there was never a threat to the public's health. As for drinking water supplies only two of 66 samples had trace amounts of 1-131 and both of those samples were below the EPA drinking water standard of three pCi/L. The following sections of this report provide a description of each of the department's monitoring programs during this event.

DEP RESPONSE

The department's response included three major actions:

1. Communication and information sharing of environmental surveillance data with the five nuclear power plant sites in Pennsylvania, the US Department of Health and Human Services (HHS) and Nuclear Regulatory Commission (NRC).
2. Increasing sampling and analysis for I-131.
3. Expediting sample analysis and result review.

It is important to note that there was never a nuclear emergency declared in Pennsylvania due to these events in Japan. Therefore, neither the nuclear power plants in the commonwealth nor state government agencies were required to take any protective action. However, enhanced monitoring was initiated out of an abundance of caution.

Staff gathered information through multiple channels including HHS and NRC teleconferences, nuclear industry Internet websites and commercial media. Based on our previous experience with the 1986 Chernobyl accident, I-131 was expected to be detected at low levels in the air, in precipitation and, perhaps, in milk in Pennsylvania. This information was discussed with the Pennsylvania Emergency Management Agency, Department of Health, and Department of Agriculture. Given the anticipated lack of impact on the public and environment, the response to this accident was mainly monitoring performed by DEP.

The department immediately developed a monitoring program to confirm there were no threats to the public or the environment as a result of the release of the radioactive material in Japan. The response effort built on routine existing radiation monitoring programs for air, water and milk that were already underway near the five nuclear power plant sites in the commonwealth by increasing sampling in those programs; adding additional monitoring programs for surface water resources and drinking water; and promptly reviewing laboratory-generated analysis data.

Under federal regulations and license requirements, nuclear power plant operators are required to have a Radiological Environmental Monitoring Program (REMP) for the vicinity of the plant. Typical REMPs consist of measurements via direct gamma radiation exposure monitoring; airborne iodine

and particulate radionuclides; radionuclides in receiving water body; and radionuclides in site-specific food chain media. This data is submitted to the NRC annually.

The five nuclear power plant sites are:

- Beaver Valley Power Station (BVPS), Beaver County;
- Limerick Generating Station (LGS), Montgomery County;
- Peach Bottom Atomic Power Station (PBAPS), York County;
- Susquehanna Steam Electric Station (SSES), Luzerne County; and
- Three Mile Island (TMI), Dauphin County.

The department also enhanced its sampling and analysis of precipitation and water beginning March 25, 2011, and continued until I-131 from Japan was no longer detected in the samples. All Japan-related enhanced sampling and analysis efforts were discontinued by June 9, 2011, because I-131 from this event was a short-term release and the I-131 had decayed to non-detectable levels due to its short eight-day half-life. That is, in ten half-lives, or 80 days, the vast majority of I-131 has decayed.

FINDINGS

To provide context for this report, please note the following:

- Non-detect or "ND" is synonymous with an amount that is less than the lower limit of detection (LLD). Readings at or below this level are not statistically reliable.
- Samples collected at the DEP Laboratory building in Harrisburg, Pennsylvania, normally serves as a scientific control because this location is outside the ten-mile emergency planning zone of any nuclear power plant.
- All liquid samples are grab samples, as opposed to composite samples.
- All samples for this report were analyzed by the accredited DEP Laboratory in Harrisburg.
- Definitions:
  - Curie (Ci) – The activity of a quantity of radioactive material in which 3.7×10^{10} atoms decay per second.
  - picocurie (pCi) = 1/1,000,000,000,000 (one trillionth) of a curie
    = 10^{-12} Ci
    = 2.22 nuclear disintegrations per minute
  - pCi/L – picocurie per liter (liquid)
  - pCi/m^3 – picocurie per cubic meter (gas)
  - Half-life – The time required for a radioisotope to decrease to one-half of its original quantity.
  - LLD – Lower Limit of Detection. Readings at or below this level are not scientifically reliable.

Air Monitoring and Analysis

Routine air sampling performed by the department around all five nuclear power stations in the commonwealth and at the DEP Laboratory building first detected I-131 on March 22 in an analysis of an air sample collected from March 14 to 21. I-131 continued to be detected into the week of April 18. Air samples are collected by drawing air through activated charcoal canisters using a continuously running vacuum pump. The levels detected ranged from ND to 0.064 picocuries per cubic meter (pCi/m^3), which are well below any level of concern and posed no danger to the public. There were 362 air samples collected, analyzed and presented in this report. See appendix page A-1 for data.

The U.S. Environmental Protection Agency's (EPA) RadNet air sampling detected similar levels of I-131 around the country. RadNet is a national network of monitoring stations that regularly collect

air, precipitation, drinking water and milk samples for analysis of radioactivity. The RadNet network, which has stations in each state in major population centers, is used to track environmental releases of radioactivity from nuclear weapons tests and nuclear accidents.

Precipitation Monitoring and Analysis

Some radioactive material in precipitation was expected as a result of the nuclear accident. This expectation was based on previous experience with large releases, such as the September 1976 Chinese nuclear test and the 1986 Chernobyl accident. I-131 from the Fukushima event was first detected by DEP on March 24 in a precipitation sample collected on March 23. The concentrations reported in the initial precipitation samples in Pennsylvania for I-131 from late March ranged from 41 to 59 pCi/L. Since then, I-131 levels in precipitation sampled at the DEP Laboratory building have steadily declined to less than detectable concentrations (see appendix page A-12). There were 27 precipitation samples collected and analyzed for this report. The elevated levels in precipitation were relatively short in duration, fell well below any level of concern, and posed no danger to the public or environment.

