Surveillance*2007*

Vermont Yankee Nuclear Power Station

Report on Public Health Monitoring
June 30, 2008

VERMONT
DEPARTMENT OF HEALTH
Agency of Human Services

108 Cherry Street, PO Box 70
Burlington, VT 05402
1.802.863.7341
healthvermont.gov

Table of Contents

Executive Summary

This 2007 Vermont Yankee Nuclear Power Station Surveillance Report is the most recent such report. Similar reports have been compiled annually by the Vermont Department of Health since 1971. Over the years the annual report has expanded from a small number of surveys in 1971 to the more than 1,300 different measurements of the air, water, milk, soil, vegetation, sediment and fish the Vermont Department of Health obtained for this current report.

Environmental surveillance helps verify that Vermont Yankee is operating in compliance with Department of Health regulations designed to protect the health and safety of Vermonters. Should measurements indicate a lack of compliance, the station is notified, an investigation is undertaken to determine if the measurements are accurate, and, if so, remedial actions are taken to prevent recurrence. Overall, the Department of Health found no issues of non-compliance in its environmental surveillance of Vermont Yankee in 2007.

Direct gamma radiation measurements taken by the Department of Health deserve special comment. Department dosimeters measure direct gamma radiation levels in the environment. Some of the radiation energy to which we are exposed is not absorbed by the body. In fact, for radiation energy levels such as those near Vermont Yankee, the human body absorbs about 60 percent of it as radiation dose. In 2007, Oak Ridge Associated Universities recommended that the Department of Health convert radiation exposure as measured by the dosimeters to biological dose using this factor of 60 percent. Using this recommended exposure to dose conversion factor, the Vermont Department of Health limits were not exceeded in 2007. More discussion of this is provided in the Direct Gamma Radiation chapter.

The many samples and measurements of the environment around Vermont Yankee provide evidence that no significant adverse health effects from radiological exposures are likely from the operation of the Station. To further investigate this, we publish statistics regarding specific potential adverse health effects for people who live near the Station in this report. These statistics show that cancer incidence and cancer mortality rates in the communities around Vermont Yankee did not differ significantly from those in the rest of Windham County or Vermont as a whole.

A summary table of environmental surveillance results is found in the Introduction chapter, and detailed presentations of the sampling methods and data are in the rest of the report. The information is sometimes complex, and we invite all who read this report to contact the radiological health staff at the Vermont Department of Health to answer any questions they may have.

Introduction

Environmental surveillance of Vermont Yankee Nuclear Power Station is important. This report profiles the radiological conditions around Vermont Yankee using samples and measurements in the communities surrounding the station. In reviewing the data tabulated here, you will find comparisons of some 2007 results to long-term historical trends. With the exception of direct gamma radiation as measured at the site boundary, these comparisons show no significant increased radiological exposures due to Vermont Yankee Nuclear Power Station operations.

As documented in the Oak Ridge Associated Universities Report of January 2007, past Vermont Department of Health reports of direct gamma radiation doses at the Vermont Yankee site boundary or fence line have been overstated by reporting the dosimeter measurement without applying an exposure to dose equivalent conversion factor. This is important to note given that exposures and calculated doses around Vermont Yankee have increased as a result of Extended Power Uprate and corrosion control practices. The Department concurs with the Oak Ridge Associated Universities Report recommendation and applies the recommended conversion factor to the 2007 exposure data as part of its analysis of direct gamma radiation at the site boundary or fence line.

This Report also contains results that are compared to background levels. Background levels, in this case, are the levels of radioactivity in the air, water and earthen materials not attributable to Vermont Yankee Nuclear Power Station. Some background measurements were obtained in Windham County, while others were obtained in other parts of Vermont. Measurements around Vermont Yankee that are significantly above the normal range of background may generally be attributed to the station, other uses of radioactivity in the measurement area, and/or changing meteorological conditions. The report also includes maps that show the locations where samples are collected or where measurements are made.

All of the measurements in this report are presented at the 95 percent confidence level. This means we are 95 percent certain (not due to chance alone) that the results lie within two standard deviations on either side of the mean. The mean is the reported result, usually found in the tables next to the location identifier, and the uncertainty, often called the error, is the plus or minus factor associated with that result. The error is usually found in the column immediately next to the mean result in the tables.

Some samples and measurements are being collected or made continuously. Other samples are taken periodically. With one exception, all of the samples are analyzed by the Vermont Department of Health Laboratory in Burlington, Vermont. Measurements of direct gamma radiation exposures using thermoluminescent dosimeters are analyzed by National Voluntary Laboratory Accreditation Program vendors. You will find the results of all of these samples and measurements in this report:

- The direct gamma radiation emanations as measured continuously at dozens of thermoluminescent dosimeter (TLD) sites.
- The amount and identity of radioactive particulates and radioactive iodine that may be found in the air as collected with numerous continuous air samplers.
- Water from wells and waterways surrounding the plant and milk from local dairy farms that are sampled every month to determine the amount and identity of natural and man-made radioactivity within them.
- Various wild and cultivated vegetation, river bed sediments, fish and soils that are sampled at least twice annually, and analyzed for man-made and naturally occurring radioactivity.

With regard to environmental surveillance, 2007 was notable for two reasons. First, it was the first full year within which Vermont Yankee operated in Extended Power Uprate. Second, it was the first year within which many improvements were fully incorporated into the Vermont Department of Health monitoring of direct gamma radiation exposures and public doses at Vermont Yankee.

The Effects of Extended Power Uprate

Extended Power Uprate, operating the reactor, turbine and generator systems at 120 percent of originally licensed levels, was initiated in early 2006. It was known that operating the plant at Extended Power Uprate would increase direct gamma radiation levels everywhere on and near the plant site. Before Extended Power Uprate was authorized by the United States Nuclear Regulatory Commission and the Vermont Pubic Service Board, it was calculated that radiation levels would increase 26 percent with Extended Power Uprate. After operating at Extended Power Uprate for a full year, it was determined that actual increases for the year 2007 were about 30 percent.

So, why did a 20 percent increase in power increase direct gamma radiation levels by more than an equal 20 percent? One reason is the simple fact that predictions, no matter how thoroughly made, are rarely equal to actual results. Another answer to this question is found in Vermont Yankee's reactor coolant water chemistry. Specifically, like other nuclear power plants, Vermont Yankee injects hydrogen into and adds noble metals to the reactor coolant system to help prevent corrosion in plant systems and components. The operators of Vermont Yankee Nuclear Power Station began injecting hydrogen and adding noble metals into the reactor coolant system after the 2001 refueling outage. Hydrogen injection prevents corrosion by scavenging oxygen from the reactor coolant. Oxygen is essential to corrosion. The addition of noble metals into the reactor coolant inhibits corrosion by forming a protective layer on the inside of reactor coolant components with metals that resist corrosion. Noble metals include gold, silver, tantalum and palladium.

A side effect of hydrogen injection and noble metals chemistry in a nuclear reactor is increased radiation levels. Nuclear reactor coolant radiochemistry is complicated, and it is unnecessary to go into details here, but the general effect of the two processes is an increased production of nitrogen-16 or ^{16}N. Nitrogen-16 is a radioactive isotope of non-radioactive nitrogen. Nitrogen is a primary element in air, in water that contains air, and

in systems that circulate water through power plants, including reactor coolant water. It may also be formed by a nuclear reaction with oxygen in water. Nitrogen-16 is also the predominant radioactive material contributing to general public doses from Vermont Yankee nuclear operations because it emits very high energy gamma radiations. The energy levels are high enough to cause measurable public doses outside the Vermont Yankee site boundary.

