

Environmental Monitoring Report

For 2017

Pilgrim, Seabrook, and Vermont Yankee
Nuclear Power Station
Emergency Planning Zones

Prepared by:

Environmental Toxicology Program
Bureau of Environmental Health
Massachusetts Department of Public Health
250 Washington Street
Boston, Massachusetts 02108

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EXECUTIVE SUMMARY

The Massachusetts Department of Public Health (MDPH) Bureau of Environmental Health's (MDPH/BEH) Environmental Toxicology and Radiation Control Programs collaborate to conduct routine environmental monitoring in the three nuclear power station Emergency Planning Zones (EPZs) within the Commonwealth. This monitoring is part of the Department's regulatory responsibility, and provides a system of watchfulness over environmental radiation in Massachusetts communities surrounding nuclear power plants. These EPZs include communities located within a 10-mile radius of Pilgrim Nuclear Power Station (Pilgrim) in Plymouth, MA, Seabrook Nuclear Power Station (Seabrook) in Seabrook, NH, and the Vermont Yankee Nuclear Power Station (VY), in Vernon, VT. VY ceased operations on December 29, 2014 and is undergoing decommissioning. This report summarizes the 2017 monitoring activities and results for each nuclear plant EPZ.

Radiation monitoring results in 2017 for areas surrounding the three nuclear power stations affecting Massachusetts have been either non-detect, naturally occurring, at levels expected to be present in the environment from background fallout from historic bomb testing and past nuclear accidents, or attributable to a known source. Iodine-131 was detected in one sample of Irish moss collected at a background location outside the Seabrook EPZ. Iodine-131 has been detected in Irish moss at this background location in previous years and, based on its location, is most likely from either a water treatment plant or medical facility located nearby, due to use of Iodine-131 for treating certain thyroid disorders. Cesium-137 was detected in two of four fish samples collected inside the former VY EPZ. MDPH/BEH has determined the Cesium-137 is attributable to historic radiation fallout in the environment.

Overall, no radiation indicators or radionuclides were detected at a level of health concern.

1. INTRODUCTION

The MDPH/BEH radiation environmental monitoring program is designed to monitor radiation levels and to protect residents in the Commonwealth from exposure to radiation. Samples of environmental media collected within and just outside the EPZs surrounding nuclear power plants by MDPH/BEH or provided by the utilities that operate the nuclear power plants, are analyzed for radiation by the MDPH/BEH Massachusetts Environmental Radiation Laboratory (MERL). Environmental media analyzed in 2017 include: air, surface water, milk, fish, shellfish, sediment, vegetation and food crops. In addition to the samples analyzed for radiation by MERL, MDPH/BEH has a network of stationary monitors surrounding Pilgrim that measures gamma radiation in real-time, which is monitored online by MDPH/BEH staff. The C-IO Research & Education Foundation, Inc., a non-profit organization under contract to MDPH/BEH, conducts direct radiation monitoring in Massachusetts communities within the Seabrook EPZ and provides summary reports to MDPH/BEH.

The radiation environmental monitoring of Pilgrim and Seabrook EPZs has been in place since the 1980s. The environmental monitoring program for Massachusetts communities within the VY EPZ began in 2011. A focused investigation of tritium in groundwater on the Pilgrim Nuclear Power Plant property is ongoing and not part of this report. Updates on this monitoring effort are posted on the MDPH website: [Tritium investigation update reports](#).

The U.S. Nuclear Regulatory Commission (NRC) requires specific environmental monitoring and annual reporting by operating nuclear power plants. The reports summarizing Seabrook's and Pilgrim's environmental monitoring can be found on the NRC website: [Pilgrim's 2017 Environmental Radiological Monitoring Report](#) and [Seabrook's 2017 Environmental Radiological Monitoring Report](#). Vermont Yankee's reports are no longer on the NRC website.

MDPH/BEH's monitoring activities for each nuclear plant are described in the Environmental Monitoring sections of this report. This report contains background information regarding environmental radiation and laboratory methods used to analyze samples for radiation; sample location and analyses for each of the three EPZs; and a summary of the monitoring results for each EPZ.

A. ENVIRONMENTAL RADIATION

Background radiation in the environment comes from three general sources: naturally occurring radiation, radioactive fallout from past weapons testing or nuclear accidents, and man-made sources.

Naturally occurring radionuclides, such as Potassium-40 and Beryllium-7, are present in most environmental media. Potassium-40 is a radioactive form of potassium, which is an essential nutrient. Beryllium-7 is produced when cosmic energy collides with nitrogen and oxygen in the atmosphere (Delaygue et al., 2015). Additional natural sources of radiation, including cosmic radiation, radon, and carbon-14, contribute to an annual background radiation dose of approximately 310 mrems/year (US NRC, 2017a). Man-made sources include medical procedures (e.g., diagnostic x-rays) and various consumer products (e.g., certain construction material, combustible fuels, televisions, smoke detectors) (US NRC 2017b). Background and man-made sources contribute to the estimated 620 mrem annual dose of environmental radiation for average U.S. residents (US NRC, 2017c).

Table 1. Background Radiation Dose for Average U.S. Resident

Source	Millirems/year
Natural background radiation	310
Man-made sources	310
Total of all sources	620

Source: US NRC, 2017c

Background radiation includes fallout radiation from historic weapons testing, which occurred primarily in the 1950s and 1960s, and from nuclear power plant accidents such as Chernobyl and Fukushima. This fallout includes radioisotopes such as Cesium-137 (Cs-137) and Strontium-90 (Sr-90), which persist in the environment due to their 28-30 year half-lives.

During active operation, nuclear power plants emit direct gamma radiation from nuclear reactor systems; noble gases, tritium, Iodine-131, Carbon-14, and particulates from the station's air stack; and discharge water containing tritium as well as alpha, beta and gamma radiation (UNSCEAR, 2008). Noble gases are chemically inert, have short half-lives, disperse quickly in the environment, and do not bioconcentrate or easily incorporate into biological tissue. Tritium is created when water passes through the reactor core; the hydrogen atoms in the water molecules and other trace elements like boron absorb neutrons from the fission of the reactor fuel. Tritium is lighter and more mobile in water than other radionuclides and is a sentinel indicator of radionuclides in water bodies. Both Iodine-131 and particulates (notably Cesium-137, Cobalt-60, Iron-59, Magnesium-54, Strontium-90 and Zinc-65) have environmental and public health significance: their half-lives range from weeks to years, they are readily incorporated into biological tissue, and they will bioconcentrate. Iodine-131 is usually the first radioactive element detected in the event of an accidental release of power plant radiation (UNSCEAR, 2008).

Exposure to radiation from nuclear power plants may occur from permitted air or liquid discharges or from unmonitored releases or leaks. MDPH/BEH evaluates possible routes of exposure for

radionuclides, particularly those that accumulate in the food chain, and samples environmental media along these routes to measure potential exposure to radiation.

B. LABORATORY METHODS

The MDPH/BEH Radiation Control Program's Massachusetts Environmental Radiation Laboratory (MERL) analyzes samples of air, water, milk, seafood, sediment, vegetation and food crops. MERL maintains its standard of excellence in analytical capability through participation with several federal agencies in inter-laboratory quality assurance measures.

MERL analyzes samples for a suite of more than 30 radioactive isotopes (e.g., radioisotopes, or radionuclides). Gamma spectroscopy is used to identify and detect environmentally significant and naturally-occurring radioisotopes; gas proportion counters measure gross beta and alpha radiation; and liquid scintillation counters measure tritium. Environmental media sample results are compared to typical background levels. In the event that gamma emitters are present above typical background, the MERL protocol calls for additional testing at an outside laboratory for alpha emitters, such as transuranic (high atomic number) elements, and beta emitters, such as Strontium-90.

Analysis methods by media are summarized below:

AIR

Air filters are collected weekly and analyzed for gross alpha and gross beta radioactivity using a gas proportion counter. Gross alpha and beta analysis is a screening-level tool that does not identify individual radionuclides; therefore, air filters are also analyzed quarterly for gamma emitting radionuclides using gamma spectroscopy. Results are compared to results from a background monitor located in Boston.

Air cartridges are analyzed weekly for iodine-131 using gamma spectroscopy.

Direct gamma radiation in air is measured with thermoluminescent dosimeters (TLDs) and analyzed using gamma spectroscopy.

WATER

Surface water samples are tested for total alpha and beta radioactivity with a gas proportional counter, and for gamma-emitting radionuclides with a gamma spectrometer. Water samples are also tested for tritium with a liquid scintillation counter.

MILK

Milk is a good indicator media for radioactive elements, particularly iodine-131, which can be detected in milk soon after cows graze on contaminated pastures or feed. Hence, cow's milk is tested for gamma radionuclides, including iodine-131, using gamma spectroscopy.

SEAFOOD, SEDIMENT, VEGETATION, AND FOOD CROPS

Seafood, sediment, vegetation and food crops were chosen to represent various stages of the food chain where radionuclides may be identified. Mollusks (such as clams and mussels) filter-feed sediment and sand where heavy and sediment-bound radionuclides may accumulate; lobsters eat clams, mussels and small fish; and radionuclides biomagnify from smaller to larger surface-dwelling fish.

Analyses of vegetation and crop samples aim to identify radionuclides that may settle on surfaces, or that may be absorbed through the roots. Samples are tested for gamma-emitting radionuclides using a gamma spectrometer.

QUALITY ASSURANCE

Laboratory sample detection levels are affected by sample size, time between collection and analysis, and equipment processing and counting time. Where detection levels fall outside our analytic sensitivity guidelines they are noted in the tables as “NR” (Result is not reported for quality control reason).

2. ENVIRONMENTAL MONITORING AND SAMPLING

This section describes the three nuclear power station EPZs in Massachusetts and summarizes the environmental samples collected and analyzed in 2017.

A. PILGRIM NUCLEAR POWER STATION

The Pilgrim Nuclear Power Station (Pilgrim) is located in Plymouth, MA. Five Massachusetts communities are included in the 10-mile EPZ of Pilgrim: Carver, Duxbury, Kingston, Marshfield, and Plymouth, all shown below in Figure 1.