Drinking Water Monitoring and Analysis

Monitoring was conducted at selected public water systems (PWS) across the state that use surface water sources (i.e., streams, reservoirs) to assess the quality of both the raw water and finished drinking water over an eight-week period. The EPA and DEP drinking water standard, also known as Maximum Contaminant Level (MCL), for I-131 is three pCi/L. This standard is based on long-term chronic exposure for consuming two liters of water per day all year over the course of a 70-year lifetime.

The department performed a special statewide collection from PWSs on Friday, March 25, 2011. Analysis was performed over the weekend of March 26 and 27. Drinking water sampling continued for eight weeks. Two sample results contained detectable levels of I-131 at the LLD; all other samples were below the DEP Laboratory's LLD and at or below the EPA drinking water standard. There were 66 samples collected and analyzed, and results are provided in appendix page A-13.

The PWS sample sites included the following:

NAME	COUNTY	SOURCE
Chambersburg Borough Water System	Franklin	Conococheague Creek
Hawthorn Area Water Authority	Clarion	Redbank Creek
Lewistown Borough Municipal Authority	Mifflin	Laurel Creek Dam
Mt. Union Municipal Authority	Huntington	Singers Gap
PA American Water Co - Susquehanna	Susquehanna	Comfort Lake
Patton Borough Water Dept.	Cambria	Chest Creek
Pittsburgh Water & Sewer Authority	Allegheny	Highland Reservoir
Ridgway Borough Water System	Elk	HB Norton Dam
Schuylkill Haven Borough Water	Schuylkill	Tumbling Run
Sellersville Borough Water Works	Bucks	Smoke Town Creek Catch Basin
Somerset Borough Municipal Authority	Somerset	Laurel Hill Creek
South Renovo Water System	Clinton	Halls Run
Union City Municipal Authority	Erie	Bentley Run Reservoir
Wellsboro Municipal Authority	Tioga	Hamilton Lake Willis Run Rock Run Lower Clark

Surface Water Monitoring and Analysis

Twelve surface waters (i.e., creeks and streams) were chosen for sampling in the eastern part of the state to correspond to the opening of trout season to reassure anglers that there was no risk of exposure. Of the 12 streams sampled, two returned detectable I-131 results; one was from the Schuylkill River, testing at two pCi/L, which is below the drinking water standard. The other was from the Wissahickon Creek, which sampled at 14 pCi/L. This one sample result alone is not a health concern because the MCL of three pCi/L is based on a rolling annual average. The finding on Wissahickon Creek is discussed below in the "unexpected results" section. The remaining results can be found in appendix page A-15.

The streams sampled were:

COUNTY	STREAM
Berks County	Mill Creek
Bucks County	Neshaminy Creek
Chester County	French Creek
Cumberland County	Yellow Breeches Creek
Delaware County	Ridley Creek
Franklin County	Conococheague Creek
Lancaster County	Hammer Creek
Montgomery County	Skippack Creek
Philadelphia County	Pennypacker Creek
Philadelphia County	Schuylkill River
Philadelphia County	Wissahickon Creek
York County	Codorus Creek

Milk Monitoring and Analysis

The DEP response consisted of an increase from monthly to weekly collection cycle for raw milk from farms around the five nuclear power plant sites in the commonwealth. Temporary sampling of goat milk was also instituted. Supplementary sampling of comingled milk from processing plants was also initiated by the Department of Agriculture, Bureau of Foods and Chemistry, in the seven Department of Agriculture regions. Raw milk and goat milk were collected voluntarily from individual dairy farmers, whereas comingled milk was purchased retail. I-131 levels were all less than the LLD. There were 83 milk samples collected and analyzed for this report. See appendix page A-16.

Unexpected Results

In the course of monitoring the surface water for traces of Fukushima radionuclides, an unexpected level (14 pCi/L) of I-131 was identified in Wissahickon Creek. Upon further investigation it was learned that, historically, low concentrations of I-131 had regularly been detected in the Wissahickon by EPA's RadNet program. In all likelihood, the source is excreted I-131 from patients who have undergone a medical procedure where millicurie levels of I-131 were used. This, combined with the unique low flow of the Wissahickon, with little in-stream dilution, may be the cause of this unexpected result. DEP, the Philadelphia Water Department and EPA continue to investigate and review the matter.

CONCLUSION

Based on all sampling and assessments during the spring of 2011, none of the precipitation, water, milk and air samples exceeded US Food and Drug Administration, EPA or DEP's normal regulatory standards. The health and safety of the public and environment within the commonwealth was never threatened by the events at Fukushima Dai-ichi. Further, because of the eight-day half-life of I-131, all of the material has decayed to undetectable concentrations.

The Department of Environmental Protection would like to recognize and thank the following organizations and individuals for their cooperation in this effort:

- Chambersburg Borough Water System
- Exelon Corporation
- FirstEnergy
- Hawthorn Area Water Authority
- Lewistown Borough Municipal Authority
- Mt. Union Municipal Authority
- PA American Water Company - Susquehanna
- Participating dairy farmers
- Patton Borough Water Department
- Pennsylvania Department of Agriculture
- Pennsylvania Department of Health
- Pennsylvania Emergency Management Agency
- Philadelphia Water Department
- Pittsburgh Water & Sewer Authority
- PPL Corporation
- Ridgway Borough Water System
- Schuylkill Haven Borough Water
- Sellersville Borough Water Works
- Somerset Borough Municipal Authority
- South Renovo Water System
- Union City Municipal Authority
- US Department of Energy
- US Department of Health and Human Services / Centers for Disease Control
- US Environmental Protection Agency
- US Nuclear Regulatory Commission
- Wellsboro Municipal Authority