With increased nitrogen-16 production due to hydrogen injection and noble metals chemistry and a 120 percent reactor power increase with Extended Power Uprate, one result was a thirty percent increase in radiation levels at the plant, including at the site boundary, the fence line and other nearby public locations. The effects of Extended Power Uprate, hydrogen injection and noble metals chemistry had never been observed for a full year at Vermont Yankee until 2007. The three factors combined to increase radiation levels significantly over levels measured in previous years. These combined effects will be seen as long as Vermont Yankee operates under these conditions.

Improvements in Vermont Yankee Direct Gamma Radiation Monitoring

The second important development was the incorporation of improvements into the methods for determining public doses from the measured exposures of direct gamma radiation at Vermont Yankee. Some of these improvements were recommendations of the Oak Ridge Associated Universities report published in 2007. This report was written after more than a year of investigation by technical experts working for the Vermont Department of Health. The report, *An Evaluation of Direct Gamma Dose at the Site Boundary of the Vermont Yankee Nuclear Power Station*, may be accessed at the Department of Health web site, at the following web address:

http://healthvermont.gov/enviro/rad/yankee/013107Site%20BoundaryEvaluation.pdf

Even before the Oak Ridge Associated Universities Report, the Vermont Department of Health began improving its direct gamma radiation measurement methods, and some of these were reported in the 2006 Environmental Surveillance Report. For example, in 2006, the Department of Health stopped using just two dosimeter sites to calculate direct gamma radiation background. Instead, background was determined using the mean of 34 different dosimeter sites. These sites are in parts of Windham County unaffected by Vermont Yankee operations, and the Department has been taking measurements of direct gamma radiation there for many years. A general rule in statistics is that your estimate of the true value of the mean (average) for any real population is better estimated with a larger sample size. Thus, the background we calculate using 34 dosimeter sites is more likely closer to the true background than that calculated using two dosimeter locations.

Another effort begun in 2006 was a comparison of different dosimeter vendors. Over eleven months in 2006 and 12 months in 2007, the Vermont Department of Health deployed the dosimeters of two different vendors. Through this process we determined that one dosimeter vendor has preferable qualities as compared to the other and the Department will use only the dosimeters of the selected vendor beginning in 2008. One particular quality we prefer is how the chosen vendor reports only exposures recorded while the dosimeters are in place in the field. The other vendor reports exposures from the time the dosimeters leave their facility. We also prefer the selected vendor's treatment of potential errors in the various steps of dosimeter deployment, retrieval and processing activities. It should be pointed out that the measurements of exposure for 2007 from the selected vendor's dosimeters were higher than those of the vendor.

One other improvement is very important. In prior years, the Vermont Department of Health measurements of site boundary dose were compared to a limit expressed with uncertainty. In particular, past statements by the Department indicated that the annual limit for direct gamma radiation was 20 plus or minus 5 millirem. The Department of Health will no longer use this approach. Uncertainty will not be expressed as part of the

limit, but as a part of the measurements. Beginning in 2008, the Department will use a hard and fast 20 millirem per year as the direct gamma radiation dose limit.

Another improvement incorporated in 2006 before the Oak Ridge Associated Universities Report is in the propagation of error. This is a mathematical process that more accurately accounts for the uncertainty of multiple time-dependent measurements that are added together as is the case for the annual summation of quarterly doses. If you would like further explanation of the propagation of error, please contact our office.

Of the Oak Ridge Associated Universities Report recommendations, the use of a dose conversion factor is among the most significant. As noted above, the Department concurs with this recommendation and in this report is applying the conversion factor in its analysis of the direct gamma radiation exposures at the site boundary. In adopting this recommendation, the Department determined that it is appropriate to also apply the conversion factor in its analysis of all direct gamma or x-ray radiation exposures. Therefore, in addition to Vermont Yankee, the Department is also applying the conversion factor to other entities such as the medical, dental and industrial X-ray registrants whom the Department of Health regulates. In applying the conversion factor, the Department reports exposures to radiation in milliroentgen, and we report biological doses to radiation in millirem. Doses in millirem were calculated using the guidance for energy specific dose conversion factors in *American National Standards Institute Standard ANSI/ANS-6.1.1-1991, Neutron and Gamma-ray Fluence-to-dose factors.*

These dose conversion factors account for the fact that human dose from an agent is not equal to the amount measurable in the environment to which they are exposed. As an example, consider exposure to another form of radiation - heat. If you are exposed to a temperature of 50 degrees Celsius, about 122 degrees Fahrenheit, your actual body temperature does not increase to 50º C. Your dose is like the actual body temperature your body rises to in response to being exposed to 50º C. In particular, your core body temperature may increase only 1º C for every 25º C increase in ambient temperature.

In the same way, when we are exposed to 20 milliroentgen of direct gamma radiation, our actual dose from that exposure is less. For the gamma radiation energies near the Vermont Yankees site boundary, the dose conversion factor is 0.60. Our bodies absorb a dose of about 0.60 millirem for each milliroentgen exposure. To put it another way, 20 milliroentgen of direct gamma radiation exposure leads to approximately 12 millirem of radiation dose. As such, starting with this 2007 report, the thermoluminescent dosimeter measurements of exposure around Vermont Yankee are being converted to dose using this 0.60 conversion factor. At least for this year, we will report both the unconverted exposure and the converted dose.

As mentioned above, the use of a conversion factor is appropriate for all our determinations of dose. In 2007, the Vermont Department of Health also started using the ANSI/ANS-6.1.1-1991 dose conversion factors for its report of occupational and patient doses from exposures to medical and dental x-rays. We will apply these conversion factors in all of our exposure and dose determinations for radiological surveillance activities in the future.

The ANSI/ANS-6.1.1-1991 exposure to dose conversion factor is just one of the many recommendations made in the Oak Ridge Associated Universities Report. Some recommendations will be adopted in our efforts to continually improve our processes. In addition to recommendations to the Vermont Department of Health, the report made recommendations to Vermont Yankee Nuclear Power Station. The station has also begun to implement improvements to its direct gamma radiation exposure assessment processes. One is a new determination of the direct gamma radiation characteristics under Extended Power Uprate and as effected by installation of the new turbine shield. Another is the development of methods to better account for changes in site boundary exposures and doses with low level and high level radioactive waste storage and other operations onsite.

Returning to the report as a whole, the samples, measurements and equipment used in the Vermont Department of Health environmental surveillance program help establish baseline values of radioactivity in the region around the Station. These baselines help us recognize measurements outside the expected range, and allow comparisons when conditions warrant them. The surveillance equipment pre-positioned in this region may also be useful in emergency responses. In the event of an unexpected release from the Station, the Department of Health air samplers and thermoluminescent dosimeters may help us determine the extent of human exposure and contamination of our environment.

This report also describes valuable expertise and capabilities of the Vermont Department of Health Laboratory and its scientific staff. Vermonters are served well by the staff and other resources there that allow the Health Department to conduct rigorous testing. All radiological analyses of the laboratory are subject to high levels of quality control as tested both from within the lab, and by outside organizations.

The entire report is published at the Vermont Department of Health web site www.healthvermont.gov. Should you have questions about the content, please call the Vermont Department of Health Radiological Health Program at 802-865-7730.