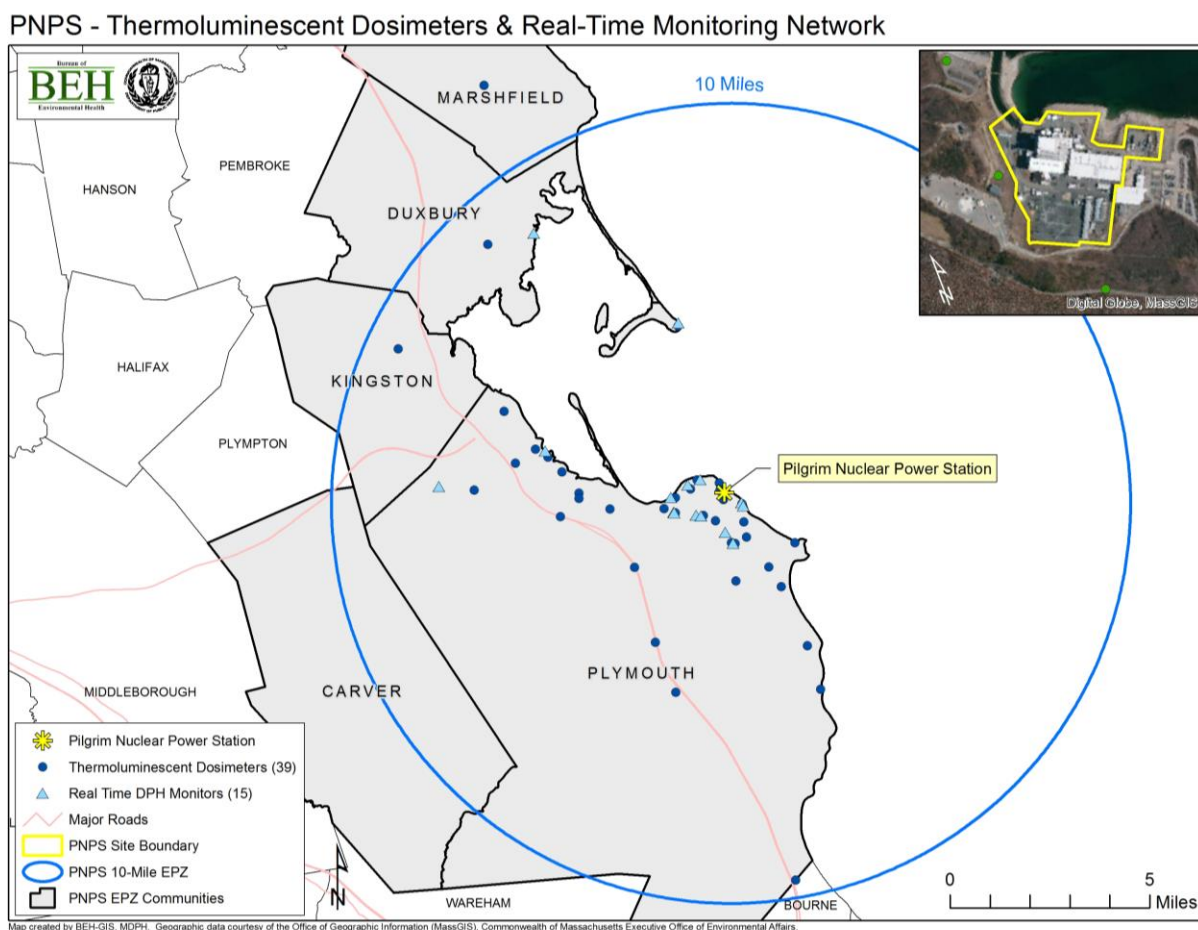


Figure 1. The MDPH/BEH Radiation -monitoring network at Pilgrim

MDPH/BEH's radiation monitoring conducted within and outside the Pilgrim EPZ is a combination of independent direct monitoring of airborne radiation; air, milk and cranberry sampling; and analysis of split samples provided by Entergy, the utility that owns Pilgrim, of water, fish, shellfish, sediment, Irish moss, and crops. Figure 1 shows locations of the air monitors for Pilgrim. Sample locations for water, fish and shellfish, sediment, Irish moss and crops are shown in Figure 2.

Pilgrim Nuclear Power Station Approximate MDPH Sampling Locations

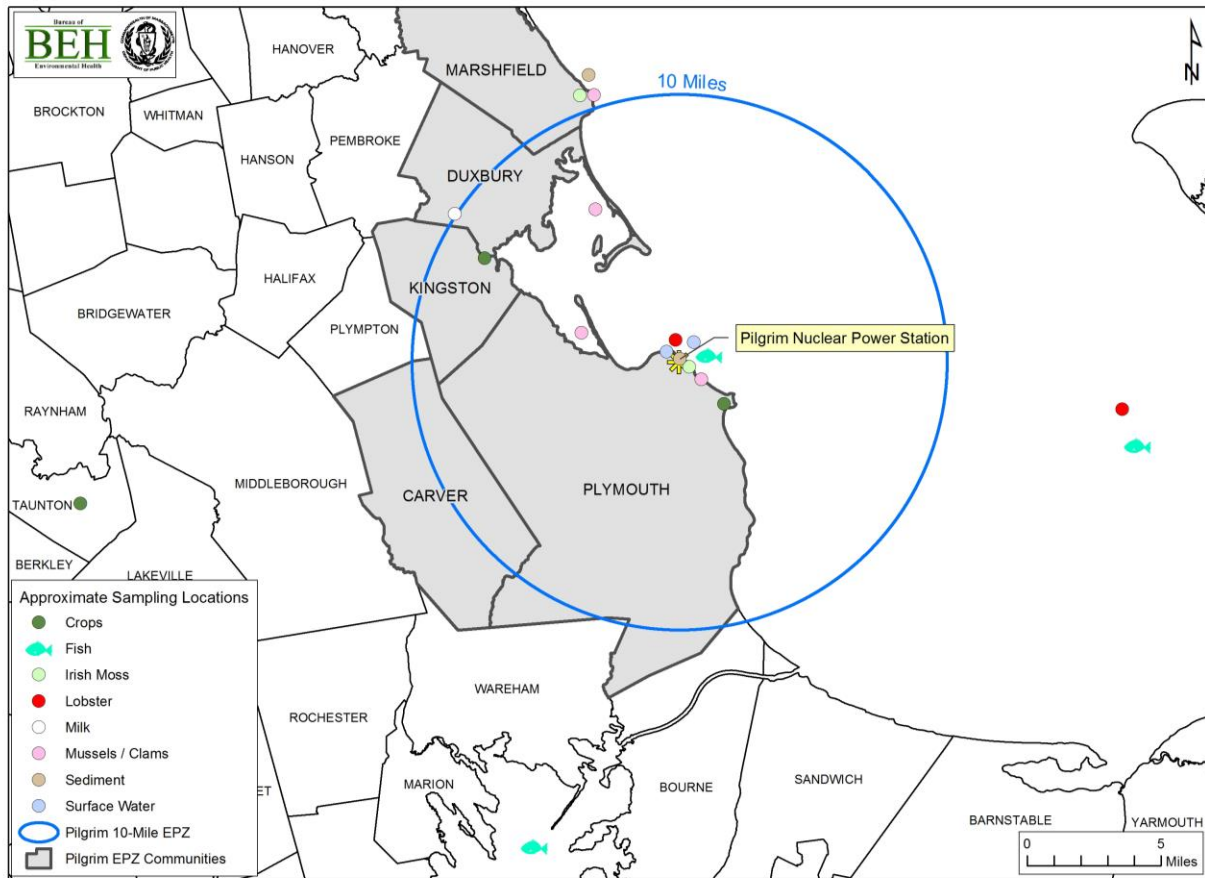


Figure 2. Pilgrim EPZ and sampling locations

Air/Direct Radiation

MDPH/BEH's direct radiation monitoring at Pilgrim is comprised of three systems operating on real-time, weekly, and quarterly bases. The redundant systems are designed to independently monitor the land areas within the 10-mile EPZ and to verify the utility's radiation monitoring.

MDPH/BEH maintains a network of 15 stationary radiation monitoring stations that detects gamma radiation in real-time and transmits data to a computer which is remotely accessed by staff. Emergency alerts are sent to MDPH and Massachusetts Emergency Management Agency (MEMA) officials if radiation is detected at levels greater than three times the typical background level. In 2016, MDPH/BEH completely replaced the older system with new monitors and servers, and installed an internet-based communication system.

MDPH/BEH analyzes samples collected from an air particulate filter and a charcoal air cartridge located just outside the Pilgrim utility's fence. Filters are analyzed for gross beta and gross alpha radioactivity and cartridges are analyzed for iodine-131. A filter composite sample is also analyzed quarterly for additional gamma-emitting radionuclides. The same analyses are done for an air particulate filter and charcoal cartridge collected from a background location in Boston.

MDPH/BEH also has a network of 39 TLDs placed throughout the Pilgrim EPZ and surrounding communities, which measure total gamma radiation in milliroentgen (mR). The majority of the TLDs are

located in the inner region of the EPZ, and three are near the plant border. These TLDs are collected and analyzed quarterly, and the results are compared to those of a background location in Boston.

Surface Water

Entergy collects seawater on a monthly basis from the Pilgrim discharge canal and the Powder Point Bridge in Duxbury and provides split samples to MDPH/BEH for analysis of gamma-emitting radionuclides. MERL also analyzes composite surface water samples from both locations for tritium.

Milk

MDPH/BEH collects samples of cow's milk monthly from a farm in Duxbury. The milk is analyzed for gamma-emitting radionuclides, including Iodine-131. Although this farm is located just outside the EPZ (11 miles from Pilgrim), it is the closest dairy farm to Pilgrim with available milk samples.

Fish and Shellfish

Entergy provides split samples of fish and shellfish collected from Plymouth Harbor, Marshfield Bay and the Pilgrim discharge canal to MERL for analysis. Entergy also provides MERL with split samples of background fish and shellfish from Cape Cod Bay.

Entergy collects mussels semiannually from Green Harbor in Marshfield and collects clams semiannually from Duxbury Bay and Plymouth Harbor. These three locations are reported to be background locations by Entergy for federal reporting requirements, but are considered to be "indicator" locations by MDPH/BEH because they fall within the 10-mile EPZ. MERL analyzes the split samples for gamma-emitting radionuclides. In 2017 Entergy also collected mussels from Plymouth Harbor and from the Pilgrim discharge canal.

Sediment

Entergy collects sediment from the Pilgrim discharge canal and Green Harbor in Marshfield semiannually and Duxbury Bay annually; MERL analyzes the split samples.

Irish moss

Irish moss (i.e., Chondrus) readily absorbs iodine and is a good reference indicator of iodine-131 in the environment. Entergy collects samples of Irish moss from the Pilgrim discharge canal and a background location at Brant Rock in Marshfield semiannually; split samples are analyzed by MERL.

Crops

MDPH/BEH collects and analyzes background cranberry samples from a bog in East Taunton annually.

In 2017 Entergy collected samples of tomatoes and summer squash during the growing season from a farm in Plymouth and a farm in Kingston. A representative portion of the samples are analyzed by MERL.

B. SEABROOK NUCLEAR POWER STATION

The Seabrook Nuclear Power Station (Seabrook) is located in Seabrook, New Hampshire, approximately two miles north of the Massachusetts border. Six Massachusetts communities are included in the 10-mile EPZ of Seabrook: Amesbury, Merrimac, Newbury, Newburyport, Salisbury, and West Newbury as shown in Figure 3.

Seabrook - Approximate Sampling Locations

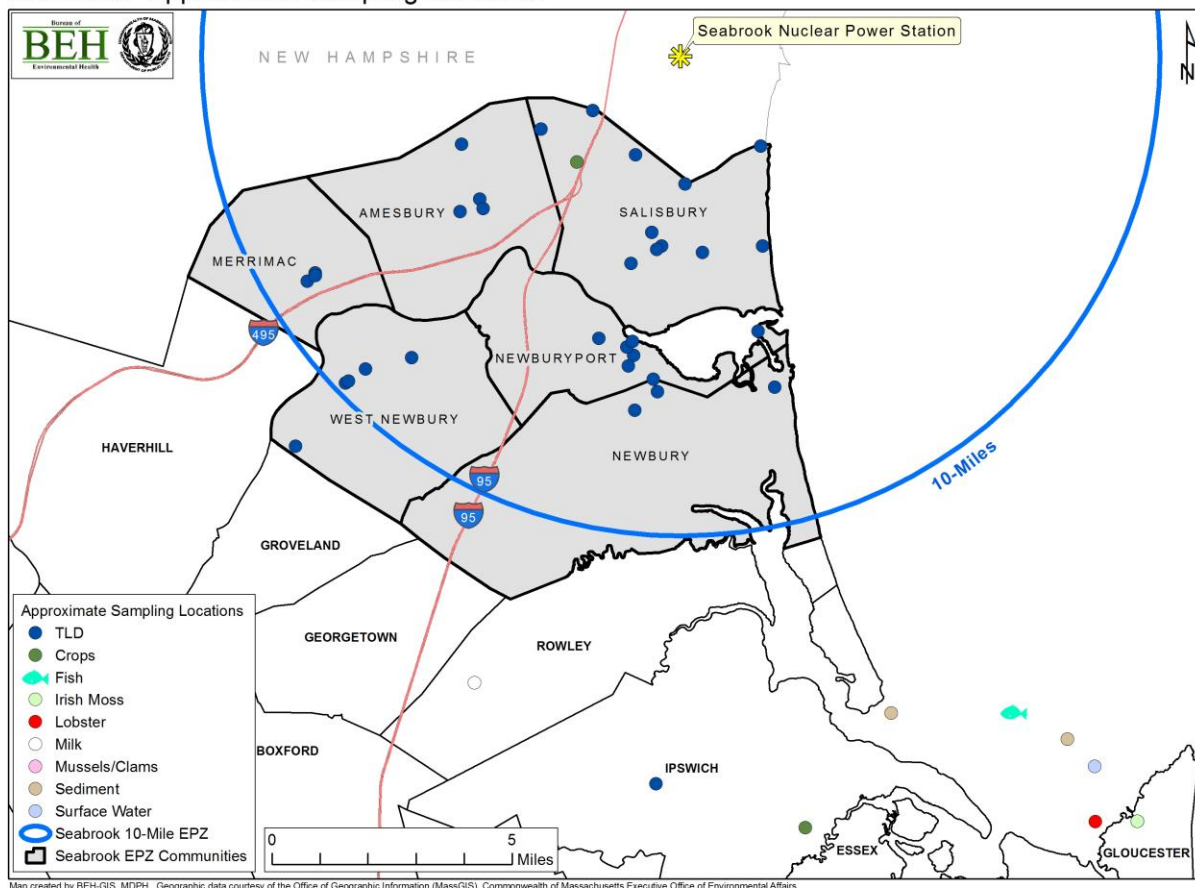


Figure 3. Seabrook EPZ and sampling locations within Massachusetts

Radiation monitoring conducted within and outside the Seabrook EPZ includes the following environmental media: air, surface water, fish, shellfish, sediment, Irish moss, crops, and milk. MDPH/BEH receives split samples from Nextera, the utility that owns Seabrook, for all media except milk and air. Sampling locations and activities within Massachusetts are described below. Sampling locations are shown in Figure 3.