Resources

- Gov. Corbett Press Release, March 28, 2011.
  http://www.portal.state.pa.us/portal/server.pt/community/newsroom/14287?id=16791&typeid=1
- EPA RadNet
  http://www.epa.gov/narel/radnet/
- Japanese Nuclear Emergency: EPA's Radiation Monitoring
  http://www.epa.gov/japan2011/
- International Atomic Energy Agency – Fukushima Nuclear Accident, An Update Log
  http://www.iaea.org/newscenter/focus/fukushima/
- US Nuclear Regulatory Commission - Japan Nuclear Accident
  http://www.nrc.gov/japan/japan-info.html
- US Environmental Protection Agency - Radionuclides in Drinking Water
  http://water.epa.gov/lawsregs/rulesregs/sdwa/radionuclides/index.cfm

Chronology

Date	Event & Commonwealth of Pennsylvania Actions
Friday, March 11, 2011	Earthquake / Tsunami
Friday, March 11, 2011	Fukushima Dai-ichi Reactors automatically shut down and soon lost emergency cooling power
Saturday, March 12, 2011	Unit 1 Reactor Building Explosion
Monday, March 14, 2011	Unit three Reactor Building Explosion
Monday, March 14, 2011	BRP initiated enhanced review of environmental monitoring laboratory analysis results
Tuesday, March 15, 2011	Unit 2 Reactor Building Explosion
Sunday, March 20, 2011	Radioactivity detected on west coast of North America
Tuesday, March 22, 2011	Preliminary laboratory analysis results of a 3/14/11 - 3/21/11 air sample indicate trace amounts of I-131
Thursday, March 24, 2011	Preliminary laboratory analysis results of 3/23/11 precipitation indicate trace amounts of I-131
Friday, March 25, 2011	Initial briefing for DEP Secretary and Governor
Friday, March 25, 2011	Initiated enhanced drinking water collection, monitoring and analysis
Saturday, March 26, 2011	Laboratory analysis of finished drinking water samples
Sunday, March 27, 2011	Laboratory analysis of finished drinking water samples
Monday, March 28, 2011	Governor's press conference regarding I-131 in precipitation and enhanced environmental monitoring
Tuesday, March 29, 2011	Initiated enhanced surface water monitoring and analysis
Wednesday, March 30, 2011	Initiated enhanced milk monitoring and analysis
Wednesday, March 30, 2011	Elevated level of I-131 first detected in surface water
Monday, April 04, 2011	Discontinued enhanced surface water monitoring and analysis
Tuesday, May 10, 2011	Discontinued enhanced drinking water monitoring and analysis
Thursday, May 12, 2011	Discontinued enhanced milk monitoring and analysis
Thursday, June 09, 2011	Discontinued enhanced precipitation monitoring and analysis

APPENDIX

Beaver Valley Power Station Air (charcoal cartridge)

Sample Period - Begin	Sample Period - End	I-131 pCi/m^3			LLD pCi/m^3
02/07/11	02/14/11	ND			0.004
02/07/11	02/14/11	ND			0.003
02/07/11	02/14/11	ND			0.004
02/07/11	02/14/11	ND			0.005
02/14/11	02/23/11	ND			0.003
02/14/11	02/23/11	ND			0.002
02/14/11	02/23/11	ND			0.003
02/14/11	02/23/11	ND			0.005
02/23/11	02/28/11	ND			0.005
02/23/11	02/28/11	ND			0.005
02/23/11	02/28/11	ND			0.005
02/23/11	02/28/11	Insufficient volume collected for sample			
02/28/11	03/07/11	ND			0.004
02/28/11	03/07/11	ND			0.004
02/28/11	03/07/11	ND			0.004
02/28/11	03/07/11	ND			0.004
03/07/11	03/14/11	ND			0.004
03/07/11	03/14/11	ND			0.003
03/07/11	03/14/11	ND			0.005
03/07/11	03/14/11	ND			0.003
Fukushima Accident → 03/14/11	03/21/11	0.005	+/-	0.002	0.003
03/14/11	03/21/11	ND			0.005
03/14/11	03/21/11	0.004	+/-	0.002	0.004
03/14/11	03/21/11	0.003	+/-	0.003	0.004
03/21/11	03/28/11	0.025	+/-	0.005	0.003
03/21/11	03/28/11	0.028	+/-	0.004	0.004
03/21/11	03/28/11	0.025	+/-	0.004	0.004
03/21/11	03/28/11	0.022	+/-	0.005	0.004
03/28/11	04/04/11	0.038	+/-	0.007	0.005
03/28/11	04/04/11	0.035	+/-	0.005	0.004
03/28/11	04/04/11	0.041	+/-	0.006	0.005
03/28/11	04/04/11	0.036	+/-	0.003	0.004
04/04/11	04/11/11	0.013	+/-	0.004	0.003
04/04/11	04/11/11	0.012	+/-	0.004	0.005
04/04/11	04/11/11	0.013	+/-	0.004	0.004
04/04/11	04/11/11	0.012	+/-	0.003	0.003
04/11/11	04/18/11	ND			0.004
04/11/11	04/18/11	ND			0.005
04/11/11	04/18/11	0.004	+/-	0.002	0.004
04/11/11	04/18/11	ND			0.004