Program Results Summary

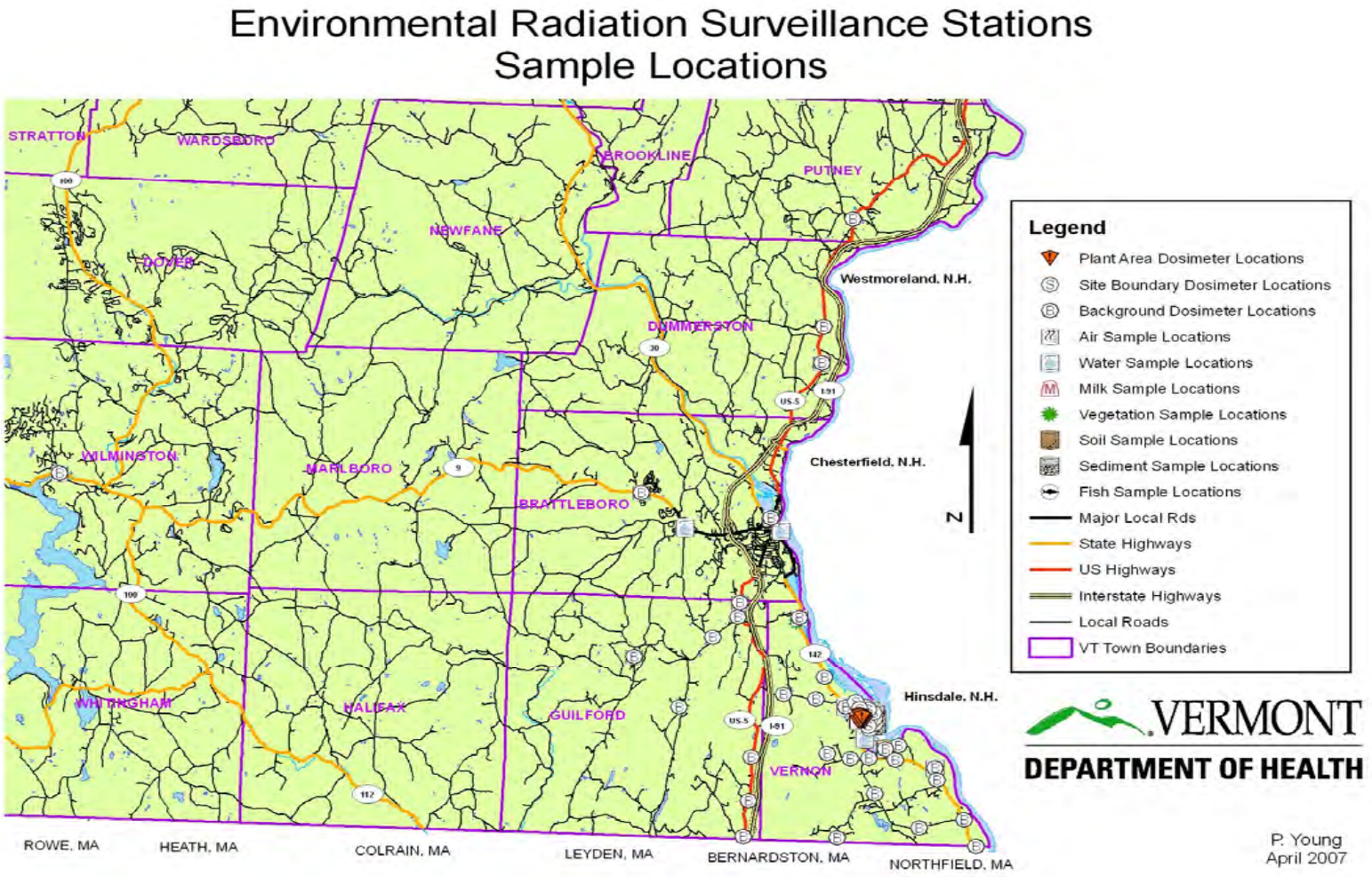
The number of samples and analyses in the Vermont Department of Health environmental surveillance program for the Vermont Yankee Nuclear Power Station is indicative of a significant commitment to evaluating compliance with Department of Health regulations and protecting public health. Table 1 indicates the number of sample types, the number of measurements or sample collection locations, the total number of samples collected, the analysis types and the overall results for each sample type. Maps 1 and 2 display the specific locations of the sampling. More detailed discussion about the sample results comprises the bulk of this report.

With each discussion are tables that show the results and map location identification numbers. Some maps are more easily viewed on the Vermont Department of Health web site, where they can be enlarged. This is especially true of Map 1, where all the sample locations and types are depicted. The printed version does not show them as clearly as the individual maps for the different sample types later in the report. You can view this report and all of the maps at http://healthvermont.gov/.

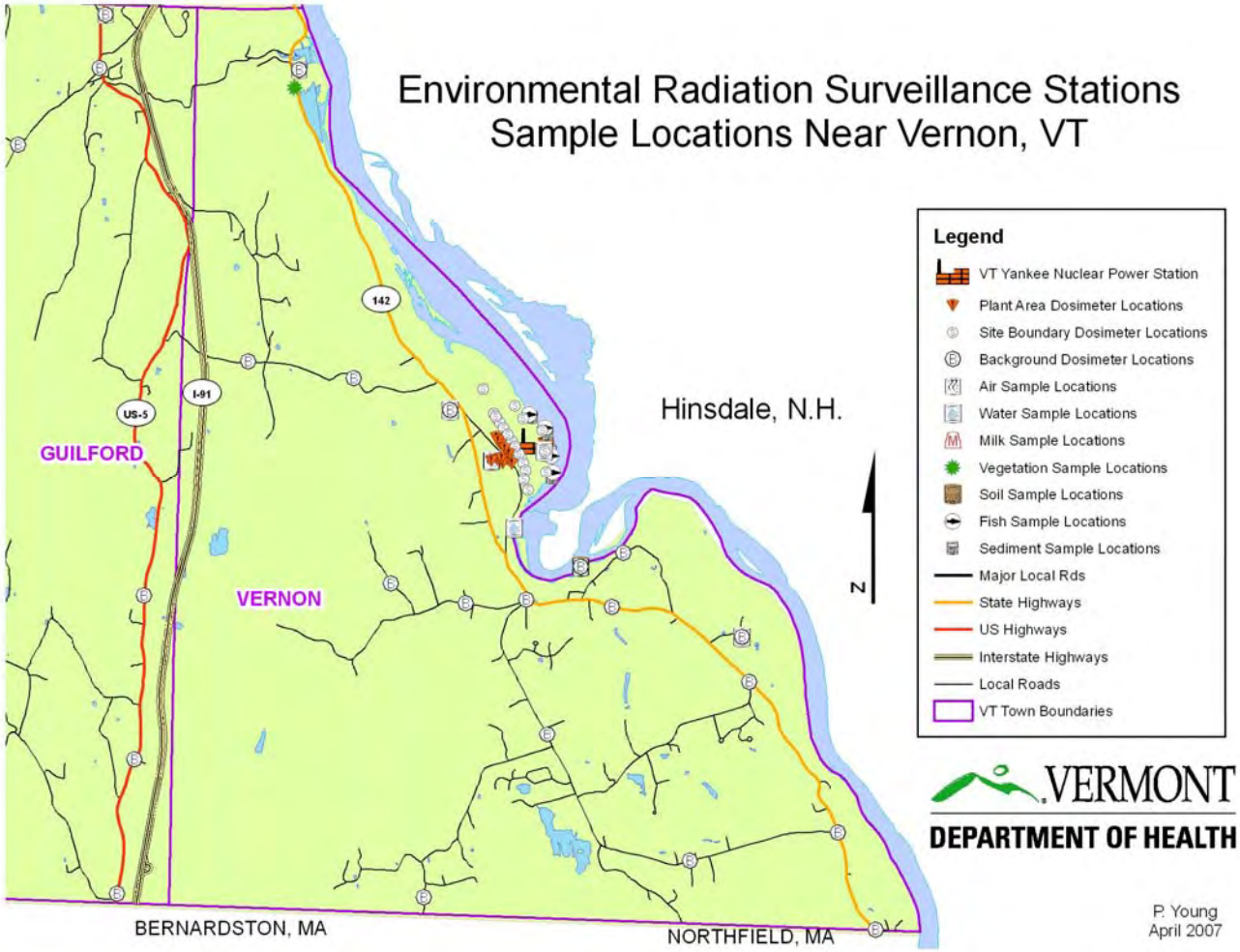
Table 1. Summary of 2007 Samples, Analyses and Results

