Surveillance2015

Vermont Yankee Nuclear Power Station

Report on Public Health Monitoring

VERMONT
DEPARTMENT OF HEALTH
Agency of Human Services

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Executive Summary

The Vermont Department of Health has been monitoring and reporting on radiation emissions and radiological effluents (discharges) from the Vermont Yankee Nuclear Power Station since 1971. The purpose of this environmental surveillance is to protect the public's health from excess amounts of radiation.

This *2015 Surveillance Report* details nearly 1,900 separate measurements of more than 900 samples of air, water, milk, sediment and fish taken during the year at the Vermont Yankee site boundary (property line), on site at Vermont Yankee, from the Connecticut River, and from the towns surrounding the station.

The Health Department enforces the state's Radiological Health Rule, which limits the amount of ionizing radiation to which any member of the public could be exposed if standing at the site boundary of the station. The Rule also limits the amount of gaseous, liquid, radioiodine and radioactive particulate effluents to which any member of the public could possibly be exposed because of activities at Vermont Yankee.

The Rule limits the annual direct gamma radiation from Vermont Yankee to a measured exposure value of 20 milliroentgen above background radiation at the site boundary on land. The Rule also limits specific emissions or discharges from Vermont Yankee to an effective dose of no more than 5 millirem from each pathway to any member of the public.

The Connecticut River site boundary around Vermont Yankee is regulated by the U.S. Nuclear Regulatory Commission, which limits the annual direct gamma radiation to any member of the public at this boundary to 100 millirem.

2015 Surveillance Results:

- Measurements in this report confirm no dose in excess of any limit established by the Vermont Department of Health's Radiological Health Rule.
- The numerous samples and measurements of the environment on site and around Vermont Yankee in 2015 show no instances of non-compliance with the Radiological Health Rule, from either activities at Vermont Yankee or the tritium-contaminated plume of groundwater first detected in January 2010.
- The Health Department's continuing analysis of cancer statistics for people who live in the communities surrounding Vermont Yankee shows that cancer incidence and mortality do not differ significantly from people in the rest of Windham County, elsewhere in Vermont, or in the United States.

For questions or more information – The information presented in this report is sometimes complex. We invite interested readers to contact the Health Department's Radiological and Toxicological Sciences program at 802-865-7730 with any questions.

Introduction

This *2015 Surveillance Report* describes the amount and types of radiation found on and near the Vermont Yankee Nuclear Power Station located in Vernon, Vermont. Until the reactor was shut down on December 29, 2014, Vermont Yankee was generating and emitting ionizing radiation in the form of direct gamma radiation, and discharging radioactive materials that emit alpha-, beta- and gamma-radiations. A person could be exposed to radiation released from Vermont Yankee in air or liquid discharges from the station, or from unmonitored releases or leaks. After reactor shutdown, there remain sources of radiation and radioactive material release pathways that may contribute to public dose. The Health Department intends to continue this surveillance until Vermont Yankee is decontaminated and dismantled, and the site is released for unrestricted use.

The Vermont Department of Health enforces the state's Radiological Health Rule, which limits the amount of ionizing radiation to which a member of the public could be exposed if standing at the site boundary (property line) of the station. Specifically, the Rule limits the annual direct gamma radiation from Vermont Yankee to a measured exposure value of 20 milliroentgen above background radiation at the site boundary on land. The Rule also limits the amount of gaseous, liquid, radioiodine and radioactive particulate effluents to which a member of the public could possibly be exposed because of activities at Vermont Yankee. The Rule limits specific emissions or discharges from Vermont Yankee to an effective dose of no more than 5 millirem from each pathway to any member of the public.

The Health Department monitors radiation levels at and near Vermont Yankee. Because both naturally-occurring and human-made radiation is all around us in the environment, the Health Department also tests other areas of the state to provide background data on types and amounts of environmental radiation. Background measurements are compared to measurements of radiation found on site and in areas near Vermont Yankee. The two sets of values are compared to determine if Vermont Yankee's activities are resulting in an increased radiation risk to the public.

This report presents nearly 1,900 measurements taken from over 900 samples that were obtained at Vermont Yankee and from background locations during 2015. Air, water, milk, fish and sediment samples were collected and tested. Maps of locations where many samples or measurements were taken, as well as the testing procedures, are provided.

Most samples are tested by the Health Department Laboratory located in Colchester, Vermont. Measurements of direct gamma radiation exposures using thermoluminescent dosimeters (TLDs) are tested by a National Voluntary Laboratory Accreditation Program vendor of dosimetry. Analyses for the hard-to-detect radioactive metals strontium-90, iron-55 and nickel-63 are performed by only a small number of laboratories in the United States. The Health Department contracted with a certified laboratory to perform these tests on water and fish samples.

The primary human health concern with chronic low-level exposure to ionizing radiation is the potential to develop cancer. For this reason, the Health Department also presents cancer incidence and cancer mortality data for the area near Vermont Yankee, and compares it to the same type of data for the state of Vermont as well as for the U.S. population.

Tritium Contamination

Testing and evaluation of the tritium contamination described in the 2010 Surveillance Report continued in 2015. Thirty-seven wells on site were tested routinely throughout the year. The concentration of tritium in the contaminated wells generally continued to decline over the year and decreased from 2014. No tritium was found in any river water downstream from the station.

Results Presented in this Report:

- Direct gamma radiation measured continuously from more than 70 sites
- Air samples collected by continuous air samplers and tested for radioactive particulates, gases, vapors and radioactive iodine
- Groundwater, drinking water wells and Connecticut River water near Vermont Yankee tested for tritium, gamma-emitting materials, total alpha radioactivity, total beta radioactivity and hard-to-detect radioactive metals (iron-55, nickel-63 and strontium-90)
- Milk, river sediments and fish tested for natural and human-made radioactive materials

These data show no radiation dose in excess of the Health Department's limits as a result of Vermont Yankee activities in 2015.

The full *Surveillance 2015* report is published at the Vermont Department of Health web site: www.healthvermont.gov. For questions about the content, call the Health Department's Radiological and Toxicological Sciences program at 802-865-7730.

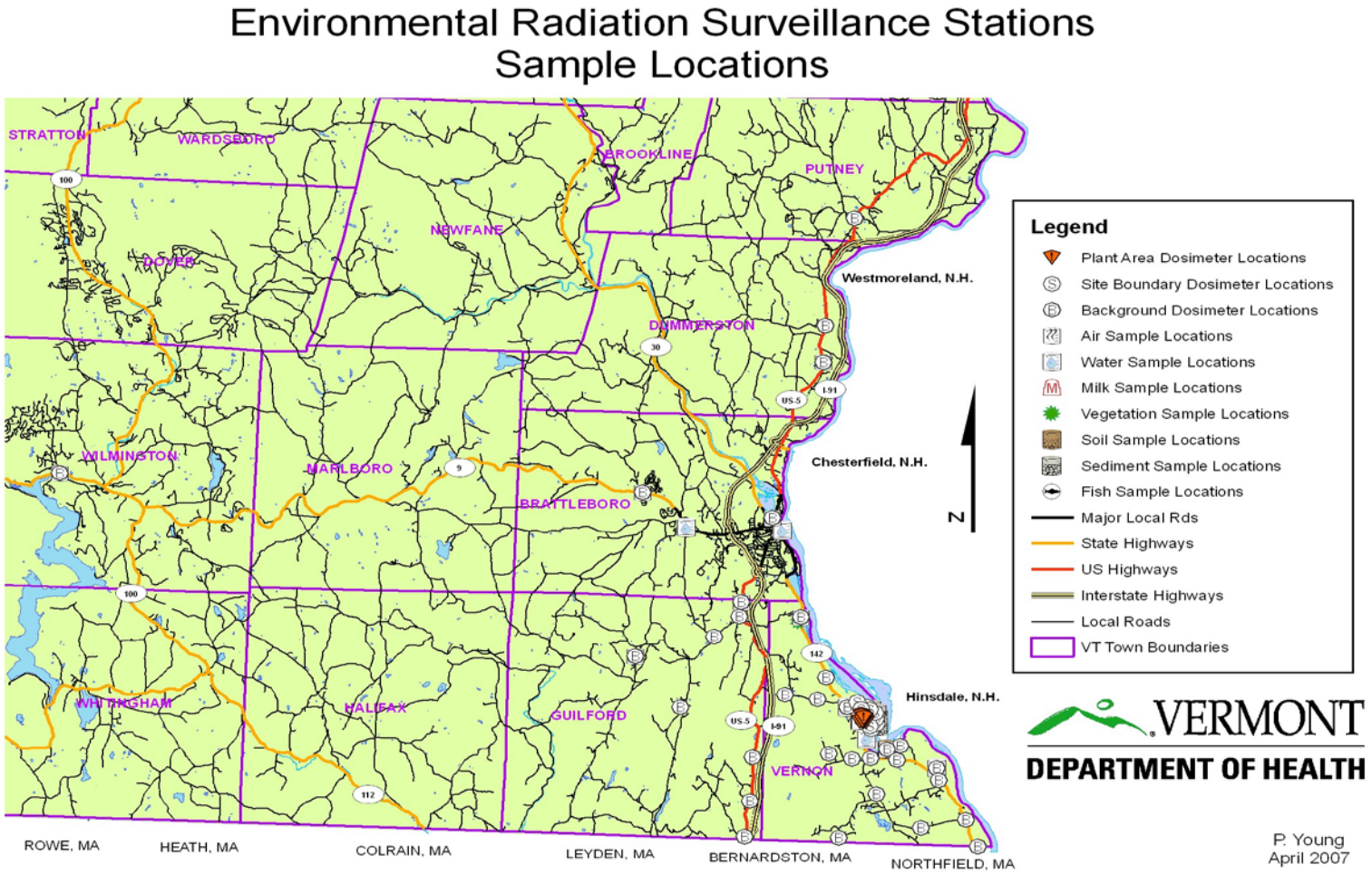
Program Results Summary

An overview of the 2015 sample data is presented in this summary. Detailed descriptions of sample measurement techniques and analyses are presented in further sections of this report. The total numbers, types of sample collected, types of analysis performed and summary results are reported in Table 1. Routine environmental sampling sites are shown in Maps 1 and 2. Map 1 shows the locations where routine samples were taken. Map 2 shows the sample locations in Vernon.

Table 1. 2015 Summary of Samples, Tests and Results

Sample Type	Sites	Number of Tests	Test Type	Results
Direct Gamma Radiation	72	288	Thermoluminescent dosimeters	Less than 20 milliroentgen per year at the land site boundary; no single quarter exceeded 10 milliroentgen.
Air: Particulates, Gases and Vapors	10	99	Total Alpha Radioactivity	Alpha radioactivity within the historical range. No increase observed as a result of operations at Vermont Yankee.
		99	Total Beta Radioactivity	Beta radioactivity within the historical range. No increase observed as a result of operations at Vermont Yankee.
		99	Iodine-131	No iodine-131 was detected in air samples.
		99	Gamma (gas/vapors) Radioactivity	Gamma radioactivity detected was of natural origin.
		4 (*quarterly composites)*	Gamma (particulates) Radioactivity	Gamma radioactivity detected was of natural origin.
Water	10	104	Total Alpha Radioactivity	Alpha radioactivity within the historical range. No increase observed as a result of operations at Vermont Yankee.
		104	Total Beta Radioactivity	Beta radioactivity within the historical range. No increase observed as a result of operations at Vermont Yankee.
	49	361	Tritium	All off-site, on-site active drinking water locations less than the lower limit of detection. Eleven (11) on-site groundwater monitoring wells tested positive for tritium. All positive wells were less than 12,000 pCi/L by December of 2015.
		361	Gamma Radioactivity	All detected gamma radioactivity of natural origin.
	40	196	Iron-55, Nickel-63, Strontium-90	All off-site, on-site active drinking water locations less than the lower limit of detection. Twelve (12) on-site groundwater monitoring wells and one (1) Connecticut River sample tested positive for Strontium-90. Two (2) on-site groundwater monitoring wells tested positive for Iron-55 and one (1) on-site groundwater monitoring well tested positive for Nickel-63.
Milk	2	18	Iodine-131	All samples less than the lower limit of detection.
		18	Gamma Radioactivity	Gamma radioactivity detected was of natural origin.
Sediments	18	36	Gamma Radioactivity	Detected gamma radioactivity attributable to natural, Chernobyl or above-ground nuclear weapons testing origin.
Fish	2	4	Gamma Radioactivity	Gamma radioactivity detected was of natural origin.
		4	Iron-55, Nickel-63, Strontium-90	All detected radioactivity attributable to natural, Chernobyl or above-ground nuclear weapons testing origin. Edible fish portions less than the lower limit of detection.
Total number of tests		**1894**		

Map 1


Environmental Radiation Surveillance Stations
Sample Locations
STRATTON
WARDSBORO
BROOKLINE
PUTNEY
NEWFANE
DOVER
Westmoreland, N.H.
DUMMERSTON
WILMINGTON
MARLBORO
BRATTLEBORO
Chesterfield, N.H.
N
WHITINGHAM
HALIFAX
GUILFORD
Hinsdale, N.H.
VERNON
ROWE, MA
HEATH, MA
COLRAIN, MA
LEYDEN, MA
BERNARDSTON, MA
NORTHFIELD, MA
Legend
Plant Area Dosimeter Locations
Site Boundary Dosimeter Locations
Background Dosimeter Locations
Air Sample Locations
Water Sample Locations
Milk Sample Locations
Vegetation Sample Locations
Soil Sample Locations
Sediment Sample Locations
Fish Sample Locations
Major Local Rds
State Highways
US Highways
Interstate Highways
Local Roads
VT Town Boundaries
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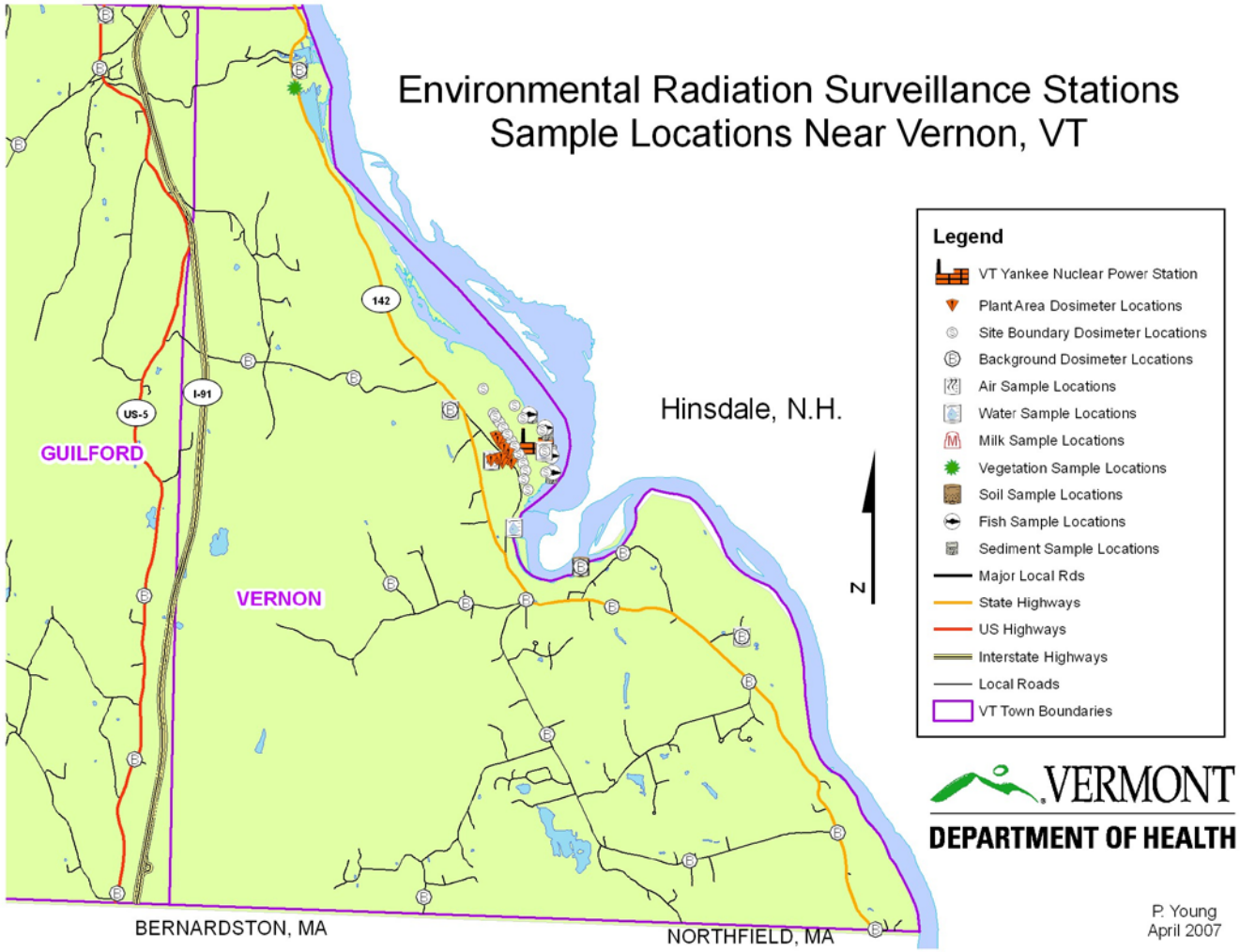
Map 2


Environmental Radiation Surveillance Stations
Sample Locations Near Vernon, VT
Hinsdale, N.H.
GUILFORD
VERNON
BERNARDSTON, MA
NORTHFIELD, MA
142
I-91
US-5
N
Legend
VT Yankee Nuclear Power Station
Plant Area Dosimeter Locations
Site Boundary Dosimeter Locations
Background Dosimeter Locations
Air Sample Locations
Water Sample Locations
Milk Sample Locations
Vegetation Sample Locations
Soil Sample Locations
Fish Sample Locations
Sediment Sample Locations
Major Local Rds
State Highways
US Highways
Interstate Highways
Local Roads
VT Town Boundaries
VERMONT
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Types of Ionizing Radiation

There are three main types of ionizing radiation that could be released from Vermont Yankee: alpha particles, beta particles and gamma rays. The risk of adverse health effects from ionizing radiation is linked to the type and energy of radiation, and the length and method of exposure to the radiation. The Health Department tests for these forms of radiation in many sample types.

Alpha and Beta (particle) Radiation

Alpha and beta radiation are particle forms of radiation energy. Alpha- and beta-charged particles can only travel a short distance and are completely blocked by simple materials.

Alpha radiation is the most biologically hazardous form of ionizing radiation. For the same amount of alpha, beta and gamma radiation energy, the alpha radiation causes about 20 times more tissue damage. It is also the type of radiation that people can most easily shield against. A sheet of paper can stop an alpha particle, and so can the dead layer of skin that covers the outer surface of our bodies. Alpha particles can only cause harm if alpha-emitting materials are inhaled, ingested or otherwise taken into the body. The most common alpha radiation exposure for people is from naturally-occurring radon gas in their homes.

Table 2. Examples of Radioactive Elements that Produce Alpha-Radiations

Naturally-occurring alpha emitters	
Uranium-238	Radon-222
Thorium-232	Polonium-210
Radium-226	Bismuth-212
Human-made alpha emitters	
Americium-241	Plutonium-239

Beta radiation is easily stopped by simple materials like plastics, aluminum and wood, but may be able to go through the first few millimeters of human skin. Beta radiation can cause damage to internal tissues and organs if a beta-emitting material is inhaled, ingested or otherwise taken into the body.

Alpha and beta-emitting materials are released from the station's air stack at Vermont Yankee. They may also be emitted in liquid discharges from contaminated reactor systems.

Figure 1. Relative Ability of Ionizing Radiations to go through Materials

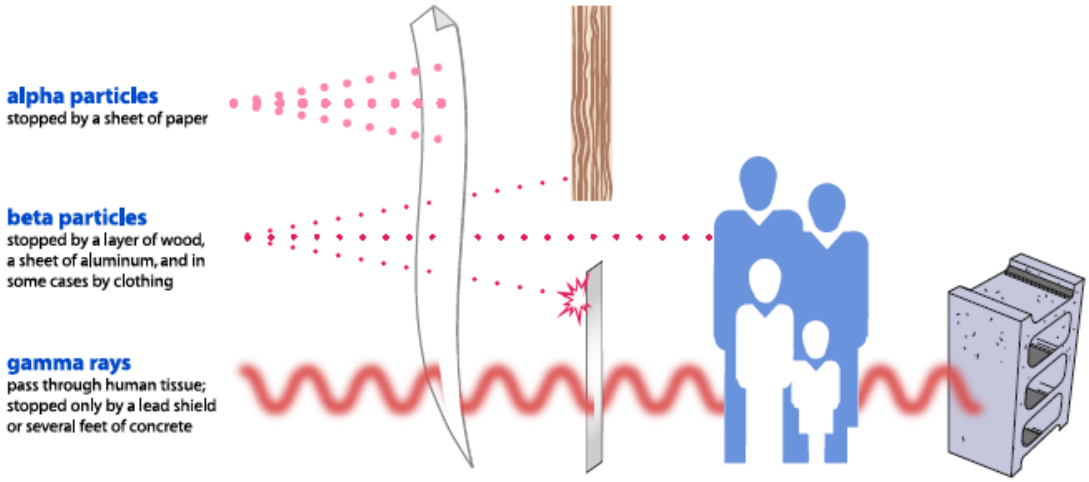


Table 3. Examples of Radioactive Elements that Produce Beta-Radiations

Naturally-occurring beta emitters	
Carbon-14	Potassium-40
Radium-228	Hydrogen-3, "tritium" (also human-made)
Human-made beta emitters	
Iodine-131	Technetium-99
Strontium-90	Hydrogen-3, "tritium" (also naturally-occurring)
Nickel-63	Iron-59

Gamma Radiation

Direct gamma radiation is an electromagnetic wave of energy similar to light, except that it passes through most materials. Gamma radiation can also scatter off materials. Direct gamma radiation loses strength as it travels away from the source. It is also reduced after large numbers of collisions with electrons in the atom.

Gamma radiation passes through the skin and may pass through the whole body. If gamma radiation passes through the body, it may damage tissues. People can be affected by gamma radiation if they are in an area where direct gamma radiation exists, or if they ingest a gamma-emitting material.

Direct gamma radiation is emitted from reactor and turbine systems such as those at Vermont Yankee. Gamma-emitting materials may also be released as gases or particles from the station's air stack.

Table 4. Examples of Radioactive Elements that Produce Gamma-Radiations

Naturally-occurring gamma emitters		
Beryllium-7	Potassium-40	Thallium-208
Bismuth-212	Bismuth-214	Lead-210
Lead-212	Lead-214	Polonium-210
Actinium-228	Radium-224	Radium-226
Radium-228	Thorium-228	Thorium-229
Thorium-230	Thorium-231	Thorium-232
Thorium-234	Uranium-233	Uranium-234
Uranium-235	Uranium-238	
Human-made gamma emitters		
Antimony-124	Antimony-126	Barium-140/ Lanthanum-140
Cerium-144/ Promethium-144	Cesium-134	Cesium-136
Chromium-51	Cobalt-56	Cobalt-58
Cobalt-60	Iodine-131	Iodine-132
Iodine-133	Iodine-135	Krypton-85
Krypton-88	Manganese-54	Neptunium-239
Plutonium-239	Plutonium-240	Ruthenium-103
Tellurium-132	Strontium-85	Strontium-89
Zinc-65	Xenon-133	Xenon-133m
Xenon-135	Zirconium-95/Niobium-95	

Ionizing Radiation Risks

The radiations to which people may be exposed as a result of Vermont Yankee activities are ionizing radiations. According to the International Agency for Research on Cancer (IARC), ionizing radiation can cause cancer in humans. The energy released by ionizing radiation may directly or indirectly damage the DNA of human cells and over time cause cancer. It has been shown that people who are exposed to high doses of ionizing radiation, greater than 10,000 millirem, have a statistically higher risk of cancer. As with other cancer-causing agents, it is not possible to prove that low doses of ionizing radiation are without risk. The risk of developing cancer from chronic exposure to very low doses of radiation, such as the doses detailed in this report, is considered very low.

The risk management approach used for public health protection with ionizing radiation is called the ALARA Principle. The ALARA Principle states that every reasonable effort must be made to maintain radiation exposures ***A****s* ***L****ow* ***A****s* ***R****easonably* ***A****chievable*. The Health Department's Radiological Health Rule not only requires that exposures to ionizing radiation be less than specific limits, but also that Vermont Yankee and all other radiation users in industry, medicine and education use the ALARA Principle.

For more information about ionizing radiation risk:

- The National Academies of Science

  National Research Council. *Health Risks from Exposure to Low Levels of Ionizing Radiation: BEIR VII Phase 2*. Washington, DC: The National Academies Press, 2006.

- The Health Physics Society

  Health Physics Society, *Radiation Risk in Perspective*: *Position Statement of the Health Physics Society*. McLean, VA: The Health Physics Society, 2016

- The International Agency for Research on Cancer

  The International Agency for Research on Cancer, *Radiation, Volume 100D*. France: The World Health Organization, 2012

Cancer Prevalence, Incidence & Mortality

The primary health concern with chronic low-level exposure to ionizing radiation is the potential to develop cancer. Starting in 2007, the Health Department began presenting cancer-related health outcome data for the population around Vermont Yankee. The Health Department tabulates, analyzes and provides data for cancer incidence (new cancer cases diagnosed) and cancer mortality (people dying from cancer) for Windham County and for the six towns nearest Vermont Yankee that make up the Emergency Planning Zone. The Health Department evaluates trends in all cancer types (all ages, all sites) and evaluates thyroid cancers, leukemia and pediatric (childhood) cancers separately because these types of cancers can be associated with excess radiation exposure or radiation exposure during fetal development.

Cancer Prevalence

Cancer is not one disease, but a group of more than 100 different diseases. Cancer is very common. Roughly four out of ten men and women in the U.S. will develop cancer in their lifetime. A cancer usually develops gradually as a result of a complex mix of factors related to personal behaviors, environment and genetics. Each type of cancer is caused by a different set of factors, some well-established, some uncertain, and some unknown.