Beaver Valley Power Station Air (charcoal cartridge) - Continued

Sample Period - Begin	Sample Period - End	I-131 pCi/m^3	LLD pCi/m^3
04/18/11	04/25/11	ND	0.003
04/18/11	04/25/11	ND	0.005
04/18/11	04/25/11	ND	0.005
04/18/11	04/25/11	ND	0.004
04/25/11	05/02/11	ND	0.004
04/25/11	05/02/11	ND	0.004
04/25/11	05/02/11	ND	0.005
04/25/11	05/02/11	ND	0.003
05/02/11	05/09/11	ND	0.004
05/02/11	05/09/11	ND	0.004
05/02/11	05/09/11	ND	0.005
05/02/11	05/09/11	ND	0.004
05/09/11	05/16/11	ND	0.004
05/09/11	05/16/11	ND	0.004
05/09/11	05/16/11	ND	0.005
05/09/11	05/16/11	ND	0.004
05/16/11	05/23/11	ND	0.004
05/16/11	05/23/11	ND	0.003
05/16/11	05/23/11	ND	0.005
05/16/11	05/23/11	ND	0.004
05/23/11	05/31/11	ND	0.003
05/23/11	05/31/11	ND	0.005
05/23/11	05/31/11	ND	0.004
05/23/11	05/31/11	ND	0.002
05/31/11	06/06/11	ND	0.005
05/31/11	06/06/11	ND	0.003
05/31/11	06/06/11	ND	0.004
05/31/11	06/06/11	ND	0.005

Limerick Generating Station Air (charcoal cartridge)

Sample Period - Begin	Sample Period - End	I-131 pCi/m^3			LLD pCi/m^3
02/03/11	02/10/11	ND			0.002
02/03/11	02/10/11	ND			0.004
02/03/11	02/10/11	ND			0.003
02/10/11	02/17/11	ND			0.002
02/10/11	02/17/11	ND			0.002
02/10/11	02/17/11	ND			0.003
02/10/11	02/17/11	ND			0.003
02/17/11	02/24/11	ND			0.003
02/17/11	02/24/11	ND			0.005
02/17/11	02/24/11	ND			0.003
02/17/11	02/24/11	ND			0.003
02/24/11	03/03/11	ND			0.003
02/24/11	03/03/11	ND			0.002
02/24/11	03/03/11	ND			0.003
02/24/11	03/03/11	ND			0.003
03/03/11	03/10/11	ND			0.002
03/03/11	03/10/11	ND			0.004
03/03/11	03/10/11	ND			0.003
03/03/11	03/10/11	ND			0.003
03/10/11	03/17/11	ND			0.004
03/10/11	03/17/11	ND			0.004
03/10/11	03/17/11	ND			0.004
03/10/11	03/17/11	ND			0.003
03/17/11	03/24/11	0.024	+/-	0.007	0.004
03/17/11	03/24/11	0.028	+/-	0.005	0.004
03/17/11	03/24/11	0.030	+/-	0.005	0.003
03/17/11	03/24/11	0.032	+/-	0.006	0.006
03/24/11	03/31/11	0.024	+/-	0.004	0.003
03/24/11	03/31/11	0.024	+/-	0.004	0.003
03/24/11	03/31/11	0.024	+/-	0.004	0.004
03/24/11	03/31/11	0.026	+/-	0.005	0.003
03/31/11	04/07/11	0.033	+/-	0.004	0.004
03/31/11	04/07/11	0.036	+/-	0.004	0.002
03/31/11	04/07/11	0.033	+/-	0.005	0.003
03/31/11	04/07/11	0.038	+/-	0.005	0.003
04/07/11	04/14/11	0.009	+/-	0.003	0.004
04/07/11	04/14/11	0.007	+/-	0.002	0.003
04/07/11	04/14/11	0.007	+/-	0.003	0.003
04/07/11	04/14/11	0.007	+/-	0.003	0.003
04/14/11	04/20/11	ND			0.005
04/14/11	04/20/11	0.005	+/-	0.002	0.003
04/14/11	04/20/11	0.004	+/-	0.002	0.004
04/14/11	04/20/11	Insufficient Air Volume for Sample			

Fukushima Accident →

Limerick Generating Station Air (charcoal cartridge) - Continued

Sample Period - Begin	Sample Period - End	I-131 pCi/m^3			LLD pCi/m^3
04/20/11	04/28/11	ND			0.002
04/20/11	04/28/11	0.002	+/-	0.002	0.003
04/20/11	04/28/11	ND			0.004
04/20/11	04/28/11	ND			0.002
04/28/11	05/05/11	ND			0.004
04/28/11	05/05/11	ND			0.004
04/28/11	05/05/11	ND			0.003
04/28/11	05/05/11	ND			0.004
05/05/11	05/12/11	ND			0.005
05/05/11	05/12/11	ND			0.004
05/05/11	05/12/11	ND			0.002
05/05/11	05/12/11	ND			0.004
05/12/11	05/19/11	ND			0.004
05/12/11	05/19/11	ND			0.004
05/12/11	05/19/11	ND			0.004
05/12/11	05/19/11	ND			0.004
05/19/11	05/26/11	ND			0.005
05/19/11	05/26/11	ND			0.004
05/19/11	05/26/11	ND			0.003
05/19/11	05/26/11	ND			0.004
05/26/11	06/02/11	ND			0.005
05/26/11	06/02/11	ND			0.004
05/26/11	06/02/11	ND			0.002
05/26/11	06/02/11	ND			0.004
06/02/11	06/09/11	ND			0.004
06/02/11	06/09/11	ND			0.002
06/02/11	06/09/11	ND			0.002
06/02/11	06/09/11	ND			0.004

Peach Bottom Atomic Power Station Air (charcoal cartridge)