Sample Type	Locations	Samples	Analysis Type	Results
Direct Gamma Radiation	71	284	Thermoluminescent Dosimeter	Less than the dose limits of 10 millirem per calendar quarter and 20 millirem per calendar year
Air Particulates, Gases,Vapors	9	108	Total Alpha Radioactivity	Within historical range; mean results near VYNPS similar to those further from VYNPS
		108	Total Beta Radioactivity	Within historical range; mean results near VYNPS similar to those further from VYNPS
		108	Iodine-131 Radioactivity	All samples less than lower limit of detection of 0.00 38 pCi/m^3
		108	Total Gamma Radioactivity	All detected gamma radioactivity of natural origin
		4	Total Particulate Gamma Radioactivity	All detected gamma radioactivity of natural origin
Water	13	120	Total Alpha Radioactivity	Within historical range; mean results near VYNPS similar to those further from VYNPS
		120	Total Beta Radioactivity	Within historical range; mean results near VYNPS similar to those further from VYNPS
		120	Tritium Radioactivity	All samples less than the lower limit of detection of 300 pCi/l
		120	Total Gamma Radioactivity	All detected gamma radioactivity of natural origin
		9	Radium-226 Radioactivity	All samples well below EPA action levels of 5 pCi/l
		9	Radium-228 Radioactivity	All samples well below EPA action levels of 5 pCi/l
		6	Uranium Radioactivity	All samples well below VT limit of 20 mg/l
Milk	2	11	Iodine-131 Radioactivity	All samples less than the lower limit of detection of 2.53 pCi/l
		11	Total Gamma Radioactivity	All detected gamma radioactivity of natural origin
Vegetation	11	18	Total Gamma Radioactivity	All of natural, Chernobyl or nuclear weapons testing origin
Soil	14	14	Total Gamma Radioactivity	All of natural, Chernobyl or nuclear weapons testing origin
River Sediments	18	36	Total Gamma Radioactivity	All of natural, Chernobyl or nuclear weapons testing origin
Fish	4	4	Total Gamma Radioactivity	All detected gamma radioactivity of natural origin
Totals	142	1318		

Map 1. All Samples, All Locations



Map 2. All Samples in Vernon, Vermont



Ionizing Radiation Risks

The radiations to which people may be exposed as a result of Vermont Yankee Nuclear Power Station operations are called ionizing radiations. According to the International Agency for Research on Cancer, ionizing radiation is a known human carcinogen. Cancer may result from exposure to ionizing radiation because the energy absorbed may directly or indirectly damage the DNA of human cells. DNA damage is a general requirement of carcinogenesis.

It has been clearly demonstrated that at high doses, generally in excess of 10 rem or 10,000 millirem (1 rem = 1,000 millirem), people exposed have a statistically higher risk of cancer as compared to people incurring to lower doses. As with other carcinogens, it is impossible to prove that low doses are without risk. With radiation exposure, it is assumed that no dose is without risk. Still, at very low doses such as those reported here, the risk of developing cancer is considered very low, if it exists at all.

The risk management approach used for public health protection with carcinogenic agents is precautionary. In the field of radiation protection, this precautionary approach is called the ALARA principle. Every reasonable effort must be made to maintain exposures and doses *As Low As Reasonably Achievable*. The Vermont Department of Health regulations not only require that exposures to ionizing radiation be less than specific limits, but also that users of ionizing radiation - in all forms of industry, medicine and education - maintain exposures as low as reasonably achievable. More about ionizing radiation risk may be found at these websites:

The National Academies of Science:
http://books.nap.edu/openbook.php?isbn=030909156X.

The Health Physics Society: http://hps.org/documents/risk_ps010-1.pdf

The International Agency for Research on Cancer, their complete series of monographs on carcinogenic agents: http://monographs.iarc.fr/ENG/Monographs/allmonos90.php

With the Surveillance 2006 Report on Public Health Monitoring published in 2007, the Vermont Department of Health began presenting information about certain health outcomes in the vicinity of Vermont Yankee. Environmental sampling is important in determining compliance with regulations and verifying that radioactivity and radiation exposures remain at or near background levels. Assessments of the health of people living near the Power Station helps us understand the actual health impacts. Working with the Department of Health Cancer Registry and the Department of Health Vital Records Office, some initial information about the health of people in Windham County and in the six towns nearest Vermont Yankee Nuclear Power Station is presented below.

Considering the primary concern about chronic low level exposure to ionizing radiation is cancer, the first health outcomes being summarized are cancer incidence (new cancer cases diagnosed) and cancer mortality (people dying from cancer). Later reports may present investigations of other health outcomes.

Cancer is, unfortunately, very common. Roughly one out of every two men and one out of every three women will develop cancer in their lifetime.

The source of the information in Table 2 is the Vermont Department of Health Cancer Registry. It was updated as of June 5, 2008. The incidence rates are for all cancers, for invasive thyroid cancers, for leukemia and for childhood (pediatric) cancers for the years 1995 - 2004. More information about cancer rates in Vermont may be found at: http://healthvermont.gov/pubs/cancerpubs/cancer_in_vermont.aspx

The data in Table 2 indicate that, for all cancer types combined, for invasive thyroid cancer and for leukemia, the rate of cancer incidence in the six towns near Vermont Yankee Nuclear Power Station (Brattleboro, Dummerston, Guilford, Halifax, Marlboro

and Vernon) is lower as compared to rates in Windham County, and in the rest of Vermont and the United States white population as a whole. The incidence rates for pediatric cancers in the six towns could not be calculated as there were too few cases (less than 6) over the time period studied. The pediatric cancer incidence rate in Windham County, however, was calculated and it is lower than that in Vermont and the United States white population as a whole. Similar results were seen in the incidence rates in last year's report which covered the five year period 1994 - 2003.

Thyroid cancers and leukemia are of particular interest because increased risk may be associated with excess radiation exposure. There is no evidence of excessive radiation exposure in these geographic areas, but the focus on these kinds of cancers remains useful. Pediatric cancers are important because radiation health effects are generally more likely when individuals are exposed prenatally or at an early age. The embryo or fetus is most radiosensitive.

Table 2. Cancer Incidence Rates Near VYNPS, in Vermont and in U.S.