Air/Direct Radiation

MDPH/BEH collects air particulate filters and charcoal cartridges weekly at the Salisbury Fire Station. Filters are analyzed for gross beta and alpha radioactivity, and cartridges for iodine-131. Additionally, a filter composite is analyzed quarterly for gamma-emitting radionuclides. The same analyses are done for air particulate filters and charcoal cartridges collected at the background location in Boston.

MDPH/BEH measures total ambient gamma radiation using a network of 34 TLDs placed at locations throughout the Seabrook EPZ in Massachusetts. These are collected and analyzed quarterly and results are compared to those of a background location in Boston.

MDPH/BEH contracts with the C-10 Research & Education Foundation, Inc. to conduct radiation monitoring in Massachusetts communities located in the Seabrook EPZ. The C-10 system consists of a network of 14 real-time radiation sensors and weather probes located in Massachusetts within a 10-mile radius of Seabrook station. Beta, gamma, and weather data are collected and uploaded every 15 minutes to a secure web-based central repository. C-10 compiles and graphs the data monthly and sends reports to MDPH/BEH. The 14 monitoring sites within the Seabrook 10-mile EPZ are located at private homes, schools, and businesses. MDPH and MEMA officials receive text alerts from C-10 if levels are greater than three times the typical background readings.

Surface Water

Seawater samples are typically collected monthly by Nextera from a background location in Ipswich Bay. MERL analyzes split samples for gamma-emitting radionuclides. MERL also analyzes surface water samples for tritium.

Milk

MDPH/BEH collects samples of cow's milk monthly from a farm located in Rowley and MERL analyzes the samples for gamma-emitting radionuclides, including iodine-131.

Fish, Lobster, and Shellfish

Nextera semi-annually collects samples of fish and shellfish, including *Modiolus* (Atlantic mussels) and *Mytilus* (Blue mussels), from Ipswich Bay, which is considered a background location; MERL analyzes the split samples for gamma-emitting radionuclides.

Sediment

Nextera semi-annually collects sediment samples from Ipswich Bay and the tidal flats on Plum Island, both background locations; MERL analyzes the split samples for gamma-emitting radionuclides.

Irish moss

As noted earlier, Irish moss readily absorbs iodine and is a sentinel indicator of environmental iodine-131. Nextera collects samples of Irish moss semiannually from a background location in Ipswich Bay, and split samples are analyzed by MERL for gamma-emitting radionuclides.

Crops

In 2017 Nextera collected strawberries and tomatoes from a farm located within the Seabrook EPZ in Salisbury, and collects strawberries, tomatoes, and squash from a farm in Ipswich, which is outside the Seabrook EPZ. Split samples of these crops are analyzed by MERL for gamma-emitting radionuclides.

C. VERMONT YANKEE NUCLEAR POWER STATION

The Vermont Yankee Nuclear Power Station (VY) is located in Vernon, VT, approximately four miles north of the Massachusetts border. The reactor was permanently shut down on December 29, 2014, and the fuel was removed on January 12, 2016. The plant is no longer producing any radioactive material. On April 16, 2016 the US Nuclear Regulatory Commission (NRC) reduced the EPZ of Vermont Yankee to the perimeter line of the plant in Vernon, VT.

Seven Massachusetts communities were located in the 10-mile EPZ of VY: Bernardston, Colrain, Gill, Greenfield, Leyden, Northfield, and Warwick. In 2017, radiation monitoring in the former 10-mile EPZ of VY included surface water and fish, as shown in Figure 4. All environmental monitoring of the VY EPZ, including 3 years after closure, indicate that radionuclide levels are either non-detectable or comparable to background or naturally occurring radiation sources (e.g., Beryllium-7).

Vermont Yankee Approximate Sampling Locations

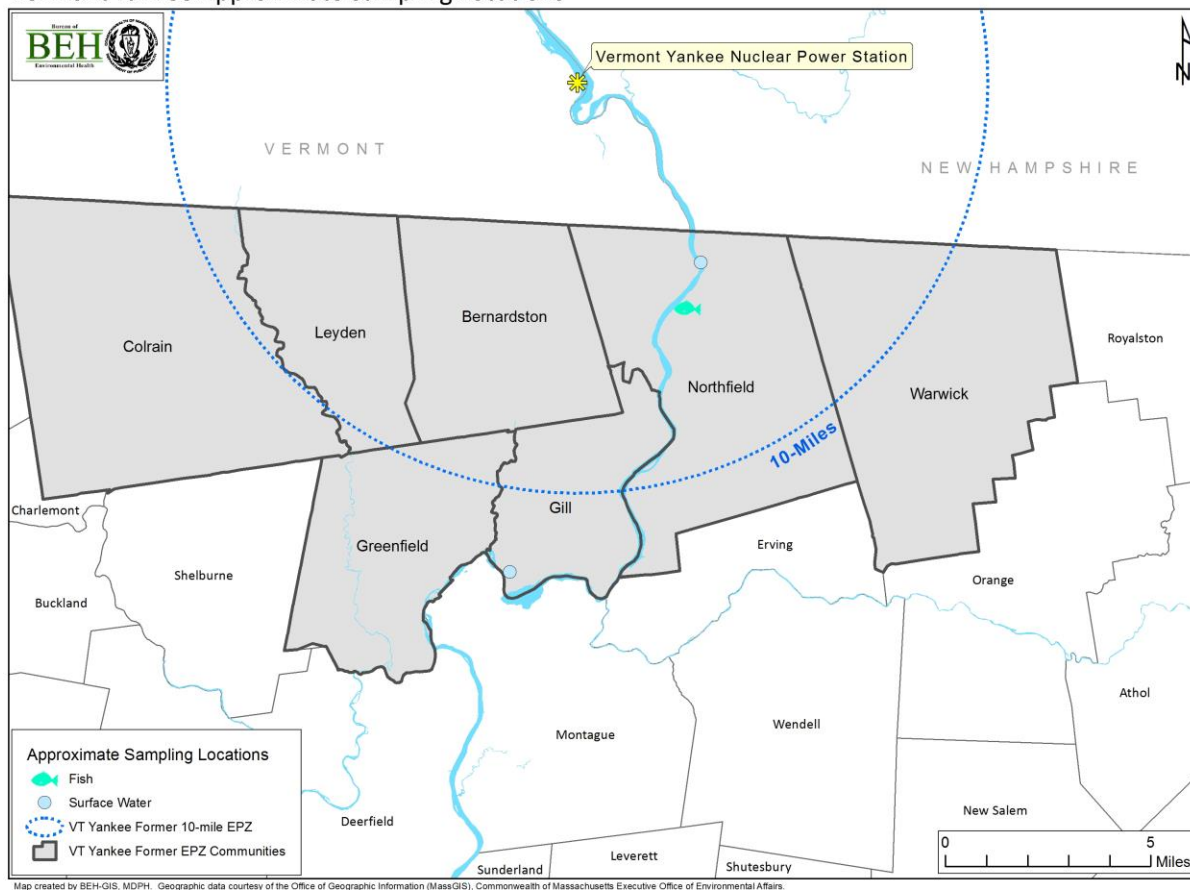


Figure 4. VY EPZ and Sampling Locations within Massachusetts

Surface Water

MDPH/BEH collected surface water samples from the Connecticut River in Northfield, MA. Surface water samples were analyzed for gamma radionuclides and for tritium.

Fish

MDPH/BEH collected fish from the Connecticut River in Northfield, MA and analyzed them for gamma radionuclides.

3. 2017 ENVIRONMENTAL MONITORING RESULTS

Radiation monitoring results in 2017 for Massachusetts have been either non-detect, naturally occurring (i.e., Potassium-40, Beryllium-7), or at levels expected to be present in the environment from historic background fallout and nuclear accidents including Chernobyl and Fukushima Dai-chi (i.e., Cesium-137). No detectable radionuclides were at levels of health concern or were indicative of an unintentional release of radiation at Pilgrim, Seabrook, or VY. I-131 was detected in one sample of Irish moss collected at a background location outside the Seabrook EPZ. Cesium-137, attributable to historic fallout, was detected in fish samples within the former VY EPZ.

Results of environmental monitoring conducted by MDPH/BEH in the Massachusetts communities in the vicinity of each of the three nuclear power stations are discussed below and presented in Tables 1-8. The tables are organized by nuclear power station and by sample media. Sampling results presented in this report include:

- Air particulate filters for gross alpha and beta radiation, and radionuclides; air cartridges for radioactive iodine; and thermoluminescent devices (TLDs) for gamma radiation.
- Individual surface water samples for gamma-emitting radionuclides, and composite surface water samples for tritium.
- Milk, fish, shellfish, sediment, vegetation and food crops for gamma-emitting radionuclides.

A. PILGRIM NUCLEAR POWER STATION

Results are provided in Tables 2, 3 and 4.

With the exception of composite air samples for the 2nd and 4th quarters of 2017, naturally occurring Potassium-40 was detected in all samples of environmental media analyzed for potassium-40 from both within and outside of the Pilgrim EPZ. Beryllium-7, which is also naturally occurring, was detected in all four of the quarterly composite air samples, and also in clams from Duxbury Harbor, Irish moss, and cranberries. No other radionuclides were detected in any of the samples collected within Pilgrim's EPZ.

In addition to naturally occurring Beryllium-7 and Potassium-40, air filter and cartridge analyses indicated low levels of gross alpha and gross beta radiation. Levels of gross alpha and beta radiation measured in the Pilgrim EPZ ranged from 0.001 – 0.018 and 0.012 – 0.039 pCi/m³, respectively. These levels are consistent with those measured at the background location in Boston, of 0.002 – 0.020 and 0.013 – 0.044 pCi/m³, respectively. No gamma-emitting radionuclides of concern were detected in quarterly composite air samples.

With the exception of the monitor located at the Pilgrim overlook, real-time monitoring did not detect radiation greater than typical background levels of approximately 0.007 - 0.009 mRoentgen/hour with the exception of brief increases up to 0.02 mRoentgen/hour. Brief increases are expected due to rainfall washout from naturally occurring radionuclides such as airborne radon daughters, and cosmic radiation events. No alerts at three times background were recorded. TLD total gamma exposure results (excluding the Pilgrim overlook monitor) ranged from 11.7 to 20.7 mRoentgen/quarter (i.e., 0.005 –

0.009 mRoentgen/hour) with an average of 15.2 mRoentgen/quarter (0.007 mRoentgen/hour). This value is compared to an average value of 13.0 mRoentgen/quarter measured at a background location in Boston, and corresponds to an average gamma exposure of 2.2 mRoentgen/quarter above background. Quarterly gamma exposure levels at the Pilgrim overlook monitor ranged from 46.8 to 72.3 mRoentgen, with an average of 57.6 mRoentgen/quarter. This corresponds to an average gamma exposure of 44.6 mRoentgen/quarter above background.

B. SEABROOK NUCLEAR POWER STATION

Seabrook sampling results are provided in Tables 5, 6 and 7.

Naturally occurring Potassium-40 was detected in all samples of environmental media from both within and outside the Seabrook EPZ. Naturally occurring Beryllium-7 was detected in Irish moss (i.e., chondrus) and common mussels (i.e., mytilus) collected from the background sampling location in Ipswich Bay, and in the four quarterly air samples collected at the Salisbury Fire Station. In addition to naturally occurring Beryllium-7 and Potassium-40, analyses of air filter and cartridge samples found low levels of gross alpha and gross beta radiation, consistent with levels measured at the background location in Boston. No gamma radionuclides of concern were detected in quarterly composite air samples.