Sample Period - Begin	Sample Period - End	I-131 pCi/m^3	LLD pCi/m^3
02/08/11	02/14/11	ND	0.005
02/08/11	02/14/11	ND	0.004
02/08/11	02/14/11	ND	0.004
02/08/11	02/14/11	ND	0.004
02/14/11	02/22/11	ND	0.003
02/14/11	02/22/11	ND	0.003
02/14/11	02/22/11	ND	0.004
02/14/11	02/22/11	ND	0.003
02/22/11	03/01/11	ND	0.004
02/22/11	03/01/11	ND	0.002
02/22/11	03/01/11	ND	0.004
02/22/11	03/01/11	ND	0.003
03/01/11	03/08/11	ND	0.005
03/01/11	03/08/11	ND	0.004
03/01/11	03/08/11	ND	0.004
03/01/11	03/08/11	ND	0.003
03/08/11	03/15/11	ND	0.003
03/08/11	03/15/11	ND	0.003
03/08/11	03/15/11	ND	0.004
03/08/11	03/15/11	Insufficient Air Volume for Sample	
03/15/11	03/22/11	ND	0.004
03/15/11	03/22/11	ND	0.006
03/15/11	03/22/11	0.006 +/- 0.003	0.005
03/15/11	03/22/11	ND	0.006
03/22/11	03/29/11	0.031 +/- 0.006	0.004
03/22/11	03/29/11	0.037 +/- 0.006	0.005
03/22/11	03/29/11	0.031 +/- 0.006	0.004
03/22/11	03/29/11	0.034 +/- 0.006	0.003
03/29/11	04/05/11	0.035 +/- 0.005	0.005
03/29/11	04/05/11	0.039 +/- 0.007	0.005
03/29/11	04/05/11	0.044 +/- 0.006	0.005
03/29/11	04/05/11	0.040 +/- 0.006	0.003
04/05/11	04/12/11	0.013 +/- 0.004	0.004
04/05/11	04/12/11	0.011 +/- 0.004	0.005
04/05/11	04/12/11	0.016 +/- 0.003	0.004
04/05/11	04/12/11	0.012 +/- 0.003	0.003
04/12/11	04/19/11	0.004 +/- 0.003	0.002
04/12/11	04/19/11	0.002 +/- 0.001	0.004
04/12/11	04/19/11	ND	0.005
04/12/11	04/19/11	ND	0.004

Fukushima Accident →

Peach Bottom Atomic Power Station Air (charcoal cartridge) - Continued

Sample Period - Begin	Sample Period - End	I-131 pCi/m^3	LLD pCi/m^3
04/19/11	04/26/11	ND	0.005
04/19/11	04/26/11	ND	0.004
04/19/11	04/26/11	ND	0.004
04/19/11	04/26/11	ND	0.003
04/26/11	05/03/11	ND	0.004
04/26/11	05/03/11	ND	0.004
04/26/11	05/03/11	ND	0.004
04/26/11	05/03/11	ND	0.002
05/03/11	05/10/11	ND	0.004
05/03/11	05/10/11	ND	0.005
05/03/11	05/10/11	ND	0.004
05/03/11	05/10/11	ND	0.003
05/10/11	05/17/11	ND	0.004
05/10/11	05/17/11	ND	0.004
05/10/11	05/17/11	ND	0.004
05/10/11	05/17/11	ND	0.002
05/17/11	05/24/11	ND	0.005
05/17/11	05/24/11	ND	0.004
05/17/11	05/24/11	ND	0.004
05/17/11	05/24/11	ND	0.004
05/24/11	05/31/11	ND	0.005
05/24/11	05/31/11	ND	0.004
05/24/11	05/31/11	ND	0.004
05/24/11	05/31/11	ND	0.005
05/31/11	06/07/11	ND	0.004
05/31/11	06/07/11	ND	0.004
05/31/11	06/07/11	ND	0.003
05/31/11	06/07/11	ND	0.005

Susquehanna Steam Electric Station Air (charcoal cartridge)

Sample Period - Begin	Sample Period - End	I-131 pCi/m^3			LLD pCi/m^3
02/02/11	02/09/11	ND			0.003
02/02/11	02/09/11	Insufficient Air Volume for Sample			
02/02/11	02/09/11	ND			0.003
02/02/11	02/09/11	ND			0.004
02/09/11	02/16/11	ND			0.003
02/10/11	02/16/11	ND			0.003
02/11/11	02/16/11	ND			0.003
02/12/11	02/16/11	ND			0.004
02/16/11	02/23/11	ND			0.003
02/16/11	02/23/11	ND			0.003
02/16/11	02/23/11	ND			0.004
02/16/11	02/23/11	ND			0.005
02/23/11	03/02/11	ND			0.003
02/23/11	03/02/11	ND			0.004
02/23/11	03/02/11	ND			0.003
02/23/11	03/02/11	ND			0.004
03/02/11	03/09/11	ND			0.003
03/02/11	03/09/11	ND			0.003
03/02/11	03/09/11	ND			0.004
03/02/11	03/09/11	ND			0.004
03/09/11	03/16/11	ND			0.003
03/09/11	03/16/11	ND			0.004
03/09/11	03/16/11	ND			0.004
03/09/11	03/16/11	ND			0.004
Fukushima Accident → 03/16/11	03/23/11	0.022	+/-	0.004	0.003
03/16/11	03/23/11	0.018	+/-	0.005	0.004
03/16/11	03/23/11	0.022	+/-	0.006	0.005
03/16/11	03/23/11	0.021	+/-	0.004	0.004
03/23/11	03/30/11	0.017	+/-	0.004	0.003
03/23/11	03/30/11	0.021	+/-	0.004	0.002
03/23/11	03/30/11	0.020	+/-	0.005	0.004
03/23/11	03/30/11	0.017	+/-	0.004	0.003
03/30/11	04/06/11	0.035	+/-	0.005	0.003
03/30/11	04/06/11	0.032	+/-	0.006	0.005
03/30/11	04/06/11	0.040	+/-	0.007	0.004
03/30/11	04/06/11	0.035	+/-	0.005	0.004
04/06/11	04/14/11	0.005	+/-	0.002	0.003
04/06/11	04/14/11	0.007	+/-	0.004	0.003
04/06/11	04/14/11	0.007	+/-	0.003	0.003
04/06/11	04/14/11	0.006	+/-	0.003	0.003
04/14/11	04/21/11	ND			0.004
04/14/11	04/21/11	0.004	+/-	0.002	0.004
04/14/11	04/21/11	ND			0.006
04/14/11	04/21/11	ND			0.004