VERMONT
DEPARTMENT OF HEALTH

Vermont Cancer Registry

Vermont and U.S. Cancer Incidence, All Sites, Males and Females, 1995 – 2004 (Urinary Bladder includes malignant and in situ)

	Rate	Lower CI	Upper CI	Avg. cases per year
U.S. White	488.8	487.9	489.8	101263
Vermont	493.4	487.9	498.9	3078
Windham County	470.3	451.2	490.1	230
Emergency Zone	427.1	400.4	455.4	97

Vermont and U.S. Cancer Incidence, Invasive Thyroid Cancer, Males and Females, 1995-2004

	Rate	Lower CI	Upper CI	Avg. cases per year
U.S. White	8.2	8.0	8.3	1707
Vermont	7.2	6.6	7.9	45
Windham County	6.2	4.2	9.0	3
Emergency Zone	5.5	2.8	10.0	1

Vermont and U.S. Cancer Incidence, Leukemia, Males and Females, 1995-2004

	Rate	Lower CI	Upper CI	Avg. cases per year
U.S. White	13.5	13.3	13.7	2791
Vermont	13.4	12.5	14.4	82
Windham County	14.1	10.9	18.0	7
Emergency Zone	9.7	6.1	15.1	2

Vermont and U.S. Cancer Incidence, Pediatric Cancers (< Age 20), Males and Females, 1995-2004 (Urinary Bladder includes malignant and in situ)

	Rate	Lower CI	Upper CI	Avg. cases per year
U.S. White	17.4	17.1	17.8	966
Vermont	17.6	15.6	19.8	29
Windham County	15.7	9.3	25.0	2
Emergency Zone	--	--	--	--

-- Rates are only presented when the number of cases is greater than 6. All rates are age adjusted to the 2000 U.S. standard population.

In Table 3, mortality rates from cancer in the United States (U.S. white rate), Vermont, Windham County and the six towns near Vermont Yankee Nuclear Power Station are presented for the ten years 1996 - 2005. The Vermont data are from the Vermont Department of Health's Vital Statistics System, last updated in June 2008, and the U.S. data were taken from the Surveillance, Epidemiology, and End Results (SEER) Program at the National Cancer Institute at www.seer.cancer.gov . The data in this table indicate there are no statistical differences in the death rates from malignant neoplasms, leukemia, thyroid cancer and pediatric cancer (ages 0 – 19 malignant neoplasms) among the six towns near Vermont Yankee and Windham County, Vermont and the United States (U.S. white population) as a whole.

It is important to note that in several cases, cancer incidence and cancer mortality rates in the United States, Vermont, Windham County and the six towns near Vermont Yankee Nuclear Power Station are not statistically different. So characterizations that one population is at more risk or at less risk as compared to another are not valid. It is clear, however, that for the years 1996 – 2005 cancer mortality rates in the towns of Brattleboro, Dummerston, Guilford, Halifax, Marlboro and Vernon are not different than those for Windham County, Vermont, or the U.S. white population as a whole. Though the six towns, Windham County and Vermont as a whole have higher mortality rates than the rate for the U.S. white population as a whole, none are statistically higher than the rate for the U.S. white population.

To understand the numbers reported in Tables 2 and 3, examining an example from each table may help. From the first set of numbers at the top of Table 2, you can see that the incidence rate for all cancers in the U.S. white male and female population is about 489 cases per 100,000 persons. Statistically speaking, we are 95 percent confident (not due to chance alone) that this rate exists in the range of 487.9 to 489.8 cases per 100,000 persons. In the six towns near Vermont Yankee, the all cancer incidence rate is 427 cases per 100,000 persons. We are 95 percent confident that the actual rate is between 400.4 cases and 455.4 cases per 100,000 persons. At the reported confidence intervals, these

differences are statistically significant. After adjusting for age and population size, people in the six towns near Vermont Yankee Nuclear Power Station were diagnosed with fewer cancers between 1995 and 2004 than Vermont and the U.S.

For an example from the second collection of rates in Table 3, it initially appears that deaths from malignant neoplasms (all sites, all ages) in the six towns nearer Vermont Yankee may be higher than in Windham County as a whole. However, this difference is not statistically significant. In Windham County, the death rate from malignant neoplasms was 203.17 deaths per 100,000 persons, while the death rate from malignant neoplasms in the six towns near Vermont Yankee was 211.53 deaths per 100,000 persons. We are 95 percent confident that these rates fall between 190.81 and 216.32 deaths per 100,000 persons in Windham County, and between 193.22 and 231.53 deaths per 100,000 persons in the six towns. Because these confidence intervals overlap, the two malignant neoplasm death rates are not statistically different. The same conclusion is drawn relative to Vermont as a whole – the all sites, all ages cancer mortality rates are not significantly different. Also, the same is true relative to the U.S. white population – the all sites, all ages cancer mortality rates are not significantly different since the confidence intervals overlap.

One other caution about the use of these data: the numbers of cancer cases and the number of cancer deaths in the six towns near Vermont Yankee are small. Making predictions for larger populations is better done with larger numbers of cases, which may be recorded over longer periods of time. This is an objective at the Vermont Department of Health – to annually update these figures to help reconcile the differences between perceived risks for developing cancer and the actual experience of cancer diagnoses in the community.

Table 3. Cancer Mortality Rates in Windham County and Towns Near VYNPS

VERMONT RESIDENTS AND U.S. WHITES

ALL AGES	Malignant Neoplasms (all sites)		
	# Deaths	Rates(1)	95% CI
Brattleboro, Dummerston, Guilford, Halifax, Marlboro, Vernon, 1996-2005	502	211.53	(193.22, 231.53)
Windham County, 1996 - 2005	1,015	203.17	(190.81, 216.32)
Vermont, 1996-2005	12,224	193.36	(189.94, 196.84)
U.S. White, 1996-2005	4,769,323	193.24	(193.07, 193.42)
ALL AGES	**Leukemia**		
	# Deaths	**Rates(1)**	**95% CI**
Brattleboro, Dummerston, Guilford, Halifax, Marlboro, Vernon, 1996-2005	19	8.19	(4.90, 13.34)
Windham County, 1996 - 2005	36	7.3	(5.09, 10.37)
Vermont, 1996-2005	481	7.7	(7.03, 8.44)
U.S. White, 1996-2005	190,024	7.72	(7.69, 7.76)
ALL AGES	**Thyroid Cancer**		
	# Deaths	**Rates(1)**	**95% CI**
Brattleboro, Dummerston, Guilford, Halifax, Marlboro, Vernon, 1996-2005	*	0.44	(0.00, 3.20)
Windham County, 1996 - 2005	*	0.5	(0.05, 2.13)
Vermont, 1996-2005	23	0.4	(.26, .60)
U.S. White, 1996-2005	11,403	0.46	(.45, .47)
AGES 0-19	**Malignant Neoplasms (all sites)**		
	# Deaths	**Rates(2)**	**95% CI**
Brattleboro, Dummerston, Guilford, Halifax, Marlboro, Vernon, 1996-2005	*	2.26	(0.00, 16.50)
Windham County, 1996 - 2005	*	1.8	(0.15, 8.09)
Vermont, 1996-2005	39	2.4	(1.70, 3.35)
U.S. White, 1996-2005	17,710	2.82	(2.78, 2.86)

(1) Rates are age-adjusted to the U.S. 2000 standard population per 100,000 persons
(2) U.S. White rate is Crude Rate, not age-adjusted
* Less than 5 deaths reported
Source of Vermont data: VT Department of Health Vital Statistics System
Source of U.S. White data: Surveillance, Epidemiology, and End Results (SEER) Program;
National Cancer Institute - Cancer Statistics Branch

Surveillance Methods

The types of surveys and analyses performed by the Department of Health deserve some description relative to their role in protecting public health.