Although not detected at levels of human health concern (Delacroix et al., 2002), Iodine-131 was detected at a level of 162 pCi/kg in the Irish moss (i.e., chondrus) sample collected in May 2017 from the background location in Ipswich Bay, approximately 20 miles from the Seabrook EPZ. Radioactive iodine was found in Irish moss from the same location in previous years (2011, 2012, 2014 and 2015). Iodine-131 is monitored carefully as it may be released from nuclear power plants. Iodine-131 is also commonly used for treating individuals with overactive thyroids and thyroid cancer, which can result in discharge of Iodine-131 into sanitary sewers (Rose et al., 2012). Thus, sewage discharge and a nearby medical center are the most likely sources of the Iodine-131 detected in the Irish Moss. Iodine-131 was not detected in any of the surface water samples collected from Ipswich Bay.

In 2017, real-time monitoring for the Seabrook EPZ did not show gamma radiation levels above typical background levels at most stations (approximately 0.010 mRoentgen/hour) with the exception of brief increases (up to 0.02 mRoentgen/hour). Brief increases are expected due to rainfall washout from naturally occurring radionuclides such as airborne radon daughters, and cosmic radiation events. Beta readings ranged from approximately 40 to 50 counts per minute with the exception of brief increases similar to the gamma results.

TLD results for total gamma exposure ranged from 8.0 to 21.5 mRoentgen/quarter (0.004 – 0.010 mRoentgen/hour) with an average exposure of 16.7 mRoentgen/quarter (0.008 mRoentgen/hour), compared to an average of 13.4 mRoentgen/quarter at the background location in Boston. The result is an average gamma exposure level of 3.3 mRoentgen/quarter over background.

C. VERMONT YANKEE NUCLEAR POWER STATION

Vermont Yankee sampling results are provided in Tables 8 and 9.

Naturally occurring Potassium-40 was detected in one of the two surface water samples, which were both collected from the Connecticut River, and from the four fish samples also collected from the Connecticut River. Beryllium-7 was not detected in any of the fish samples.

Cesium-137 was detected in two of the four fish samples collected from the Connecticut River, at levels of 4.83 and 14.7 pCi/kg. These results are lower than those from other locations reported in the scientific literature, and are considered attributable to historical fallout from weapons testing and past nuclear power plant accidents (VTDOH, 2012; Burger et al., 2007; ATSDR, 2004; Amund et al., 1996). Other power plant-produced radionuclides were not detected in the fish, nor was Cs-137 detected in surface water collected from the Connecticut River, supporting the conclusion that residual deposition is the source of the Cs-137. These concentrations of Cs-137 in fish present a very low health risk.

Aside from Potassium-40 and Cesium-137, no other radionuclides were detected in surface water or fish samples.

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E. RESULTS TABLES

Table 2. Pilgrim Nuclear Power Station 2017 Environmental Monitoring Data - Air Samples

Sample Type	Location	Date	I-131* (pCi/m ³)	Be-7* (pCi/m ³)	K-40* (pCi/m ³)	Mn-54* (pCi/m ³)	Fe-59* (pCi/m ³)	Co-60* (pCi/m ³)	Zn-65* (pCi/m ³)	Cs-137* (pCi/m ³)	Gross Alpha (pCi/m ³)	Gross Beta (pCi/m ³)
Air	Pilgrim Station	1/5/2017	<0.0228	-	-	-	-	-	-	-	0.00567	0.0212
Air	Pilgrim Station	1/12/2017	<0.0189	-	-	-	-	-	-	-	0.00540	0.0219
Air	Pilgrim Station	1/19/2017	<0.0173	-	-	-	-	-	-	-	0.00741	0.0284
Air	Pilgrim Station	1/27/2017	<0.0166	-	-	-	-	-	-	-	0.00472	0.0180
Air	Pilgrim Station	2/1/2017	<0.0263	-	-	-	-	-	-	-	0.00754	0.0236
Air	Pilgrim Station	2/8/2017	<0.0423	-	-	-	-	-	-	-	0.00620	0.0247
Air	Pilgrim Station Quarterly composite	2/15/2017	-	0.119	0.095	<0.001	<0.009	<0.001	<0.002	<0.001	-	-
Air	Pilgrim Station	2/17/2017	<0.0141	-	-	-	-	-	-	-	0.00406	0.0176
Air	Pilgrim Station	2/23/2017	<0.0172	-	-	-	-	-	-	-	0.00624	0.0290
Air	Pilgrim Station	3/1/2017	<0.0220	-	-	-	-	-	-	-	0.00569	0.0233
Air	Pilgrim Station	3/8/2017	<0.0195	-	-	-	-	-	-	-	0.00485	0.0248
Air	Pilgrim Station	3/17/2017	<0.0195	-	-	-	-	-	-	-	0.00565	0.0246
Air	Pilgrim Station	3/22/2017	<0.0313	-	-	-	-	-	-	-	0.00457	0.0310
Air	Pilgrim Station	3/29/2017	<0.0168	-	-	-	-	-	-	-	0.00595	0.0229
Air	Pilgrim Station	4/21/2017	<0.0163	-	-	-	-	-	-	-	0.00611	0.0205
Air	Pilgrim Station	4/27/2017	<0.0175	-	-	-	-	-	-	-	0.00461	0.0160
Air	Pilgrim Station	5/5/2017	<0.0153	-	-	-	-	-	-	-	0.00365	0.0177
Air	Pilgrim Station	5/11/2017	<0.0183	-	-	-	-	-	-	-	0.00478	0.0166
Air	Pilgrim Station Quarterly composite	5/15/2017	-	0.121	<0.019	<0.001	<0.004	<0.001	<0.002	<0.001	-	-
Air	Pilgrim Station	5/19/2017	<0.0148	-	-	-	-	-	-	-	0.00495	0.0190
Air	Pilgrim Station	5/24/2017	<0.0195	-	-	-	-	-	-	-	0.00588	0.0219
Air	Pilgrim Station	6/1/2017	<0.0136	-	-	-	-	-	-	-	0.00255	0.0122
Air	Pilgrim Station	6/9/2017	<0.0139	-	-	-	-	-	-	-	0.00288	0.0127
Air	Pilgrim Station	6/16/2017	<0.0124	-	-	-	-	-	-	-	0.00311	0.0267
Air	Pilgrim Station	6/22/2017	<0.0191	-	-	-	-	-	-	-	0.00236	0.0196
Air	Pilgrim Station	6/28/2017	<0.0196	-	-	-	-	-	-	-	0.00341	0.0269
Air	Pilgrim Station	7/6/2017	<0.0164	-	-	-	-	-	-	-	0.00411	0.0187
Air	Pilgrim Station	7/13/2017	<0.0154	-	-	-	-	-	-	-	0.00495	0.0259
Air	Pilgrim Station	7/21/2017	<0.0148	-	-	-	-	-	-	-	0.00588	0.0240

- " = Not analyzed

* I-131 = iodine 131; Ba-140 = Barium 140; Be-7 = Beryllium 7; Co-60 = Cobalt 60; Cs-134 = Cesium 134; Cs-137=Cesium 137; Fe-59=Iron 59; H-3* = Tritium; K-40 = Potassium-40; Mn-54=Manganese-54; Zn-65=Zinc 65

"<" = value is less than the listed MDA (Minimum Detectable Activity) value

"NR"= result not reported for quality control reasons.

Sample Type	Location	Date	I-131* (pCi/m ³)	Be-7* (pCi/m ³)	K-40* (pCi/m ³)	Mn-54* (pCi/m ³)	Fe-59* (pCi/m ³)	Co-60* (pCi/m ³)	Zn-65* (pCi/m ³)	Cs-137* (pCi/m ³)	Gross Alpha (pCi/m ³)	Gross Beta (pCi/m ³)
Air	Pilgrim Station	7/27/2017	<0.0185	-	-	-	-	-	-	-	0.00465	0.0191
Air	Pilgrim Station	8/2/2017	<0.0179	-	-	-	-	-	-	-	0.00341	0.0203
Air	Pilgrim Station	8/11/2017	<0.0084	-	-	-	-	-	-	-	0.00480	0.0220
Air	Pilgrim Station Quarterly composite	8/15/2017	-	0.116	0.093	<0.001	<0.002	<0.001	<0.001	<0.0005	-	-
Air	Pilgrim Station	8/18/2017	<0.0135	-	-	-	-	-	-	-	0.00254	0.0188
Air	Pilgrim Station	8/22/2017	<0.0302	-	-	-	-	-	-	-	0.00473	0.0350
Air	Pilgrim Station	8/30/2017	<0.0115	-	-	-	-	-	-	-	0.00289	0.0227
Air	Pilgrim Station	9/7/2017	<0.0112	-	-	-	-	-	-	-	0.00210	0.0250
Air	Pilgrim Station	9/15/2017	<0.0144	-	-	-	-	-	-	-	0.00172	0.0245
Air	Pilgrim Station	9/20/2017	<0.0227	-	-	-	-	-	-	-	0.00287	0.0327
Air	Pilgrim Station	9/26/2017	<0.0183	-	-	-	-	-	-	-	0.00101	0.0171
Air	Pilgrim Station	10/6/2017	<0.0118	-	-	-	-	-	-	-	0.00854	0.0217
Air	Pilgrim Station	10/12/2017	<0.0209	-	-	-	-	-	-	-	0.01320	0.0308
Air	Pilgrim Station	10/19/2017	<0.0169	-	-	-	-	-	-	-	0.00988	0.0257
Air	Pilgrim Station	10/27/2017	<0.0149	-	-	-	-	-	-	-	0.01290	0.0336
Air	Pilgrim Station	11/3/2017	<0.0188	-	-	-	-	-	-	-	0.01780	0.0390
Air	Pilgrim Station	11/9/2017	<0.0201	-	-	-	-	-	-	-	0.01520	0.0342
Air	Pilgrim Station Quarterly composite	11/15/2017	-	0.101	<0.017	<0.001	<0.004	<0.001	<0.001	<0.001	-	-
Air	Pilgrim Station	11/16/2017	<0.0144	-	-	-	-	-	-	-	0.01220	0.0315
Air	Pilgrim Station	11/22/2017	<0.0168	-	-	-	-	-	-	-	0.01120	0.0312
Air	Pilgrim Station	12/1/2017	<0.0098	-	-	-	-	-	-	-	0.00985	0.0304
Air	Pilgrim Station	12/8/2017	<0.0198	-	-	-	-	-	-	-	0.01280	0.0363
Air	Pilgrim Station	12/14/2017	<0.0180	-	-	-	-	-	-	-	0.01140	0.0375
Air	Pilgrim Station	12/22/2017	<0.0175	-	-	-	-	-	-	-	0.00924	0.0281
Air	Background	1/3/2017	<0.0428	-	-	-	-	-	-	-	0.02030	0.0442
Air	Background	1/10/2017	<0.0228	-	-	-	-	-	-	-	0.01400	0.0284
Air	Background	1/17/2017	<0.0197	-	-	-	-	-	-	-	0.01420	0.0332
Air	Background	1/25/2017	<0.0209	-	-	-	-	-	-	-	0.01090	0.0246
Air	Background	1/30/2017	<0.0258	-	-	-	-	-	-	-	0.01700	0.0384
Air	Background	2/6/2017	<0.0175	-	-	-	-	-	-	-	0.01660	0.0317

- " = Not analyzed

* I-131 = iodine 131; Ba-140 = Barium 140; Be-7 = Beryllium 7; Co-60 = Cobalt 60; Cs-134 = Cesium 134; Cs-137=Cesium 137; Fe-59=Iron 59; H-3* = Tritium; K-40 = Potassium-40; Mn-54=Manganese-54; Zn-65=Zinc 65

"<" = value is less than the listed MDA (Minimum Detectable Activity) value

"NR"= result not reported for quality control reasons.