Cancer *prevalence* means the number of people alive today who have ever been diagnosed with cancer. According to 2015 Behavioral Risk Factor Surveillance System (BRFSS) data, approximately 35,000, or seven percent, of Vermonters age 18 and older have ever been told by a doctor they had cancer. This includes people who are newly diagnosed, in active treatment, or have completed active treatment, and people living with progressive symptoms of their disease.

As a population ages, the occurrence of new cancer cases can be expected to increase. With treatment advances, people are living longer with a cancer diagnosis. Between 2004 and 2013 the number of cancer survivors has increased by approximately a third (SEER Cancer Statistics Review 1975-2004 and 1975-2013).

Cancer Incidence

Cancer *incidence* means the number of newly diagnosed cases during a specific time period. Incidence data in Table 5 were compiled from Vermont Cancer Registry data.

Incidence rates are shown for all cancers, thyroid cancers, leukemia, and childhood (pediatric) cancers for the 10-year period 2004 to 2013.

The data in Table 5 indicate that:

- Incidence rates for thyroid cancer and leukemia in the Emergency Planning Zone are not different from Windham County, Vermont as a whole, or the U.S. population.
- Incidence rates for pediatric cancers in the Emergency Planning Zone are not different from Windham County, Vermont, or the U.S. population.
- The incidence of thyroid cancer in Windham County is significantly lower than Vermont and the U.S. rate.
- The incidence of leukemia in Windham County is significantly higher than the U.S. rate but is not different compared to Vermont.
- For all cancer types combined, the rate of cancer incidence in the six towns near Vermont Yankee (Brattleboro, Dummerston, Guilford, Halifax, Marlboro and Vernon) is not different from Vermont, Windham County, or the U.S. population.

The U.S. incidence rates and mortality rates are all races population rates. Analysis prior to the 2011 report compared only U.S. white population incidence and mortality rates to Vermont rates. This change is consistent with current Health Department publications that compare Vermont (all races) to U.S. (all races) rates.

Table 5. Cancer Incidence Rates Near Vermont Yankee, in Vermont & U.S.

Age Adjusted Vermont and U.S. Cancer Incidence, All Sites, Males and Females per 100,000 population, 2004-2013.

	Rate	Lower CL	Upper CL	Avg. cases per year
U.S.	458.7	458.5	458.9	1,510,325
Vermont	477.2	472.1	482.3	3,535
Windham County	477.8	459.5	496.6	273
Emergency Zone	461.8	435.2	489.7	120

Age Adjusted Vermont and U.S. Cancer Incidence, Thyroid, Males and Females per 100,000 population, 2004-2013.

	Rate	Lower CL	Upper CL	Avg. cases per year
U.S.	12.7	12.6	12.7	40,044
Vermont	13.1	12.2	14.0	86
Windham County	8.3	5.8	11.5	4
Emergency Zone	9.2	5.5	14.6	2

Age Adjusted Vermont and U.S. Cancer Incidence, Leukemia, Males and Females per 100,000 population, 2004-2013.

	Rate	Lower CL	Upper CL	Avg. cases per year
U.S.	13.3	13.2	13.3	42,783
Vermont	13.2	12.4	14.1	93
Windham County	16.7	13.4	20.6	9
Emergency Zone	13.3	9.2	18.9	4

Age Adjusted Vermont and U.S. Cancer Incidence, Pediatric Cancers (Ages 0-19), Males and Females per 100,000 population, 2004-2013.

	Rate	Lower CL	Upper CL	Avg. cases per year
U.S.	17.3	17.2	17.4	14,489
Vermont	15.8	13.9	18.0	25
Windham County	15.9	9.2	25.6	2
Emergency Zone	12.0	4.4	27.0	<1

-- Rates are only presented when the total number of cases is greater than 5.
Data Sources: Vermont Cancer Registry (VCR), Vermont Department of Health (1994-2013). National Program of Cancer Registries (NPCR) and Surveillance, Epidemiology, and End Results (SEER) Program - Incidence State Restricted Access Data File (1999-2013).
Technical Notes: Emergency Zone towns include: Brattleboro, Dummerston, Guilford, Halifax, Marlboro, and Vernon. All rates are age adjusted to the 2000 U.S. standard population and rates are per 100,000 population. Incidence rates are for invasive cancers and in situ urinary bladder cancers. Cancer diagnoses exclude basal cell and squamous cell skin cancers. A reporting delay by Department of Veterans Affairs (VA) has resulted in incomplete reporting of VA hospital cases in 2011, 2012 and 2013.

Cancer Mortality

In Table 6, mortality rates from the U.S., Vermont, Windham County, and the Emergency Planning Zone towns are presented for the 10 years 2004 to 2013. The Vermont data are from the Vermont Department of Health's Vital Statistics System. Data for U.S. cancer mortality rates are from the Vital Statistics System of the United States. Cancer mortality data are presented for all cancers, thyroid cancers, leukemia and pediatric cancers.

The data in Table 6 indicate:

- For the years 2004 to 2013, cancer mortality rates for all cancers combined and the leukemia mortality rates in the six towns of the Emergency Planning Zone around Vermont Yankee do not differ from those for Windham County, Vermont or the U.S.
- Similar results were seen in mortality rates in the prior report.
- Mortality rates for thyroid and pediatric cancers in Windham County and the six towns could not be calculated as there were too few deaths (fewer than six) over the time period studied (10 years).

Table 6. Cancer Mortality Rates Near Vermont Yankee, in Vermont & U.S.

**Age Adjusted Vermont and U.S. Cancer Mortality, All Sites,
Males and Females per 100,000 population, 2004-2013.**

	Rate	Lower CL	Upper CL	Avg. deaths per year
U.S.	174.8	174.7	175.0	568,791
Vermont	175.0	171.9	178.0	1,291
Windham County	177.5	166.5	189.0	102
Emergency Zone	179.8	163.6	197.5	47

**Age Adjusted Vermont and U.S. Cancer Mortality, Thyroid,
Males and Females per 100,000 population, 2004-2013.**

	Rate	Lower CL	Upper CL	Avg. deaths per year
U.S.	0.5	0.5	0.5	1,628
Vermont	0.5	0.3	0.7	4
Windham County	--	--	--	<1
Emergency Zone	--	--	--	0

**Age Adjusted Vermont and U.S. Cancer Mortality, Leukemia,
Males and Females per 100,000 population, 2004-2013.**

	Rate	Lower CL	Upper CL	Avg. deaths per year
U.S.	7.0	7.0	7.1	22,498
Vermont	6.9	6.3	7.5	49
Windham County	8.4	6.1	11.3	5
Emergency Zone	7.1	4.2	11.7	2

**Age Adjusted Vermont and U.S. Cancer Mortality, Pediatric Cancers (Ages 0-19),
Males and Females per 100,000 population, 2004-2013.**

	Rate	Lower CL	Upper CL	Avg. deaths per year
U.S.	2.4	2.4	2.5	2,027
Vermont	3.0	2.2	4.0	5
Windham County	--	--	--	<1
Emergency Zone	--	--	--	<1

-- Rates are only presented when the total number of deaths is greater than 5.
Data Sources: Vermont Vital Statistics System, Vermont Department of Health (1994-2013). SEER Program Mortality - Aggregated Total U.S. (1969-2013).
Technical Notes: Emergency Zone towns include: Brattleboro, Dummerston, Guilford, Halifax, Marlboro, and Vernon. All rates are age adjusted to the 2000 U.S. standard population and rates are per 100,000 population.

Cancer Surveillance Methodology

The rates in this report are calculated at a 95 percent confidence level. This means, for example, given a reported thyroid cancer incidence rate of 13.1 per 100,000 for Vermont in 2004-2013, that we are 95 percent confident (not due to chance alone) that the true 2004 to 2013 Vermont thyroid cancer rate is in the range of 12.2 to 14.0 per 100,000. In Windham County, the thyroid cancer incidence rate is 8.3 cases per 100,000 people. Statistically speaking, this means we are 95 percent confident that the actual rate is between 5.8 cases and 11.5 cases per 100,000 people. Because the *ranges* for these populations do not overlap, we conclude that there is a meaningful statistical difference between the two rates.

In Table 6, it may appear that the cancer mortality rates are different in the Emergency Planning Zone around Vermont Yankee compared to Windham County, Vermont, or the U.S. However, the confidence intervals (ranges) for these rates overlap, and the cancer mortality rates are *not* statistically different. In Windham County, the death rate from cancer, all sites, males and females, was 177.5 deaths per 100,000 people, while the death rate in the six towns near Vermont Yankee was 179.8 deaths per 100,000 people. The same conclusion is drawn for Vermont and the U.S. as a whole. All sites, all ages cancer mortality rates are not significantly different.

Data Limitations

One limitation of these data is that the number of cancer cases and the number of cancer deaths in the six towns near Vermont Yankee are small. There are challenges associated with computing rates for small geographical areas, such as the Vermont Yankee Emergency Planning Zone, with an estimated population that is less than 20,000 people in 2013. When the rates are based on a small number of cases, it is almost impossible to distinguish random fluctuation from true changes in the underlying risk of disease. This is an issue in a state like Vermont, which has many communities with small populations. To improve rate stability, the cases have been combined for the 10-year period from 2004 through 2013. For more information about cancer and resources to assist those living with cancer in Vermont: http://healthvermont.gov/wellness/cancer.

Environmental Surveillance Methods

The types of surveys and analyses performed by the Vermont Department of Health are described here in relationship to their role in protecting the public from ionizing radiation resulting from activities at Vermont Yankee.

Direct Gamma Radiation Monitoring

Direct gamma radiation in air is measured by the Health Department with thermoluminescent dosimeters (TLDs). Gamma radiation energy interacts with and changes the materials inside the TLDs. The more gamma energy, the more change occurs in the materials. The TLDs are then tested in a laboratory, by reversing the physical changes. When this occurs, light is emitted, and the amount of light measured in the process is directly related to the amount of gamma radiation energy the TLD received in the environment. These instruments are calibrated to provide a measure of radiation exposure, reported in milliroentgen.

TLDs are placed in the environment to measure how much direct gamma radiation is being given off from Vermont Yankee and how much exists from natural or other human-made sources in background areas of Vermont. The Health Department's dosimeters are located on the site boundary (property line), in the area around the station and at background locations in Windham County. A total of 72 locations are monitored. Samples are tested quarterly.

Vermont Yankee emits direct gamma radiation from components and nuclear reactor systems. Direct gamma radiation may also result when gases and particulates are released from the station's air stack, or from industrial activities, including spent fuel movement and building demolition. Measuring the amount emitted ensures that no member of the public is exposed to increased levels of gamma radiation because of activities at Vermont Yankee.

Continuous Flow Air Sampling

Continuous air samplers are located in Vernon, Guilford, Dummerston, Wilmington and Brattleboro. An additional air sampler exists in Burlington. These air samplers have a mechanical pump that pulls air through two types of sample media, and an in-line flow meter that tracks the volume of air pulled through the sample. The air samplers run continuously.

The samplers collect alpha-, beta- and gamma-emitting materials in air. Each sampler has two collection media to capture these radioactive materials. The first medium is a glass fiber filter. As outdoor air is pulled through the sampler, particulates containing alpha-, beta- and gamma-emitting materials are collected on the glass fiber filter.

Located behind the glass fiber filter is the second medium, a charcoal cartridge. The cartridge is treated with triethylenediamine (TEDA), a compound that attracts radioactive iodine vapors. As air passes through, radioactive iodine as well as other gamma-emitting gases and vapors are collected.

The filter is sent to the Health Department Laboratory where the alpha- and beta-emitting materials are counted on a gas flow proportional counter. The charcoal cartridge is tested by the Health Department Laboratory on a gamma spectrometer. Samples are collected and tested monthly. In addition, every three months the filters are grouped together and tested by gamma spectroscopy. These grouped samples are called quarterly composites.

Measurements of total alpha and beta radiation, gamma radiation and specifically iodine-131 ensure that activities at—and discharges from—Vermont Yankee are within limits and do not result in an increased radiation exposure to the public.

Water Monitoring

Water samples are collected both on site at Vermont Yankee and off site at nearby locations. Off-site water samples include drinking water wells, a municipal water supply, and samples from the Connecticut River. These locations allow the Health Department to determine if radioactive materials have left the Vermont Yankee site and entered these waters. On-site groundwater monitoring wells are sampled and tested to determine if any radioactive materials are leaking from systems at Vermont Yankee. Several on-site wells are located side-by-side and are known as coupled wells. They are in the same location, with one well set slightly deeper than the other. The shallower well is designated with an “S” after the well number, the deeper well has a “D” designation. On-site drinking water wells are also sampled and tested to ensure that the drinking water supplies are not contaminated.

Water samples can be tested for total alpha and beta radioactivity, and gamma-emitting materials. Alpha and beta radioactivity are tested with a gas proportional counter. Gamma-emitting materials are measured with a gamma spectrometer.

Water samples are also tested for tritium. Tritium is a radioactive form of hydrogen, and is a weak beta-emitter. Tritium is created when water passes through the reactor core and the hydrogen atoms in the water molecules as well as trace elements like boron absorb neutrons from the fission of the reactor fuel. Tritiated water can leave the power station in the same ways that non-radioactive water leaves the station: in the air, in groundwater, and through discharges into surface water. Tritium is also created by cosmic radiation in the atmosphere. The Health Department Laboratory measures tritium with a liquid scintillation counter.

Since 2010, water samples have also been tested for three hard-to-detect radioactive metals: strontium-90, iron-55, and nickel-63. The Health Department contracts with a certified laboratory to perform these analyses. Strontium-90 is associated with nuclear reactor fission, but was also released in significant quantities in the 1940s, 50s and 60s during above-ground nuclear weapons testing, and as a result of global nuclear events like Chernobyl and Fukushima. Nickel-63 and iron-55 are associated with nuclear facility operations. These radioactive metals can be released from leaking reactor systems or through permitted discharges. They are not identifiable by routine laboratory test methods.

Monitoring Food Chain Inputs

The Health Department also routinely tests milk, sediment and fish in the Vernon and Brattleboro area.

Milk Sampling

Milk samples are collected from two farms located near Vermont Yankee. Raw cows' milk samples are taken monthly and tested for gamma-emitting materials and specifically for iodine-131 (I-131).

Sediment Sampling

Sediments from the bottom of the Connecticut River are collected twice a year. They are tested for gamma-emitting materials.

Fish Sampling

Fish are collected at two sites in the Connecticut River by an environmental contractor. One site is outside the Vermont Yankee discharge and the other site is about nine miles upstream from Vermont Yankee, where the Route 9 bridge crosses the Connecticut River. Fish are caught by a method known as electro-fishing. This involves putting a weak electric current in the water. Fish exposed to the current are temporarily stunned and float to the surface where they are collected. Sport and pan fish species are caught and tested, including large and small mouth bass, yellow perch and pumpkinseed.

The extent of the testing that can be done depends on the mass of fish collected. Fish are tested for gamma-emitting materials and strontium-90 as well as other hard-to-detect radioactive metals nickel-63 and iron-55 when quantities permit.

Laboratory Testing and Measurements

Laboratory instruments at the Health Department that are used to test samples can measure very small amounts of radioactivity. Each instrument has a limit as to how low it can measure or identify radioactivity. This limit is determined by the Health Department radiochemists and reported as the *Lower Limit of Detection* (LLD). Lower Limits of Detection are calculated for each sample, based on the specific instrument and sample characteristics such as type (*e.g.* water, soil, milk, air), length of time the sample is tested and the amount of the sample tested. The Health Department's Lower Limits of Detection for routine gamma spectroscopy tests are presented in Table 8.

All of the Health Department's instruments meet strict quality control checks. Data reported by the Health Department is thoroughly reviewed by both the radiochemists and data review personnel.

Units of Measurement

For most results in this report, radioactivity is reported in units of *picocuries per mass or volume* of sample. One picocurie is one trillionth of a curie or 0.000000000001 curie. Curies and picocuries are units that measure the amount of radiation "activity" in the sample.

Direct gamma exposure is measured and reported in milliroentgen. Milliroentgen is a unit of exposure to ionizing radiation. One milliroentgen is equal to one thousandth of a roentgen or 0.001 roentgens.

Table 7. Units of Measurement

Type	Unit	Abbreviation	Measures (amount of)	Equivalent to
Radiation units	curie	Ci	activity of a radioactive material	1,000,000,000,000 picocuries (pCi)
	picocurie	pCi	activity of a radioactive material	0.000000000001 curie (Ci)
	roentgen	R	*exposure* to ionizing radiation	1000 milliroentgens (mR)
	milliroentgen	mR	*exposure* to ionizing radiation	0.001 roentgen (R)
	roentgen **e**quivalent **m**an	rem	*dose* equivalent of ionizing radiation	1000 millirem (mrem)
	milli**rem**	mrem	*dose* equivalent of ionizing radiation	0.001 roentgen equivalent man (rem)
Mass & Volume units	gram	g	mass	0.001 kilogram (kg)
	kilogram	kg	mass	1000 grams (g)
	liter	L	volume of liquid	1000 milliliters (mL)
	milliliter	mL	volume of liquid	0.001 liter (L)
	cubic meter	m^3	volume of air	1,000,000 centimeters^3 (cm^3)

Roentgens are units of radiation exposure in air. To determine the effect that the exposure would have on a person, roentgens are converted to **rem** ("**r**oentgen **e**quivalent **m**an"). A rem accounts for both the amount of radiation energy absorbed by a person and the potential biological effects of that energy in the human body. The Health Department's Radiological Health Rule provides limits for gamma radiation emitted from Vermont Yankee in units of measured exposure and relates it to a *biological dose*. As the Vermont Yankee site boundary TLDs measure exposure in milliroentgen, the corresponding limit in milliroentgen applies. Personal TLDs, like those worn by workers in nuclear power, medical or research facilities, are calibrated to provide a measure of *biological dose* for the wearer and are reported in millirem.

Uncertainty of Radiation Measurements

Measurements reported by a laboratory have an amount of *uncertainty* associated with them. Uncertainty, sometimes called error, results from variability in sampling and testing. The smaller the uncertainty associated with a measurement, the more accurate the number reported is likely to be. The uncertainty associated with a measurement is calculated by radiochemists and reported as a plus/minus (+/-) value. All of the measurements in this report are presented at the 95 percent confidence level. This means it is 95 percent certain (not due to chance alone) that the results are within the value and error range reported. Uncertainty can be minimized by increasing instrument efficiency, sample size and counting time.

Uncertainty of Thermoluminescent Dosimeter (TLD) Measurements

Dosimeter measurements over time are estimates and are also subject to uncertainty. The error for the sum of the quarterly results is the total propagated error at the 95 percent confidence level. The formula for the propagation of error is a root-mean-square formula:

$$[(\sigma_1^2) + (\sigma_2^2) + (\sigma_3^2) + (\sigma_4^2)]^{1/2}$$

Where (σ_1^2) is the uncertainty for quarter 1, (σ_2^2) is the uncertainty for quarter 2, (σ_3^2) is the uncertainty for quarter 3 and (σ_4^2) is the uncertainty for quarter 4. The Health Department regulates the direct gamma radiation exposure on the reported measurement.

Table 8. Health Department Gamma Spectroscopy Calculated Lower Limits of Detection

Radioactive element	Calculated Lower Limit of Detection: fish, water, vegetation & milk (pCi/L or pCi/kg)	Calculated Lower Limit of Detection: soil, sediment (pCi/kg)
Antimony-124	3	24
Antimony-126	3	23
Barium-133	4	30
Beryllium-7	24	183
Cadmium-109	48	349
Cerium-139	3	18
Cerium-141	4	29
Cerium-144	16	115
Cesium-134	4	25
Cesium-136	3	23
Cesium-137	4	24
Chromium-51	24	182
Cobalt-57	2	14
Cobalt-58	3	23
Cobalt-60	3	23
Iodine-131	3	23
Manganese-54	4	24
Mercury-203	3	22
Potassium-40	48	367
Ruthenium-103	3	22
Ruthenium-106	29	220
Silver-110m	3	23
Strontium-85	4	26
Tin-113	4	31
Yttrium-88	4	26
Zinc-65	6	46

Direct Gamma Radiation Results

Thermoluminescent dosimeters (TLDs) are located along the Vermont Yankee site boundary (property line) and in public areas in Vernon and other Windham County towns. Thirteen TLDs placed at the Vermont Yankee site boundary are evaluated for compliance with the regulations detailed in the Health Department's Radiological Health Rule. The Health Department limits the measured exposure at the site boundary to no more than 20 milliroentgen per year above background radiation, and no more than 10 milliroentgen per calendar quarter above background radiation.

Site boundary TLDs:

- VY North Fence
- VY North Fence #2
- VY SW Fence
- VY SW Fence #2
- VY Parking Lot A
- VDH T07A
- Governor Hunt Road # 39
- VDH T07B
- VDH DR42
- VDH DR48
- VDH DR51A
- VDH DR52A
- VDH DR53A

Five additional TLDs—VDH DR43, DR44, DR45, DR46 and DR47—are located on the Connecticut River site boundary and are subject to the U.S. Nuclear Regulatory Commission limit of 100 millirem per year.

Additional Health Department TLDs are located in other areas of Vernon, and in Guilford, Brattleboro, Dummerston, Putney and Wilmington. These provide the background measurements of direct gamma radiation from both natural and human-made sources unrelated to the operation of Vermont Yankee. All TLDs are collected and tested every three months (quarterly).

Comparison to Background Levels

To determine the amount of direct gamma radiation exposure attributed to emissions from Vermont Yankee, the background gamma radiation is subtracted from the site boundary (property line) measurements. Background gamma radiation unrelated to

Vermont Yankee may be from naturally-occurring sources, other industrial applications, and global contaminants remaining from above-ground weapons testing during the 1940s, 50s and 60s and global nuclear incidents like Chernobyl and Fukushima.

To measure background gamma radiation an additional 34 TLDs are placed in locations beyond the immediate area of Vermont Yankee's activities. These locations are as far west as Wilmington, as far north as Putney, and as far south as the Massachusetts state line in Guilford and Vernon. Each quarter's average exposure to these 34 TLDs is calculated and used to estimate environmental background radiation. Background gamma radiation levels for the four quarters of 2015 are presented in Table 9.

The exposures reported in Tables 10 and 11 show the total (gross) dosimeter measurement and the net value. The net value is calculated by subtracting the background radiation measurement from the total radiation measurement. For regulatory purposes, the net values are compared to the quarterly and annual limits.

Table 9. 2015 Average Direct Gamma Background Radiation Results

Calendar Quarter	Average Background Exposure Measurements (milliroentgen)
January 1 to March 31	12.5 ± 2.1
April 1 to June 30	14.6 ± 5.6
July 1 to September 30	15.2 ± 2.5
October 1 to December 31	13.5 ± 5.2
Total for Calendar Year 2015	**55.7 ± 8.4**
Calendar Year 2014	57.7 ± 4.9
Calendar Year 2013	56.8 ± 4.5
Calendar Year 2012	57.0 ± 4.4
Calendar Year 2011	56.1 ± 7.3
Calendar Year 2010	59.2 ± 7.1
Calendar Year 2009	57.9 ± 4.8
Calendar Year 2008	56.4 ± 4.6
Calendar Year 2007	56.2 ± 5.2

2015 Direct Gamma Radiation Exposure Results

The following tables show the results of the Health Department's TLD measurements of direct gamma radiation. Table 10 contains the results for the Vermont Yankee site boundary, and the dosimeters in the immediate area around the power station. Table 11 contains the results for the dosimeters placed in 34 locations beyond the immediate area of Vermont Yankee.

In 2015:

- 288 TLDs were tested for direct gamma radiation.
    - 136 of those provided background exposure measurements
    - 152 of those provided exposure measurements at the site boundary and in the immediate area of Vermont Yankee

Dosimeter locations on the site boundary bordered by land and used for direct gamma radiation compliance measurements reflect Vermont Yankee property purchases on or before August 1, 2008. The site boundary dosimeter location data are bolded in Table 10.

For 2015, the net site boundary results used for verifying compliance ranged from 0.0 to 7.0 milliroentgen.

Map 3 shows the locations of the site boundary and station area dosimeters. Maps 4 and 5 show the locations of the background dosimeters. The ID numbers on the maps can be matched to the locations in Tables 10 and 11.

For 2015, the quarterly limit of 10 milliroentgen and the annual limit of 20 milliroentgen were not exceeded.