Direct Gamma Radiation

The Vermont Department of Health uses thermoluminescent dosimeters (TLDs) to monitor direct gamma radiation. Direct gamma radiation is the energy emanating from the Vermont Yankee Nuclear Power Station systems and components. Direct gamma radiation is not a contaminant that collects on surfaces like particles, gases or vapors released from a facility might. Direct gamma radiation is energy that the body is affected by only when a person is located in an area where gamma radiation exists. Everyone is continuously exposed to direct gamma radiation from natural and human-made sources.

Department of Health thermoluminescent dosimeters are installed all the way around the Vermont Yankee site fence line, along its site boundary and in the publicly occupied spaces around the station to identify the amount of public exposure that may be associated with operations at the Station. Additional Department of Health thermoluminescent dosimeters are installed throughout the towns of Vernon and Guilford, and in locations in Brattleboro, Dummerston, Putney and Wilmington to establish what the background levels of direct gamma radiation are, in the absence of radiation from the Vermont Yankee Nuclear Power Station.

The gamma radiation measured by the Department of Health thermoluminescent dosimeters is an electromagnetic wave similar to X-rays. Gamma radiation passes through your skin and may pass through your entire body. As it does pass through your body, the radiation energy delivers ionizing radiation dose to the tissues with which it interacts.

With a thermoluminescent dosimeter, the gamma radiation interacts with and changes the physical composition of the materials in the thermoluminescent dosimeter. When the

thermoluminescent dosimeter is removed from its monitoring location and sent to a laboratory for analysis, the physical changes in the thermoluminescent dosimeter are reversed. When this occurs, light is emitted, and the amount of light measured in the process is directly proportional to the amount of ionizing radiation energy to which the thermoluminescent dosimeter was exposed.

While the dosimeter's radiation exposure is directly proportional to the wearer's radiation exposure, the Oak Ridge Report made it clear that the radiation dose the wearer absorbs from this exposure is not equal to the dosimeter exposure. According to the Oak Ridge Report, the human body absorbs about 60 percent of the radiation energy to which it is exposed at the energy levels found near the nuclear power station. As described earlier, the thermoluminescent dosimeter exposure results are converted to human dose prior to being compared to the regulatory dose limits. Because this is the first year doing this for Vermont Yankee, we will show both the exposure values from the thermoluminescent dosimeters and the converted biological dose equivalent.

Typical gamma radiation emitting radioactive materials include the potassium-40 inside our own bodies, the beryllium-7 in most earthen materials and the nitrogen-16 in neutron-activated reactor coolant water at a nuclear power plant. Other important reactor-generated gamma radiation emitters include the particulate solids cobalt-60 and cesium-137, vaporous iodine-131 and gaseous krypton-88 and xenon-133.

Personnel thermoluminescent dosimeters, like those worn by workers in nuclear power plants and in medical and research facilities, are calibrated to provide a measure of biological dose for the wearer. Dose is the amount of an agent to which you are exposed that actually affects you. The dose is recorded in units called millirem.

On the other hand, environmental thermoluminescent dosimeters, including those reported on in this document, are not calibrated to provide direct measures of dose in millirem. Environmental thermoluminescent dosimeters are only calibrated to provide a

measure of exposure. These thermoluminescent dosimeter exposures are recorded in milliroentgen. Historically, the Vermont Department of Health has considered the amount of radiation exposure measured in milliroentgen to be equal to the amount of biological dose equivalent in millirem. The Oak Ridge Report documented that this assumption results in overstating the biological dose equivalent. Following the recommendation of the Oak Ridge Report, the Department of Health now converts the exposures measured by the dosimeters in milliroentgen to biological dose equivalent in millirems using the guidance of nationally recognized standards, in particular, the 0.6 millirem per milliroentgen dose conversion factor of *American National Standards Institute Standard ANSI/ANS-6.1.1-1991, Neutron and Gamma-ray Fluence-to-dose Factors.*

Both personnel and environmental thermoluminescent dosimeters are used to measure beta and gamma radiation exposure. The Vermont Department of Health accounts for exposures from beta radiation with our analyses of beta radiation in water and air samples. This is appropriate because beta radiation, like alpha radiation, contributes to whole body dose essentially only through internal contamination by radioactive materials inhaled or ingested into the body. It is to these kinds of samples we turn next.

The remaining sample types are used to determine the amount of radioactivity, or radioactive contamination, in the media being sampled. Identifying the quantities and types of radioactive materials in the environment helps us predict how much may end up in our bodies from the air we breathe and in the water and food we eat.

Air Monitoring

The Vermont Department of Health uses continuously operating air samplers to monitor the air near Vermont Yankee Nuclear Power Station in Vernon, as well as air in the nearby towns of Guilford, Brattleboro, Dummerston and Wilmington. The air samples allow us to evaluate the amount of three different kinds of radiation to which people may be exposed in the air they breathe. These are alpha, beta and gamma radiation.

Alpha and beta radiation are similar to gamma radiation in that the health risk associated with each is carcinogenesis from damage to DNA. Alpha and beta radiation differ from gamma radiation because they are particle forms of radiation energy, and gamma radiation is an electromagnetic wave of energy. While electromagnetic waves like gamma radiation travel great distances and through most materials, particle radiations like alpha and beta radiation travel relatively short distances and are completely stopped by simple materials.

Alpha particle radiation is the most biologically hazardous form of ionizing radiation. For equal amounts of alpha, beta and gamma radiation energy, alpha particle radiation may cause roughly 20 times more tissue damage. Radon gas and its radioactive decay daughter products emit alpha, beta and gamma radiation. It is the alpha radiation that leads to so much concern about lung cancer.

Fortunately, alpha radiation cannot penetrate the simplest of materials. For example, a sheet of paper can completely stop an alpha particle, as can the dead layer of skin that covers the outer surface of the skin of our bodies. Thus, the only way alpha particles may actually harm us is if radioactive material that emits alpha radiation is inhaled, ingested or otherwise taken into the body.

Most alpha-emitting radioactive materials are heavy metals like human-made americium-241 and plutonium-239 or naturally-occurring uranium-238 or thorium-232. Radon-222 is unusual because it is a radioactive gas. It is this characteristic that also adds to our exposures to, and risks from, radon. Radon gas seeps from the earth's crust and accumulates in buildings and other structures, unlike solids like uranium and thorium that are trapped in soil and rock.

Beta particle radiations also have predictable ranges through materials and are stopped by simple materials. Most beta particle radiations are stopped by plastics and simple construction materials. The dead layer of skin on the outside of our bodies is not always

capable of protecting the living skin beneath it. Most beta particle radiation can also cause skin dose. Risks from beta radiation exposure of the skin are low, on the order of ten times lower than whole body irradiation by gamma rays.

Still, beta particles do not penetrate the living skin more than a few millimeters, so our internal organs are only affected by beta particle radiation if we inhale or ingest beta particle emitting radioactive materials. Once taken into the body, like alpha particle radiation, the beta particle radiation may damage the tissues of our internal organs. This is why monitoring of the air, water and food chain is so important in an environmental surveillance program.