Sample Type	Location	Date	I-131* (pCi/m ³)	Be-7* (pCi/m ³)	K-40* (pCi/m ³)	Mn-54* (pCi/m ³)	Fe-59* (pCi/m ³)	Co-60* (pCi/m ³)	Zn-65* (pCi/m ³)	Cs-137* (pCi/m ³)	Gross Alpha (pCi/m ³)	Gross Beta (pCi/m ³)
Air	Background quarterly composite	2/15/2017	-	0.147	0.270	<0.001	<0.015	<0.001	<0.003	<0.001	-	-
Air	Background	2/17/2017	<0.0141	-	-	-	-	-	-	-	.	.
Air	Background	2/21/2017	<0.0170	-	-	-	-	-	-	-	0.01590	0.0344
Air	Background	2/23/2017	<0.0172	-	-	-	-	-	-	-	.	.
Air	Background	2/27/2017	<0.0247	-	-	-	-	-	-	-	0.01370	0.0325
Air	Background	3/6/2017	<0.0177	-	-	-	-	-	-	-	0.01300	0.0355
Air	Background	3/8/2017	<0.0195	-	-	-	-	-	-	-	.	.
Air	Background	3/13/2017	<0.0189	-	-	-	-	-	-	-	0.01280	0.0340
Air	Background	3/20/2017	<0.0233	-	-	-	-	-	-	-	0.00771	0.0217
Air	Background	3/27/2017	<0.0208	-	-	-	-	-	-	-	0.00893	0.0274
Air	Background	4/3/2017	<0.0249	-	-	-	-	-	-	-	0.00592	0.0187
Air	Background	4/10/2017	<0.0235	-	-	-	-	-	-	-	0.00431	0.0167
Air	Background	4/18/2017	<0.0357	-	-	-	-	-	-	-	0.00788	0.0253
Air	Background	5/1/2017	<0.0357	-	-	-	-	-	-	-	0.00843	0.0404
Air	Background	5/8/2017	<0.0155	-	-	-	-	-	-	-	0.00420	0.0172
Air	Background	5/15/2017	<0.0181	-	-	-	-	-	-	-	0.00206	0.0130
Air	Background quarterly composite	5/15/2017	-	0.114	0.209	<0.001	<0.005	<0.001	<0.002	<0.001	-	-
Air	Background	5/22/2017	<0.0178	-	-	-	-	-	-	-	0.00485	0.0221
Air	Background	5/30/2017	<0.0120	-	-	-	-	-	-	-	0.00222	0.0137
Air	Background	6/5/2017	<0.0171	-	-	-	-	-	-	-	0.00294	0.0163
Air	Background	6/12/2017	<0.0185	-	-	-	-	-	-	-	0.00299	0.0189
Air	Background	6/19/2017	<0.0176	-	-	-	-	-	-	-	0.00216	0.0226
Air	Background	6/26/2017	<0.0171	-	-	-	-	-	-	-	0.00275	0.0259
Air	Background	7/3/2017	<0.0173	-	-	-	-	-	-	-	0.00712	0.0239
Air	Background	7/10/2017	<0.0136	-	-	-	-	-	-	-	0.00442	0.0215
Air	Background	7/17/2017	<0.0161	-	-	-	-	-	-	-	0.00597	0.0268
Air	Background	7/24/2017	<0.0156	-	-	-	-	-	-	-	0.00665	0.0289
Air	Background	7/31/2017	<0.0167	-	-	-	-	-	-	-	0.00578	0.0203
Air	Background	8/7/2017	<0.0155	-	-	-	-	-	-	-	0.00627	0.0239
Air	Background	8/14/2017	<0.0159	-	-	-	-	-	-	-	0.00676	0.0290

- " = Not analyzed

* I-131 = iodine 131; Ba-140 = Barium 140; Be-7 = Beryllium 7; Co-60 = Cobalt 60; Cs-134 = Cesium 134; Cs-137=Cesium 137; Fe-59=Iron 59; H-3* = Tritium; K-40 = Potassium-40; Mn-54=Manganese-54; Zn-65=Zinc 65

"<" = value is less than the listed MDA (Minimum Detectable Activity) value

"NR"= result not reported for quality control reasons.

Sample Type	Location	Date	I-131* (pCi/m ³)	Be-7* (pCi/m ³)	K-40* (pCi/m ³)	Mn-54* (pCi/m ³)	Fe-59* (pCi/m ³)	Co-60* (pCi/m ³)	Zn-65* (pCi/m ³)	Cs-137* (pCi/m ³)	Gross Alpha (pCi/m ³)	Gross Beta (pCi/m ³)
Air	Background quarterly composite	8/15/2017	-	0.109	<0.024	<0.001	<0.003	<0.001	<0.002	<0.0005	-	-
Air	Background	8/21/2017	<0.0173	-	-	-	-	-	-	-	0.00461	0.0300
Air	Background	8/28/2017	<0.0180	-	-	-	-	-	-	-	0.00498	0.0320
Air	Background	9/5/2017	<0.0108	-	-	-	-	-	-	-	0.00176	0.0170
Air	Background	9/11/2017	<0.0200	-	-	-	-	-	-	-	0.00373	0.0284
Air	Background	9/18/2017	<0.0173	-	-	-	-	-	-	-	0.00227	0.0235
Air	Background	9/25/2017	<0.0123	-	-	-	-	-	-	-	0.00177	0.0262
Air	Background	10/2/2017	<0.0137	-	-	-	-	-	-	-	0.01170	0.0208
Air	Background	10/10/2017	<0.0152	-	-	-	-	-	-	-	0.01410	0.0324
Air	Background	10/16/2017	<0.0201	-	-	-	-	-	-	-	0.01260	0.0302
Air	Background	10/23/2017	<0.0166	-	-	-	-	-	-	-	0.01750	0.0364
Air	Background	10/30/2017	<0.0131	-	-	-	-	-	-	-	0.01420	0.0235
Air	Background	11/6/2017	<0.0125	-	-	-	-	-	-	-	0.01510	0.0336
Air	Background	11/13/2017	<0.0173	-	-	-	-	-	-	-	0.01330	0.0312
Air	Background quarterly composite	11/15/2017	-	0.105	0.261	<0.001	<0.004	<0.001	<0.002	<0.001	-	-
Air	Background	11/20/2017	<0.0198	-	-	-	-	-	-	-	0.01310	0.0291
Air	Background	11/27/2017	<0.0148	-	-	-	-	-	-	-	0.01350	0.0390
Air	Background	12/4/2017	<0.0182	-	-	-	-	-	-	-	0.01250	0.0366
Air	Background	12/11/2017	<0.0152	-	-	-	-	-	-	-	0.01150	0.0374
Air	Background	12/18/2017	<0.0188	-	-	-	-	-	-	-	0.01160	0.0294
Air	Background	12/26/2017	<0.0166	-	-	-	-	-	-	-	0.00757	0.0234

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* I-131 = iodine 131; Ba-140 = Barium 140; Be-7 = Beryllium 7; Co-60 = Cobalt 60; Cs-134 = Cesium 134; Cs-137=Cesium 137; Fe-59=Iron 59; H-3* = Tritium; K-40 = Potassium-40; Mn-54=Manganese-54; Zn-65=Zinc 65

"<" = value is less than the listed MDA (Minimum Detectable Activity) value

"NR"= result not reported for quality control reasons.

Table 3. Pilgrim Nuclear Power Station 2017 Environmental Monitoring Data – Liquid Matrices

Sample Type	Location	Date	K-40* (pCi/L)	Mn-54* (pCi/L)	Fe-59* (pCi/L)	Co-60* (pCi/L)	Zn-65* (pCi/L)	I-131* (pCi/L)	Cs-134* (pCi/L)	Cs-137* (pCi/L)	Ba-140* (pCi/L)	H-3* (pCi/L)
Surface water	Discharge Canal	1/15/2017	-	-	-	-	-	-	-	-	-	<300
Surface water	Discharge Canal	1/31/2017	1000	<4	<23.9	<3.5	<8.4	NR	-	<3.6	-	-
Surface water	Discharge Canal	2/15/2017	-	-	-	-	-	-	-	-	-	<300
Surface water	Discharge Canal	2/27/2017	345	<3.4	<13	<3	<7.3	NR	-	<2.8	-	-
Surface water	Discharge Canal	3/15/2017	-	-	-	-	-	-	-	-	-	<300
Surface water	Discharge Canal	3/28/2017	1010	<3	<9	<3.1	<6.6	<31.7	-	<3.5	-	-
Surface water	Discharge Canal	4/15/2017	-	-	-	-	-	-	-	-	-	<300
Surface water	Discharge Canal	5/2/2017	295	<2.7	<6.1	<2.7	<5.7	<7.1	-	<2.9	-	-
Surface water	Discharge Canal	5/15/2017	-	-	-	-	-	-	-	-	-	<300
Surface water	Discharge Canal	5/30/2017	1370	<3.1	<6.5	<3.2	<6.9	<10.3	-	<3	-	-
Surface water	Discharge Canal	6/15/2017	-	-	-	-	-	-	-	-	-	<300
Surface water	Discharge Canal	6/27/2017	245	<3.3	<9	<2.8	<7	NR	-	<2.8	-	-
Surface water	Discharge Canal	7/15/2017	-	-	-	-	-	-	-	-	-	<300
Surface water	Discharge Canal	8/1/2017	281	<3	<6.1	<3	<6.2	<6.2	-	<2.8	-	-
Surface water	Discharge Canal	8/15/2017	-	-	-	-	-	-	-	-	-	<300
Surface water	Discharge Canal	8/29/2017	306	<3.1	<10.4	<2.7	<6.9	<120	-	<2.8	-	-
Surface water	Discharge Canal	9/15/2017	-	-	-	-	-	-	-	-	-	<300
Surface water	Discharge Canal	10/4/2017	294	<2.9	<6.4	<2.7	<5.8	<5.8	-	<2.9	-	-
Surface water	Discharge Canal	10/31/2017	323	<2.5	<5.8	<2.8	<5.1	<4.9	-	<2.7	-	-
Surface water	Discharge Canal	11/28/2017	324	<3.2	<6	<2.9	<6.5	<5.6	-	<2.8	-	-
Surface water	Powder Point Bridge ¹	1/15/2017	-	-	-	-	-	-	-	-	-	<300
Surface water	Powder Point Bridge ¹	1/31/2017	264	<3.1	<18.4	<3	<7.3	NR	-	<2.8	-	-
Surface water	Powder Point Bridge ¹	2/15/2017	-	-	-	-	-	-	-	-	-	<300
Surface water	Powder Point Bridge ¹	2/27/2017	292	<3.6	<14.8	<3.1	<7.6	NR	-	<3	-	-
Surface water	Powder Point Bridge ¹	3/15/2017	-	-	-	-	-	-	-	-	-	<300
Surface water	Powder Point Bridge ¹	3/28/2017	320	<2.6	<7.3	<2.5	<6.1	<25.4	-	<2.8	-	-
Surface water	Powder Point Bridge ¹	4/4/2017	242	<3.2	<7.2	<3	<6.3	<7.9	-	<3.1	-	-
Surface water	Powder Point Bridge ¹	4/15/2017	-	-	-	-	-	-	-	-	-	<300
Surface water	Powder Point Bridge ¹	5/15/2017	-	-	-	-	-	-	-	-	-	<300
Surface water	Powder Point Bridge ¹	6/15/2017	-	-	-	-	-	-	-	-	-	<300
Surface water	Powder Point Bridge ¹	5/30/2017	266	<2.5	<4.9	<2.6	<5.2	<5.1	-	<2.7	-	-
Surface water	Powder Point Bridge ¹	6/27/2017	317	<2.5	<7.6	<2.7	<5.3	NR	-	<2.6	-	-
Surface water	Powder Point Bridge ¹	7/15/2017	-	-	-	-	-	-	-	-	-	<300
Surface water	Powder Point Bridge ¹	8/1/2017	308	<2.5	<4.8	<2.7	<5.3	<4.7	-	<2.6	-	-

- = Not analyzed

* I-131 = iodine 131; Ba-140 = Barium 140; Be-7 = Beryllium 7; Co-60 = Cobalt 60; Cs-134 = Cesium 134; Cs-137=Cesium 137; Fe-59=Iron 59; H-3* = Tritium; K-40 = Potassium-40; Mn-54=Manganese-54; Zn-65=Zinc 65

< = value is less than the listed MDA (Minimum Detectable Activity) value

NR = result not reported for quality control reasons.