Map 3

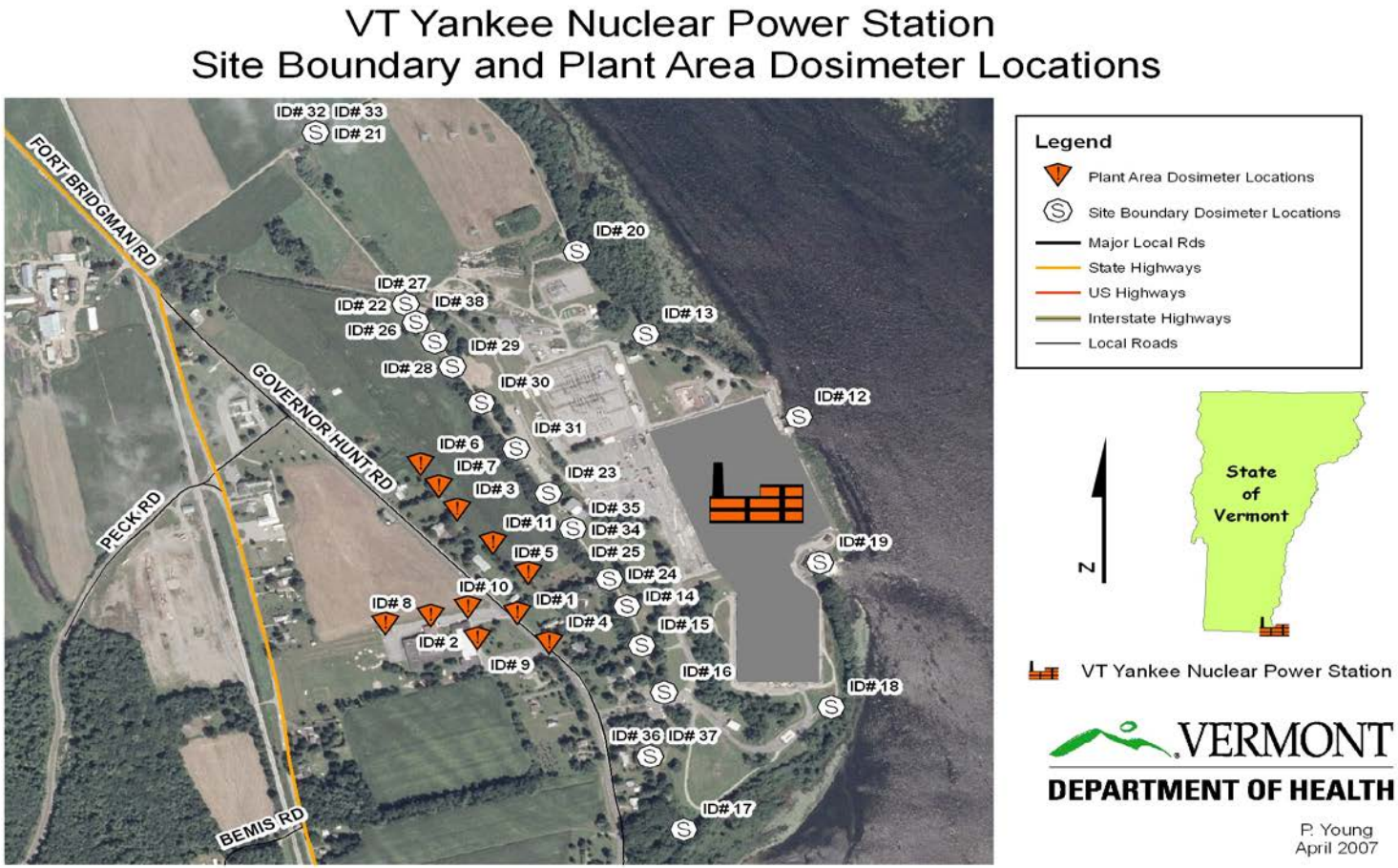

VT Yankee Nuclear Power Station
Site Boundary and Plant Area Dosimeter Locations
FORT BRIDGMAN RD
GOVERNOR HUNT RD
PECK RD
BEMIS RD
ID# 32
ID# 33
ID# 21
ID# 20
ID# 27
ID# 22
ID# 38
ID# 26
ID# 29
ID# 28
ID# 30
ID# 31
ID# 13
ID# 12
ID# 6
ID# 7
ID# 23
ID# 3
ID# 35
ID# 11
ID# 34
ID# 5
ID# 25
ID# 24
ID# 10
ID# 1
ID# 14
ID# 8
ID# 4
ID# 15
ID# 2
ID# 9
ID# 16
ID# 18
ID# 19
ID# 36
ID# 37
ID# 17
Legend
Plant Area Dosimeter Locations
Site Boundary Dosimeter Locations
Major Local Rds
State Highways
US Highways
Interstate Highways
Local Roads
N
State of Vermont
VT Yankee Nuclear Power Station
VERMONT
DEPARTMENT OF HEALTH
P. Young
April 2007

Table 10. 2015 Thermoluminescent Dosimeter Exposure Measurements and Net Gamma Radiation: Station Area & Site Boundary Locations

2015 **Site Boundary and Station Area** Dosimeter Exposure (milliroentgen)																												
Location	Map ID #	Qtr1 Gross	1SD Error	Avg Bkgrd	Qtr1 Net	Net Q1 >=0	2SD Error	Qrtr2 Gross	1SD Error	Avg Bkgrd	Qtr2 Net	Net Q2 >=0	2SD Error	Qrtr3 Gross	1SD Error	Avg Bkgrd	Qtr3 Net	Net Q3 >=0	2SD Error	Qrtr4 Gross	1SD Error	Avg Bkgrd	Qtr4 Net	Net Q4 >=0	2SD Error	Annual Net	2SD Error
Gov Hunt Road #39	**1**	**12.82**	**0.72**	**12.5**	**0.3**	**0.3**	**1.4**	**15.22**	**0.99**	**14.6**	**0.7**	**0.7**	**1.9**	**16.24**	**0.71**	**15.2**	**1.0**	**1.0**	**1.4**	**14.29**	**0.66**	**13.5**	**0.8**	**0.8**	**1.3**	**2.8**	**3.1**
VDH DR06	2	12.63	0.65	**12.5**	0.1	0.1	1.3	15.03	1.06	**14.6**	0.5	0.5	2.1	16.04	0.71	**15.2**	0.8	0.8	1.4	14.29	0.75	**13.5**	0.8	0.8	1.5	2.3	3.2
VDH DR51A	**3**	**11.55**	**0.51**	**12.5**	**-0.9**	**0.0**	**1.0**	**15.77**	**1.16**	**14.6**	**1.2**	**1.2**	**2.3**	**15.66**	**0.85**	**15.2**	**0.5**	**0.5**	**1.7**	**14.19**	**0.67**	**13.5**	**0.7**	**0.7**	**1.3**	**2.4**	**3.3**
VDH DR52A	**4**	**12.77**	**0.53**	**12.5**	**0.3**	**0.3**	**1.0**	**16.66**	**0.84**	**14.6**	**2.1**	**2.1**	**1.6**	**16.65**	**0.72**	**15.2**	**1.4**	**1.4**	**1.4**	**15.05**	**0.74**	**13.5**	**1.6**	**1.6**	**1.5**	**5.4**	**2.8**
VDH DR53A	**5**	**12.68**	**0.62**	**12.5**	**0.2**	**0.2**	**1.2**	**17.05**	**1.01**	**14.6**	**2.5**	**2.5**	**2.0**	**17.78**	**1.07**	**15.2**	**2.6**	**2.6**	**2.1**	**15.18**	**0.61**	**13.5**	**1.7**	**1.7**	**1.2**	**7.0**	**3.4**
VDH T07A	**6**	**12.39**	**0.50**	**12.5**	**-0.1**	**0.0**	**1.0**	**15.66**	**1.01**	**14.6**	**1.1**	**1.1**	**2.0**	**16.06**	**0.72**	**15.2**	**0.9**	**0.9**	**1.4**	**14.68**	**0.62**	**13.5**	**1.2**	**1.2**	**1.2**	**3.2**	**2.9**
VDH T07B	**7**	**11.64**	**0.59**	**12.5**	**-0.9**	**0.0**	**1.2**	**15.28**	**0.92**	**14.6**	**0.7**	**0.7**	**1.8**	**16.13**	**0.77**	**15.2**	**0.9**	**0.9**	**1.5**	**14.90**	**0.60**	**13.5**	**1.4**	**1.4**	**1.2**	**3.1**	**2.9**
Vernon School (air sampler)	8	13.27	0.58	**12.5**	0.8	0.8	1.1	15.91	0.83	**14.6**	1.4	1.4	1.6	16.11	0.64	**15.2**	0.9	0.9	1.3	14.50	0.68	**13.5**	1.0	1.0	1.3	4.1	2.7
Vernon School Nurse	9	17.18	0.66	**12.5**	4.7	4.7	1.3	18.14	1.30	**14.6**	3.6	3.6	2.5	17.24	0.76	**15.2**	2.0	2.0	1.5	16.46	0.53	**13.5**	3.0	3.0	1.0	13.3	3.4
Vernon School Pole	10	12.39	0.74	**12.5**	-0.1	0.0	1.5	14.72	0.90	**14.6**	0.2	0.2	1.8	15.37	0.95	**15.2**	0.2	0.2	1.9	13.95	0.67	**13.5**	0.5	0.5	1.3	0.8	3.2
VY Parking Lot A	**11**	**12.19**	**0.55**	**12.5**	**-0.3**	**0.0**	**1.1**	**16.30**	**0.96**	**14.6**	**1.7**	**1.7**	**1.9**	**17.71**	**0.78**	**15.2**	**2.5**	**2.5**	**1.5**	**15.32**	**0.60**	**13.5**	**1.9**	**1.9**	**1.2**	**6.1**	**2.9**
VDH DR45	12	24.82	1.59	**12.5**	12.3	12.3	3.1	24.10	1.57	**14.6**	9.5	9.5	3.1	25.15	1.66	**15.2**	9.9	9.9	3.3	24.42	1.49	**13.5**	11.0	11.0	2.9	42.8	6.2
VDH DR46	13	11.82	0.53	**12.5**	-0.7	0.0	1.0	21.43	1.18	**14.6**	6.9	6.9	2.3	15.57	0.61	**15.2**	0.4	0.4	1.2	14.27	0.52	**13.5**	0.8	0.8	1.0	8.0	3.0
VDH DR08	15	13.27	0.51	**12.5**	0.8	0.8	1.0	16.20	0.84	**14.6**	1.6	1.6	1.6	16.48	0.78	**15.2**	1.3	1.3	1.5	13.80	0.76	**13.5**	0.3	0.3	1.5	4.0	2.9
VDH DR41	16	12.96	0.60	**12.5**	0.5	0.5	1.2	17.46	1.52	**14.6**	2.9	2.9	3.0	15.49	0.73	**15.2**	0.3	0.3	1.4	13.75	0.57	**13.5**	0.3	0.3	1.1	3.9	3.7
VDH DR42	**17**	**11.93**	**0.79**	**12.5**	**-0.6**	**0.0**	**1.5**	**16.21**	**0.81**	**14.6**	**1.7**	**1.7**	**1.6**	**16.51**	**0.75**	**15.2**	**1.3**	**1.3**	**1.5**	**13.98**	**0.50**	**13.5**	**0.5**	**0.5**	**1.0**	**3.5**	**2.8**
VDH DR43	18	12.47	0.51	**12.5**	0.0	0.0	1.0	15.97	0.84	**14.6**	1.4	1.4	1.6	16.67	0.93	**15.2**	1.5	1.5	1.8	14.43	0.60	**13.5**	1.0	1.0	1.2	3.8	2.9
VDH DR44	19	12.03	0.61	**12.5**	-0.5	0.0	1.2	14.07	0.97	**14.6**	-0.5	0.0	1.9	14.25	0.76	**15.2**	-1.0	0.0	1.5	12.51	0.55	**13.5**	-1.0	0.0	1.1	0.0	2.9
VDH DR47	20	13.74	0.67	**12.5**	1.2	1.2	1.3	17.10	0.90	**14.6**	2.5	2.5	1.8	18.09	0.91	**15.2**	2.9	2.9	1.8	16.07	0.65	**13.5**	2.6	2.6	1.3	9.3	3.1
VDH DR48	**21**	**11.22**	**0.64**	**12.5**	**-1.3**	**0.0**	**1.3**	**14.45**	**0.72**	**14.6**	**-0.1**	**0.0**	**1.4**	**14.13**	**0.72**	**15.2**	**-1.1**	**0.0**	**1.4**	**13.18**	**0.52**	**13.5**	**-0.3**	**0.0**	**1.0**	**0.0**	**2.6**
VDH T01	22	11.75	0.68	**12.5**	-0.7	0.0	1.3	14.97	0.76	**14.6**	0.4	0.4	1.5	15.40	0.76	**15.2**	0.2	0.2	1.5	13.62	0.53	**13.5**	0.2	0.2	1.0	0.8	2.7
VDH DR49	22	11.49	0.58	**12.5**	-1.0	0.0	1.1	14.34	0.76	**14.6**	-0.2	0.0	1.5	13.42	0.81	**15.2**	-1.8	0.0	1.6	12.75	0.51	**13.5**	-0.7	0.0	1.0	0.0	2.7
VDH DR51	23	11.48	0.55	**12.5**	-1.0	0.0	1.1	16.25	0.81	**14.6**	1.7	1.7	1.6	16.20	0.82	**15.2**	1.0	1.0	1.6	14.74	0.76	**13.5**	1.3	1.3	1.5	4.0	2.9
VDH DR52	24	13.40	0.66	**12.5**	0.9	0.9	1.3	15.65	0.98	**14.6**	1.1	1.1	1.9	16.77	0.71	**15.2**	1.6	1.6	1.4	14.64	0.59	**13.5**	1.2	1.2	1.2	4.7	2.9
VDH DR53	25	14.76	1.41	**12.5**	2.3	2.3	2.8	16.55	0.80	**14.6**	2.0	2.0	1.6	17.27	1.19	**15.2**	2.1	2.1	2.3	14.59	0.89	**13.5**	1.1	1.1	1.7	7.4	4.3
VDH T03	26	11.47	0.73	**12.5**	-1.0	0.0	1.4	15.12	0.75	**14.6**	0.6	0.6	1.5	15.73	0.90	**15.2**	0.5	0.5	1.8	13.45	0.49	**13.5**	0.0	0.0	1.0	1.1	2.9

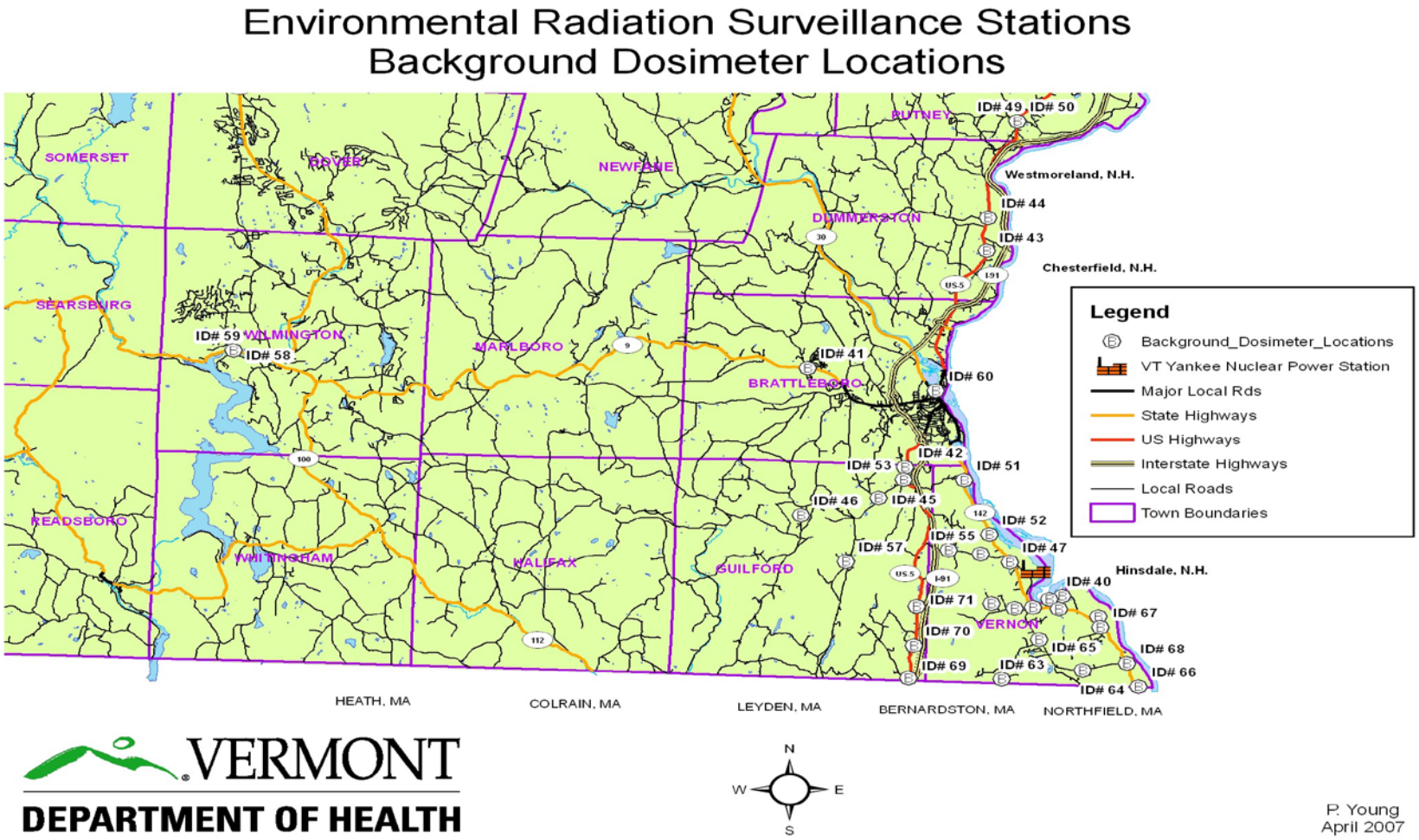
Site boundary dosimeter measurements are bolded.

Table 10 (continued). 2015 Thermoluminescent Dosimeter Exposure Measurements and Net Gamma Radiation: Station Area & Site Boundary Locations

2015 **Site Boundary and Station Area** Dosimeter Exposure (milliroentgen)																											
Location	Map ID #	Qtr1 Gross	1SD Error	Avg Bkgrd	Qtr1 Net	Net Q1 >=0	2SD Error	Qrtr2 Gross	1SD Error	Avg Bkgrd	Qtr2 Net	Net Q2 >=0	2SD Error	Qrtr3 Gross	1SD Error	Avg Bkgrd	Qtr3 Net	Net Q3 >=0	2SD Error	Qrtr4 Gross	1SD Error	Avg Bkgrd	Qtr4 Net	Net Q4 >=0	2SD Error	Annual Net	2SD Error
VDH T05	28	12.08	0.61	**12.5**	-0.4	0.0	1.2	15.07	0.69	**14.6**	0.5	0.5	1.4	15.93	0.92	**15.2**	0.7	0.7	1.8	13.88	0.50	**13.5**	0.4	0.4	1.0	1.7	2.7
VDH T04	29	12.15	0.56	**12.5**	-0.3	0.0	1.1	14.61	0.89	**14.6**	0.1	0.1	1.7	15.38	0.70	**15.2**	0.2	0.2	1.4	13.40	0.63	**13.5**	-0.1	0.0	1.2	0.2	2.8
VDH T06	30	11.67	0.71	**12.5**	-0.8	0.0	1.4	15.14	1.03	**14.6**	0.6	0.6	2.0	15.87	0.73	**15.2**	0.7	0.7	1.4	13.48	0.62	**13.5**	0.0	0.0	1.2	1.3	3.1
VDH DR07	31	12.35	0.74	**12.5**	-0.1	0.0	1.5	15.74	0.73	**14.6**	1.2	1.2	1.4	16.50	0.84	**15.2**	1.3	1.3	1.6	13.87	0.73	**13.5**	0.4	0.4	1.4	2.9	3.0
VY North Fence	**32**	**11.06**	**0.59**	**12.5**	**-1.4**	**0.0**	**1.2**	**14.32**	**1.44**	**14.6**	**-0.2**	**0.0**	**2.8**	**15.02**	**0.90**	**15.2**	**-0.2**	**0.0**	**1.8**	**13.22**	**0.52**	**13.5**	**-0.2**	**0.0**	**1.0**	**0.0**	**3.7**
VY North Fence #2	**33**	**11.51**	**0.49**	**12.5**	**-1.0**	**0.0**	**1.0**	**15.05**	**0.78**	**14.6**	**0.5**	**0.5**	**1.5**	**15.37**	**0.80**	**15.2**	**0.2**	**0.2**	**1.6**	**13.76**	**0.54**	**13.5**	**0.3**	**0.3**	**1.1**	**1.0**	**2.6**
VY Parking Lot #2	34	13.55	0.55	**12.5**	1.1	1.1	1.1	16.28	1.25	**14.6**	1.7	1.7	2.5	15.94	1.11	**15.2**	0.7	0.7	2.2	15.52	0.60	**13.5**	2.1	2.1	1.2	5.6	3.6
VY Parking Lot, ID	35	13.75	0.96	**12.5**	1.3	1.3	1.9	16.56	1.50	**14.6**	2.0	2.0	2.9	16.31	1.12	**15.2**	1.1	1.1	2.2	15.08	0.59	**13.5**	1.6	1.6	1.2	6.0	4.3
VY SW Fence	**36**	**11.64**	**0.59**	**12.5**	**-0.9**	**0.0**	**1.2**	**14.61**	**1.27**	**14.6**	**0.1**	**0.1**	**2.5**	**14.40**	**0.70**	**15.2**	**-0.8**	**0.0**	**1.4**	**13.19**	**0.49**	**13.5**	**-0.3**	**0.0**	**1.0**	**0.1**	**3.2**
VY SW Fence #2	**37**	**11.55**	**0.63**	**12.5**	**-0.9**	**0.0**	**1.2**	**14.38**	**1.13**	**14.6**	**-0.2**	**0.0**	**2.2**	**14.80**	**0.70**	**15.2**	**-0.4**	**0.0**	**1.4**	**13.09**	**0.63**	**13.5**	**-0.4**	**0.0**	**1.2**	**0.0**	**3.1**
VDH T02	38	11.71	0.48	**12.5**	-0.8	0.0	0.9	14.78	1.06	**14.6**	0.2	0.2	2.1	15.35	0.84	**15.2**	0.1	0.1	1.6	13.06	0.58	**13.5**	-0.4	0.0	1.1	0.4	3.0
Meteorology Tower	n/a	11.68	0.78	**12.5**	-0.8	0.0	1.5	15.99	0.96	**14.6**	1.4	1.4	1.9	16.19	0.98	**15.2**	1.0	1.0	1.9	13.32	0.59	**13.5**	-0.1	0.0	1.2	2.4	3.3

Site boundary dosimeter measurements are bolded.

Map 4


Environmental Radiation Surveillance Stations
Background Dosimeter Locations
SOMERSET
NEWFANE
PUTNEY
DUMMERSTON
SEARSBURG
WILMINGTON
MARLBORO
BRATTLEBORO
READSBORO
WHITINGHAM
HALIFAX
GUILFORD
VERNON
Westmoreland, N.H.
Chesterfield, N.H.
Hinsdale, N.H.
ID# 49
ID# 50
ID# 44
ID# 43
ID# 59
ID# 58
ID# 41
ID# 60
ID# 53
ID# 42
ID# 51
ID# 46
ID# 45
ID# 52
ID# 55
ID# 57
ID# 47
ID# 40
ID# 71
ID# 67
ID# 70
ID# 65
ID# 68
ID# 69
ID# 63
ID# 66
ID# 64
Legend
Background_Dosimeter_Locations
VT Yankee Nuclear Power Station
Major Local Rds
State Highways
US Highways
Interstate Highways
Local Roads
Town Boundaries
HEATH, MA
COLRAIN, MA
LEYDEN, MA
BERNARDSTON, MA
NORTHFIELD, MA
VERMONT
DEPARTMENT OF HEALTH
N
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April 2007

Map 5

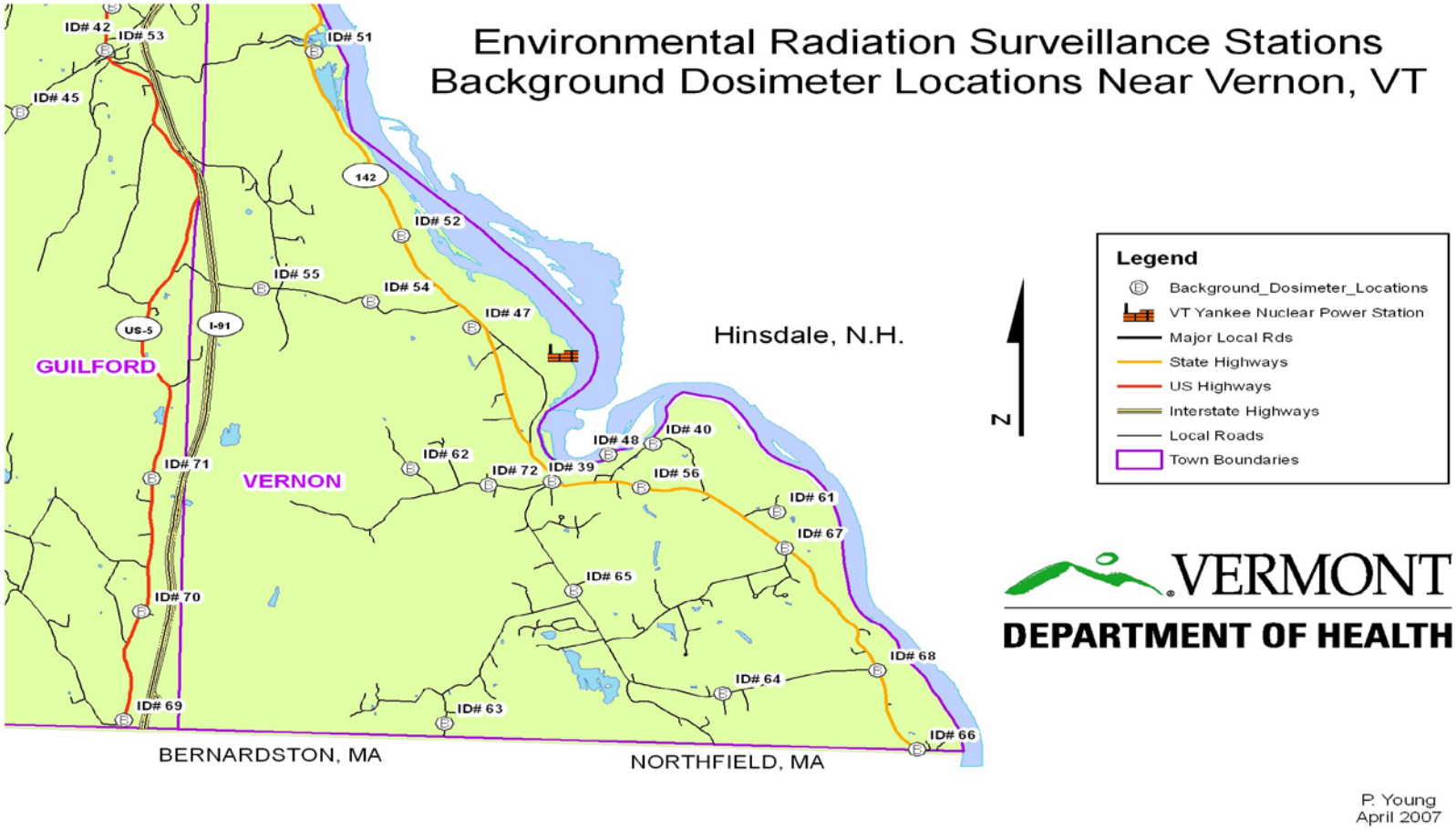

Environmental Radiation Surveillance Stations
Background Dosimeter Locations Near Vernon, VT
ID# 42
ID# 53
ID# 51
ID# 45
142
ID# 52
ID# 55
ID# 54
ID# 47
US-5
I-91
GUILFORD
Hinsdale, N.H.
ID# 48
ID# 40
ID# 62
ID# 71
VERNON
ID# 72
ID# 39
ID# 56
ID# 61
ID# 67
ID# 65
ID# 70
ID# 68
ID# 64
ID# 69
ID# 63
ID# 66
BERNARDSTON, MA
NORTHFIELD, MA
N
Legend
Background_Dosimeter_Locations
VT Yankee Nuclear Power Station
Major Local Rds
State Highways
US Highways
Interstate Highways
Local Roads
Town Boundaries
VERMONT
DEPARTMENT OF HEALTH
P. Young
April 2007