Materials that emit beta particle radiation include the naturally-occurring carbon-14 in all living things, as well as hydrogen-3 (also known as tritium), which may be both human-made or of natural origin. Strontium-90 is a beta radiation emitting radioactive material. It is a product of the fission process that may be found in nuclear reactor coolant water.

Radioactive materials that emit alpha, beta or gamma radiation behave chemically just like non-radioactive materials. For example, radioactive hydrogen in water goes everywhere water (a compound of two atoms of hydrogen and one atom of oxygen) goes in our bodies; radioactive iodine goes to the thyroid gland like non-radioactive iodine does; and, radioactive strontium goes to the bone just like non-radioactive strontium does. Obviously, our concern is that radioactive materials in these parts of our bodies may subject our bodies to unnecessary risk. Thus far, in the history of Vermont Yankee surveillance, the Vermont Department of Health has found no significant reactor-produced radioactive contaminants in the environment near the station. Department records indicate that those contaminants that have been identified in past years were small amounts unlikely to be associated with any adverse public health effects. Results this year do not indicate any additional VYNPS-related radioactive contaminants in the environment.

Alpha and beta particle radiation in radioactive materials in the air is determined by drawing air through a glass fiber filter. Radioactive materials are trapped on the filter and the filter is counted on a gas flow proportional counter in the Vermont Department of Health Laboratory. All radiological analyses of the laboratory are subject to high levels of quality control as tested both from within the lab, and by outside organizations.

Radioactive materials that emit gamma radiation are also monitored in the air samples the Vermont Department of Health takes each month. Specifically, a charcoal cartridge is positioned in the air sampler immediately downstream from the glass fiber filter described above. While the glass fiber filter traps particulate materials, the charcoal cartridge traps molecules of gas and vapors. One particular radioactive material of interest existing in a vaporous form especially likely to be trapped by the charcoal cartridge is iodine-131.

Iodine-131 is a vapor at temperatures above room temperature. It is created during the fission of nuclear reactor fuel. Leaks in fuel rod cladding allow the iodine-131 into the reactor coolant, the water that runs through the reactor core, and other plant components and systems. The iodine-131 vapor may be trapped by plant ventilation system charcoal beds, but some may also be released from the plant stack. Iodine-131 is not generally found in the environment except where used in medicine and produced by nuclear facilities.

Iodine-131 that is inhaled, like other isotopes of iodine that may also be released, travels through the bloodstream to the thyroid gland in a person's neck. That which is not taken up by the thyroid gland is soon excreted from the body with other waste fluids. If a person's thyroid gland is saturated with iodine, most of the iodine-131 taken into the body passes straight from the bloodstream to the urine for elimination. This is the benefit afforded to those who take potassium iodide. If one takes a sufficient dose of potassium iodide, about 130 milligrams (mg) for an adult and 65 mg for children between the ages

of 3 and 18, radioactive iodine-131 will not be taken up into the thyroid, and risks of thyroid cancer will be reduced significantly.

More about potassium iodide availability and use around the Vermont Yankee Nuclear Power Station may be found at: http://healthvermont.gov/enviro/rad/KI_program.aspx.

In addition to analyzing the charcoal cartridges for radioactive iodine-131, both the charcoal cartridges and the air filters are analyzed for most other gamma radiation emitting radioactive materials. Hence, the Vermont Department of Health looks for nearly every radioactive material that may be emitted from the Vermont Yankee Nuclear Power Station and found in air.

Gamma radiation is analyzed by gamma spectroscopy. Gamma spectroscopy relies on the unique energy signatures of radioactive materials that emit gamma radiation. These unique gamma radiation energies are analyzed to identify the specific radioactive materials in the sample. Gamma spectroscopy can also determine the amount of radioactivity in the sample by measuring the number of gamma radiation photons emitted by the sample over a given counting time. Gamma spectroscopy is performed by the Vermont Department of Health Laboratory under relatively ideal conditions.

Water Monitoring

Groundwater and surface water around the Vermont Yankee Nuclear Power Station is monitored with methods similar to those for air. Water is collected from separate wells that supply water to two Vernon farms and to the Vernon Elementary School. Samples are also taken from the Brattleboro municipal water supply. Surface water is sampled from the Connecticut River near the plant discharge, downstream of Vernon Dam and in Brattleboro.

Water samples are collected monthly by the Vermont Department of Health and by an environmental monitoring contractor. All of the samples are analyzed by the Vermont

Department of Health Laboratory through various methods. The Vermont Department of Health Laboratory analyzes all water samples for total alpha radioactivity and total beta radioactivity. It also analyzes for all gamma radiation-emitting radioactive materials through gamma spectroscopy. All of these water samples are analyzed specifically for tritium (hydrogen-3).

Beginning in 2007, the Vermont Department of Health Laboratory analyzed samples from each of the ground water locations for naturally occurring uranium and radium. These radioactive materials emit alpha, beta and gamma radiation, and have contributed to elevated radiation levels in water samples for decades. The Vermont Department of Health will periodically test these water sources for uranium and radium to keep track of their possible impact on other water sample results.

Monitoring of the Inputs to the Food Chain

Given that direct gamma radiation that may contribute to public ionizing radiation dose is monitored, and that radioactive materials in the air we breathe and in the water we drink are measured, the remaining pathway for public exposure from Vermont Yankee Nuclear Power Station is the food we consume. To evaluate the food chain and inputs to it, the Vermont Department of Health takes samples from the soil within which plants grow and obtain nutrients and water, from sediments that support fish and other aquatic species in waterways, from wild and cultivated vegetation, from fish, and from cow's raw milk.

Every soil, sediment, vegetation, fish and milk sample is evaluated for gamma radiation emitting radioactive materials, while raw cow's milk is also specifically analyzed for iodine-131. These analyses are via gamma spectroscopy at the Vermont Department of Health Laboratory.

Direct Gamma Radiation Results

Direct gamma radiation is what we call the electromagnetic energy that is emitted from the reactor and turbine systems at Vermont Yankee Nuclear Power Station. Like light from a bulb, this energy is emitted in all directions from certain station components and operations. Like light, this direct gamma radiation is reduced in intensity with increasing distance. Also like light, it scatters and reflects off of nearby materials. Some direct gamma radiation actually reflects from the atmosphere above the station back to earth. This is called skyshine.

The Vermont Department of Health direct gamma radiation measurements also account for any gamma radiation exposures from gases, vapors and particles in the air. This includes gamma radiation exposures from gases like krypton-88 and xenon-133 that might be released from the Vermont Yankee Nuclear Power Station plant stack, as well as particulates and vapors, including radioactive iodine. These exposures are very small, especially as compared to the direct gamma radiation and scattered and skyshine radiation from plant components, systems and operations.

Direct gamma radiation can contribute to public exposures outside the site boundary of the station. The Vermont Department of Health limits direct gamma radiation doses for members of the public. The limit is expressed in millirem, a unit that accounts for both the amount of radiation energy absorbed and the potential biological effects of that radiation energy absorption. The unit millirem quantifies what is called the biological dose equivalent. The Vermont Department of Health regulations for radiological health can be found at http://healthvermont.gov/regs/radio_health.pdf.

The biological dose equivalent allowed annually for a member of the general public from direct gamma radiation emitted from Vermont Yankee Nuclear Power Station is limited to 5 millirem. Because it is impossible to verify that the biological dose equivalent to every single person exposed throughout the year is less than 5 millirem, the regulations provide for measurements of the site boundary dose as an acceptable alternative for

verifying compliance. This makes sense, since measurements of the actual dose at a location along the site boundary may be readily obtained. Specifically, the regulations limit the calculated biological dose equivalent at the site boundary to 20 millirem per year. There is a further, separate limit of no more than 10 millirem per calendar quarter.