Sample Type	Location	Date	K-40* (pCi/L)	Mn-54* (pCi/L)	Fe-59* (pCi/L)	Co-60* (pCi/L)	Zn-65* (pCi/L)	I-131* (pCi/L)	Cs-134* (pCi/L)	Cs-137* (pCi/L)	Ba-140* (pCi/L)	H-3* (pCi/L)
Surface water	Powder Point Bridge ¹	8/15/2017	-	-	-	-	-	-	-	-	-	<300
Surface water	Powder Point Bridge ¹	8/29/2017	315	<2.4	<8.4	<2.4	<5.7	NR	-	<2.7	-	-
Surface water	Powder Point Bridge ¹	9/15/2017	-	-	-	-	-	-	-	-	-	<300
Surface water	Powder Point Bridge ¹	10/4/2017	288	<2.4	<4.5	<2.7	<5.2	<2.2	-	<2.5	-	-
Surface water	Powder Point Bridge ¹	10/15/2017	-	-	-	-	-	-	-	-	-	<300
Surface water	Powder Point Bridge ¹	10/31/2017	333	<3.3	<6.7	<3.1	<6.5	<8	-	<3	-	-
Surface water	Powder Point Bridge ¹	11/15/2017	-	-	-	-	-	-	-	-	-	<300
Surface water	Powder Point Bridge ¹	11/28/2017	315	<2.4	<5.1	<2.6	<5.5	<4.4	-	<2.4	-	-
Surface water	Powder Point Bridge ¹	12/15/2017	-	-	-	-	-	-	-	-	-	<300
Milk	Duxbury	1/12/2017	1370	-	-	-	-	<2.5	<2.4	<2.9	<10.3	-
Milk	Duxbury	2/16/2017	1340	-	-	-	-	<2.5	<2.5	<2.8	<9.3	-
Milk	Duxbury	3/29/2017	1100	-	-	-	-	<4.6	<3	<3.5	<15.9	-
Milk	Duxbury	4/13/2017	1350	-	-	-	-	<3.3	<2.7	<3.1	<10.9	-
Milk	Duxbury	5/11/2017	974	-	-	-	-	<3.4	<3.4	<4.1	<12.8	-
Milk	Duxbury	6/22/2017	961	-	-	-	-	<3	<3	<3.5	<11.5	-
Milk	Duxbury	7/13/2017	1410	-	-	-	-	NR	<2.6	<3	<21.6	-
Milk	Duxbury	8/22/2017	1300	-	-	-	-	<2.4	<2.4	<3	<9.6	-
Milk	Duxbury	9/26/2017	1310	-	-	-	-	<2.4	<2.3	<3	<9.5	-
Milk	Duxbury	10/19/2017	1220	-	-	-	-	<2.3	<2.4	<2.7	<9.2	-
Milk	Duxbury	11/16/2017	1280	-	-	-	-	<3.5	<2.9	<3.2	<11.6	-
Milk	Duxbury	12/14/2017	1370	-	-	-	-	<2.8	<2.5	<3.2	<10	-

(1) Sample considered "background" for the purpose of NRC regulations, but considered "indicator" by MDPH because it falls within the 10-mile EPZ.

- = Not analyzed

* I-131 = iodine 131; Ba-140 = Barium 140; Be-7 = Beryllium 7; Co-60 = Cobalt 60; Cs-134 = Cesium 134; Cs-137=Cesium 137; Fe-59=Iron 59; H-3* = Tritium; K-40 = Potassium-40; Mn-54=Manganese-54; Zn-65=Zinc 65

"<" = value is less than the listed MDA (Minimum Detectable Activity) value

"NR"= result not reported for quality control reasons.

Table 4. Pilgrim Nuclear Power Station 2016 Environmental Monitoring Data – Solid matrices

Sample	Location	Date	Be-7* (pCi/kg)	K-40* (pCi/kg)	Mn-54* (pCi/kg)	Fe-59* (pCi/kg)	Co-60* (pCi/kg)	Zn-65* (pCi/kg)	Cs-137* (pCi/kg)	I-131* (pCi/kg)
Bluefish	PNPS Discharge Canal	9/27/2017	<159	3480	<5.6	<56.5	<5.3	<14.9	<5.4	-
Bluefish	Buzzard's Bay (background)	9/25/2017	<1370	3830	<43.5	<398	<35.9	<94.8	<34.3	-
Striped Bass	Buzzard's Bay (background)	9/7/2017	<190	3970	<6	<73.8	<4.9	<14.7	<4.5	-
Tautog	Buzzard's Bay (background)	9/30/2017	<730	4290	<25.9	<225	<24.3	<60.3	<22	-
White Flounder	PNPS Discharge Canal	5/3/2017	<77	3080	<5	<23.1	<5.4	<12.8	<5.2	-
White Flounder	Cape Cod Bay (background)	5/4/2017	<83	3340	<5.6	<23.9	<5.5	<13.4	<5.5	-
Softshell Clams	Duxbury	4/30/2017	67.6	3430	<4.3	<18.9	<3.9	<9.7	<3.7	-
Softshell Clams	Duxbury	11/2/2017	<78	1340	<5.1	<23.9	<4.2	<11.2	<4.1	-
Softshell Clams	Plymouth Harbor	4/30/2017	<67	3350	<4.6	<18.4	<3.9	<10.2	<3.5	-
Softshell Clams	Plymouth Harbor	11/3/2017	<81	1400	<4.5	<22.3	<4.5	<10.6	<4.2	-
Mussels	Green Harbor-Marshfield	5/30/2017	<47	1750	<3.9	<13.8	<4.2	<8.4	<3.6	-
Mussels	Green Harbor-Marshfield	10/18/2017	<104	1390	<5.7	<30.9	<5.4	<13.2	<4.7	-
Mussels	Plymouth Harbor	4/30/2017	<78	1880	<4.3	<21.9	<4.5	<10.7	<4	-
Mussels	PNPS Discharge Canal	6/13/2017	<58	1560	<4	<14.5	<4.2	<9.1	<3.6	-
Mussels	PNPS Discharge Canal	12/14/2017	<48	1220	<4.4	<10.8	<4.9	<10.2	<4.4	-
Lobster	PNPS Discharge Canal	8/27/2017	<187	1900	<5.8	<69.8	<4.6	<13.4	<4.1	-
Lobster	Cape Cod Bay (background)	7/27/2017	<254	2110	<5	<105	<4.6	<14.2	<4	-
Irish Moss	PNPS Discharge Canal	6/13/2017	799	53600	NR	NR	NR	NR	NR	NR
Irish Moss	PNPS Discharge Canal	12/14/2017	2290	20400	NR	NR	NR	NR	NR	<65.2
Irish Moss	Brant Rock (background)	5/30/2017	404	15400	NR	NR	NR	NR	NR	<84.6
Irish Moss	Brant Rock (background)	12/2/2017	779	18000	<15.8	<40.8	<16.4	<38.1	<15.2	<68.1
Sediment	Green Harbor-Marshfield	5/30/2017	-	6950	-	-	<18.8	-	<18.9	-
Sediment	Green Harbor-Marshfield	10/18/2017	-	10600	-	-	<23.3	-	<23.9	-
Sediment	PNPS Discharge Canal	6/13/2017	-	16700	-	-	<19.2	-	<20.1	-
Sediment	PNPS Discharge Canal	12/14/2017	-	12500	-	-	<22.4	-	<20.9	-
Summer Squash	Cretinon's Farm, Kingston	8/30/2017	<34.1	1600	<3.9	<8.9	<4.4	<9.2	<3.9	-
Summer Squash	Holmes Farm, Plymouth	8/30/2017	<47.4	1470	<5.1	<10.9	<5.6	<11.3	<5.9	-
Tomatoes	Cretinon's Farm, Kingston	8/30/2017	<26.3	2000	<3.2	<6.5	<3.3	<7.3	<3.2	-
Tomatoes	Holmes Farm, Plymouth	8/30/2017	<32.8	941	<3.8	<8.8	<3.5	<8.4	<3.9	-
Cranberries	Taunton(background)	9/29/2017	91.3	651	<3.3	<6.4	<3	<7.4	<3.3	-
Cranberries	Taunton(background)	9/29/2017	56	759	<2.9	<5.7	<3.2	<5.9	<3	-

- = Not analyzed

* I-131 = iodine 131; Ba-140 = Barium 140; Be-7 = Beryllium 7; Co-60 = Cobalt 60; Cs-134 = Cesium 134; Cs-137=Cesium 137; Fe-59=Iron 59; H-3* = Tritium; K-40 = Potassium-40; Mn-54=Manganese-54; Zn-65=Zinc 65

"<" = value is less than the listed MDA (Minimum Detectable Activity) value

"NR"= result not reported for quality control reasons.

Table 5. Seabrook Nuclear Power Station 2017 Environmental Monitoring Data - Air Samples

Sample Type	Location	Date	I-131* (pCi/m ³)	Be-7* (pCi/m ³)	K-40* (pCi/m ³)	Mn-54* (pCi/m ³)	Fe-59* (pCi/m ³)	Co-60* (pCi/m ³)	Zn-65* (pCi/m ³)	Cs-137* (pCi/m ³)	Gross Alpha (pCi/m ³)	Gross Beta (pCi/m ³)
Air	Salisbury Fire Station	1/4/2017	<0.0232	-	-	-	-	-	-	-	0.01170	0.0289
Air	Salisbury Fire Station	1/11/2017	<0.0234	-	-	-	-	-	-	-	0.00948	0.0247
Air	Salisbury Fire Station	1/19/2017	<0.0152	-	-	-	-	-	-	-	0.01060	0.0272
Air	Salisbury Fire Station	1/25/2017	<0.0287	-	-	-	-	-	-	-	0.00854	0.0211
Air	Salisbury Fire Station	2/1/2017	<0.0168	-	-	-	-	-	-	-	0.00823	0.0235
Air	Salisbury Fire Station	2/8/2017	<0.0310	-	-	-	-	-	-	-	0.00888	0.0209
Air	Salisbury Fire Station	2/15/2017	<0.0243	-	-	-	-	-	-	-	0.00677	0.0308
Air	Salisbury Fire Station quarterly composite	2/15/2017	-	0.087	0.221	<0.001	<0.015	<0.001	<0.003	<0.001	-	-
Air	Salisbury Fire Station	2/22/2017	<0.0255	-	-	-	-	-	-	-	0.00629	0.0236
Air	Salisbury Fire Station	3/1/2017	<0.0204	-	-	-	-	-	-	-	0.00620	0.0210
Air	Salisbury Fire Station	3/7/2017	<0.0287	-	-	-	-	-	-	-	0.00654	0.0223
Air	Salisbury Fire Station	3/13/2017	<0.0279	-	-	-	-	-	-	-	0.00593	0.0261
Air	Salisbury Fire Station	3/21/2017	<0.0322	-	-	-	-	-	-	-	0.00704	0.0318
Air	Salisbury Fire Station	3/28/2017	<0.0228	-	-	-	-	-	-	-	0.00678	0.0247
Air	Salisbury Fire Station	4/5/2017	<0.0135	-	-	-	-	-	-	-	0.00359	0.0141
Air	Salisbury Fire Station	4/12/2017	<0.0140	-	-	-	-	-	-	-	0.00487	0.0160
Air	Salisbury Fire Station	4/20/2017	<0.0201	-	-	-	-	-	-	-	0.00466	0.0166
Air	Salisbury Fire Station	4/26/2017	<0.0269	-	-	-	-	-	-	-	0.00236	0.0158
Air	Salisbury Fire Station	5/3/2017	<0.017	-	-	-	-	-	-	-	0.00405	0.0152
Air	Salisbury Fire Station	5/10/2017	<0.0145	-	-	-	-	-	-	-	0.00316	0.0157
Air	Salisbury Fire Station quarterly composite	5/15/2017	-	0.069	0.257	<0.001	<0.004	<0.001	<0.002	<0.001	-	-
Air	Salisbury Fire Station	5/17/2017	<0.0193	-	-	-	-	-	-	-	0.00232	0.0122
Air	Salisbury Fire Station	5/24/2017	<0.0187	-	-	-	-	-	-	-	0.00459	0.0235
Air	Salisbury Fire Station	5/31/2017	<0.0166	-	-	-	-	-	-	-	0.00325	0.0118
Air	Salisbury Fire Station	6/7/2017	<0.0153	-	-	-	-	-	-	-	0.00187	0.0137
Air	Salisbury Fire Station	6/14/2017	<0.0179	-	-	-	-	-	-	-	0.00313	0.0251
Air	Salisbury Fire Station	6/20/2017	<0.0220	-	-	-	-	-	-	-	0.00385	0.0174
Air	Salisbury Fire Station	6/28/2017	<0.0129	-	-	-	-	-	-	-	0.00294	0.0178
Air	Salisbury Fire Station	7/5/2017	<0.0195	-	-	-	-	-	-	-	0.00931	0.0228
Air	Salisbury Fire Station	7/12/2017	<0.0189	-	-	-	-	-	-	-	0.00575	0.0199
Air	Salisbury Fire Station	7/19/2017	<0.0194	-	-	-	-	-	-	-	0.00629	0.0253

- = Not analyzed

* I-131 = iodine 131; Ba-140 = Barium 140; Be-7 = Beryllium 7; Co-60 = Cobalt 60; Cs-134 = Cesium 134; Cs-137=Cesium 137; Fe-59=Iron 59; H-3* = Tritium; K-40 = Potassium-40; Mn-54=Manganese-54; Zn-65=Zinc 65

"<" = value is less than the listed MDA (Minimum Detectable Activity) value

"NR"= result not reported for quality control reasons.