Table 11. 2015 Thermoluminescent Dosimeter Exposure Measurements and Net Gamma Radiation: Background Locations

2015 **Background** Dosimeter Exposure (milliroentgen)																											
Location	Map ID #	Qtr1 Gross	1SD Error	Avg Bkgrd	Qtr1 Net	Net >=0	2SD Error	Qrtr2 Gross	1SD Error	Avg Bkgrd	Qtr2 Net	Net >=0	2SD Error	Qrtr3 Gross	1SD Error	Avg Bkgrd	Qtr3 Net	Net >=0	2SD Error	Qrtr4 Gross	1SD Error	Avg Bkgrd	Qtr4 Net	Net >=0	2SD Error	Annual Net	2SD Error
142/Pond Road (N)	39	13.20	0.57	**12.5**	0.7	0.7	1.1	14.46	1.04	14.6	-0.1	0.0	2.0	14.30	0.74	15.2	-0.9	0.0	1.5	13.64	0.76	13.5	0.2	0.2	1.5	0.9	3.1
A&M Auto/Smead Rd	40	11.44	0.61	**12.5**	-1.1	0.0	1.2	0.00	0.00	14.6	-14.6	0.0	0.0	14.43	0.61	15.2	-0.8	0.0	1.2	13.32	0.65	13.5	-0.1	0.0	1.3	0.0	2.1
West Brattleboro State Police	41	11.24	0.85	**12.5**	-1.3	0.0	1.7	14.05	0.81	14.6	-0.5	0.0	1.6	14.08	0.64	15.2	-1.1	0.0	1.3	12.15	0.45	13.5	-1.3	0.0	0.9	0.0	2.8
D&E Tree, Rt 5, Guilford	42	13.59	0.67	**12.5**	1.1	1.1	1.3	17.02	1.23	14.6	2.5	2.5	2.4	16.19	0.74	15.2	1.0	1.0	1.5	14.85	0.55	13.5	1.4	1.4	1.1	5.9	3.3
Dummerston AOT	43	12.61	0.51	**12.5**	0.1	0.1	1.0	15.35	1.06	14.6	0.8	0.8	2.1	15.94	0.72	15.2	0.7	0.7	1.4	14.50	0.66	13.5	1.0	1.0	1.3	2.7	3.0
Dummerston School	44	11.18	0.65	**12.5**	-1.3	0.0	1.3	13.13	0.95	14.6	-1.4	0.0	1.9	13.99	0.73	15.2	-1.2	0.0	1.4	13.19	1.12	13.5	-0.3	0.0	2.2	0.0	3.5
Guilford Center Rd/Tater Rd	45	12.51	0.65	**12.5**	0.0	0.0	1.3	14.38	1.01	14.6	-0.2	0.0	2.0	15.34	0.75	15.2	0.1	0.1	1.5	13.36	0.49	13.5	-0.1	0.0	1.0	0.2	2.9
Guilford Town Garage	46	14.23	0.59	**12.5**	1.7	1.7	1.2	16.08	1.15	14.6	1.5	1.5	2.3	15.67	0.79	15.2	0.5	0.5	1.5	14.40	0.78	13.5	0.9	0.9	1.5	4.7	3.3
Miller Farm	47	12.20	0.62	**12.5**	-0.3	0.0	1.2	12.42	0.86	14.6	-2.1	0.0	1.7	13.38	0.69	15.2	-1.8	0.0	1.4	11.75	0.43	13.5	-1.7	0.0	0.8	0.0	2.6
Power Line River Crossing	48	12.51	0.81	**12.5**	0.0	0.0	1.6	14.35	0.75	14.6	-0.2	0.0	1.5	14.75	0.77	15.2	-0.5	0.0	1.5	13.71	0.62	13.5	0.2	0.2	1.2	0.3	2.9
Putney Pole	49	13.33	0.60	**12.5**	0.8	0.8	1.2	15.91	1.04	14.6	1.4	1.4	2.0	16.50	0.94	15.2	1.3	1.3	1.8	14.82	0.58	13.5	1.4	1.4	1.1	4.8	3.2
Putney Town Clerk	50	12.60	0.62	**12.5**	0.1	0.1	1.2	13.19	0.78	14.6	-1.4	0.0	1.5	13.43	0.56	15.2	-1.8	0.0	1.1	12.49	0.45	13.5	-1.0	0.0	0.9	0.1	2.4
Renaud Brothers	51	13.14	0.59	**12.5**	0.6	0.6	1.2	14.46	0.86	14.6	-0.1	0.0	1.7	14.85	0.77	15.2	-0.4	0.0	1.5	14.03	0.49	13.5	0.6	0.6	1.0	1.2	2.7
Rt 142 N Trans Line	52	11.75	0.59	**12.5**	-0.7	0.0	1.2	15.36	1.07	14.6	0.8	0.8	2.1	14.58	0.80	15.2	-0.6	0.0	1.6	0.00	0.00	13.5	-13.5	0.0	0.0	0.8	2.9
Rt 5/Guilford Ctr Rd	53	12.15	0.71	**12.5**	-0.3	0.0	1.4	14.41	1.01	14.6	-0.1	0.0	2.0	14.73	0.64	15.2	-0.5	0.0	1.3	13.01	0.50	13.5	-0.5	0.0	1.0	0.0	2.9
Tyler Hill Road	54	11.84	0.58	**12.5**	-0.7	0.0	1.1	14.79	1.61	14.6	0.2	0.2	3.2	15.15	0.65	15.2	-0.1	0.0	1.3	14.04	0.65	13.5	0.6	0.6	1.3	0.8	3.8
Tyler Rd/Franklin Rd	55	12.55	0.63	**12.5**	0.1	0.1	1.2	15.63	0.83	14.6	1.1	1.1	1.6	15.79	0.77	15.2	0.6	0.6	1.5	14.44	0.66	13.5	1.0	1.0	1.3	2.7	2.8
Vernon Fire Station	56	12.09	0.58	**12.5**	-0.4	0.0	1.1	14.69	1.32	14.6	0.1	0.1	2.6	14.42	0.71	15.2	-0.8	0.0	1.4	13.65	0.57	13.5	0.2	0.2	1.1	0.3	3.3
Weatherhead Hollow Rd	57	10.74	0.72	**12.5**	-1.8	0.0	1.4	13.90	0.75	14.6	-0.7	0.0	1.5	13.35	0.77	15.2	-1.9	0.0	1.5	12.19	0.60	13.5	-1.3	0.0	1.2	0.0	2.8
Wilmington AOT Pole	58	12.42	0.57	**12.5**	-0.1	0.0	1.1	15.98	1.12	14.6	1.4	1.4	2.2	17.08	0.98	15.2	1.9	1.9	1.9	14.70	0.58	13.5	1.2	1.2	1.1	4.5	3.3
Wilmington AOT (air sampler)	59	13.77	0.76	**12.5**	1.3	1.3	1.5	17.41	0.78	14.6	2.9	2.9	1.5	18.41	0.72	15.2	3.2	3.2	1.4	16.51	0.66	13.5	3.0	3.0	1.3	10.4	2.9
Windham County Court	60	15.87	0.72	**12.5**	3.4	3.4	1.4	17.02	1.97	14.6	2.5	2.5	3.9	17.13	0.92	15.2	1.9	1.9	1.8	15.95	0.58	13.5	2.5	2.5	1.1	10.2	4.6
Blodgett Farm	61	14.49	0.58	**12.5**	2.0	2.0	1.1	15.55	0.93	14.6	1.0	1.0	1.8	14.60	0.62	15.2	-0.6	0.0	1.2	14.98	0.55	13.5	1.5	1.5	1.1	4.5	2.7
Fairman Road	62	11.73	0.71	**12.5**	-0.8	0.0	1.4	14.73	1.18	14.6	0.2	0.2	2.3	14.90	0.60	15.2	-0.3	0.0	1.2	13.24	0.60	13.5	-0.2	0.0	1.2	0.2	3.2

Table 11. 2015 Thermoluminescent Dosimeter Exposure Measurements and Net Gamma Radiation: Background Locations (continued)

2015 **Background** Dosimeter Exposure (milliroentgen)																												
Location	Map ID #	Qtr1 Gross	1SD Error	Avg Bkgrd	Qtr1 Net	Net >=0	2SD Error	Qrtr2 Gross	1SD Error	Avg Bkgrd	Qtr2 Net	Net >=0	2SD Error	Qrtr3 Gross	1SD Error	Avg Bkgrd	Qtr3 Net	Net >=0	2SD Error	Qrtr4 Gross	1SD Error	Avg Bkgrd	Qtr4 Net	Net >=0	2SD Error	Annual Net	2SD Error
Huckle Hill Rd VT	63	13.43	0.85	**12.5**	0.9	0.9	1.7	17.64	1.33	14.6	3.1	3.1	2.6	17.66	0.86	15.2	2.5	2.5	1.7	16.66	0.74	13.5	3.2	3.2	1.5	9.7	3.8
Pond Rd & Houghton	64	11.69	0.71	**12.5**	-0.8	0.0	1.4	14.49	0.81	14.6	-0.1	0.0	1.6	15.35	0.96	15.2	0.1	0.1	1.9	13.36	0.64	13.5	-0.1	0.0	1.3	0.1	3.1
Pond Rd/Vernon Rec	65	12.03	0.66	**12.5**	-0.5	0.0	1.3	12.87	1.14	14.6	-1.7	0.0	2.2	13.52	0.65	15.2	-1.7	0.0	1.3	11.89	0.47	13.5	-1.6	0.0	0.9	0.0	3.0
Rt 142 & Depot St	66	12.67	0.59	**12.5**	0.2	0.2	1.2	15.12	0.95	14.6	0.6	0.6	1.9	16.08	0.86	15.2	0.9	0.9	1.7	14.39	0.55	13.5	0.9	0.9	1.1	2.5	3.0
Rt 142 & Newton Rd	67	11.20	0.47	**12.5**	-1.3	0.0	0.9	13.21	0.99	14.6	-1.3	0.0	1.9	13.60	0.65	15.2	-1.6	0.0	1.3	12.27	0.70	13.5	-1.2	0.0	1.4	0.0	2.8
Rt 142 & Pond Rd (S)	68	11.90	0.63	**12.5**	-0.6	0.0	1.2	14.68	1.10	14.6	0.1	0.1	2.2	15.02	0.73	15.2	-0.2	0.0	1.4	13.66	0.68	13.5	0.2	0.2	1.3	0.3	3.2
Route 5/Wolosko Rd	69	12.59	0.60	**12.5**	0.1	0.1	1.2	17.25	1.19	14.6	2.7	2.7	2.3	16.77	0.75	15.2	1.6	1.6	1.5	15.24	0.55	13.5	1.8	1.8	1.1	6.1	3.2
Rt 5/Andrews Cmtry	70	11.63	0.63	**12.5**	-0.9	0.0	1.2	15.13	0.92	14.6	0.6	0.6	1.8	15.22	1.04	15.2	0.0	0.0	2.0	13.82	0.49	13.5	0.4	0.4	1.0	0.9	3.1
Rt 5/Tkaczyk Frm Rd	71	13.06	0.77	**12.5**	0.6	0.6	1.5	15.65	0.69	14.6	1.1	1.1	1.4	16.02	0.78	15.2	0.8	0.8	1.5	14.14	0.68	13.5	0.7	0.7	1.3	3.1	2.9
West Rd/Edgewood	72	11.53	0.59	**12.5**	-1.0	0.0	1.2	14.67	0.93	14.6	0.1	0.1	1.8	14.60	0.79	15.2	-0.6	0.0	1.5	13.50	0.48	13.5	0.0	0.0	0.9	0.1	2.8
Average Background (Avg)		**12.5**						**14.6**						**15.2**						**13.5**						**55.7**	

Continuous Flow Air Sampling Results

The Health Department uses continuously operating air samplers to monitor the air near Vermont Yankee. They are located in Vernon, Guilford, Brattleboro, Dummerston and Wilmington. The locations of the air samplers are shown on Map 6. In 2011, to provide comparison, another air sampler was sited in Burlington at the Health Department.

Air filters are tested monthly for alpha- and beta-emitting materials and are then grouped quarterly to test for gamma-emitting materials. Air cartridges are collected and tested monthly for iodine-131 (I-131) and other gamma-emitting materials at the Health Department Laboratory. Data associated with the air filters are provided in Appendix A.

For 2015:

- 99 air cartridges were tested for iodine-131 and gamma-emitting materials.
- 99 air filters were tested for total alpha and beta radioactivity.
- 4 sets of air filters were grouped and tested for gamma-emitting materials.

Air Filter Total Alpha and Beta Radioactivity Results

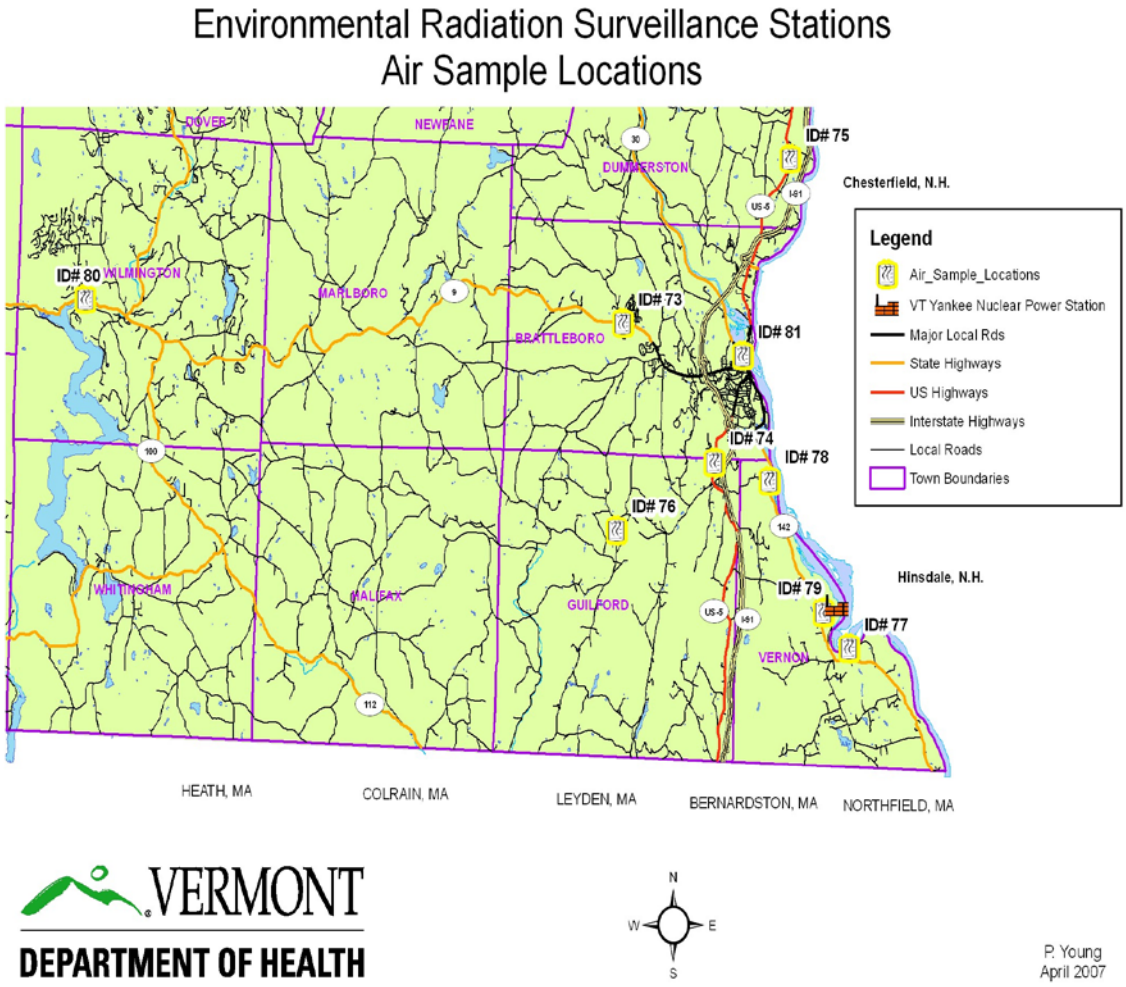
In 2015, the average result for total alpha radioactivity was 0.001361 picocuries per cubic meter (pCi/m^3). The 2015 average result for total beta radioactivity was 0.01665 pCi/m^3. The 2015 total alpha and beta radioactivity air filter results are presented in Appendix A.

Figures 2 and 3 show the average total alpha and beta radioactivity for the sample locations compared to the 2011, 2012, 2013 and 2014 results. Very low results that were uncertain because of noted collection problems were removed prior to calculating the average result. This is a conservative approach and results in an increased average.

Air Cartridge and Air Filter Gamma-Emitting Materials Results

No iodine-131 was detected in any air cartridge in 2015. Only naturally-occurring gamma-emitting materials were detected.

Map 6



Sample Location	Map ID	Sample Location	Map ID
D & E Tree	74	Vermont State Police-Brattleboro	73
Dummerston State Garage	75	Vernon Elementary School	79
Guilford Town Garage	76	Wilmington State Highway Garage	80
Power Line River Crossing	77	Windham County Courthouse	81
Renaud Brothers	78	108 Cherry St. Burlington	n/a

Figure 2. 2011-2015 Average Alpha Radioactivity in Air

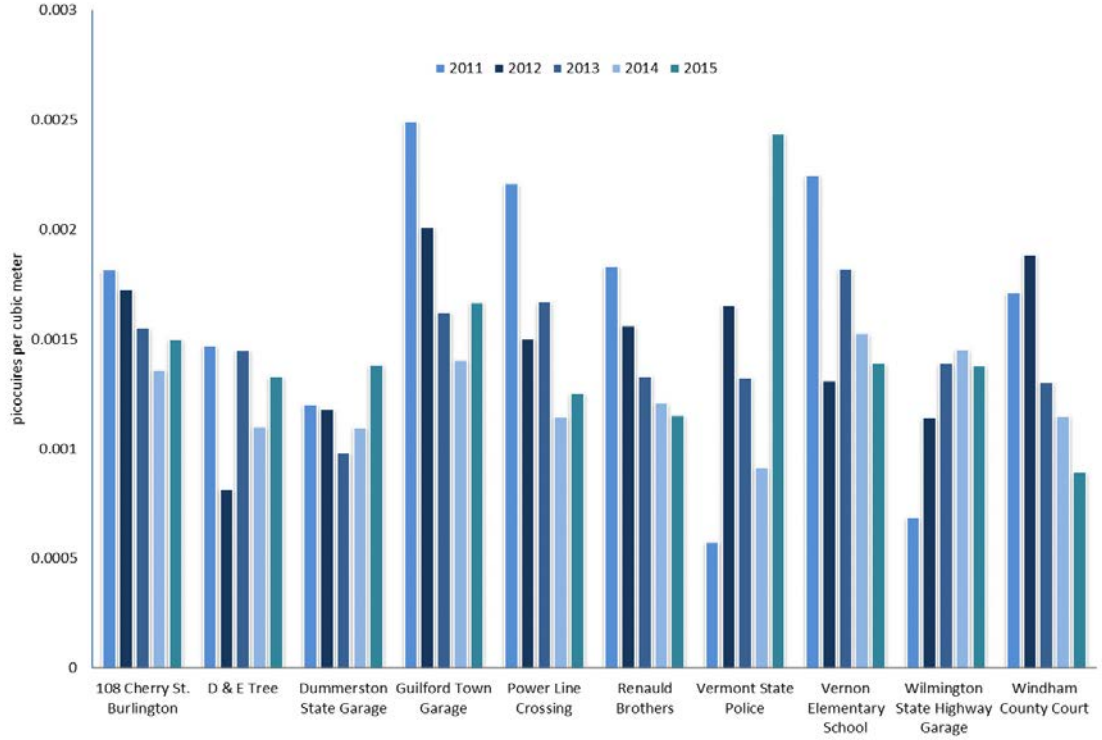


Figure 3. 2011-2015 Average Beta Radioactivity in Air

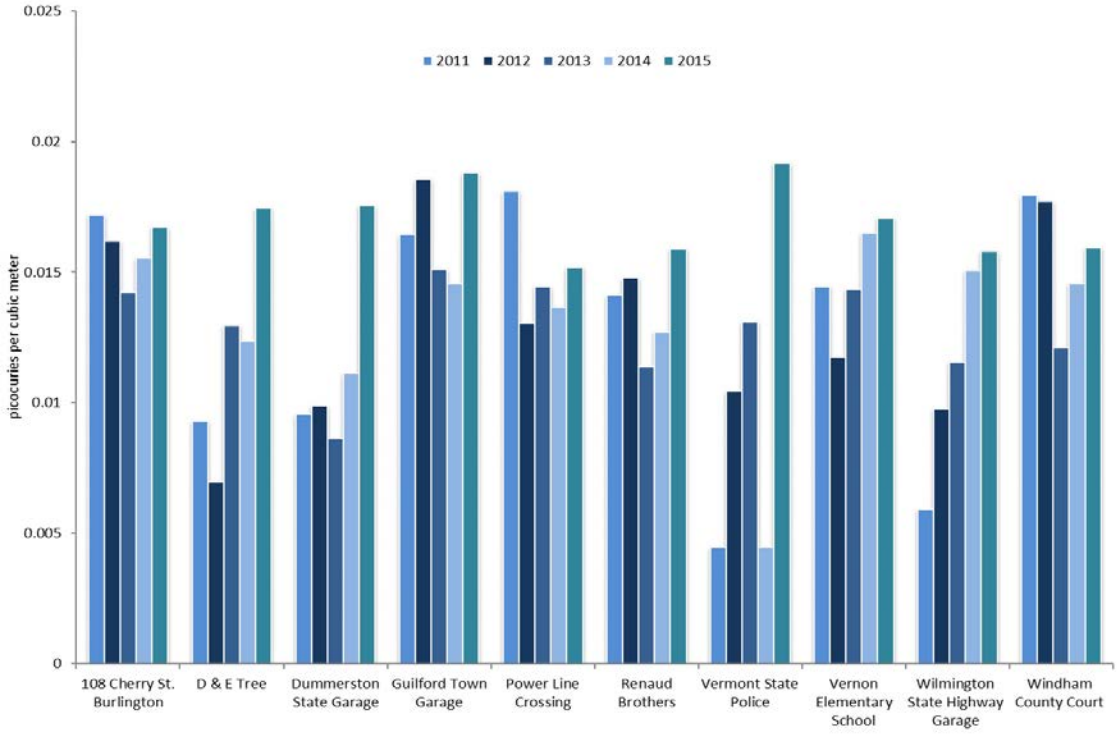


Table 12. 2015 Air Filter Composite Results (Gamma Spectroscopy)

Quarter	Last Date of Quarter	Element	Concentration +/- error (pCi)
1st Quarter	3/31/2015	Beryllium-7	10,600 +/- 900
2nd Quarter	6/30/2015	Beryllium-7	9,980 +/- 870
3rd Quarter	9/30/2015	Beryllium-7	13,400 +/- 1300
4th Quarter	12/31/2015	Beryllium-7	10,500 +/- 900
Historical Range	2010-2014	Beryllium-7	1690-10,900

In 2015, no alpha, beta or gamma radioactivity related to the activities of Vermont Yankee was identified in the continuous flow air samples. Results were within historical ranges.

Water Sampling Results

The Health Department has routinely collected off-site monthly water samples from six locations around Vermont Yankee. These routine water samples are tested for tritium, gamma-emitting materials, and total alpha and beta radioactivity. Samples are collected from drinking water wells (3), a public water supply (1) and the Connecticut River (2). These sample locations are shown on Map 7.

In addition, Vermont Yankee routinely collects at four Connecticut River sites monthly: Stations 3-3, 3-4, 3-8 and the Discharge Forebay. These sample locations are shown in Map 8. Additional off-site samples are collected at private residences and a nursing home.

In 2009, Vermont Yankee implemented the Nuclear Energy Institute Groundwater Protection Initiative and began sampling on-site groundwater monitoring wells and on-site drinking water supplies. These on-site water sample sites are shown on Map 9. The Health Department receives field duplicate water samples of these groundwater monitoring sites. The on-site groundwater monitoring well samples and on-site drinking water supply samples are also used to survey for other radioactive materials released when tritium is or was released. Measurements of alpha-, beta-, and gamma-emitting radioactive materials, including strontium-90, nickel-63 and iron-55, provide knowledge about the migration of these contaminants in the soils and water.

Routine off-site water samples are tested by the Health Department Laboratory for total alpha and beta radioactivity, gamma radioactivity and tritium. Tests for hard-to-detect metals are performed by a contract laboratory.