Susquehanna Steam Electric Station Air (charcoal cartridge) - Continued

Sample Period - Begin	Sample Period - End	I-131 pCi/m^3	LLD pCi/m^3
04/21/11	04/27/11	ND	0.004
04/21/11	04/27/11	Insufficient Air Volume for Sample	
04/21/11	04/27/11	ND	0.005
04/21/11	04/27/11	Insufficient Air Volume for Sample	
04/27/11	05/04/11	ND	0.003
04/27/11	05/04/11	ND	0.005
04/27/11	05/04/11	ND	0.004
04/27/11	05/04/11	ND	0.003
05/04/11	05/11/11	ND	0.003
05/04/11	05/11/11	ND	0.004
05/04/11	05/11/11	ND	0.003
05/04/11	05/11/11	ND	0.004
05/11/11	05/18/11	ND	0.003
05/11/11	05/18/11	ND	0.004
05/11/11	05/18/11	ND	0.004
05/11/11	05/18/11	ND	0.005
05/18/11	05/25/11	ND	0.002
05/18/11	05/25/11	ND	0.005
05/18/11	05/25/11	ND	0.003
05/18/11	05/25/11	ND	0.004
05/25/11	06/01/11	ND	0.002
05/25/11	06/01/11	ND	0.005
05/25/11	06/01/11	ND	0.004
05/25/11	06/01/11	ND	0.003
06/01/11	06/08/11	ND	0.005
06/01/11	06/08/11	ND	0.004
06/01/11	06/08/11	ND	0.005
06/01/11	06/08/11	ND	0.003

Three Mile Island Air (charcoal cartridge)

Sample Period - Begin	Sample Period - End	I-131 pCi/m^3			LLD pCi/m^3
02/02/11	02/09/11	ND			0.005
02/02/11	02/09/11	ND			0.003
02/02/11	02/09/11	ND			0.002
02/02/11	02/09/11	Insufficient Air Volume for Sample			
02/09/11	02/16/11	ND			0.004
02/09/11	02/16/11	ND			0.003
02/09/11	02/16/11	ND			0.003
02/09/11	02/16/11	ND			0.003
02/16/11	02/24/11	ND			0.003
02/16/11	02/24/11	ND			0.003
02/16/11	02/24/11	ND			0.003
02/16/11	02/24/11	ND			0.002
02/24/11	03/02/11	ND			0.003
02/24/11	03/02/11	ND			0.003
02/24/11	03/02/11	ND			0.004
02/24/11	03/02/11	ND			0.004
03/02/11	03/10/11	ND			0.003
03/02/11	03/10/11	ND			0.003
03/02/11	03/10/11	ND			0.003
03/02/11	03/10/11	ND			0.004
03/10/11	03/16/11	ND			0.003
03/10/11	03/16/11	ND			0.004
03/10/11	03/16/11	ND			0.004
03/10/11	03/16/11	ND			0.005
03/16/11	03/23/11	0.023	+/-	0.004	0.004
03/16/11	03/23/11	0.023	+/-	0.005	0.003
03/16/11	03/23/11	0.022	+/-	0.004	0.004
03/16/11	03/23/11	0.024	+/-	0.003	0.003
03/23/11	03/30/11	0.027	+/-	0.004	0.004
03/23/11	03/30/11	0.031	+/-	0.006	0.005
03/23/11	03/30/11	0.028	+/-	0.005	0.003
03/23/11	03/30/11	0.029	+/-	0.004	0.002
03/30/11	04/06/11	0.032	+/-	0.005	0.004
03/30/11	04/06/11	0.036	+/-	0.006	0.003
03/30/11	04/06/11	0.035	+/-	0.004	0.004
03/30/11	04/06/11	0.037	+/-	0.004	0.003
04/06/11	04/13/11	0.013	+/-	0.005	0.005
04/06/11	04/13/11	0.009	+/-	0.003	0.003
04/06/11	04/13/11	0.011	+/-	0.002	0.003
04/06/11	04/13/11	0.009	+/-	0.003	0.002
04/13/11	04/20/11	0.005	+/-	0.002	0.005
04/13/11	04/20/11	ND			0.005
04/13/11	04/20/11	ND			0.004
04/13/11	04/20/11	ND			0.005

Fukushima Accident →

Three Mile Island Air (charcoal cartridge) - Continued

Sample Period - Begin	Sample Period - End	I-131 pCi/m^3	LLD pCi/m^3
04/20/11	04/27/11	ND	0.004
04/20/11	04/27/11	ND	0.004
04/20/11	04/27/11	ND	0.004
04/20/11	04/27/11	Insufficient Air Volume for Sample	
04/27/11	05/04/11	ND	0.004
04/27/11	05/04/11	ND	0.003
04/27/11	05/04/11	ND	0.004
04/27/11	05/04/11	ND	0.005
05/04/11	05/11/11	ND	0.003
05/04/11	05/11/11	ND	0.003
05/04/11	05/11/11	ND	0.004
05/04/11	05/11/11	ND	0.003
05/11/11	05/18/11	ND	0.004
05/11/11	05/18/11	ND	0.002
05/11/11	05/18/11	ND	0.004
05/11/11	05/18/11	ND	0.003
05/18/11	05/25/11	ND	0.005
05/18/11	05/25/11	ND	0.002
05/18/11	05/25/11	ND	0.005
05/18/11	05/25/11	ND	0.004
05/25/11	06/01/11	ND	0.005
05/25/11	06/01/11	ND	0.003
05/25/11	06/01/11	ND	0.006
05/25/11	06/01/11	ND	0.004
06/01/11	06/08/11	ND	0.003
06/01/11	06/08/11	ND	0.003
06/01/11	06/08/11	ND	0.003
06/01/11	06/08/11	ND	0.003