Sample Type	Location	Date	I-131* (pCi/m ³)	Be-7* (pCi/m ³)	K-40* (pCi/m ³)	Mn-54* (pCi/m ³)	Fe-59* (pCi/m ³)	Co-60* (pCi/m ³)	Zn-65* (pCi/m ³)	Cs-137* (pCi/m ³)	Gross Alpha (pCi/m ³)	Gross Beta (pCi/m ³)
Air	Salisbury Fire Station	7/26/2017	<0.0135	-	-	-	-	-	-	-	0.00556	0.0224
Air	Salisbury Fire Station	8/2/2017	<0.0171	-	-	-	-	-	-	-	0.00520	0.0194
Air	Salisbury Fire Station	8/9/2017	<0.0188	-	-	-	-	-	-	-	0.00459	0.0191
Air	Salisbury Fire Station quarterly composite	8/15/2017	-	0.116	0.161	<0.001	<0.003	<0.001	<0.002	<0.001	-	-
Air	Salisbury Fire Station	8/16/2017	<0.0179	-	-	-	-	-	-	-	0.00516	0.0251
Air	Salisbury Fire Station	8/23/2017	<0.0167	-	-	-	-	-	-	-	0.00393	0.0241
Air	Salisbury Fire Station	8/29/2017	<0.0231	-	-	-	-	-	-	-	0.00329	0.0245
Air	Salisbury Fire Station	9/6/2017	<0.0173	-	-	-	-	-	-	-	0.00203	0.0193
Air	Salisbury Fire Station	9/13/2017	<0.0125	-	-	-	-	-	-	-	0.00262	0.0252
Air	Salisbury Fire Station	9/21/2017	<0.0152	-	-	-	-	-	-	-	0.00226	0.0220
Air	Salisbury Fire Station	9/27/2017	<0.0222	-	-	-	-	-	-	-	0.00211	0.0299
Air	Salisbury Fire Station	10/3/2017	<0.0192	-	-	-	-	-	-	-	0.01480	0.0297
Air	Salisbury Fire Station	10/10/2017	<0.0175	-	-	-	-	-	-	-	0.01660	0.0339
Air	Salisbury Fire Station	10/18/2017	<0.0122	-	-	-	-	-	-	-	0.01280	0.0251
Air	Salisbury Fire Station	10/25/2017	<0.0255	-	-	-	-	-	-	-	0.01590	0.0383
Air	Salisbury Fire Station	11/1/2017	<0.0186	-	-	-	-	-	-	-	0.00995	0.0234
Air	Salisbury Fire Station	11/8/2017	<0.0197	-	-	-	-	-	-	-	0.01400	0.0300
Air	Salisbury Fire Station	11/15/2017	<0.0162	-	-	-	-	-	-	-	0.01060	0.0228
Air	Salisbury Fire Station quarterly composite	11/15/2017	-	0.091	0.096	<0.001	<0.003	<0.001	<0.001	<0.001	-	-
Air	Salisbury Fire Station	11/20/2017	<0.0273	-	-	-	-	-	-	-	0.01570	0.0319
Air	Salisbury Fire Station	11/29/2017	<0.0166	-	-	-	-	-	-	-	0.01060	0.0299
Air	Salisbury Fire Station	12/5/2017	<0.0170	-	-	-	-	-	-	-	0.01460	0.0388
Air	Salisbury Fire Station	12/13/2017	<0.0200	-	-	-	-	-	-	-	0.01040	0.0317
Air	Salisbury Fire Station	12/20/2017	<0.0161	-	-	-	-	-	-	-	0.01140	0.0341
Air	Salisbury Fire Station	12/27/2017	<0.0182	-	-	-	-	-	-	-	0.01000	0.0297
Air	Background	1/3/2017	<0.0428	-	-	-	-	-	-	-	0.02030	0.0442
Air	Background	1/10/2017	<0.0228	-	-	-	-	-	-	-	0.01400	0.0284
Air	Background	1/17/2017	<0.0197	-	-	-	-	-	-	-	0.01420	0.0332
Air	Background	1/25/2017	<0.0209	-	-	-	-	-	-	-	0.01090	0.0246
Air	Background	1/30/2017	<0.0258	-	-	-	-	-	-	-	0.01700	0.0384
Air	Background	2/6/2017	<0.0175	-	-	-	-	-	-	-	0.01660	0.0317

- " = Not analyzed

* I-131 = iodine 131; Ba-140 = Barium 140; Be-7 = Beryllium 7; Co-60 = Cobalt 60; Cs-134 = Cesium 134; Cs-137=Cesium 137; Fe-59=Iron 59; H-3* = Tritium; K-40 = Potassium-40; Mn-54=Manganese-54; Zn-65=Zinc 65

"<" = value is less than the listed MDA (Minimum Detectable Activity) value

"NR"= result not reported for quality control reasons.

Sample Type	Location	Date	I-131* (pCi/m ³)	Be-7* (pCi/m ³)	K-40* (pCi/m ³)	Mn-54* (pCi/m ³)	Fe-59* (pCi/m ³)	Co-60* (pCi/m ³)	Zn-65* (pCi/m ³)	Cs-137* (pCi/m ³)	Gross Alpha (pCi/m ³)	Gross Beta (pCi/m ³)
Air	Background quarterly composite	2/15/2017	-	0.147	0.270	<0.001	<0.015	<0.001	<0.003	<0.001	-	-
Air	Background	2/17/2017	<0.0141	-	-	-	-	-	-	-	.	.
Air	Background	2/21/2017	<0.0170	-	-	-	-	-	-	-	0.01590	0.0344
Air	Background	2/23/2017	<0.0172	-	-	-	-	-	-	-	.	.
Air	Background	2/27/2017	<0.0247	-	-	-	-	-	-	-	0.01370	0.0325
Air	Background	3/6/2017	<0.0177	-	-	-	-	-	-	-	0.01300	0.0355
Air	Background	3/8/2017	<0.0195	-	-	-	-	-	-	-	.	.
Air	Background	3/13/2017	<0.0189	-	-	-	-	-	-	-	0.01280	0.0340
Air	Background	3/20/2017	<0.0233	-	-	-	-	-	-	-	0.00771	0.0217
Air	Background	3/27/2017	<0.0208	-	-	-	-	-	-	-	0.00893	0.0274
Air	Background	4/3/2017	<0.0249	-	-	-	-	-	-	-	0.00592	0.0187
Air	Background	4/10/2017	<0.0235	-	-	-	-	-	-	-	0.00431	0.0167
Air	Background	4/18/2017	<0.0357	-	-	-	-	-	-	-	0.00788	0.0253
Air	Background	5/1/2017	<0.0357	-	-	-	-	-	-	-	0.00843	0.0404
Air	Background	5/8/2017	<0.0155	-	-	-	-	-	-	-	0.00420	0.0172
Air	Background	5/15/2017	<0.0181	-	-	-	-	-	-	-	0.00206	0.0130
Air	Background quarterly composite	5/15/2017	-	0.114	0.209	<0.001	<0.005	<0.001	<0.002	<0.001	-	-
Air	Background	5/22/2017	<0.0178	-	-	-	-	-	-	-	0.00485	0.0221
Air	Background	5/30/2017	<0.0120	-	-	-	-	-	-	-	0.00222	0.0137
Air	Background	6/5/2017	<0.0171	-	-	-	-	-	-	-	0.00294	0.0163
Air	Background	6/12/2017	<0.0185	-	-	-	-	-	-	-	0.00299	0.0189
Air	Background	6/19/2017	<0.0176	-	-	-	-	-	-	-	0.00216	0.0226
Air	Background	6/26/2017	<0.0171	-	-	-	-	-	-	-	0.00275	0.0259
Air	Background	7/3/2017	<0.0173	-	-	-	-	-	-	-	0.00712	0.0239
Air	Background	7/10/2017	<0.0136	-	-	-	-	-	-	-	0.00442	0.0215
Air	Background	7/17/2017	<0.0161	-	-	-	-	-	-	-	0.00597	0.0268
Air	Background	7/24/2017	<0.0156	-	-	-	-	-	-	-	0.00665	0.0289
Air	Background	7/31/2017	<0.0167	-	-	-	-	-	-	-	0.00578	0.0203
Air	Background	8/7/2017	<0.0155	-	-	-	-	-	-	-	0.00627	0.0239
Air	Background	8/14/2017	<0.0159	-	-	-	-	-	-	-	0.00676	0.0290
Air	Background quarterly composite	8/15/2017	-	0.109	<0.024	<0.001	<0.003	<0.001	<0.002	<0.0005	-	-

- " = Not analyzed

* I-131 = iodine 131; Ba-140 = Barium 140; Be-7 = Beryllium 7; Co-60 = Cobalt 60; Cs-134 = Cesium 134; Cs-137=Cesium 137; Fe-59=Iron 59; H-3* = Tritium; K-40 = Potassium-40; Mn-54=Manganese-54; Zn-65=Zinc 65

"<" = value is less than the listed MDA (Minimum Detectable Activity) value

"NR"= result not reported for quality control reasons.

Sample Type	Location	Date	I-131* (pCi/m ³)	Be-7* (pCi/m ³)	K-40* (pCi/m ³)	Mn-54* (pCi/m ³)	Fe-59* (pCi/m ³)	Co-60* (pCi/m ³)	Zn-65* (pCi/m ³)	Cs-137* (pCi/m ³)	Gross Alpha (pCi/m ³)	Gross Beta (pCi/m ³)
Air	Background	8/21/2017	<0.0173	-	-	-	-	-	-	-	0.00461	0.0300
Air	Background	8/28/2017	<0.0180	-	-	-	-	-	-	-	0.00498	0.0320
Air	Background	9/5/2017	<0.0108	-	-	-	-	-	-	-	0.00176	0.0170
Air	Background	9/11/2017	<0.0200	-	-	-	-	-	-	-	0.00373	0.0284
Air	Background	9/18/2017	<0.0173	-	-	-	-	-	-	-	0.00227	0.0235
Air	Background	9/25/2017	<0.0123	-	-	-	-	-	-	-	0.00177	0.0262
Air	Background	10/2/2017	<0.0137	-	-	-	-	-	-	-	0.01170	0.0208
Air	Background	10/10/2017	<0.0152	-	-	-	-	-	-	-	0.01410	0.0324
Air	Background	10/16/2017	<0.0201	-	-	-	-	-	-	-	0.01260	0.0302
Air	Background	10/23/2017	<0.0166	-	-	-	-	-	-	-	0.01750	0.0364
Air	Background	10/30/2017	<0.0131	-	-	-	-	-	-	-	0.01420	0.0235
Air	Background	11/6/2017	<0.0125	-	-	-	-	-	-	-	0.01510	0.0336
Air	Background	11/13/2017	<0.0173	-	-	-	-	-	-	-	0.01330	0.0312
Air	Background quarterly composite	11/15/2017	-	0.105	0.261	<0.001	<0.004	<0.001	<0.002	<0.001	-	-
Air	Background	11/20/2017	<0.0198	-	-	-	-	-	-	-	0.01310	0.0291
Air	Background	11/27/2017	<0.0148	-	-	-	-	-	-	-	0.01350	0.0390
Air	Background	12/4/2017	<0.0182	-	-	-	-	-	-	-	0.01250	0.0366
Air	Background	12/11/2017	<0.0152	-	-	-	-	-	-	-	0.01150	0.0374
Air	Background	12/18/2017	<0.0188	-	-	-	-	-	-	-	0.01160	0.0294
Air	Background	12/26/2017	<0.0166	-	-	-	-	-	-	-	0.00757	0.0234

- " = Not analyzed

* I-131 = iodine 131; Ba-140 = Barium 140; Be-7 = Beryllium 7; Co-60 = Cobalt 60; Cs-134 = Cesium 134; Cs-137=Cesium 137; Fe-59=Iron 59; H-3* = Tritium; K-40 = Potassium-40; Mn-54=Manganese-54; Zn-65=Zinc 65

"<" = value is less than the listed MDA (Minimum Detectable Activity) value

"NR"= result not reported for quality control reasons.