For 2015:

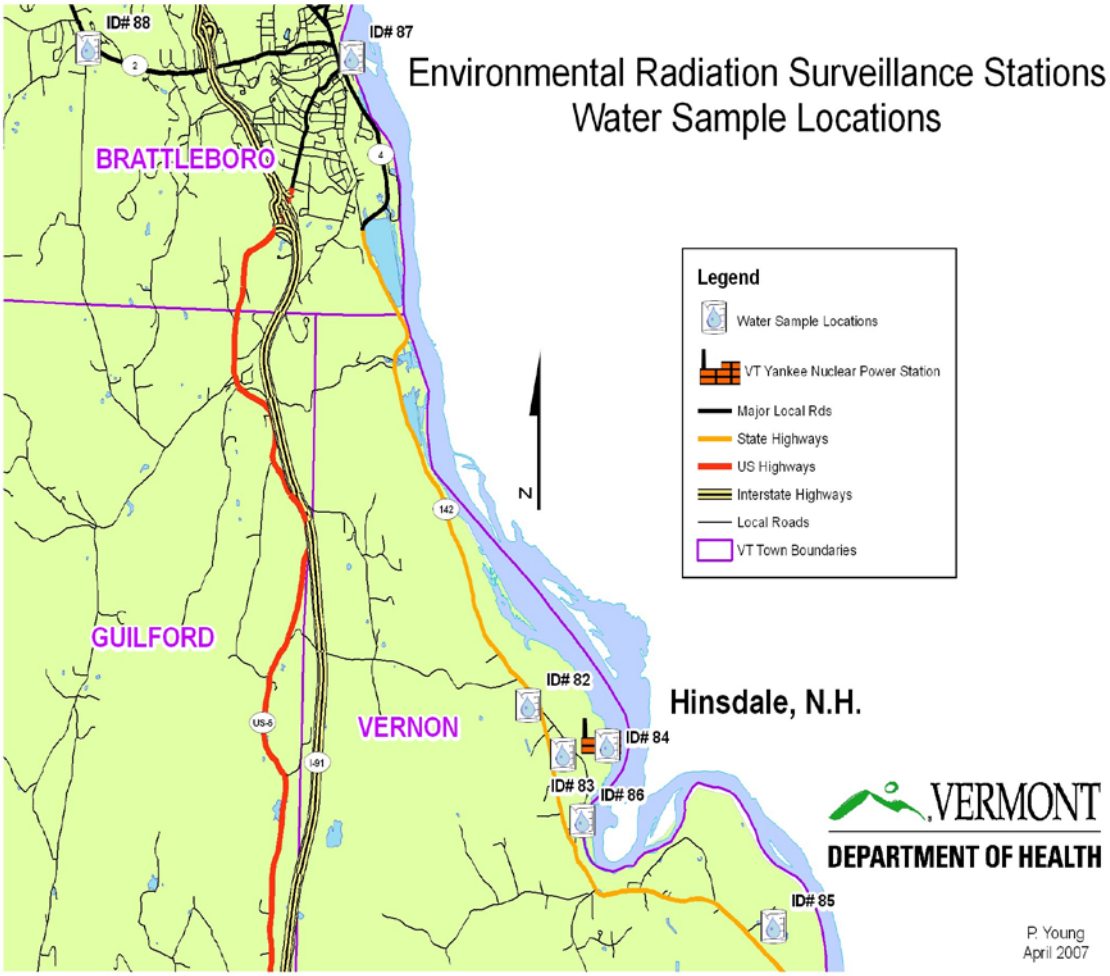
- 104 water samples were tested for total alpha and beta radioactivity.
- 361 water (ground, drinking, surface) samples were tested for tritium.
- 361 water samples were tested for gamma-emitting materials.
- 196 water samples were tested for hard-to-detect metals: iron-55, nickel-63 and strontium-90.

Due to the large number of results associated with tritium, gamma spectroscopy and hard-to-detect analyses, the individual data for these tests are presented in Appendices B, C and D.

Water Total Alpha and Beta Radioactivity Results

The alpha and beta radioactivity measured in the water samples is within the historical range for both types of radioactivity. Water alpha and beta radioactivity measurements around Vermont Yankee have both historically ranged from below the lower limit of detection to 15 picocuries per liter (pCi/L). In 2015, the range for alpha radioactivity was -0.55 to 9.22 pCi/L. The 2015 range for beta radioactivity was -0.50 to 7.87 pCi/L. Results from 2015 are presented in Table 13. Comparisons of 2011-2015 data are presented in Figures 4 and 5. Trends for both alpha and beta results are similar to past years: Vernon Elementary School and Blodgett Farm have historically had higher levels of natural radioactivity in the water.

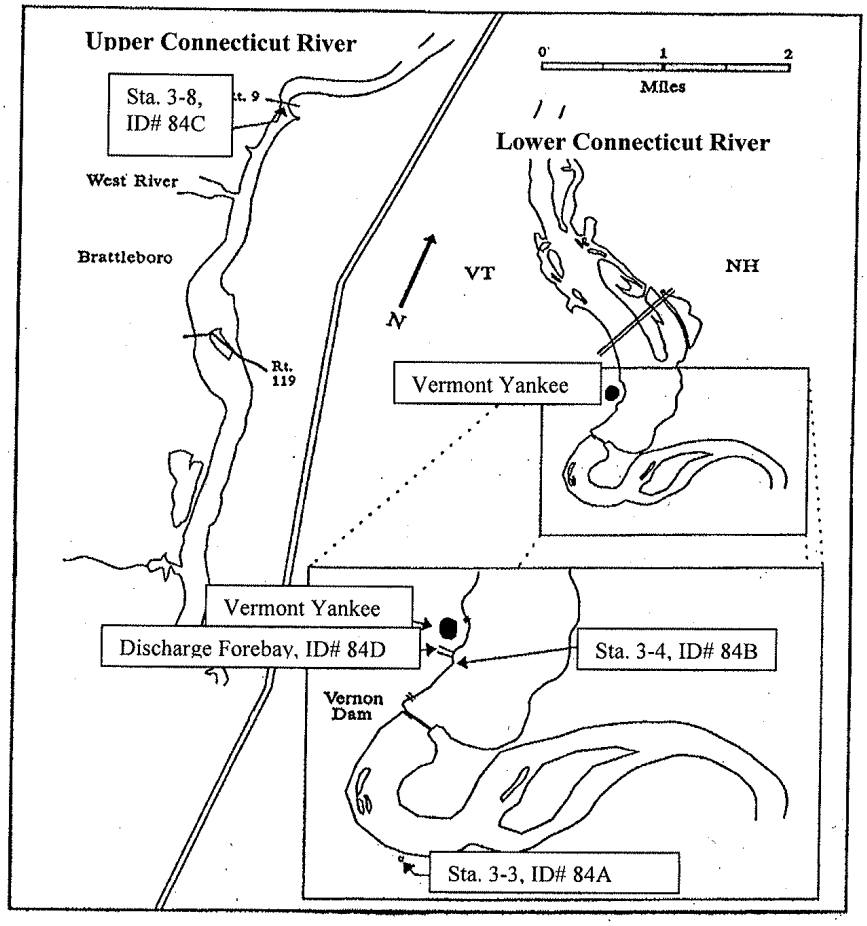
Map 7



Sample Location	Map ID
Miller Farm	82
Vernon Elementary School	83
Blodgett Farm	85
Connecticut River, Downstream	86
Connecticut River, Upstream	87
Brattleboro Fire Dept., West Station	88

Map 8

Routine Connecticut River Water Sample Locations



Sample Location	Map ID
3-3 Connecticut River Station	84A
3-4 Connecticut River Station	84B
3-8 Connecticut River Station	84C
Discharge Forebay	84D

Table 13. 2015 Total Alpha and Beta Radioactivity Water Results

Sample Location	Date of Sample	Total Alpha Radioactivity +/- error (pCi/L)	Total Beta Radioactivity +/- error (pCi/L)
3-3 Connecticut River Station	1/14/2015	0.00 +/- 0.60	0.77 +/- 1.05
	2/17/2015	0.58 +/- 0.66	1.43 +/- 1.03
	3/16/2015	0.00 +/- 0.53	1.77 +/- 1.04
	4/13/2015	0.35 +/- 0.42	1.30 +/- 0.93
	5/15/2015	0.00 +/- 0.54	0.55 +/- 1.07
	6/17/2015	-0.53 +/- 0.61	2.64 +/- 1.13
	7/16/2015	0.33 +/- 0.46	2.59 +/- 1.09
	8/13/2015	0.27 +/- 0.54	0.75 +/- 1.15
	9/16/2015	0.58 +/- 0.64	1.00 +/- 0.98
	10/15/2015	0.35 +/- 0.38	2.55 +/- 0.97
	11/13/2015	0.27 +/- 0.65	1.51 +/- 1.02
	12/15/2015	0.43 +/- 0.38	1.82 +/- 1.08
3-4 Connecticut River Station	1/14/2015	0.00 +/- 0.25	1.77 +/- 1.09
	2/17/2015	0.58 +/- 0.67	1.32 +/- 1.03
	3/16/2015	0.31 +/- 0.62	1.88 +/- 1.05
	4/13/2015	0.57 +/- 0.44	1.70 +/- 0.94
	5/15/2015	0.56 +/- 0.64	0.55 +/- 1.07
	6/17/2015	0.52 +/- 0.74	1.32 +/- 1.09
	7/16/2015	0.33 +/- 0.46	2.50 +/- 1.08
	8/13/2015	0.28 +/- 0.55	1.29 +/- 1.17
	9/16/2015	0.00 +/- 0.53	-0.50 +/- 0.93
	10/15/2015	0.12 +/- 0.34	2.75 +/- 0.97
	11/13/2015	0.00 +/- 0.59	1.51 +/- 1.02
	12/15/2015	0.44 +/- 0.40	1.53 +/- 1.07
3-8 Connecticut River Station	1/14/2015	0.28 +/- 0.63	0.40 +/- 0.42
	2/17/2015	0.23 +/- 0.26	0.84 +/- 0.42
	3/16/2015	0.12 +/- 0.24	0.71 +/- 0.42
	4/13/2015	0.10 +/- 0.35	0.30 +/- 0.89
	5/15/2015	0.00 +/- 0.51	0.66 +/- 1.07
	6/17/2015	0.26 +/- 0.71	0.77 +/- 1.07
	7/16/2015	0.11 +/- 0.42	2.39 +/- 1.08
	8/13/2015	0.90 +/- 0.71	0.97 +/- 1.16
	9/16/2015	0.29 +/- 0.57	1.20 +/- 0.99
	10/15/2015	0.12 +/- 0.28	1.55 +/- 0.93
	11/13/2015	0.10 +/- 0.24	0.60 +/- 0.41
	12/15/2015	0.21 +/- 0.19	0.96 +/- 0.54

Table 13. 2015 Total Alpha and Beta Radioactivity Water Results (continued)

Sample Location	Date of Sample	Total Alpha Radioactivity +/- error (pCi/L)	Total Beta Radioactivity +/- error (pCi/L)
Blodgett Farm	1/6/2015	4.74 +/- 0.92	4.34 +/- 1.18
	2/5/2015	4.52 +/- 1.11	6.02 +/- 1.19
	3/3/2015	4.55 +/- 0.94	4.71 +/- 1.16
	4/7/2015	4.92 +/- 1.11	4.44 +/- 1.02
	5/5/2015	4.14 +/- 0.88	4.59 +/- 1.22
	8/4/2015	4.37 +/- 0.89	3.81 +/- 1.29
	9/1/2015	2.48 +/- 0.71	4.63 +/- 1.11
	10/6/2015	3.56 +/- 0.86	5.90 +/- 1.08
	11/3/2015	5.70 +/- 1.14	4.02 +/- 1.13
	12/1/2015	5.75 +/- 1.16	4.23 +/- 1.18
Brattleboro Fire Dept, West Station	1/6/2015	0.00 +/- 0.58	1.43 +/- 1.08
	2/5/2015	-0.55 +/- 0.45	2.42 +/- 1.06
	3/3/2015	0.00 +/- 0.53	1.54 +/- 1.03
	4/7/2015	0.77 +/- 0.45	0.70 +/- 0.91
	5/5/2015	0.53 +/- 0.61	0.66 +/- 1.07
	8/4/2015	0.27 +/- 0.54	-0.32 +/- 1.09
	9/1/2015	0.00 +/- 0.49	1.10 +/- 0.99
	10/6/2015	-0.11 +/- 0.25	2.14 +/- 0.95
	11/3/2015	0.00 +/- 0.55	0.32 +/- 0.97
	12/1/2015	0.00 +/- 0.26	1.13 +/- 1.06
Connecticut River Downstream	1/6/2015	-0.28 +/- 0.55	1.87 +/- 1.09
	4/7/2015	1.41 +/- 0.52	0.70 +/- 0.91
	5/5/2015	0.28 +/- 0.60	0.11 +/- 1.05
	8/4/2015	0.00 +/- 0.50	-0.11 +/- 1.11
	9/1/2015	0.58 +/- 0.63	0.80 +/- 0.98
	10/6/2015	0.84 +/- 0.46	1.95 +/- 0.95
	11/3/2015	-0.26 +/- 0.52	1.29 +/- 1.01
	12/1/2015	0.22 +/- 0.34	1.82 +/- 1.08
Connecticut River Upstream	1/6/2015	-0.50 +/- 0.99	1.35 +/- 1.09
	4/7/2015	0.56 +/- 0.44	1.00 +/- 0.92
	5/5/2015	0.27 +/- 0.58	0.99 +/- 1.08
	8/4/2015	0.28 +/- 0.56	1.73 +/- 1.19
	9/1/2015	0.87 +/- 0.69	0.30 +/- 0.96
	10/6/2015	0.36 +/- 0.39	2.25 +/- 0.96
	11/3/2015	0.28 +/- 0.67	0.65 +/- 0.99
	12/1/2015	0.89 +/- 0.49	1.53 +/- 1.07

Table 13. 2015 Total Alpha and Beta Radioactivity Water Results (continued)

Sample Location	Date of Sample	Total Alpha Radioactivity +/- error (pCi/L)	Total Beta Radioactivity +/- error (pCi/L)
Discharge Forebay	1/14/2015	-0.28 +/- 0.57	1.10 +/- 1.07
	2/17/2015	0.86 +/- 0.70	1.43 +/- 1.03
	3/16/2015	0.62 +/- 0.66	2.65 +/- 1.08
	4/13/2015	0.34 +/- 0.41	1.20 +/- 0.92
	5/15/2015	0.00 +/- 0.55	1.54 +/- 1.10
	6/17/2015	0.26 +/- 0.71	0.44 +/- 1.06
	7/16/2015	0.12 +/- 0.45	0.60 +/- 1.03
	8/13/2015	0.55 +/- 0.61	0.76 +/- 1.15
	9/16/2015	0.29 +/- 0.57	0.50 +/- 0.97
	10/15/2015	0.34 +/- 0.36	1.55 +/- 0.93
	11/13/2015	0.26 +/- 0.63	1.62 +/- 1.02
	12/15/2015	0.44 +/- 0.39	1.03 +/- 1.05
Miller Farm	1/6/2015	1.28 +/- 0.57	7.20 +/- 1.26
	2/5/2015	0.60 +/- 0.67	7.87 +/- 1.24
	3/3/2015	0.49 +/- 0.52	7.30 +/- 1.23
	4/7/2015	0.50 +/- 0.59	7.12 +/- 1.07
	5/5/2015	-0.11 +/- 0.42	7.74 +/- 1.30
	8/4/2015	0.11 +/- 0.39	6.06 +/- 1.38
	9/1/2015	-0.20 +/- 0.52	5.51 +/- 1.13
	10/6/2015	-0.15 +/- 0.43	5.78 +/- 1.08
	11/3/2015	0.55 +/- 0.53	4.44 +/- 1.14
	12/1/2015	0.79 +/- 0.59	5.79 +/- 1.22
Vernon Elementary School	1/6/2015	6.62 +/- 1.06	4.77 +/- 1.19
	2/5/2015	8.13 +/- 1.40	4.67 +/- 1.15
	3/3/2015	7.34 +/- 1.14	5.92 +/- 1.19
	4/7/2015	9.03 +/- 1.24	5.84 +/- 1.05
	5/5/2015	5.92 +/- 1.31	3.68 +/- 1.18
	8/4/2015	5.87 +/- 1.02	4.56 +/- 1.32
	9/1/2015	9.22 +/- 1.46	6.82 +/- 1.17
	10/6/2015	7.74 +/- 1.17	6.69 +/- 1.11
	11/3/2015	6.20 +/- 1.19	6.60 +/- 1.22
	12/1/2015	7.43 +/- 1.29	5.90 +/- 1.23

Figure 4. 2011-2015 Average Alpha Radioactivity in Water

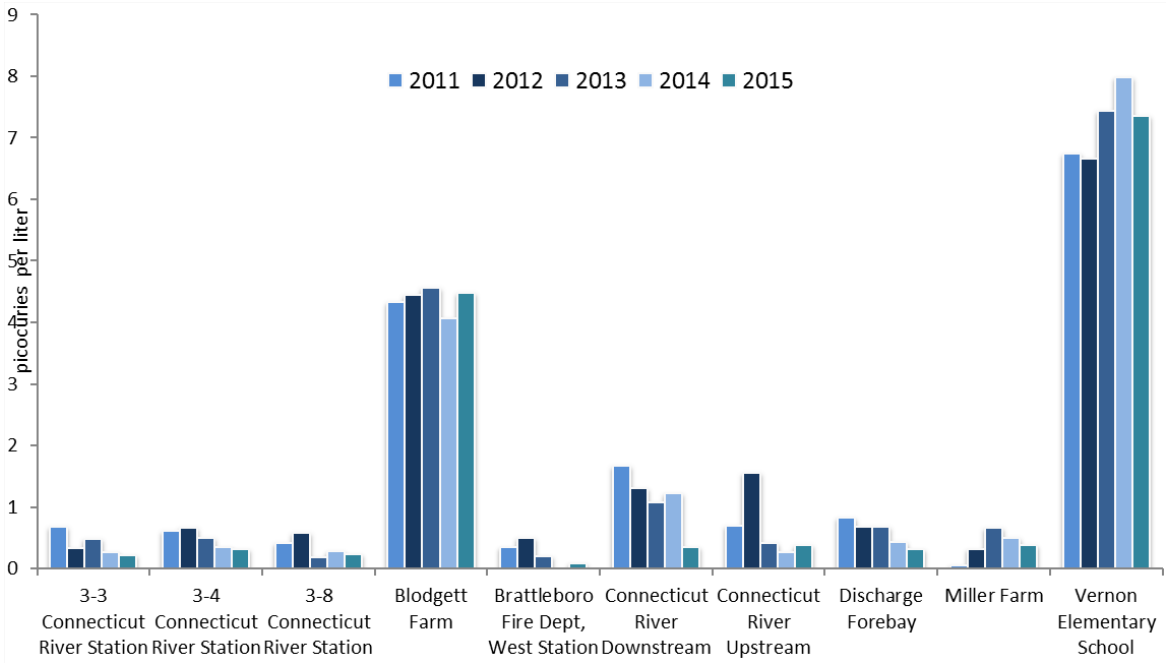
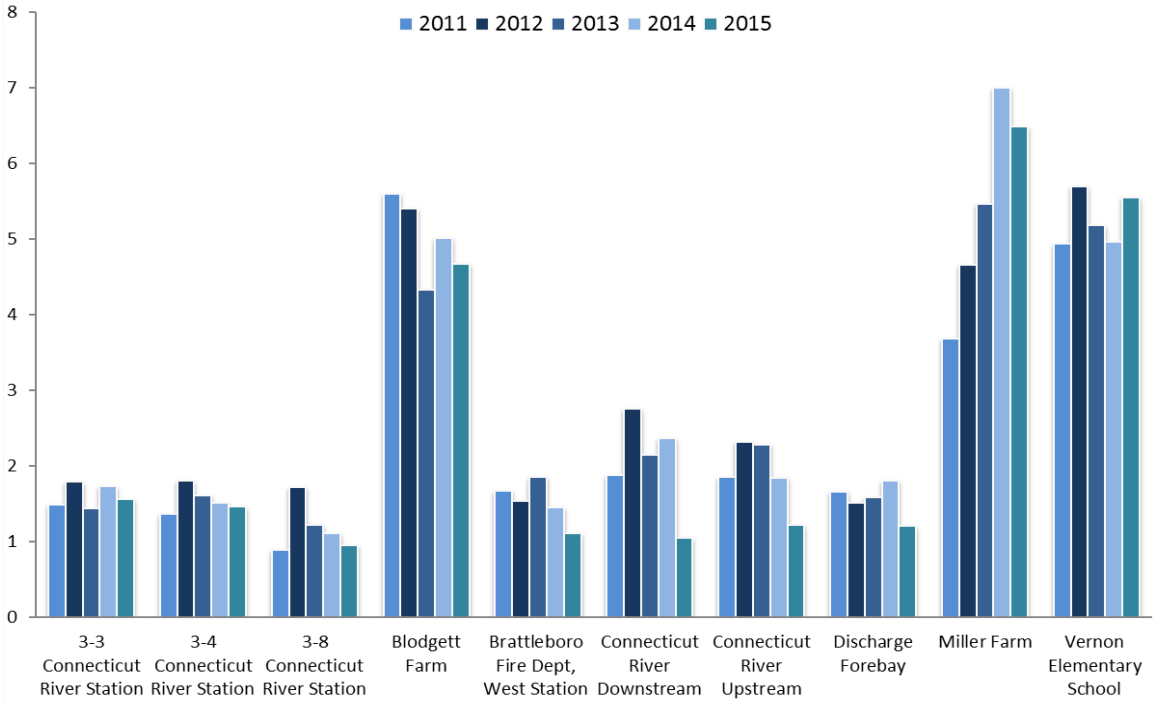


Figure 5. 2011-2015 Average Beta Radioactivity in Water



Water Tritium Results

In 2015, the Health Department Laboratory tested 361 drinking, ground and surface (Connecticut River) water samples from both on and off-site locations for tritium. The maximum tritium concentration measured was 11,000 picocuries per liter (pCi/L) in well GZ-14D in March 2015. This well's tritium concentration declined to 10,100 pCi/L by August 2015.

Tritium concentrations over time, as measured by groundwater well results, generally decreased over the year. The highest concentration of tritium at the year's end was found in GZ-14D. While the tritium concentration in on-site groundwater wells has declined, water samples continue to be tested for tritium as an indicator of new leaks, and for other radioactive materials to survey for movement of these materials in the soils and water.

No tritium was detected from any off-site water sample or any on-site active drinking water sample, or in any Connecticut River samples in 2015. The Health Department Laboratory's lower limit of detection for tritium is 500 picocuries per liter.

A summary of tritium results by sampling location is presented in Table 14. All tritium data are presented in Appendix B.

Water Gamma Spectroscopy Results

A total of 361 drinking, ground and surface (Connecticut River) water samples were collected from both on and off-site locations in 2015 for gamma-emitting materials. No radioactive materials other than naturally-occurring were identified in any water sample collected in 2015. The Health Department calculated limits of detection for gamma-emitting materials are listed in Table 8. All results are presented in Appendix C.

Map 9

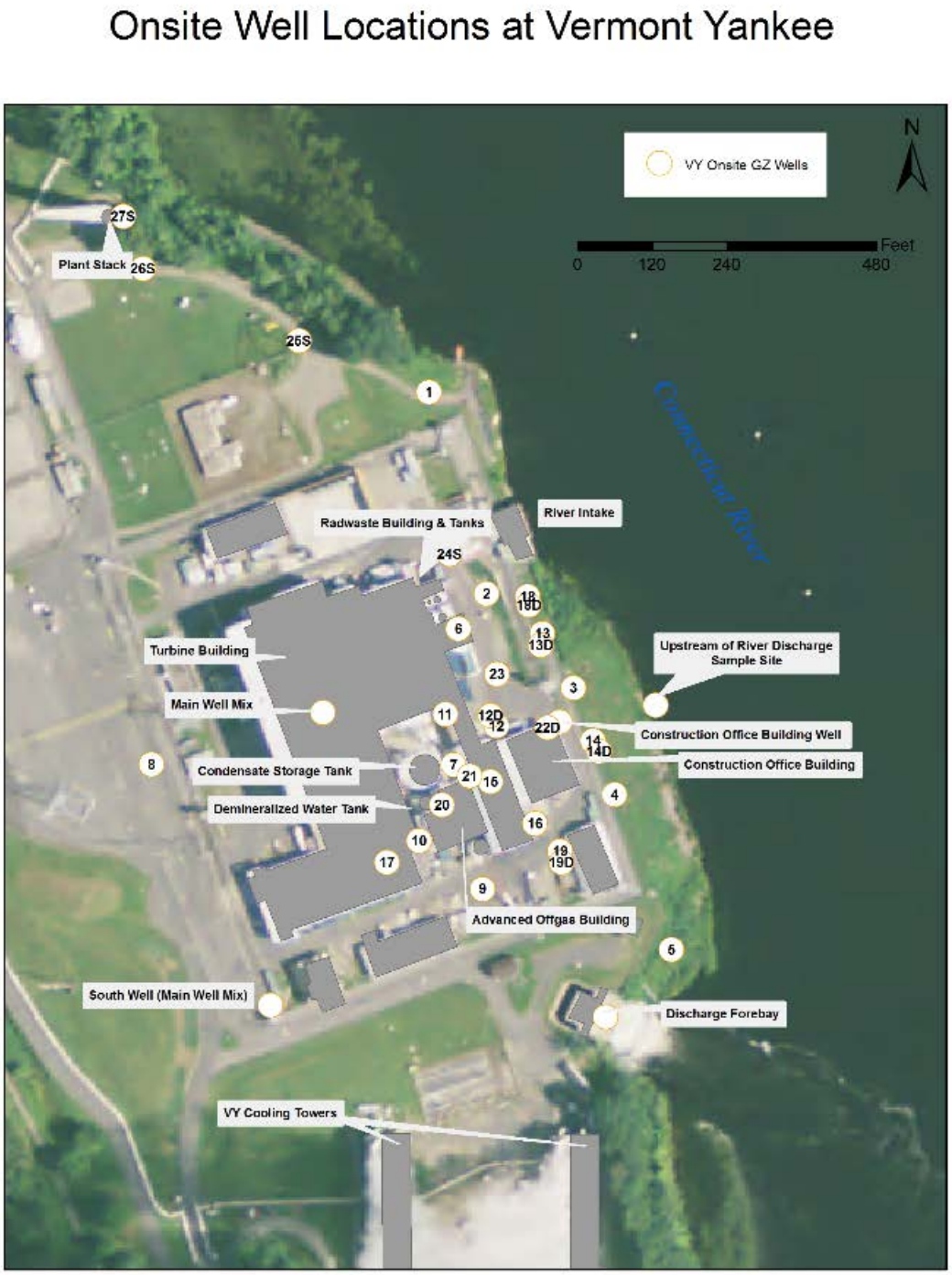

Onsite Well Locations at Vermont Yankee
VY Onsite GZ Wells
N
Feet
0
120
240
480
27S
Plant Stack
26S
25S
1
Connecticut River
River Intake
Radwaste Building & Tanks
24S
2
18
18D
6
13
13D
Turbine Building
Upstream of River Discharge Sample Site
23
3
Main Well Mix
11
12D
12
22D
Construction Office Building Well
14
14D
Construction Office Building
8
Condensate Storage Tank
7
21
15
4
Demineralized Water Tank
20
16
10
19
19D
17
9
Advanced Offgas Building
6
South Well (Main Well Mix)
Discharge Forebay
VY Cooling Towers

Table 14. 2015 Vermont Yankee Groundwater Wells, Tritium Detected

Monitoring Well	Range of tritium concentration in well (pCi/L) [a]			Trend of Tritium Concentration in 2015
GZ-11	637	to	< 500	relatively steady
GZ-12D	5,070	to	2,460	decreased
GZ-12S	1,070	to	832	decreased
GZ-13D	< 500	to	1020	increased
GZ-14D	11,000	to	10,100	decreased
GZ-14S	1,460	to	2,270	increased
GZ-15	4,590	to	4,720	relatively steady
GZ-18D	637	to	< 500	relatively steady
GZ-21	1380	to	< 500	decreased
GZ-22D	10,400	to	7,580	decreased
GZ-23S	3,340	to	964	decreased

[a] Ranges presented are from tests performed at the Health Department Laboratory.
< 500 means less than the laboratory's lower limit of detection of 500 pCi/L

Table 15. 2015 Water Sample Locations, Number of TritiumTests

Wells near Vermont Yankee		Connecticut River Sample Sites	
Blodgett Farm	20	3-3 Connecticut River Station	12
Brattleboro Fire Department, West Station	20	3-4 Connecticut River Station	12
Miller Farm	20	3-8 Connecticut River Station	12
Residence - 1	18	Discharge Forebay	12
Vernon Elementary School	20	Connecticut River Downstream	17
Vernon Green Nursing Home	21	Connecticut River Upstream	17
On-site Wells			
GZ-01	4	GZ-18S	3
GZ-02	3	GZ-19D	4
GZ-03	3	GZ-19S	4
GZ-04	4	GZ-20	4
GZ-05	4	GZ-21	3
GZ-06	3	GZ-22D	9
GZ-07	4	GZ-23S	9
GZ-09	4	GZ-25S	11
GZ-10	4	GZ-26S	11
GZ-11	4	GZ-27S	11
GZ-12D	3	WVN0201	4
GZ-12S	2	WVN0202	4
GZ-13D	4	WVN0203	4
GZ-13S	3	WVN0204	4
GZ-14D	3	Main Well	1
GZ-14S	3	Plant Support Building	1
GZ-15	3	Southwest Well	4
GZ-16	3		
GZ-17	4	**Total number of samples tested for tritium**	
GZ-18D	4	**361**	

Hard-to-Detect Results

This is the sixth year that tests for hard-to-detect metals (iron-55, nickel-63 and strontium-90) have been performed by the Health Department. Quarterly water samples taken from each water sampling location were submitted to a contract laboratory for testing. Results for hard-to-detect samples are provided in Appendix D. Of the 196 water samples tested, iron-55 was detected in two on-site locations, while nickel-63 was detected in one on-site location. Strontium-90 was detected in sixteen on-site groundwater samples at twelve different sites and one Connecticut River sample upstream of Vermont Yankee. Subsequent samples at the Connecticut River location had no detectable levels of strontium-90. None of the hard-to-detect metals were detected in drinking water samples.