Control Air (charcoal cartridge)

DEP Laboratory Building
2575 Interstate Drive, Harrisburg, PA 17110

Sample Period - Begin	Sample Period - End	I-131 pCi/m^3			LLD pCi/m^3
1/31/2011	02/07/11	ND			0.002
02/07/11	02/14/11	ND			0.002
02/14/11	02/22/11	ND			0.004
02/22/11	02/28/11	ND			0.005
02/28/11	03/07/11	ND			0.002
03/07/11	03/14/11	ND			0.004
03/14/11	03/21/11	0.003	+/-	0.002	0.002
03/21/11	03/28/11	0.043	+/-	0.006	0.005
03/28/11	04/04/11	0.064	+/-	0.008	0.005
04/04/11	04/11/11	0.017	+/-	0.005	0.005
04/11/11	04/18/11	ND			0.004
04/18/11	04/25/11	ND			0.004
04/25/11	05/02/11	ND			0.004
05/02/11	05/09/11	ND			0.003
05/09/11	05/16/11	ND			0.003
05/16/11	05/23/11	ND			0.003
05/23/11	05/31/11	ND			0.004
05/31/11	06/06/11	ND			0.004
06/06/11	06/13/11	ND			0.006

Fukushima Accident →

Precipitation

DEP Laboratory Building
2575 Interstate Drive, Harrisburg, PA 17110

Collection Date	I-131 pCi/L			LLD pCi/L
02/07/11	ND			2
02/22/11	ND			2
02/28/11	ND			3
03/07/11	ND			3
03/10/11	ND			2
Fukushima Accident → 03/14/11	ND			2
03/23/11	41	+/-	3	2
03/28/11	26	+/-	2	2
03/31/11	59	+/-	7	5
04/01/11	18	+/-	6	4
04/05/11	12	+/-	2	2
04/08/11	8	+/-	2	2
04/11/11	7	+/-	2	2
04/12/11	ND			5
04/13/11	ND			2
04/18/11	ND			2
04/20/11	2	+/-	1	2
04/25/11	ND			2
04/28/11	ND			8
05/04/11	ND			2
05/16/11	ND			2
05/17/11	ND			3
05/19/11	ND			2
05/20/11	ND			3
05/23/11	ND			1
05/27/11	ND			2
06/09/11	ND			2

Finished Drinking Water

Collection Date	Location	I- 131 pCi/L			LLD pCi/L
03/25/11	East Stroudsburg Borough Water Authority	ND			1
03/25/11	Greenville Municipal water Authority	ND			2
03/25/11	Harrisburg Authority Finished Water	ND			2
03/25/11	PA American Norristown Finished Water	ND			2
03/25/11	PA American Norristown Raw Water	2	+/-	1	2
03/25/11	Pittsburgh - 400 Building Tap Sample (only 1L submitted)	ND			5
03/25/11	Williamsport Municipal Water Authority Finished Water	ND			2
03/29/11	Columbia Drinking water	ND			2
03/29/11	Columbia Drinking water	ND			2
03/29/11	Conowingo Dam Fisherman's park	ND			2
03/29/11	Harrisburg Drinking Water	ND			3
04/04/11	Chambersburg Water Treatment Plant Fayetteville	ND			2
04/04/11	Laurel Creek Lewistown Borough Municipal Authority Mifflin	ND			1
04/04/11	Philadelphia Water Department - Queen Lane	3	+/-	2	3
04/05/11	Conowingo Dam Fisherman's park	ND			2
04/05/11	Hawthorn Water Treatment Plant	ND			2
04/05/11	Patton Water Supply	ND			2
04/05/11	Pittsburgh Water and Sewer Authority Highland Park Reservoir	ND			2
04/05/11	Renovo Water Treatment plant	ND			2
04/05/11	Union City Municipal Authority	ND			2
04/05/11	Wellsboro Municipal Authority	ND			2
04/06/11	Columbia Drinking water	ND			2
04/07/11	Harrisburg Drinking Water	ND			1
04/11/11	Cambridge Springs	ND			2
04/11/11	Hawthorn	ND			2
04/11/11	Lewistown	ND			3
04/11/11	Mount Union	ND			2
04/11/11	Pittsburgh	ND			2
04/11/11	Renovo	ND			3
04/11/11	Susquehanna	ND			1
04/11/11	Wellsboro	ND			2
04/12/11	Patton	ND			3
04/13/11	Columbia Drinking water	ND			2
04/14/11	Harrisburg Drinking Water	ND			2
04/18/11	Cambridge Springs	ND			2
04/18/11	Chambersburg	ND			2
04/18/11	Hooversville	ND			2
04/18/11	Mount Union	ND			2
04/18/11	Pittsburgh	ND			2
04/18/11	Renovo	ND			1