Table 6. Seabrook Nuclear Power Station 2017 Environmental Monitoring Data – Liquid Matrices

Sample Type	Location	Date	K-40* (pCi/L)	Mn-54* (pCi/L)	Fe-59* (pCi/L)	Co-60* (pCi/L)	Zn-65* (pCi/L)	I-131* (pCi/L)	Cs-134* (pCi/L)	Cs-137* (pCi/L)	Ba-140* (pCi/L)	H-3* (pCi/L)
Surface water	Ipswich bay ¹	1/15/2017	-	-	-	-	-	-	-	-	-	<300
Surface water	Ipswich bay ¹	1/18/2017	287	<3.9	<28	<3.1	<8.5	NR	-	<3.2	-	
Surface water	Ipswich bay ¹	2/14/2017	296	<3.1	<16.3	<3.1	<7.2	NR	-	<2.9	-	<300
Surface water	Ipswich bay ¹	3/13/2017	988	<3.7	<13.3	<3.6	<8.1	NR	-	<3.6	-	
Surface water	Ipswich bay ¹	3/14/2017	-	-	-	-	-	-	-	-	-	<300
Surface water	Ipswich bay ¹	4/10/2017	198	<2.8	<6.4	<2.8	<5.4	<10.9	-	<3	-	<300
Surface water	Ipswich bay ¹	5/16/2017	988	<3.4	<8.4	<3.3	<6.8	<21.7	-	<3.4	-	<300
Surface water	Ipswich bay ¹	6/13/2017	226	<3.1	<10.7	<2.7	<6.5	NR	-	<2.8	-	<300
Surface water	Ipswich bay ¹	7/10/2017	263	<2.4	<5.9	<2.4	<5.4	<10.5	-	<2.3	-	
Surface water	Ipswich bay ¹	7/17/2017	-	-	-	-	-	-	-	-	-	<300
Surface water	Ipswich bay ¹	8/14/2017	275	<3.1	<10.1	<2.5	<6.5	NR	-	<2.7	-	<300
Surface water	Ipswich bay ¹	9/12/2017	1,060	<3	<9	<3.1	<7.2	<30.4	-	<3.2	-	
Surface water	Ipswich bay ¹	10/17/2017	323	<2.8	<6.7	<2.8	<6.2	<20.6	-	<2.8	-	
Surface water	Ipswich bay ¹	11/13/2017	304	<3	<8.4	<3	<5.8	<31.5	-	<2.8	-	<300
Surface water	Ipswich bay ¹	11/15/2017	-	-	-	-	-	-	-	-	-	<300
Surface water	Ipswich bay ¹	12/6/2017	334	<3.2	<8.1	<3	<6.8	<23.5	-	<2.9	-	
Surface water	Ipswich bay ¹	12/15/2017	-	-	-	-	-	-	-	-	-	<300
Milk	Rowley	1/4/2017	1,100	-	-	-	-	<3	<3.1	<3.4	<11.8	
Milk	Rowley	1/4/2017	1,370	-	-	-	-	<2.6	<2.6	<2.8	<10.4	
Milk	Rowley	2/1/2017	1,070	-	-	-	-	<2.9	<3	<3.4	<12.3	
Milk	Rowley	3/22/2017	1,380	-	-	-	-	<3.3	<2.6	<3.1	<10.8	
Milk	Rowley	4/5/2017	1,400	-	-	-	-	<2.8	<2.6	<3.1	<10.6	
Milk	Rowley	5/3/2017	1,380	-	-	-	-	<2.4	<2.4	<2.8	<9.5	
Milk	Rowley	6/7/2017	1,040	-	-	-	-	<2.8	<2.9	<3.7	<11.6	
Milk	Rowley	7/12/2017	1,050	-	-	-	-	<3.2	<3.1	<3.5	<12.2	
Milk	Rowley	8/2/2017	1,460	-	-	-	-	<2.4	<2.4	<2.8	<9.9	
Milk	Rowley	9/6/2017	1,420	-	-	-	-	<2.4	<2.3	<2.8	<8.8	
Milk	Rowley	10/10/2017	1,320	-	-	-	-	<2.3	<2.2	<2.8	<9.4	
Milk	Rowley	11/1/2017	1,370	-	-	-	-	<3.1	<2.6	<3	<10.7	
Milk	Rowley	11/1/2017	1,250	-	-	-	-	<2.4	<2.4	<2.9	<9.4	
Milk	Rowley	12/5/2017	1,400	-	-	-	-	<3.3	<2.8	<3.2	<10.8	

(1) Background sample

- " = Not analyzed

* I-131 = iodine 131; Ba-140 = Barium 140; Be-7 = Beryllium 7; Co-60 = Cobalt 60; Cs-134 = Cesium 134; Cs-137=Cesium 137; Fe-59=Iron 59; H-3* = Tritium; K-40 = Potassium-40; Mn-54=Manganese-54; Zn-65=Zinc 65

"<" = value is less than the listed MDA (Minimum Detectable Activity) value

"NR"= result not reported for quality control reasons.

Table 7. Seabrook Nuclear Power Station 2017 Environmental Monitoring Data –Solid Matrices

Sample	Location	Date	Be-7* (pCi/kg)	K-40* (pCi/kg)	Mn-54* (pCi/kg)	Fe-59* (pCi/kg)	Co-60* (pCi/kg)	Zn-65* (pCi/kg)	Cs-137* (pCi/kg)	I-131* (pCi/kg)
Mackerel	Ipswich Bay (background)	5/16/2017	<276	4480	<6.4	<124	<4.7	<17.3	<4.7	-
Mackerel	Ipswich Bay (background)	8/14/2017	<530	5090	<30.8	<144	<22.8	<68.5	<25.8	-
Sculpin	Ipswich Bay (background)	11/22/2017	<1090	4730	<52	<283	<48.3	<126	<47.6	-
Skate	Ipswich Bay (background)	2/14/2017	NR	3040	NR	NR	<78.4	NR	<88.2	-
Modiolus ¹	Ipswich Bay (background)	5/16/2017	<48	1560	<5.6	<11.2	<5.5	<13.1	<5.7	-
Modiolus ¹	Ipswich Bay (background)	11/22/2017	<61	1240	<4.6	<16.6	<4	<10.4	<4.2	-
Mytilus ¹	Ipswich Bay (background)	11/13/2017	133	1670	<4.2	<18.7	<4.2	<9.6	<3.9	-
Mytilus ¹	Ipswich Bay (background)	5/15/2017	<98	1790	<4.2	<29.3	<4.4	<10.7	<3.9	-
Lobster	Ipswich Bay (background)	5/18/2017	<226	2160	<5.7	<88.5	<4.3	<14	<3.9	-
Lobster	Ipswich Bay (background)	11/14/2017	<98	2060	<4.4	<32.4	<4.9	<11.9	<4.3	-
Irish Moss	Ipswich Bay (background)	5/16/2017	722	40700	NR	NR	NR	NR	NR	162
Irish Moss	Ipswich Bay (background)	11/22/2017	789	29500	<15.6	<48.5	<14.7	<38	<13.9	NR
Sediment	Ipswich Bay- beach (background)	5/15/2017	-	22900	-	-	<21.6	-	<21.4	-
Sediment	Ipswich Bay- beach (background)	11/13/2017	-	15800	-	-	<22.9	-	<21.8	-
Sediment	Ipswich Bay-Subtidal (background)	5/16/2017	-	10400	-	-	<26.9	-	<28.4	-
Sediment	Ipswich Bay-Subtidal (background)	11/22/2017	-	11800	-	-	<24.1	-	<25.1	-
Strawberries	Bartlett Farm/Salisbury	6/19/2017	<30.4	888	<3.5	<6.8	<3.6	<7.3	<3.6	-
Strawberries	Bartlett Farm/Salisbury	7/19/2017	<37.7	1980	<4.5	<9.3	<4.7	<9.8	<4.6	-
Strawberries	Russell Orchards/Ipswich	6/19/2017	<30.8	774	<3.3	<7	<3.8	<7.3	<3.6	-
Summer Squash	Russell Orchards/Ipswich	7/19/2017	<38.9	1750	<4.3	<9.7	<5	<10.4	<4.6	-
Tomatoes	Bartlett Farm/Salisbury	8/15/2017	<38.2	1610	<4.5	<9	<5	<10	<5	-
Tomatoes	Russell Orchards/Ipswich	8/15/2017	<29.3	2520	<3.6	<8.4	<4.3	<8.2	<3.9	-

¹Mytilus (i.e., common mussel) samples collected on Plum Island; Modiolus (i.e., giant mussel) samples collected offshore.

- = Not analyzed

* I-131 = iodine 131; Ba-140 = Barium 140; Be-7 = Beryllium 7; Co-60 = Cobalt 60; Cs-134 = Cesium 134; Cs-137=Cesium 137; Fe-59=Iron 59; H-3* = Tritium; K-40 = Potassium-40; Mn-54=Manganese-54; Zn-65=Zinc 65

"<" = value is less than the listed MDA (Minimum Detectable Activity) value

"NR"= result not reported for quality control reasons.

Table 8. Vermont Yankee Nuclear Power Station 2017 Environmental Monitoring Data – Liquid Matrices

Sample Type	Location	Date	K-40* (pCi/L)	Mn-54* (pCi/L)	Fe-59* (pCi/L)	Co-60* (pCi/L)	Zn-65* (pCi/L)	I-131* (pCi/L)	Cs-137* (pCi/L)	H-3* (pCi/L)
Surface water	CT River - Northfield	8/19/2017	1,090	<2.7	<5.6	<2.9	<5.6	<4.5	<2.9	<300
Surface water	CT River - Northfield	8/19/2017	<71	<2.6	<4.5	<2.4	<5.0	<3.4	<2.7	<300

Table 9. Vermont Yankee Nuclear Power Station 2016 Environmental Monitoring Data – Solid matrices

Sample Type	Location	Date	Be-7* (pCi/kg)	K-40* (pCi/kg)	Mn-54* (pCi/kg)	Fe-59* (pCi/kg)	Co-60* (pCi/kg)	Zn-65* (pCi/kg)	Cs-137* (pCi/kg)
Bluegill	CT River - Northfield	8/8/2017	<53.9	3750	<6.55	<13.9	<6.43	<14	14.7
Small mouth bass	CT River - Northfield	8/8/2017	<45.4	4250	<6.11	<12.3	<6.45	<14	<7.67
White crappie	CT River - Northfield	8/8/2017	<362	3430	<48	<88.5	<41.9	<84.7	<43.7
White suckers	CT River - Northfield	8/8/2017	<30.1	3290	<3.61	<8.53	<3.56	<8.57	4.83

- " = Not analyzed

* I-131 = iodine 131; Ba-140 = Barium 140; Be-7 = Beryllium 7; Co-60 = Cobalt 60; Cs-134 = Cesium 134; Cs-137=Cesium 137; Fe-59=Iron 59; H-3* = Tritium; K-40 = Potassium-40; Mn-54=Manganese-54; Zn-65=Zinc 65

"<" = value is less than the listed MDA (Minimum Detectable Activity) value

"NR"= result not reported for quality control reasons.