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In 2015, all off-site water sample locations showed no significant dose impact from activities at Vermont Yankee for total alpha, total beta, tritium, gamma spectroscopy, and hard-to-detect radioactive elements, and VDH dose limits were not exceeded. The only human-made radioactive elements that have been measured in water samples are tritium and hard-to-detect metals from on-site water sources, and strontium-90 in one off-site sample at a level just above the limit of detection. The levels of tritium detected show a groundwater plume traveling from the source of the leaks to the Connecticut River. The dose associated with the tritium-contaminated plume in 2015 at Vermont Yankee did not measurably increase the dose from liquid effluents (discharges) to any member of the public.

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Food Chain Sampling Results

Monitoring the food chain involves direct monitoring of some foods such as milk and fish. It also involves testing the sediment that supports land and aquatic species.

For 2015:

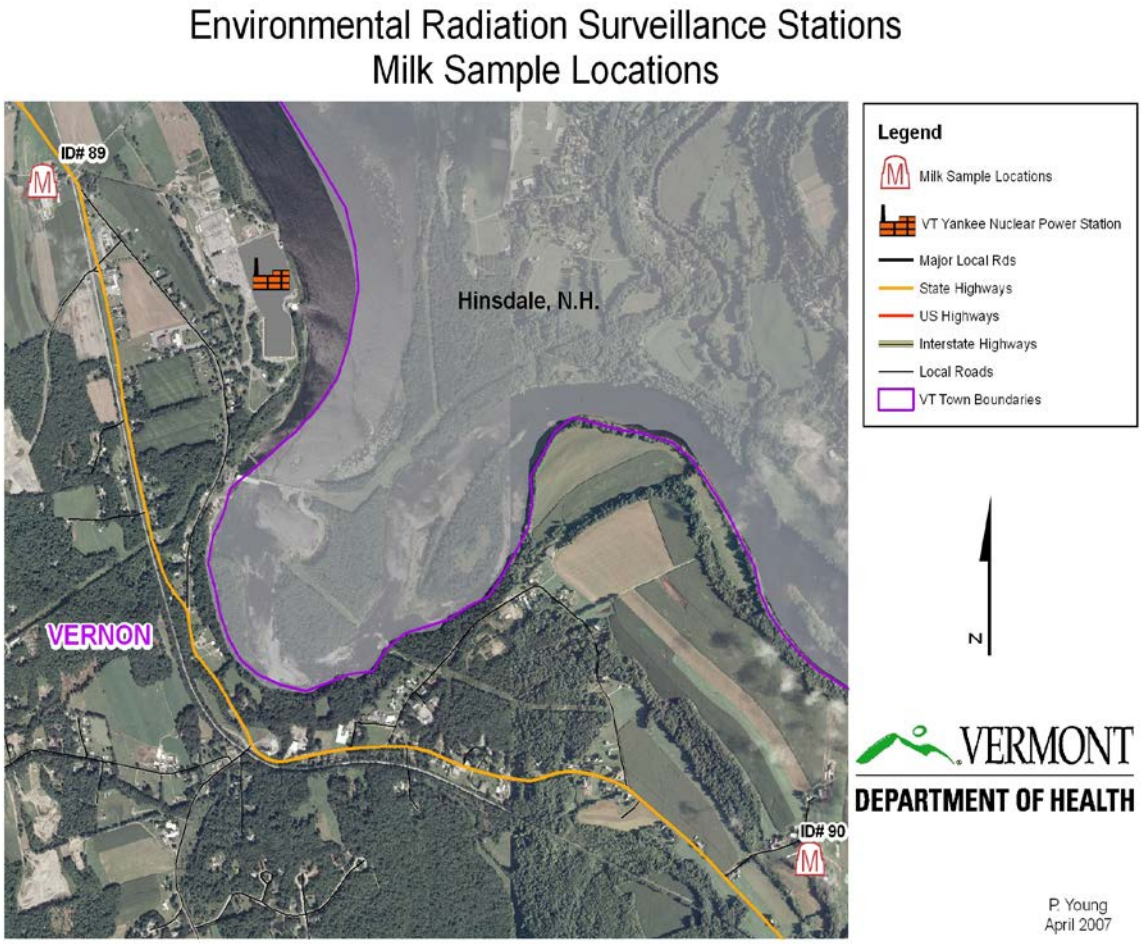
- 18 milk samples were tested for iodine-131 and gamma-emitting materials.
- 36 Connecticut River sediment samples were tested for gamma-emitting materials.
- 4 fish samples collected in the Connecticut River were tested for gamma-emitting materials, iron-55, nickel-63 and strontium-90.

Milk Sample Results

Cows' raw milk is sampled monthly from two farms in Vernon. One farm is about one-half mile north of Vermont Yankee and the other is about three miles south of Vermont Yankee. Map 10 shows the locations of these two dairy farms.

Potassium-40 (K-40) was the only radioactive material found in milk samples. Potassium-40 is a primordial radioactive material with a half-life of 1.28 billion years. Primordial radioactive materials are those created with the formation of the earth. In 2015 potassium-40 was detected in all milk samples. Results are shown in Table 16. The potassium-40 results for all milk samples range from 1,310 to 1,520 picocuries per liter (pCi/L), and fall within the historical range of 1,200 to 2,000 pCi/L. The average potassium-40 result in 2015 was 1,400 pCi/L. No iodine-131 was found in any milk sample in 2015.

Map 10



Sample Location	Map ID
Miller Farm	89
Blodgett Farm	90

Table 16. 2015 Milk Iodine-131 and Gamma Spectroscopy Results

Sample Location	Date of Sample	Iodine-131 Result	Gamma Spectrometry Result	Potassium-40 Result +/- error (pCi/L)
Blodgett Farm	1/6/2015	< LLD	Natural	1360 +/- 300
	3/3/2015	< LLD	Natural	1390 +/- 300
	4/7/2015	< LLD	Natural	1520 +/- 330
	5/5/2015	< LLD	Natural	1360 +/- 260
	8/4/2015	< LLD	Natural	1490 +/- 330
	10/6/2015	< LLD	Natural	1340 +/- 290
	11/3/2015	< LLD	Natural	1450 +/- 320
	12/1/2015	< LLD	Natural	1420 +/- 310
Miller Farm	1/6/2015	< LLD	Natural	1310 +/- 250
	2/5/2015	< LLD	Natural	1340 +/- 290
	3/3/2015	< LLD	Natural	1310 +/- 250
	4/7/2015	< LLD	Natural	1390 +/- 270
	5/5/2015	< LLD	Natural	1460 +/- 320
	8/4/2015	< LLD	Natural	1440 +/- 270
	9/1/2015	< LLD	Natural	1380 +/- 300
	10/6/2015	< LLD	Natural	1380 +/- 260
	11/3/2015	< LLD	Natural	1440 +/- 270
	12/1/2015	< LLD	Natural	1410 +/- 270

< LLD = Less than the laboratory's Lower Limit of Detection
Natural = gamma-emitting materials measured are not related to nuclear reactions

Sediment Sample Results

Sediment samples were collected from the bottom of the Connecticut River. The sediment samples were taken from four areas of the Connecticut River: Station 3-3 (south of Vernon Dam), Station 3-4 (near Vermont Yankee discharge), Station 3-8 (upstream near the Route 9 Bridge) and the North Storm Drain area. In 1997, the North Storm Drain area was identified as having been contaminated with cobalt-60 from Vermont Yankee operations. The North Storm Drain area is sampled at 15 distinct locations: S-1, S-2, T-1, T-2, T-3, U-1, U-2, U-3, U-4, V-3, V-4, V-5, W-4, W-5 and X-5. These sample locations are shown in Map 11. Cobalt-60 was last detected in a sediment sample obtained and tested in 2004.

All sediment locations are sampled each spring and fall. A sediment sample is taken with a mass ranging from 0.75 to 1.25 kilograms. Sediment samples are dried and tested by gamma spectroscopy. Tested sediments contained naturally-occurring potassium-40 (K-40) as well as cesium-137 (Cs-137), which is related to fallout from above-ground weapons testing and global nuclear incidents like Chernobyl and Fukushima. The results are presented in Table 20. No cobalt-60 was detected in samples collected in 2015. Concentrations of potassium-40 and cesium-137 were within historical ranges for Vermont. Comparisons to previous years' data are presented in Figures 6 and 7.

Table 17. 2015 Sediment Gamma Spectroscopy Ranges as Compared to Historical Ranges

Radioactive Element	2015 Sediment Concentration Range (pCi/kg)	Historical Sediment Concentration Range (pCi/kg)
Beryllium-7	< LLD	< LLD-3,000
Potassium-40	10,700-23,600	6,000-30,400
Cesium-137	< LLD-125	< LLD-500
< LLD means less than the Laboratory's Lower Limit of Detection		

Map 11

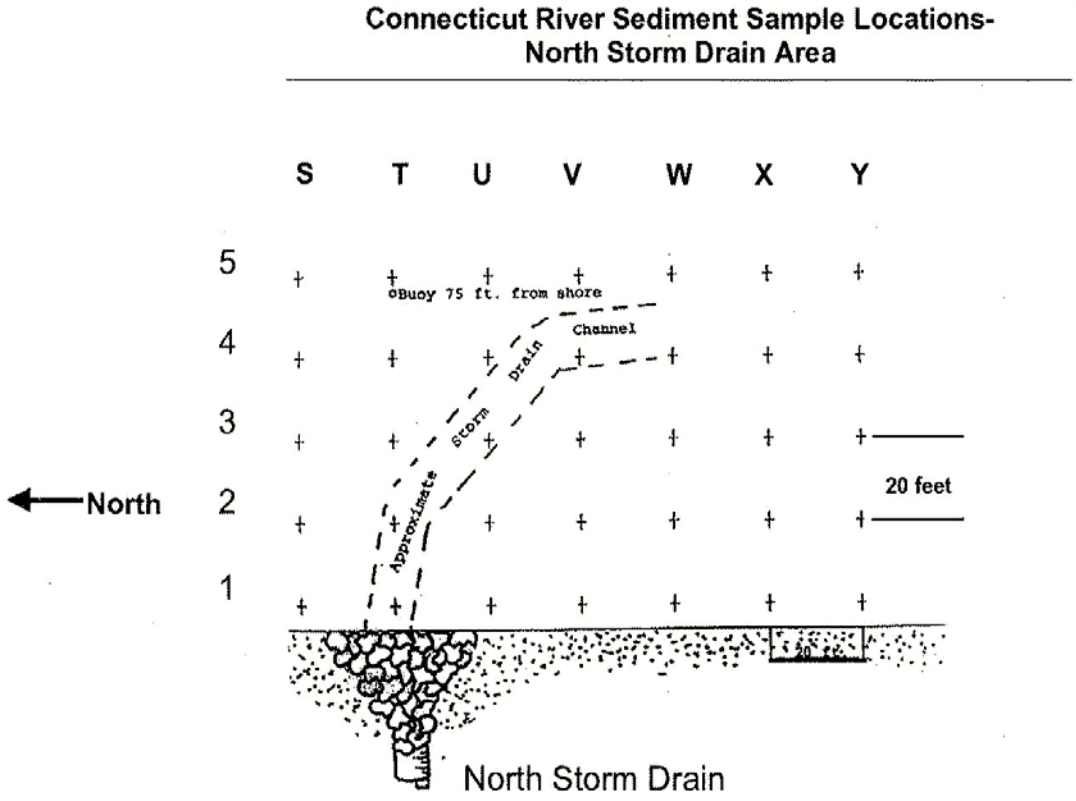

Connecticut River Sediment Sample Locations-
North Storm Drain Area
S
T
U
V
W
X
Y
5
4
3
2
1
North
Buoy 75 ft. from shore
Channel
Drain
Storm
Approximate
20 feet
North Storm Drain

Table 18. 2015 Sediment Gamma Spectroscopy Results

Sample Location	Date of Sample	Beryllium-7 Result +/- error (pCi/kg)	Potassium-40 Result +/- error (pCi/kg)	Cesium-137 Result +/- error (pCi/kg)
3-3	4/28/2015	< LLD	11,400 +/- 2,000	45.3 +/- 23.6
3-4	4/28/2015	< LLD	13,600 +/- 2,400	53.2 +/- 22.5
3-8	4/28/2015	< LLD	12,500 +/- 2,200	59.3 +/- 24.4
S-1	4/28/2015	< LLD	20,600 +/- 3,600	107.0 +/- 29.0
S-2	4/28/2015	< LLD	22,300 +/- 3,900	78.0 +/- 30.9
T-1	4/28/2015	< LLD	11,600 +/- 2,000	54.3 +/- 23.4
T-2	4/28/2015	< LLD	20,100 +/- 3,500	76.8 +/- 35.9
T-3	4/28/2015	< LLD	22,100 +/- 3,800	103.0 +/- 31.0
U-1	4/28/2015	< LLD	18,200 +/- 3,200	125.0 +/- 39.0
U-2	4/28/2015	< LLD	22,400 +/- 3,900	76.8 +/- 29.4
U-3	4/28/2015	< LLD	22,800 +/- 4,000	99 +/- 39.6
U-4	4/28/2015	< LLD	21,600 +/- 3,700	111.0 +/- 32.0
V-3	4/28/2015	< LLD	23,200 +/- 4,000	93.1 +/- 31.9
V-4	4/28/2015	< LLD	18,100 +/- 3,100	93.8 +/- 28.9
V-5	4/28/2015	< LLD	17,600 +/- 3,100	83.4 +/- 27.4
W-4	4/28/2015	< LLD	19,500 +/- 3,400	< LLD
W-5	4/28/2015	< LLD	17,100 +/- 3,000	60.7 +/- 30.2
X-5	4/28/2015	< LLD	18,300 +/- 3,200	66.9 +/- 23.0
3-3	11/2/2015	< LLD	10,700 +/- 1,900	47.8 +/- 21.6
3-4	10/30/2015	< LLD	14,000 +/- 2,400	81.3 +/- 26.4
3-8	10/30/2015	< LLD	10,900 +/- 1,900	41.8 +/- 21.1
S-1	10/30/2015	< LLD	17,300 +/- 3,000	41.8 +/- 25.7
S-2	10/30/2015	< LLD	23,500 +/- 4,100	98 +/- 28.8
T-1	10/30/2015	< LLD	13,700 +/- 2,400	44.3 +/- 28.2
T-2	10/30/2015	< LLD	22,200 +/- 3,900	101.1 +/- 40.0
T-3	10/30/2015	< LLD	21,200 +/- 3,700	62.7 +/- 32.8
U-1	10/30/2015	< LLD	20,000 +/- 3,500	90.2 +/- 33.2
U-2	10/30/2015	< LLD	22,200 +/- 3,900	65.2 +/- 36.1
U-3	10/30/2015	< LLD	22,100 +/- 3,900	99.8 +/- 36.3
U-4	10/30/2015	< LLD	23,400 +/- 4,100	70.6 +/- 29.1
V-3	10/30/2015	< LLD	23,600 +/- 4,100	85.1 +/- 32.7
V-4	10/30/2015	< LLD	21,700 +/- 3,800	85.3 +/- 37.1
V-5	10/30/2015	< LLD	18,300 +/- 3,200	61 +/- 31.8
W-4	10/30/2015	< LLD	19,900 +/- 3,500	93 +/- 31.4
W-5	10/30/2015	< LLD	17,700 +/- 3,100	< LLD
X-5	10/30/2015	< LLD	16,800 +/- 2,900	87 +/- 25.1

< LLD = Less than the laboratory's Lower Limit of Detection

Figure 6. 2012-2015 Average Potassium-40 Levels in Sediment

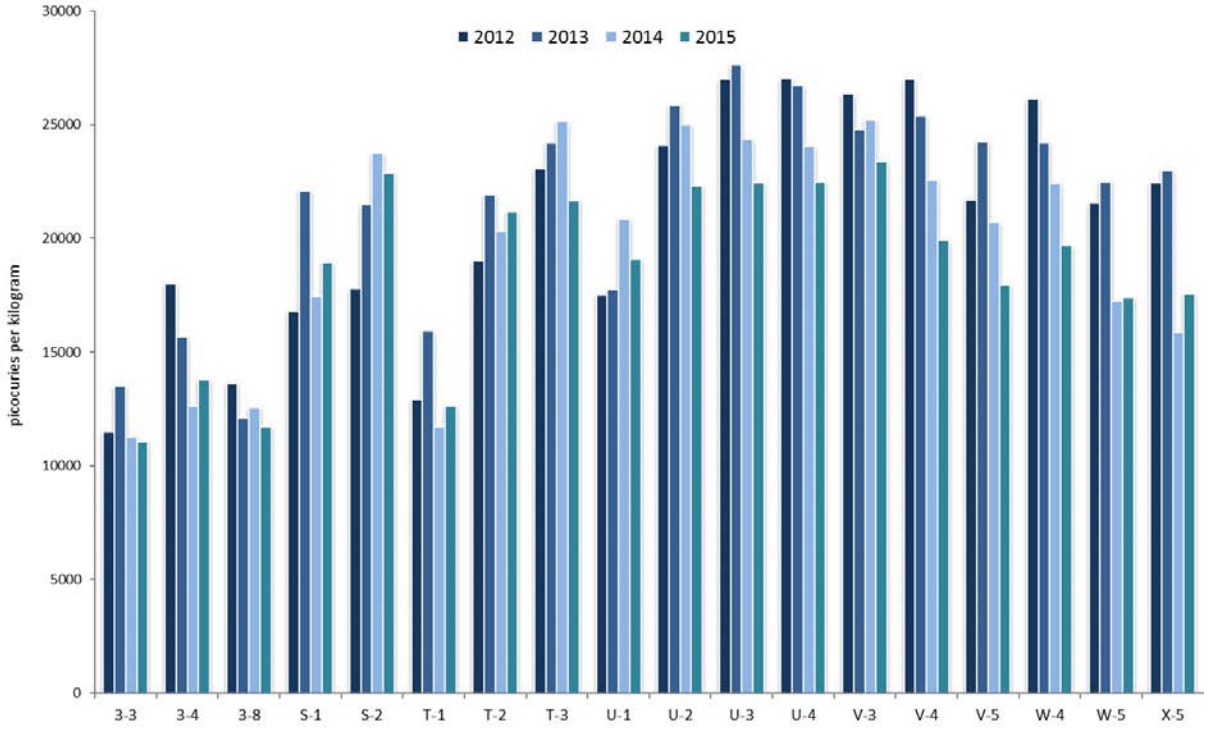
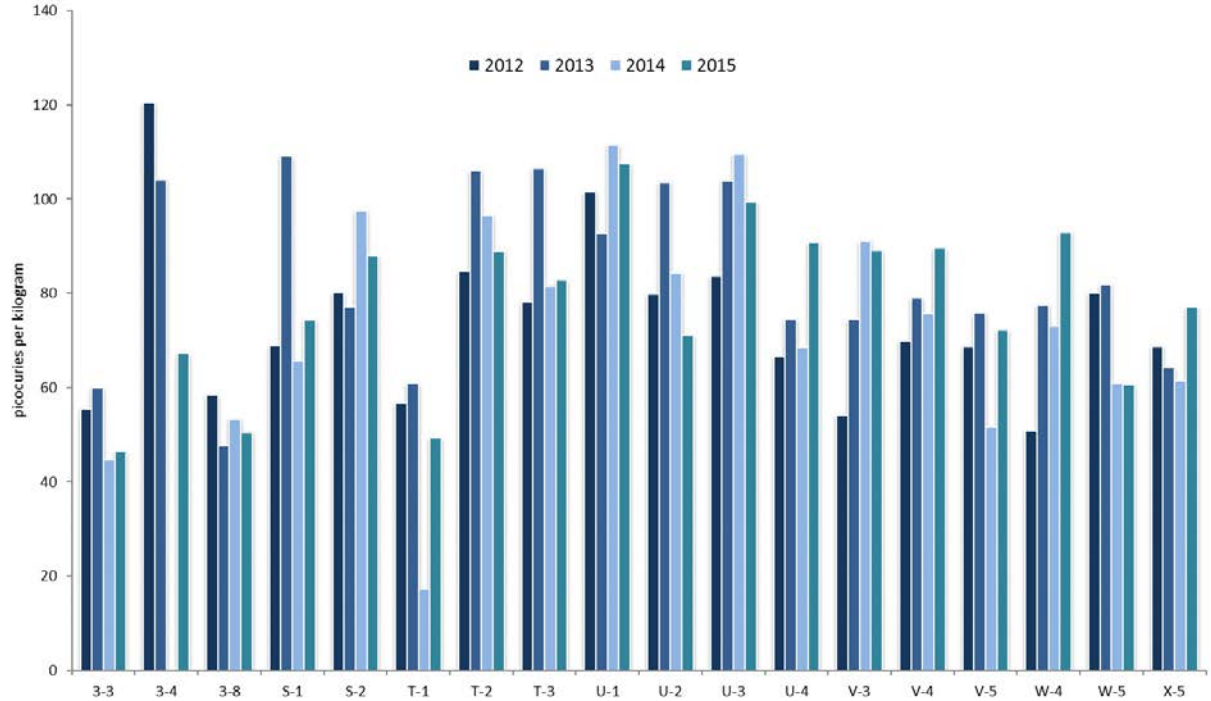


Figure 7. 2012-2015 Average Cesium-137 Levels in Sediment



Fish Sample Results

Each year, fish are collected at two sites in the Connecticut River by an environmental contractor. One site is near the Vermont Yankee discharge and the other site is about nine miles upstream from Vermont Yankee, where the Route 9 Bridge crosses the Connecticut River.

The Health Department's contract laboratory tests fish samples for hard-to-detect radioactive metals and gamma-emitting materials. Fish types tested in 2015 included large and small mouth bass. Fish gamma spectroscopy results are presented in Table 21 and hard-to-detect metal results are in Table 22.

Potassium-40, cesium-137 and strontium-90 were measured in the Connecticut River fish in 2015. Potassium-40, a naturally-occurring radioactive material, was detected in all fish, while fallout-related cesium-137 was not found in any of the fish samples. Strontium-90 was found in the fish collected in 2015, but only in the inedible portions of the samples. The level of strontium-90 measured may be attributed to the fallout from above-ground weapons testing and global nuclear incidents like Chernobyl and Fukushima.

In 2015, no radioactivity in food chain inputs was measured above historical and background ranges. Radioactivity measured in the food chain inputs can be attributed to natural sources or human-made sources released in above-ground weapons testing or global nuclear incidents.