Finished Drinking Water – Continued

Collection Date	Location	I- 131 pCi/L	LLD pCi/L
04/19/11	Conowingo Dam Fisherman's park	ND	2
04/19/11	Sellersville	ND	2
04/20/11	Columbia Drinking water	ND	2
04/20/11	Harrisburg Drinking Water	ND	2
04/25/11	Chambersburg	ND	2
04/25/11	Hawthorn	ND	2
04/25/11	Patton	ND	2
04/25/11	Sellersville	ND	2
04/25/11	Susquehanna	ND	2
04/25/11	Wellsboro	ND	2
04/26/11	Hooversville	ND	2
04/27/11	Columbia Drinking water	ND	1
05/02/11	Cambridge Springs	ND	2
05/02/11	Chambersburg	ND	2
05/02/11	Pittsburgh	ND	2
05/02/11	Renovo	ND	3
05/03/11	Conowingo Dam Fisherman's park	ND	2
05/03/11	Patton	ND	2
05/09/11	Hawthorn	ND	2
05/09/11	Lewistown	ND	2
05/09/11	Pittsburgh	ND	2
05/09/11	Robert George	ND	2
05/09/11	Sellersville	ND	2
05/09/11	Susquehanna	ND	2
05/09/11	Wellsboro	ND	2
05/10/11	Conowingo Dam Fisherman's park	ND	2

Surface Water

Collection Date	Creek	County	I- 131 pCi/L			LLD pCi/L
03/29/11	Mill Creek	Berks	ND			2
03/29/11	Yellow Breeches Creek	Cumberland	ND			2
03/29/11	Conococheague Creek	Franklin	ND			1
03/29/11	Hammer Creek	Lancaster	ND			3
03/29/11	Codorus Creek	York	ND			2
03/30/11	Neshaminy Creek	Bucks	ND			5
03/30/11	French Creek	Chester	ND			3
03/30/11	Ridley Creek	Delaware	ND			2
03/30/11	Skippack Creek	Montgomery	ND			2
03/30/11	Wissahickon Creek	Philadelphia	14	+/-	1	1
03/30/11	Pennypacker creek	Philadelphia	ND			2
04/04/11	Schuylkill River	Philadelphia	2	+/-	1	2

Milk

Collection Date	Area	I-131 pCi/L	LLD pCi/L
02/02/11	TMI	ND	3
02/02/11	TMI	ND	3
02/07/11	PBAPS	ND	3
02/07/11	PBAPS	ND	3
02/07/11	SSES	ND	3
02/07/11	SSES	ND	3
02/14/11	BVPS	ND	3
02/14/11	BVPS	ND	3
02/15/11	LGS	ND	3
02/15/11	LGS	ND	3
03/02/11	TMI	ND	3
03/02/11	TMI	ND	2
03/07/11	PBAPS	ND	2
03/07/11	PBAPS	ND	3
03/08/11	SSES	ND	2
03/08/11	SSES	ND	2
Fukushima Accident →			
03/14/11	BVPS	ND	2
03/14/11	BVPS	ND	2
03/15/11	LGS	ND	3
03/15/11	LGS	ND	3
03/30/11	LGS	ND	7
03/30/11	TMI	ND	2
03/31/11	Bear Lake, PA	ND	6
03/31/11	Lansdale, PA	ND	8
03/31/11	New Wilmington, PA	ND	7
03/31/11	Shavertown, PA	ND	10
03/31/11	Shippensburg, PA	ND	5
03/31/11	Williamsport, PA	ND	6
04/04/11	PBAPS	ND	3
04/04/11	PBAPS	ND	3
04/04/11	PBAPS	ND	4
04/04/11	SSES	ND	2
04/04/11	SSES	ND	3
04/05/11	LGS	ND	3
04/05/11	LGS	ND	4
04/05/11	LGS	ND	10
04/06/11	TMI	ND	5
04/11/11	PBAPS	ND	2
04/13/11	LGS	ND	2
04/13/11	TMI	ND	5
04/13/11	TMI	ND	2
04/17/11	BVPS	ND	3
04/17/11	BVPS	ND	3
04/18/11	PBAPS	ND	6

Milk - Continued

Collection Date	Area	I-131 pCi/L	LLD pCi/L
04/19/11	Aliquippa, PA	ND	7
04/19/11	Bear Lake, PA	ND	6
04/19/11	LGS	ND	6
04/19/11	Williamsport, PA	ND	4
04/20/11	Lansdale, PA	ND	5
04/20/11	Quarryville, PA	ND	7
04/20/11	TMI	ND	4
04/25/11	LGS	ND	7
04/25/11	PBAPS	ND	8
04/27/11	TMI	ND	5
05/02/11	PBAPS	ND	3
05/02/11	PBAPS	ND	3
05/02/11	PBAPS	ND	4
05/02/11	SSES	ND	4
05/02/11	SSES	ND	3
05/03/11	LGS	ND	3
05/03/11	LGS	ND	3
05/04/11	TMI	ND	5
05/09/11	PBAPS	ND	3
05/11/11	TMI	ND	3
05/11/11	TMI	ND	2
05/16/11	BVPS	ND	3
05/17/11	BVPS	ND	2
06/13/11	BVPS	ND	3
06/13/11	PBAPS	ND	3
06/13/11	PBAPS	ND	2
06/13/11	SSES	ND	3
06/13/11	SSES	ND	3
06/14/11	BVPS	ND	3
06/14/11	BVPS	ND	3
06/14/11	LGS	ND	3
06/14/11	LGS	ND	3

Goat Milk

Collection Date	I-131 pCi/L	LLD pCi/L
03/31/11	ND	6
04/07/11	ND	5
04/14/11	ND	9
04/21/11	ND	7
05/03/11	ND	6
05/06/11	ND	8
05/12/11	ND	6