Table 19. 2015 Connecticut River Fish Gamma Spectroscopy Results

2015 Connecticut River Fish Gamma Spectroscopy Results					
Month Sample Collected	Sample Location	Edible (flesh) Potassium-40 +/- error (pCi/kg)	Edible (flesh) Cesium-137 +/- error (pCi/kg)	Inedible (bones, head, scales, guts) Potassium-40 +/- error (pCi/kg)	Inedible (bones, head, scales, guts) Cesium-137 +/- error (pCi/kg)
May 2015	Near VY Discharge	2,430 ± 440	< LLD	1,900 ± 460	< LLD
April 2015	Upstream of VY	2,890 ± 480	< LLD	2,030 ± 360	< LLD
October 2015	Near VY Discharge	3,030 ± 570	< LLD	1,720 ± 450	< LLD
	Upstream of VY	3,430 ± 640	< LLD	2,380 ± 590	< LLD
< LLD means less than the Laboratory's Lower Limit of Detection					

Table 20. 2015 Connecticut River Fish Hard-to-Detect Results

2015 Connecticut River Fish Hard-to-Detect Results			
Month Sample Collected	Sample Location	Edible (flesh) Strontium-90 +/- error (pCi/kg)	Inedible Strontium-90 +/- error (pCi/kg)
May 2015	Near VY Discharge	< LLD	75 ± 20
April 2015	Upstream of VY	< LLD	91 ± 24
October 2015	Near VY Discharge	< LLD	<LLD
	Upstream of VY	< LLD	23 ± 10
< LLD means less than the Laboratory's Lower Limit of Detection			

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Appendix A

2015 Air Filter Data for Total Alpha & Beta Radioactivity

Alpha and beta radioactivity results for all air filter samples tested by the Health Department in 2015 are provided in this appendix. Results are presented in order by sampling date.

2015 Air Filter Results for Total Alpha & Beta Radioactivity

Sample Location	Date of Sample	Total Alpha Radioactivity +/- error (pCi/m^3)	Total Beta Radioactivity +/- error (pCi/m^3)
108 Cherry St Burlington	1/6/2015	0.00126 +/- 0.00017	0.0139 +/- 0.0004
D & E Tree	1/6/2015	0.00108 +/- 0.00016	0.0142 +/- 0.0004
Dummerston IFO	1/6/2015	0.0014 +/- 0.00018	0.017 +/- 0.0005
Guilford Town Garage	1/6/2015	0.00118 +/- 0.00018	0.0167 +/- 0.0005
Power Line Crossing	1/6/2015	0.0014 +/- 0.00017	0.016 +/- 0.0004
Renaud/Puffer	*1/6/2015*	*0.00118 +/- 0.00018*	*0.0128 +/- 0.0005*
Vermont Courthouse	1/6/2015	0.000929 +/- 0.000147	0.0134 +/- 0.0004
Vermont State Police	*1/6/2015*	*0.00017 +/- 0.00021*	*0.00209 +/- 0.0005*
Vernon Elementary School	1/6/2015	0.00118 +/- 0.00016	0.0146 +/- 0.0004
Wilmington State Highway Garage	1/6/2015	0.00123 +/- 0.00016	0.0134 +/- 0.0004
108 Cherry St Burlington	2/3/2015	0.00165 +/- 0.00022	0.0177 +/- 0.0006
D & E Tree	2/5/2015	0.00166 +/- 0.00023	0.0186 +/- 0.0006
Dummerston IFO	2/5/2015	0.00128 +/- 0.0002	0.021 +/- 0.0006
Guilford Town Garage	2/5/2015	0.00224 +/- 0.00026	0.0232 +/- 0.0006
Power Line Crossing	2/5/2015	0.0018 +/- 0.00023	0.019 +/- 0.0006
Renaud/Puffer	2/5/2015	0.0014 +/- 0.00023	0.017 +/- 0.0006
Vermont Courthouse	2/5/2015	0.000997 +/- 0.000167	0.0174 +/- 0.0005
Vernon Elementary School	2/5/2015	0.00174 +/- 0.00023	0.0199 +/- 0.0006
Wilmington State Highway Garage	2/5/2015	0.00152 +/- 0.00019	0.0161 +/- 0.0005
108 Cherry St Burlington	3/2/2015	0.00286 +/- 0.00032	0.0277 +/- 0.0007
D & E Tree	3/3/2015	0.00138 +/- 0.00023	0.0237 +/- 0.0007
Dummerston IFO	3/3/2015	0.00146 +/- 0.00023	0.0241 +/- 0.0007
Guilford Town Garage	3/3/2015	0.00236 +/- 0.00031	0.0275 +/- 0.0008
Power Line Crossing	3/3/2015	0.00197 +/- 0.00024	0.0222 +/- 0.0006
Renaud/Puffer	3/3/2015	0.00205 +/- 0.00029	0.0255 +/- 0.0008
Vermont Courthouse	3/3/2015	0.000942 +/- 0.000179	0.0176 +/- 0.0006
Vernon Elementary School	3/3/2015	0.00196 +/- 0.00025	0.0245 +/- 0.0007
Wilmington State Highway Garage	3/3/2015	0.00129 +/- 0.00021	0.0183 +/- 0.0006
108 Cherry St Burlington	4/7/2015	0.00121 +/- 0.00017	0.0141 +/- 0.0005
D & E Tree	4/7/2015	0.000916 +/- 0.000156	0.0165 +/- 0.0005
Dummerston IFO	4/7/2015	0.000885 +/- 0.000151	0.0145 +/- 0.0005
Guilford Town Garage	4/7/2015	0.00131 +/- 0.00019	0.0172 +/- 0.0005
Power Line Crossing	4/7/2015	0.00122 +/- 0.00017	0.0145 +/- 0.0004
Renaud/Puffer	4/7/2015	0.00113 +/- 0.00018	0.0148 +/- 0.0005
Vermont Courthouse	4/7/2015	0.00044 +/- 0.000104	0.0127 +/- 0.0004
Vernon Elementary School	4/7/2015	0.00131 +/- 0.00017	0.0173 +/- 0.0005
Wilmington State Highway Garage	4/7/2015	0.00115 +/- 0.00016	0.0152 +/- 0.0005

Sample Location	Date of Sample	Total Alpha Radioactivity +/- error (pCi/m^3)	Total Beta Radioactivity +/- error (pCi/m^3)
108 Cherry St Burlington	5/5/2015	0.000698 +/- 0.00016	0.0102 +/- 0.0005
D & E Tree	5/5/2015	0.000821 +/- 0.000173	0.0107 +/- 0.0005
Dummerston IFO	5/5/2015	0.000753 +/- 0.000163	0.0112 +/- 0.0005
Guilford Town Garage	5/5/2015	0.000635 +/- 0.000158	0.0107 +/- 0.0005
Power Line Crossing	5/5/2015	0.000783 +/- 0.000161	0.00921 +/- 0.00042
Renaud/Puffer	5/5/2015	0.000481 +/- 0.000149	0.00951 +/- 0.00047
Vermont Courthouse	5/5/2015	0.000403 +/- 0.000117	0.011 +/- 0.0004
Vernon Elementary School	5/5/2015	0.000923 +/- 0.00017	0.0107 +/- 0.0004
Wilmington State Highway Garage	5/5/2015	0.00072 +/- 0.00015	0.0104 +/- 0.0004
108 Cherry St Burlington	7/7/2015	0.000724 +/- 0.000148	0.0101 +/- 0.0004
D & E Tree	7/8/2015	0.000255 +/- 0.000069	0.0109 +/- 0.0003
Dummerston IFO	7/8/2015	0.000273 +/- 0.00067	0.0114 +/- 0.0003
Guilford Town Garage	7/8/2015	0.00047 +/- 0.000085	0.0117 +/- 0.0003
Power Line Crossing	7/8/2015	0.000343 +/- 0.00007	0.0111 +/- 0.0003
Renaud/Puffer	7/8/2015	0.000301 +/- 0.000075	0.00899 +/- 0.00028
Vermont Courthouse	7/8/2015	0.000198 +/- 0.000055	0.00953 +/- 0.00025
Vernon Elementary School	7/8/2015	0.000259 +/- 0.000062	0.0107 +/- 0.0003
Wilmington State Highway Garage	7/8/2015	0.000363 +/- 0.000072	0.0103 +/- 0.0003
108 Cherry St Burlington	8/6/2015	0.00171 +/- 0.00025	0.0162 +/- 0.0006
D & E Tree	8/4/2015	0.00182 +/- 0.00031	0.0156 +/- 0.0007
Dummerston IFO	8/4/2015	0.00238 +/- 0.00029	0.0172 +/- 0.0006
Guilford Town Garage	8/4/2015	0.00186 +/- 0.00027	0.0162 +/- 0.0006
Renaud/Puffer	8/4/2015	0.0014 +/- 0.00025	0.0145 +/- 0.0006
Vermont Courthouse	8/4/2015	0.00116 +/- 0.0002	0.0161 +/- 0.0005
Vernon Elementary School	8/4/2015	0.002 +/- 0.00025	0.0167 +/- 0.0005
Wilmington State Highway Garage	8/4/2015	0.0015 +/- 0.00023	0.0155 +/- 0.0005
108 Cherry St Burlington	9/1/2015	0.00144 +/- 0.00025	0.019 +/- 0.0007
D & E Tree	9/1/2015	0.000635 +/- 0.000198	0.019 +/- 0.0007
Dummerston IFO	9/1/2015	0.000988 +/- 0.000207	0.0127 +/- 0.0005
Guilford Town Garage	9/1/2015	0.00129 +/- 0.00023	0.0182 +/- 0.0006
Renaud/Puffer	9/1/2015	0.00105 +/- 0.00023	0.0161 +/- 0.0006
Vermont Courthouse	9/1/2015	0.000917 +/- 0.000185	0.0184 +/- 0.0006
Wilmington State Highway Garage	9/1/2015	0.00137 +/- 0.00023	0.0187 +/- 0.0006

Sample Location	Date of Sample	Total Alpha Radioactivity +/- error (pCi/m^3)	Total Beta Radioactivity +/- error (pCi/m^3)
108 Cherry St Burlington	10/6/2015	0.00289 +/- 0.00027	0.0223 +/- 0.0006
D & E Tree	10/6/2015	0.00275 +/- 0.00028	0.0234 +/- 0.0006
Dummerston IFO	10/6/2015	0.00273 +/- 0.00026	0.0234 +/- 0.0006
Guilford Town Garage	10/6/2015	0.0034 +/- 0.00029	0.0246 +/- 0.0006
Renaud/Puffer	10/6/2015	0.00151 +/- 0.00021	0.018 +/- 0.0005
Vermont Courthouse	10/6/2015	0.00182 +/- 0.0002	0.0218 +/- 0.0005
Vermont State Police	10/6/2015	0.00405 +/- 0.00043	0.0234 +/- 0.0008
Vernon Elementary School	*10/6/2015*	*0.00202 +/- 0.00016*	*0.0185 +/- 0.0004*
Wilmington State Highway Garage	10/6/2015	0.00267 +/- 0.00024	0.0215 +/- 0.0005
108 Cherry St Burlington	11/3/2015	0.00103 +/- 0.0002	0.0135 +/- 0.0005
D & E Tree	11/3/2015	0.00184 +/- 0.00027	0.018 +/- 0.0007
Dummerston IFO	11/3/2015	0.0016 +/- 0.00023	0.0189 +/- 0.0006
Guilford Town Garage	11/3/2015	0.00188 +/- 0.00026	0.0192 +/- 0.0006
Power Line Crossing	*11/3/2015*	*0.00151 +/- 0.00014*	*0.0136 +/- 0.0003*
Renaud/Puffer	11/3/2015	0.0012 +/- 0.00022	0.016 +/- 0.0006
Vermont Courthouse	11/3/2015	0.00113 +/- 0.00018	0.018 +/- 0.0006
Vermont State Police	11/3/2015	0.00156 +/- 0.00031	0.0164 +/- 0.0008
Vernon Elementary School	11/3/2015	0.00152 +/- 0.00021	0.0185 +/- 0.0006
Wilmington State Highway Garage	11/3/2015	0.00186 +/- 0.00024	0.0173 +/- 0.0006
108 Cherry St Burlington	12/1/2015	0.00143 +/- 0.00023	0.0181 +/- 0.0006
D & E Tree	12/1/2015	0.00147 +/- 0.00025	0.0216 +/- 0.0007
Dummerston IFO	12/1/2015	0.00146 +/- 0.00022	0.0215 +/- 0.0006
Guilford Town Garage	12/1/2015	0.00169 +/- 0.00025	0.0216 +/- 0.0007
Power Line Crossing	12/1/2015	0.00126 +/- 0.0002	0.0142 +/- 0.0005
Renaud/Puffer	12/1/2015	0.000988 +/- 0.000208	0.0183 +/- 0.0007
Vermont Courthouse	12/1/2015	0.000894 +/- 0.000167	0.0194 +/- 0.0006
Vermont State Police	12/1/2015	0.0017 +/- 0.00033	0.0177 +/- 0.0008
Vernon Elementary School	12/1/2015	0.00161 +/- 0.00022	0.0207 +/- 0.0006
Wilmington State Highway Garage	12/1/2015	0.0015 +/- 0.00022	0.0172 +/- 0.0006

pCi/m^3 is picocurie per cubic meter of air volume
Data in italics were qualified due to sampling issues.

Appendix B

2015 Tritium Water Data

Tritium results for all water samples tested by the Health Department in 2015 are provided in this appendix. Results are presented in order by sample location and by sampling date based on the following categories:

- Connecticut River samples
- On-site groundwater monitoring wells
- Off-site drinking water wells
- On-site drinking water wells

The Health Department's Lower Limit of Detection for tritium is 500 picocuries per liter (pCi/L).

Sample Location	Date of Sample	Tritium Result +/- error (pCi/L)
3-3 Connecticut River Station	1/15/2015	< 500
	2/18/2015	< 500
	3/17/2015	< 500
	4/14/2015	< 500
	5/19/2015	< 500
	6/18/2015	< 500
	7/17/2015	< 500
	8/14/2015	< 500
	9/17/2015	< 500
	10/16/2015	< 500
	11/16/2015	< 500
	12/16/2015	< 500
3-4 Connecticut River Station	1/14/2015	< 500
	2/17/2015	< 500
	3/16/2015	< 500
	4/13/2015	< 500
	5/15/2015	< 500
	6/17/2015	< 500
	7/16/2015	< 500
	8/13/2015	< 500
	9/16/2015	< 500
	10/15/2015	< 500
	11/13/2015	< 500
	12/15/2015	< 500
3-8 Connecticut River Station	1/15/2015	< 500
	2/18/2015	< 500
	3/17/2015	< 500
	4/14/2015	< 500
	5/19/2015	< 500
	6/18/2015	< 500
	7/17/2015	< 500
	8/14/2015	< 500
	9/17/2015	< 500
	10/16/2015	< 500
	11/16/2015	< 500
	12/16/2015	< 500

Sample Location	Date of Sample	Tritium Result +/- error (pCi/L)
Connecticut River, Downstream	1/6/2015	< 500
	1/21/2015	< 500
	3/24/2015	< 500
	4/7/2015	< 500
	4/21/2015	< 500
	5/5/2015	< 500
	5/19/2015	< 500
	8/4/2015	< 500
	8/18/2015	< 500
	9/1/2015	< 500
	9/22/2015	< 500
	10/6/2015	< 500
	10/20/2015	< 500
	11/3/2015	< 500
	11/17/2015	< 500
	12/1/2015	< 500
	12/15/2015	< 500
Connecticut River, Upstream	1/6/2015	< 500
	1/21/2015	< 500
	3/24/2015	< 500
	4/7/2015	< 500
	4/21/2015	< 500
	5/5/2015	< 500
	5/19/2015	< 500
	8/4/2015	< 500
	8/18/2015	< 500
	9/1/2015	< 500
	9/22/2015	< 500
	10/6/2015	< 500
	10/20/2015	< 500
	11/3/2015	< 500
	11/17/2015	< 500
	12/1/2015	< 500
	12/15/2015	< 500

Sample Location	Date of Sample	Tritium Result +/- error (pCi/L)
Discharge Forebay	1/14/2015	< 500
	2/17/2015	< 500
	3/16/2015	< 500
	4/13/2015	< 500
	5/15/2015	< 500
	6/17/2015	< 500
	7/16/2015	< 500
	8/13/2015	< 500
	9/16/2015	< 500
	10/15/2015	< 500
	11/13/2015	< 500
	12/15/2015	< 500
GZ-01	2/8/2015	< 500
	5/5/2015	< 500
	8/3/2015	< 500
	11/2/2015	< 500
GZ-02	2/12/2015	< 500
	5/7/2015	< 500
	8/4/2015	< 500
GZ-03	2/19/2015	< 500
	5/5/2015	< 500
	8/3/2015	< 500
GZ-04	3/2/2015	< 500
	5/5/2015	< 500
	8/5/2015	< 500
	11/2/2015	< 500
GZ-05	2/18/2015	< 500
	5/5/2015	< 500
	8/5/2015	< 500
	11/2/2015	< 500
GZ-06	2/19/2015	< 500
	5/7/2015	< 500
	8/4/2015	< 500
GZ-07	2/11/2015	< 500
	5/7/2015	< 500
	8/5/2015	< 500
	11/3/2015	< 500

Sample Location	Date of Sample	Tritium Result +/- error (pCi/L)
GZ-09	2/19/2015	< 500
	5/7/2015	< 500
	8/4/2015	< 500
	11/2/2015	< 500
GZ-10	2/5/2015	< 500
	5/7/2015	< 500
	8/4/2015	< 500
	11/2/2015	< 500
GZ-11	2/11/2015	< 500
	5/7/2015	637 +/- 140
	8/5/2015	< 500
	11/3/2015	< 500
GZ-12D	2/10/2015	5070 +/- 190
	5/6/2015	4380 +/- 180
	8/4/2015	2460 +/- 150
GZ-12S	5/5/2015	1070 +/- 140
	8/4/2015	832 +/- 133
GZ-13D	2/11/2015	< 500
	5/6/2015	767 +/- 140
	8/4/2015	824 +/- 133
	11/3/2015	1020 +/- 140
GZ-13S	2/11/2015	< 500
	5/6/2015	< 500
	8/5/2015	< 500
GZ-14D	3/4/2015	11000 +/- 200
	5/7/2015	10300 +/- 200
	8/3/2015	10100 +/- 200
GZ-14S	3/4/2015	1460 +/- 160
	5/5/2015	2040 +/- 150
	8/3/2015	2270 +/- 150
GZ-15	2/5/2015	4590 +/- 190
	5/7/2015	4720 +/- 180
	8/5/2015	4590 +/- 170
GZ-16	2/12/2015	< 500
	5/7/2015	< 500
	8/4/2015	< 500

Sample Location	Date of Sample	Tritium Result +/- error (pCi/L)
GZ-17	2/12/2015	< 500
	5/7/2015	< 500
	8/4/2015	< 500
	11/4/2015	< 500
GZ-18D	2/11/2015	< 500
	5/6/2015	620 +/- 148
	8/4/2015	< 500
	11/3/2015	637 +/- 133
GZ-18S	2/11/2015	< 500
	5/6/2015	< 500
	8/4/2015	< 500
GZ-19D	2/5/2015	< 500
	5/7/2015	< 500
	8/4/2015	< 500
	11/2/2015	< 500
GZ-19S	2/5/2015	< 500
	5/7/2015	< 500
	8/4/2015	< 500
	11/2/2015	< 500
GZ-20	2/11/2015	< 500
	5/7/2015	< 500
	8/5/2015	< 500
	11/3/2015	< 500
GZ-21	2/11/2015	1380 +/- 160
	5/7/2015	1040 +/- 140
	8/5/2015	< 500
GZ-22D	1/5/2015	10400 +/- 200
	2/10/2015	8840 +/- 220
	3/2/2015	8920 +/- 220
	4/3/2015	8330 +/- 210
	5/5/2015	8560 +/- 210
	6/2/2015	8230 +/- 210
	7/2/2015	8090 +/- 200
	8/3/2015	8200 +/- 200
	9/1/2015	7580 +/- 200

Sample Location	Date of Sample	Tritium Result +/- error (pCi/L)
GZ-23S	1/5/2015	3340 +/- 180
	2/5/2015	2770 +/- 170
	3/2/2015	2600 +/- 170
	4/3/2015	2430 +/- 160
	5/5/2015	2560 +/- 160
	6/2/2015	2650 +/- 160
	7/2/2015	2550 +/- 160
	8/3/2015	2200 +/- 150
	9/1/2015	964 +/- 138
GZ-25S	1/5/2015	< 500
	2/5/2015	< 500
	3/2/2015	< 500
	4/3/2015	< 500
	5/5/2015	< 500
	6/2/2015	< 500
	7/2/2015	< 500
	8/3/2015	< 500
	9/1/2015	< 500
	10/1/2015	< 500
	11/2/2015	< 500
GZ-26S	1/5/2015	< 500
	2/5/2015	< 500
	3/2/2015	< 500
	4/3/2015	< 500
	5/5/2015	< 500
	6/2/2015	< 500
	7/2/2015	< 500
	8/3/2015	< 500
	9/1/2015	< 500
	10/1/2015	< 500
	11/2/2015	< 500

Sample Location	Date of Sample	Tritium Result +/- error (pCi/L)
GZ-27S	1/5/2015	< 500
	2/5/2015	< 500
	3/2/2015	< 500
	4/3/2015	< 500
	5/5/2015	< 500
	6/2/2015	< 500
	7/2/2015	< 500
	8/3/2015	< 500
	9/1/2015	< 500
	10/1/2015	< 500
	11/2/2015	< 500
WVN0201	2/18/2015	< 500
	5/18/2015	< 500
	8/6/2015	< 500
	11/18/2015	< 500
WVN0202	2/18/2015	< 500
	5/18/2015	< 500
	8/6/2015	< 500
	11/18/2015	< 500
WVN0203	2/18/2015	< 500
	5/18/2015	< 500
	8/6/2015	< 500
	11/5/2015	< 500
WVN0204	2/18/2015	< 500
	5/18/2015	< 500
	8/6/2015	< 500
	11/5/2015	< 500
Blodgett Farm	1/6/2015	< 500
	1/21/2015	< 500
	2/5/2015	< 500
	2/17/2015	< 500
	3/3/2015	< 500
	3/24/2015	< 500
	4/7/2015	< 500
	4/21/2015	< 500
	5/5/2015	< 500
	5/19/2015	< 500
	8/4/2015	< 500
	8/18/2015	< 500

Sample Location	Date of Sample	Tritium Result +/- error (pCi/L)
Blodgett Farm	9/1/2015	< 500
(continued)	9/22/2015	< 500
	10/6/2015	< 500
	10/20/2015	< 500
	11/3/2015	< 500
	11/17/2015	< 500
	12/1/2015	< 500
	12/15/2015	< 500
Brattleboro Fire Dept, West Station	1/6/2015	< 500
	1/21/2015	< 500
	2/5/2015	< 500
	2/17/2015	< 500
	3/3/2015	< 500
	3/24/2015	< 500
	4/7/2015	< 500
	4/21/2015	< 500
	5/5/2015	< 500
	5/19/2015	< 500
	8/4/2015	< 500
	8/18/2015	< 500
	9/1/2015	< 500
	9/22/2015	< 500
	10/6/2015	< 500
	10/20/2015	< 500
	11/3/2015	< 500
	11/17/2015	< 500
	12/1/2015	< 500
	12/15/2015	< 500
Miller Farm	1/6/2015	< 500
	1/21/2015	< 500
	2/5/2015	< 500
	2/17/2015	< 500
	3/3/2015	< 500
	3/24/2015	< 500
	4/7/2015	< 500
	4/21/2015	< 500
	5/5/2015	< 500
	5/19/2015	< 500
	8/4/2015	< 500
	8/18/2015	< 500

Sample Location	Date of Sample	Tritium Result +/- error (pCi/L)
Miller Farm (continued)	9/1/2015	< 500
	9/22/2015	< 500
	10/6/2015	< 500
	10/20/2015	< 500
	11/3/2015	< 500
	11/17/2015	< 500
	12/1/2015	< 500
	12/15/2015	< 500
Residence - 1	1/6/2015	< 500
	1/21/2015	< 500
	2/5/2015	< 500
	2/17/2015	< 500
	3/3/2015	< 500
	3/24/2015	< 500
	4/21/2015	< 500
	5/5/2015	< 500
	5/19/2015	< 500
	8/4/2015	< 500
	8/18/2015	< 500
	9/1/2015	< 500
	9/22/2015	< 500
	10/6/2015	< 500
	11/3/2015	< 500
	11/17/2015	< 500
	12/1/2015	< 500
	12/15/2015	< 500
Vernon Elementary School	1/6/2015	< 500
	1/21/2015	< 500
	2/5/2015	< 500
	2/17/2015	< 500
	3/3/2015	< 500
	3/24/2015	< 500
	4/7/2015	< 500
	4/21/2015	< 500
	5/5/2015	< 500
	5/19/2015	< 500

Sample Location	Date of Sample	Tritium Result +/- error (pCi/L)
Vernon Elementary School (continued)	8/4/2015	< 500
	8/18/2015	< 500
	9/1/2015	< 500
	9/22/2015	< 500
	10/6/2015	< 500
	10/20/2015	< 500
	11/3/2015	< 500
	11/17/2015	< 500
	12/1/2015	< 500
	12/15/2015	< 500
Vernon Green Nursing Home	1/6/2015	< 500
	1/21/2015	< 500
	1/22/2015	< 500
	2/5/2015	< 500
	2/17/2015	< 500
	3/3/2015	< 500
	3/24/2015	< 500
	4/7/2015	< 500
	4/21/2015	< 500
	5/5/2015	< 500
	5/19/2015	< 500
	8/4/2015	< 500
	8/18/2015	< 500
	9/1/2015	< 500
	9/22/2015	< 500
	10/6/2015	< 500
	10/20/2015	< 500
	11/3/2015	< 500
	11/17/2015	< 500
	12/1/2015	< 500
	12/15/2015	< 500
Main Well	1/22/2015	< 500
PSB Well	1/22/2015	< 500
Southwest Well	1/15/2015	< 500
	4/15/2015	< 500
	7/16/2015	< 500
	10/13/2015	< 500
pCi/L = picocuries per liter		

Appendix C

2015 Gamma Spectroscopy Water Data

Gamma spectroscopy data for all water samples tested by the Health Department in 2015 are provided in this appendix. Results are presented in order by sample location and by sampling date based on the following categories:

- Connecticut River samples
- On-site groundwater monitoring wells
- Off-site drinking water wells
- On-site drinking water wells

"Natural" means that gamma-emitting materials detected are not related to nuclear power stations or above-grounds weapons testing.

< LLD means less than the Laboratory's Lower Limit of Detection.

Sample Location	Date of Sample	Gamma Spectroscopy Result
3-3 Connecticut River Station	1/15/2015	<LLD
	2/18/2015	<LLD
	3/17/2015	<LLD
	4/14/2015	<LLD
	5/19/2015	<LLD
	6/18/2015	<LLD
	7/17/2015	<LLD
	8/14/2015	<LLD
	9/17/2015	<LLD
	10/16/2015	<LLD
	11/16/2015	<LLD
	12/16/2015	<LLD
3-4 Connecticut River Station	1/14/2015	<LLD
	2/17/2015	<LLD
	3/16/2015	<LLD
	4/13/2015	<LLD
	5/15/2015	<LLD
	6/17/2015	<LLD
	7/16/2015	<LLD
	8/13/2015	<LLD
	9/16/2015	<LLD
	10/15/2015	<LLD
	11/13/2015	<LLD
	12/15/2015	<LLD
3-8 Connecticut River Station	1/15/2015	<LLD
	2/18/2015	<LLD
	3/17/2015	<LLD
	4/14/2015	<LLD
	5/19/2015	<LLD
	6/18/2015	<LLD
	7/17/2015	<LLD
	8/14/2015	<LLD
	9/17/2015	<LLD
	10/16/2015	<LLD
	11/16/2015	<LLD
	12/16/2015	<LLD

Sample Location	Date of Sample	Gamma Spectroscopy Result
Connecticut River, Downstream	1/6/2015	<LLD
	1/21/2015	<LLD
	3/24/2015	<LLD
	4/7/2015	<LLD
	4/21/2015	<LLD
	5/5/2015	<LLD
	5/19/2015	<LLD
	8/4/2015	<LLD
	8/18/2015	<LLD
	9/1/2015	<LLD
	9/22/2015	<LLD
	10/6/2015	<LLD
	10/20/2015	<LLD
	11/3/2015	<LLD
	11/17/2015	<LLD
	12/1/2015	<LLD
	12/15/2015	<LLD
Connecticut River, Upstream	1/6/2015	<LLD
	1/21/2015	<LLD
	3/24/2015	<LLD
	4/7/2015	<LLD
	4/21/2015	<LLD
	5/5/2015	<LLD
	5/19/2015	<LLD
	8/4/2015	<LLD
	8/18/2015	<LLD
	9/1/2015	<LLD
	9/22/2015	<LLD
	10/6/2015	<LLD
	10/20/2015	Natural
	11/3/2015	<LLD
	11/17/2015	<LLD
	12/1/2015	<LLD
	12/15/2015	Natural

Sample Location	Date of Sample	Gamma Spectroscopy Result
Discharge Forebay	1/14/2015	<LLD
	2/17/2015	<LLD
	3/16/2015	<LLD
	4/13/2015	<LLD
	5/15/2015	<LLD
	6/17/2015	<LLD
	7/16/2015	<LLD
	8/13/2015	<LLD
	9/16/2015	<LLD
	10/15/2015	<LLD
	11/13/2015	<LLD
	12/15/2015	<LLD
GZ-01	2/8/2015	<LLD
	5/5/2015	<LLD
	8/3/2015	<LLD
	11/2/2015	<LLD
GZ-02	2/12/2015	<LLD
	5/7/2015	Natural
	8/4/2015	<LLD
GZ-03	2/19/2015	<LLD
	5/5/2015	<LLD
	8/3/2015	<LLD
GZ-04	3/2/2015	<LLD
	5/5/2015	<LLD
	8/5/2015	<LLD
	11/2/2015	<LLD
GZ-05	2/18/2015	<LLD
	5/5/2015	<LLD
	8/5/2015	<LLD
	11/2/2015	<LLD
GZ-06	2/19/2015	<LLD
	5/7/2015	Natural
	8/4/2015	<LLD
GZ-07	2/11/2015	<LLD
	5/7/2015	<LLD
	8/5/2015	<LLD
	11/3/2015	<LLD

Sample Location	Date of Sample	Gamma Spectroscopy Result
GZ-09	2/19/2015	<LLD
	5/7/2015	<LLD
	8/4/2015	<LLD
	11/2/2015	<LLD
GZ-10	2/5/2015	<LLD
	5/7/2015	<LLD
	8/4/2015	<LLD
	11/2/2015	<LLD
GZ-11	2/11/2015	<LLD
	5/7/2015	<LLD
	8/5/2015	<LLD
	11/3/2015	<LLD
GZ-12D	2/10/2015	<LLD
	5/6/2015	<LLD
	8/4/2015	Natural
GZ-12S	2/10/2015	<LLD
	5/5/2015	<LLD
	8/4/2015	<LLD
GZ-13D	2/11/2015	<LLD
	5/6/2015	<LLD
	8/4/2015	<LLD
	11/3/2015	<LLD
GZ-13S	2/11/2015	<LLD
	5/6/2015	<LLD
	8/5/2015	<LLD
GZ-14D	3/4/2015	<LLD
	5/7/2015	<LLD
	8/3/2015	<LLD
GZ-14S	3/4/2015	<LLD
	5/5/2015	<LLD
	8/3/2015	<LLD
GZ-15	2/5/2015	<LLD
	5/7/2015	<LLD
	8/5/2015	<LLD
GZ-16	2/12/2015	<LLD
	5/7/2015	<LLD
	8/4/2015	<LLD

Sample Location	Date of Sample	Gamma Spectroscopy Result
GZ-17	2/12/2015	<LLD
	5/7/2015	<LLD
	8/4/2015	<LLD
	11/4/2015	<LLD
GZ-18D	2/11/2015	<LLD
	5/6/2015	<LLD
	8/4/2015	<LLD
	11/3/2015	Natural
GZ-18S	2/11/2015	<LLD
	5/6/2015	<LLD
	8/4/2015	<LLD
GZ-19D	2/5/2015	<LLD
	5/7/2015	<LLD
	8/4/2015	<LLD
	11/2/2015	<LLD
GZ-19S	2/5/2015	<LLD
	5/7/2015	<LLD
	8/4/2015	<LLD
	11/2/2015	<LLD
GZ-20	2/11/2015	<LLD
	5/7/2015	<LLD
	8/5/2015	<LLD
	11/3/2015	<LLD
GZ-21	2/11/2015	<LLD
	5/7/2015	<LLD
	8/5/2015	<LLD
GZ-22D	1/5/2015	<LLD
	2/10/2015	<LLD
	3/2/2015	<LLD
	4/3/2015	<LLD
	5/5/2015	<LLD
	6/2/2015	<LLD
	7/2/2015	<LLD
	8/3/2015	<LLD
	9/1/2015	<LLD

Sample Location	Date of Sample	Gamma Spectroscopy Result
GZ-23S	1/5/2015	<LLD
	2/5/2015	<LLD
	3/2/2015	<LLD
	4/3/2015	<LLD
	5/5/2015	<LLD
	6/2/2015	<LLD
	7/2/2015	<LLD
	8/3/2015	<LLD
	9/1/2015	<LLD
GZ-25S	1/5/2015	<LLD
	2/5/2015	<LLD
	3/2/2015	<LLD
	4/3/2015	<LLD
	5/5/2015	<LLD
	6/2/2015	<LLD
	7/2/2015	<LLD
	8/3/2015	<LLD
	9/1/2015	<LLD
	10/1/2015	<LLD
	11/2/2015	<LLD
GZ-26S	1/5/2015	<LLD
	2/5/2015	<LLD
	3/2/2015	<LLD
	4/3/2015	<LLD
	5/5/2015	<LLD
	6/2/2015	<LLD
	7/2/2015	<LLD
	8/3/2015	<LLD
	9/1/2015	<LLD
	10/1/2015	<LLD
	11/2/2015	<LLD

Sample Location	Date of Sample	Gamma Spectroscopy Result
GZ-27S	1/5/2015	<LLD
	2/5/2015	<LLD
	3/2/2015	<LLD
	4/3/2015	<LLD
	5/5/2015	<LLD
	6/2/2015	<LLD
	7/2/2015	Natural
	8/3/2015	<LLD
	9/1/2015	<LLD
	10/1/2015	<LLD
	11/2/2015	<LLD
WVN0201	2/18/2015	<LLD
	5/18/2015	<LLD
	8/6/2015	<LLD
	11/18/2015	<LLD
WVN0202	2/18/2015	<LLD
	5/18/2015	<LLD
	8/6/2015	<LLD
	11/18/2015	<LLD
WVN0203	2/18/2015	<LLD
	5/18/2015	<LLD
	8/6/2015	<LLD
	11/5/2015	<LLD
WVN0204	2/18/2015	<LLD
	5/18/2015	<LLD
	8/6/2015	<LLD
	11/5/2015	<LLD
Blodgett Farm	1/6/2015	Natural
	1/21/2015	Natural
	2/5/2015	Natural
	2/17/2015	Natural
	3/3/2015	Natural
	3/24/2015	Natural
	4/7/2015	Natural
	4/21/2015	Natural
	5/5/2015	Natural
	5/19/2015	Natural

Sample Location	Date of Sample	Gamma Spectroscopy Result
Blodgett Farm	8/4/2015	<LLD
(continued)	8/18/2015	<LLD
	9/1/2015	Natural
	9/22/2015	Natural
	10/6/2015	Natural
	10/20/2015	Natural
	11/3/2015	Natural
	11/17/2015	Natural
	12/1/2015	Natural
	12/15/2015	Natural
Brattleboro Fire Dept, West	1/6/2015	<LLD
Station	1/21/2015	<LLD
	2/5/2015	<LLD
	2/17/2015	<LLD
	3/3/2015	<LLD
	3/24/2015	<LLD
	4/7/2015	<LLD
	4/21/2015	<LLD
	5/5/2015	<LLD
	5/19/2015	<LLD
	8/4/2015	<LLD
	8/18/2015	<LLD
	9/1/2015	<LLD
	9/22/2015	<LLD
	10/6/2015	<LLD
	10/20/2015	<LLD
	11/3/2015	<LLD
	11/17/2015	<LLD
	12/1/2015	<LLD
	12/15/2015	<LLD
Miller Farm	1/6/2015	Natural
	1/21/2015	Natural
	2/5/2015	Natural
	2/17/2015	Natural
	3/3/2015	Natural
	3/24/2015	Natural
	4/7/2015	Natural
	4/21/2015	Natural

Sample Location	Date of Sample	Gamma Spectroscopy Result
Miller Farm	5/5/2015	Natural
(continued)	5/19/2015	Natural
	8/4/2015	<LLD
	8/18/2015	<LLD
	9/1/2015	Natural
	9/22/2015	Natural
	10/6/2015	Natural
	10/20/2015	Natural
	11/3/2015	Natural
	11/17/2015	Natural
	12/1/2015	Natural
	12/15/2015	Natural
Residence - 1	1/6/2015	Natural
	1/21/2015	Natural
	2/5/2015	Natural
	2/17/2015	Natural
	3/3/2015	Natural
	3/24/2015	Natural
	4/21/2015	Natural
	5/5/2015	Natural
	5/19/2015	Natural
	8/4/2015	<LLD
	8/18/2015	<LLD
	9/1/2015	<LLD
	9/22/2015	Natural
	10/6/2015	Natural
	11/3/2015	Natural
	11/17/2015	<LLD
	12/1/2015	Natural
	12/15/2015	Natural
Vernon Elementary School	1/6/2015	Natural
	1/21/2015	Natural
	2/5/2015	<LLD
	2/17/2015	Natural
	3/3/2015	Natural
	3/24/2015	Natural
	4/7/2015	Natural
	4/21/2015	Natural
	5/5/2015	Natural
	5/19/2015	Natural

Sample Location	Date of Sample	Gamma Spectroscopy Result
Vernon Elementary School	8/4/2015	<LLD
(continued)	8/18/2015	<LLD
	9/1/2015	Natural
	9/22/2015	Natural
	10/6/2015	Natural
	10/20/2015	Natural
	11/3/2015	Natural
	11/17/2015	<LLD
	12/1/2015	<LLD
	12/15/2015	<LLD
Vernon Green Nursing Home	1/6/2015	Natural
	1/21/2015	Natural
	2/5/2015	Natural
	2/17/2015	Natural
	3/3/2015	Natural
	3/24/2015	Natural
	4/7/2015	Natural
	4/21/2015	Natural
	5/5/2015	Natural
	5/19/2015	Natural
	8/4/2015	<LLD
	8/18/2015	<LLD
	9/1/2015	<LLD
	9/22/2015	Natural
	10/6/2015	Natural
	10/20/2015	Natural
	11/3/2015	Natural
	11/17/2015	<LLD
	12/1/2015	Natural
	12/15/2015	<LLD
Main Well	1/22/2015	Natural
PSB Well	1/22/2015	Natural
Southwest Well	1/15/2015	<LLD
	4/15/2015	<LLD
	7/16/2015	<LLD
	10/13/2015	<LLD
< LLD means less than the Laboratory's Lower Limit of Detection		

Appendix D

2015 Hard-to-Detect Water Data

Hard-to-detect metal results for all water samples tested by the Health Department in 2015 are provided in this appendix. Results are presented in alphabetical order by sample location and by sampling date based on the following categories:

- Connecticut River samples
- On-site groundwater monitoring wells
- Off-site drinking water wells
- On-site drinking water wells

Lower limits of detection (LLDs) for water samples:
Iron-55: 20 pCi/L
Nickel-63: 5.0 pCi/L
Strontium-90: 1.0 pCi/L

Sample Location	Date of Sample	Iron-55 Result +/- error (pCi/L)	Nickel-63 Result +/- error (pCi/L)	Strontium-90 Result +/- error (pCi/L)
3-3 Connecticut River Station	2/17/2015	< LLD	< LLD	< LLD
	5/15/2015	< LLD	< LLD	< LLD
	8/13/2015	< LLD	< LLD	< LLD
	11/13/2015	< LLD	< LLD	< LLD
3-4 Connecticut River Station	2/17/2015	< LLD	< LLD	< LLD
	5/15/2015	< LLD	< LLD	< LLD
	8/13/2015	< LLD	< LLD	< LLD
	11/13/2015	< LLD	< LLD	< LLD
3-8 Connecticut River Station	2/17/2015	< LLD	< LLD	< LLD
	5/15/2015	< LLD	< LLD	1.06 +/- 0.42
	8/13/2015	< LLD	< LLD	< LLD
	11/13/2015	< LLD	< LLD	< LLD
Connecticut River, Downstream	5/5/2015	< LLD	< LLD	< LLD
	8/4/2015	< LLD	< LLD	< LLD
	11/3/2015	< LLD	< LLD	< LLD
Connecticut River, Upstream	5/5/2015	< LLD	< LLD	< LLD
	8/4/2015	< LLD	< LLD	< LLD
	11/3/2015	< LLD	< LLD	< LLD
Discharge Forebay	2/17/2015	< LLD	< LLD	< LLD
	5/15/2015	< LLD	< LLD	< LLD
	8/13/2015	< LLD	< LLD	< LLD
	11/13/2015	< LLD	< LLD	< LLD
GZ-01	2/8/2015	< LLD	< LLD	< LLD
	5/5/2015	< LLD	< LLD	< LLD
	8/3/2015	< LLD	< LLD	< LLD
	11/2/2015	< LLD	< LLD	< LLD
GZ-02	2/12/2015	< LLD	< LLD	< LLD
	5/7/2015	< LLD	< LLD	< LLD
	8/4/2015	< LLD	< LLD	1.02 +/- 0.43
GZ-03	2/19/2015	< LLD	< LLD	< LLD
	5/5/2015	< LLD	< LLD	< LLD
	8/3/2015	< LLD	< LLD	< LLD
GZ-04	5/5/2015	< LLD	< LLD	< LLD
	8/5/2015	< LLD	< LLD	< LLD
	11/2/2015	< LLD	< LLD	< LLD
GZ-05	2/18/2015	< LLD	< LLD	< LLD
	5/5/2015	< LLD	< LLD	< LLD
	8/5/2015	< LLD	< LLD	< LLD
	11/2/2015	< LLD	< LLD	< LLD
GZ-06	2/19/2015	< LLD	< LLD	< LLD
	5/7/2015	< LLD	< LLD	< LLD
	8/4/2015	< LLD	< LLD	< LLD
GZ-07	2/11/2015	< LLD	< LLD	< LLD
	5/7/2015	< LLD	< LLD	< LLD
	8/4/2015	< LLD	< LLD	< LLD
	11/2/2015	< LLD	< LLD	< LLD
GZ-09	2/19/2015	< LLD	< LLD	< LLD
	5/7/2015	< LLD	< LLD	< LLD
	8/4/2015	< LLD	< LLD	< LLD
	11/3/2015	< LLD	< LLD	< LLD

Sample Location	Date of Sample	Iron-55 Result +/- error (pCi/L)	Nickel-63 Result +/- error (pCi/L)	Strontium-90 Result +/- error (pCi/L)
GZ-10	2/5/2015	< LLD	< LLD	< LLD
	5/7/2015	< LLD	< LLD	< LLD
	8/5/2015	< LLD	< LLD	2.66 +/- 0.77
	11/2/2015	< LLD	< LLD	< LLD
GZ-11	2/11/2015	< LLD	< LLD	< LLD
	5/7/2015	< LLD	< LLD	< LLD
	8/4/2015	< LLD	< LLD	2.60 +/- 0.77
	11/3/2015	< LLD	< LLD	< LLD
GZ-12D	2/10/2015	< LLD	< LLD	< LLD
	5/6/2015	< LLD	< LLD	< LLD
	8/4/2015	< LLD	< LLD	< LLD
GZ-12S	2/10/2015	< LLD	< LLD	< LLD
	5/5/2015	< LLD	< LLD	< LLD
	8/4/2015	< LLD	< LLD	< LLD
GZ-13D	2/11/2015	< LLD	< LLD	< LLD
	5/6/2015	< LLD	< LLD	< LLD
	8/4/2015	< LLD	< LLD	< LLD
	11/3/2015	< LLD	< LLD	< LLD
GZ-13S	2/11/2015	< LLD	< LLD	1.21 +/- 0.44
	5/6/2015	< LLD	< LLD	< LLD
	8/5/2015	< LLD	< LLD	< LLD
GZ-14D	3/4/2015	< LLD	< LLD	< LLD
	5/7/2015	< LLD	< LLD	< LLD
	8/3/2015	< LLD	< LLD	< LLD
GZ-14S	3/4/2015	< LLD	< LLD	1.13 +/- 0.41
	5/5/2015	< LLD	< LLD	< LLD
	8/3/2015	< LLD	< LLD	< LLD
GZ-15	2/5/2015	< LLD	< LLD	< LLD
	5/7/2015	< LLD	< LLD	< LLD
	8/5/2015	< LLD	< LLD	< LLD
GZ-16	2/12/2015	< LLD	< LLD	1.75 +/- 0.57
	5/7/2015	< LLD	< LLD	1.24 +/- 0.52
	8/4/2015	< LLD	< LLD	1.33 +/- 0.48
GZ-17	2/12/2015	< LLD	< LLD	< LLD
	5/7/2015	< LLD	< LLD	< LLD
	8/4/2015	< LLD	< LLD	1.49 +/- 0.53
	11/4/2015	< LLD	< LLD	< LLD
GZ-18D	2/11/2015	< LLD	< LLD	< LLD
	5/6/2015	< LLD	< LLD	< LLD
	8/4/2015	< LLD	< LLD	2.00 +/- 0.63
	11/3/2015	< LLD	< LLD	< LLD
GZ-18S	2/11/2015	< LLD	< LLD	2.89 +/- 0.81
	5/6/2015	< LLD	< LLD	1.34 +/- 0.49
	8/4/2015	< LLD	< LLD	2.33 +/- 0.72
GZ-19D	2/5/2015	< LLD	< LLD	< LLD
	5/7/2015	< LLD	< LLD	< LLD
	8/4/2015	< LLD	< LLD	2.10 +/- 0.66
	11/2/2015	< LLD	< LLD	< LLD

Sample Location	Date of Sample	Iron-55 Result +/- error (pCi/L)	Nickel-63 Result +/- error (pCi/L)	Strontium-90 Result +/- error (pCi/L)
GZ-19S	2/5/2015	< LLD	< LLD	< LLD
	5/7/2015	< LLD	< LLD	< LLD
	8/4/2015	< LLD	< LLD	< LLD
	11/2/2015	< LLD	< LLD	< LLD
GZ-20	2/11/2015	< LLD	< LLD	< LLD
	5/7/2015	< LLD	< LLD	< LLD
	8/5/2015	< LLD	< LLD	< LLD
	11/3/2015	< LLD	< LLD	< LLD
GZ-21	2/11/2015	< LLD	< LLD	< LLD
	5/7/2015	< LLD	< LLD	< LLD
	8/5/2015	< LLD	< LLD	< LLD
GZ-22D	1/5/2015	< LLD	< LLD	1.16 +/- 0.42
	2/10/2015	< LLD	< LLD	< LLD
	3/2/2015	< LLD	< LLD	< LLD
	4/3/2015	< LLD	< LLD	< LLD
	5/5/2015	< LLD	< LLD	< LLD
	6/2/2015	< LLD	< LLD	< LLD
	7/2/2015	< LLD	< LLD	< LLD
	8/3/2015	< LLD	< LLD	< LLD
	9/1/2015	< LLD	< LLD	< LLD
GZ-23S	1/5/2015	< LLD	< LLD	< LLD
	2/5/2015	< LLD	< LLD	< LLD
	3/2/2015	< LLD	< LLD	< LLD
	4/3/2015	21.0 +/- 11.0	< LLD	< LLD
	5/5/2015	< LLD	< LLD	< LLD
	6/2/2015	< LLD	< LLD	< LLD
	7/2/2015	< LLD	< LLD	< LLD
	8/3/2015	< LLD	< LLD	< LLD
	9/1/2015	< LLD	< LLD	< LLD
GZ-25S	2/5/2015	< LLD	< LLD	< LLD
	5/5/2015	< LLD	< LLD	< LLD
	6/2/2015	< LLD	10.3 +/- 6.0	< LLD
	7/2/2015	< LLD	< LLD	< LLD
	8/3/2015	< LLD	< LLD	< LLD
	9/1/2015	< LLD	< LLD	< LLD
	10/27/2015	< LLD	< LLD	< LLD
	11/2/2015	< LLD	< LLD	< LLD
GZ-26S	2/5/2015	< LLD	< LLD	< LLD
	5/5/2015	< LLD	< LLD	< LLD
	6/2/2015	< LLD	< LLD	< LLD
	7/2/2015	< LLD	< LLD	< LLD
	8/3/2015	< LLD	< LLD	< LLD
	9/1/2015	< LLD	< LLD	< LLD
	10/27/2015	< LLD	< LLD	< LLD
	11/2/2015	< LLD	< LLD	< LLD
GZ-27S	2/5/2015	< LLD	< LLD	< LLD
	5/5/2015	< LLD	< LLD	< LLD
	6/2/2015	< LLD	< LLD	< LLD
	7/2/2015	< LLD	< LLD	1.32 +/- 0.54
	8/3/2015	< LLD	< LLD	< LLD
	9/1/2015	< LLD	< LLD	< LLD
	10/27/2015	< LLD	< LLD	< LLD
	11/2/2015	< LLD	< LLD	< LLD

Sample Location	Date of Sample	Iron-55 Result +/- error (pCi/L)	Nickel-63 Result +/- error (pCi/L)	Strontium-90 Result +/- error (pCi/L)
WVN0201	2/18/2015	< LLD	< LLD	< LLD
	5/18/2015	< LLD	< LLD	< LLD
	8/6/2015	< LLD	< LLD	< LLD
	11/18/2015	< LLD	< LLD	< LLD
WVN0202	2/18/2015	< LLD	< LLD	< LLD
	5/18/2015	< LLD	< LLD	< LLD
	8/6/2015	< LLD	< LLD	< LLD
	11/18/2015	< LLD	< LLD	< LLD
WVN0203	2/18/2015	< LLD	< LLD	< LLD
	5/18/2015	< LLD	< LLD	< LLD
	8/6/2015	< LLD	< LLD	< LLD
	11/5/2015	< LLD	< LLD	< LLD
WVN0204	2/18/2015	20.2 +/- 9.5	< LLD	< LLD
	5/18/2015	< LLD	< LLD	< LLD
	8/6/2015	< LLD	< LLD	< LLD
	11/5/2015	< LLD	< LLD	< LLD
Blodgett Farm	2/5/2015	< LLD	< LLD	< LLD
	5/5/2015	< LLD	< LLD	< LLD
	8/4/2015	< LLD	< LLD	< LLD
	11/3/2015	< LLD	< LLD	< LLD
Brattleboro Fire Department, West Station	2/5/2015	< LLD	< LLD	< LLD
	5/5/2015	< LLD	< LLD	< LLD
	8/4/2015	< LLD	< LLD	< LLD
	11/3/2015	< LLD	< LLD	< LLD
Miller Farm	2/5/2015	< LLD	< LLD	< LLD
	5/5/2015	< LLD	< LLD	< LLD
	8/4/2015	< LLD	< LLD	< LLD
	11/3/2015	< LLD	< LLD	< LLD
Residence - 1	2/5/2015	< LLD	< LLD	< LLD
	5/5/2015	< LLD	< LLD	< LLD
	8/4/2015	< LLD	< LLD	< LLD
	11/3/2015	< LLD	< LLD	< LLD
Vernon Elementary School	2/5/2015	< LLD	< LLD	< LLD
	5/5/2015	< LLD	< LLD	< LLD
	8/4/2015	< LLD	< LLD	< LLD
	11/3/2015	< LLD	< LLD	< LLD
Vernon Green Nursing Home	2/5/2015	< LLD	< LLD	< LLD
	5/5/2015	< LLD	< LLD	< LLD
	8/4/2015	< LLD	< LLD	< LLD
	11/3/2015	< LLD	< LLD	< LLD
Southwest Well	1/15/2015	< LLD	< LLD	< LLD
	4/15/2015	< LLD	< LLD	< LLD
	7/16/2015	< LLD	< LLD	< LLD
	10/3/2015	< LLD	< LLD	< LLD
	10/13/2015	< LLD	< LLD	< LLD
pCi/L = picocuries per liter				