It is important to note that the Vermont Department of Health regulations for site boundary direct gamma radiation dose pertain only to that portion of the site boundary bordered by land. Thermoluminescent dosimeter locations DR42, DR43, DR44, DR45, DR46 and DR47 in Table 5 below are on the site boundary along the Connecticut River. Also note that the thermoluminescent dosimeter exposure results in Tables 5a, 6a and 7a below are in units of milliroentgen. The unit milliroentgen (mR) is a unit of exposure, and environmental thermoluminescent dosimeters only record exposure. The calculated dose equivalents are shown in units of millirem in Tables 5b, 6b and 7b. These dose equivalents were calculated using the 0.60 millirem per milliroentgen conversion factor.

When evaluating compliance with Vermont Department of Health regulations, measurements of exposure are taken. These measurements record exposures in units of milliroentgen (mR). The regulations are in units of dose equivalent in millirem. Obtaining dose equivalents in millirem from exposures in milliroentgen requires use of nationally recognized dose conversion factors in accordance with Vermont Department of Health Regulations for Radiation Protection, specifically Section 5-305, Standards. The Department of Health uses the dose conversion factors found in *American National Standards Institute Standard ANSI/ANS-6.1.1-1991, Neutron and Gamma-ray Fluence-to-dose Factors* as recommended in the Oak Ridge Report. The use of such dose conversion factors is done whether we are evaluating compliance for the use of medical X-rays or whether we are evaluating compliance at Vermont Yankee Nuclear Power Station. After calculating the dose equivalents, they are compared to the Vermont Department of Health limits. There are two relevant limits: no more than 10 millirem per calendar quarter and no more than 20 millirem per calendar year. For 2007, neither any quarterly limit nor the annual limit was exceeded.

Background Gamma Radiation

To determine the direct gamma radiation exposure attributable only to Vermont Yankee Nuclear Power Station, background radiation must be subtracted from measurements. The 71 thermoluminescent dosimeters the Vermont Department of Health deploys in its environmental surveillance program record what are called gross measurements. Gross measurements of gamma radiation include exposures from all natural and man-made sources of radiation where the thermoluminescent dosimeter is physically located.

Gross gamma radiation measurements include exposures from radon gas in the air; from naturally-occurring radioactive materials in the soil, water and vegetation; from radioactive materials in building materials; from contaminants deposited as a result of above-ground nuclear weapons testing; from passing vehicles containing radioactive materials; from people who have varying amounts of natural and human-made radioactive materials within their bodies, and from the direct and scattered gamma radiation from the systems, components and operations at Vermont Yankee Nuclear Power Station.

For thermoluminescent dosimeter measurements, the Vermont Department of Health uses the results of measurements at 34 locations unlikely to be affected by Vermont Yankee Nuclear Power Station to establish what the background exposure levels are. These 34 thermoluminescent dosimeters are located as far west as Wilmington, as far north as Putney, and as far south as the Vermont/Massachusetts state line in Guilford and Vernon.

Each quarter's average (or mean) dose to these 34 thermoluminescent dosimeters is calculated to estimate background radiation. Past determinations of background gamma radiation were from the mean of two thermoluminescent dosimeter stations, one in Putney and one Wilmington. This change from the past was implemented because the calculated mean background is more accurate when 34 measurements are used than when

only two measurements are used to calculate the mean. The mean background exposures are reported in Table 4.

The exposures and dose equivalents reported in Tables 5a, 5b, 6a, 6b, 7a and 7b for comparison to the annual limit are the net thermoluminescent dosimeter results – the gross thermoluminescent dosimeter reading minus the mean background radiation.

Background gamma radiation levels for the four quarters of 2007 are presented in summary in Table 4 at the 95 percent confidence level. These results, as well as the complete results in Tables 5a, 5b, 6a, 6b, 7a and 7b, are provided in units of both gamma radiation exposure, milliroentgen (mR), and in units of biological dose equivalent, millirem (mrem) as converted using the Oak Ridge dose conversion factor, for completeness and for technical accuracy.

Note also that the tables have more columns than last year's direct gamma radiation dose table. In Table 4, there are four columns to the right of the calendar quarter column. These columns allow for comparison of the exposures and calculated doses as calculated using the 0.60 dose conversion factor for two different dosimeter vendors used in 2007. As described earlier, the Department of Health used two different dosimeter vendors for most of 2006 and all of 2007. This was done to compare the qualities of the two vendors for subsequent choice between them. The Vermont Department of Health chose AREVA NP Dosimetry Services to be its dosimetry vendor for 2008 and beyond.

Table 4. Mean Direct Gamma Radiation Background for 2007

	Exposure		Dose Equivalent	
Calendar Quarter of 2007	Mean Background Exposure and Error (mR) at the 95% Confidence Level	Mean Background Exposure and Error (mR) at the 95% Confidence Level	Mean Background Dose Equivalent and Error (mrem) at the 95% Confidence Level	Mean Background Dose Equivalent and Error (mrem) at the 95% Confidence Level
	Vendor 1	AREVA NP	Vendor 1	AREVA NP
January 1 to March 31	20.3 ± 1.8	13.3 ± 2.2	12.2 ± 1.1	8.0 ± 1.3
April 1 to June 30	18.0 ± 3.4	13.9 ± 2.6	10.8 ± 2.1	8.4 ± 1.6
July 1 to September 30	22.6 ± 3.2	14.8 ± 3.1	13.6 ± 1.9	8.9 ± 1.8
October 1 to December 31	21.6 ± 3.3	14.1 ± 2.5	13.0 ± 2.0	8.5 ± 1.5
Calendar Year 2007	82.5 ± 6.0	56.2 ± 5.2	49.5 ± 3.6	33.7 ± 3.1

Uncertainty of Dosimeter Measurements

All dosimeter measurements over time are estimates. They are best estimates, but these measurements are subject to error or uncertainty. It is appropriate when reporting measurements, then, to also report the amount of uncertainty. Uncertainty results from variability in what is being measured, in the measurement devices, and in the persons doing the measurements. The uncertainty in what is being measured – radioactivity - may be accounted for statistically; the uncertainty in measurement instruments can be determined readily in a laboratory; and, the uncertainty in human performance during measurement can be reasonably estimated.

Uncertainty can be minimized, too. For example, the amount of uncertainty in the background measurements the Vermont Department of Health uses was greater when only two dosimeters were used to calculate the mean background, as compared to when the mean background is calculated from 34 background thermoluminescent dosimeter

measurements, as was begun in 2006. Generally, the greater the number in the sample size, the more accurate statistics like the mean and standard deviation will be. The same is true of time. The longer you collect measurements, the more likely it is that the measurement accurately characterizes the condition. For example, it may be better to characterize background radiation using 10 years worth of measurements than to use the measurements for a three-month calendar quarter.

In the past, the Vermont Department of Health indicated it would account for uncertainty in the direct gamma radiation measured at the site boundary by allowing up to 25 percent more radiation than the limit. This was seen in expressing the limit as 20 plus or minus 5 millirem. Unlike the new methods for accounting for uncertainty, the plus or minus 5 millirem factor for uncertainty was not accurately calculated. Instead, and from this time onward, the Department of Health will express uncertainty as it is calculated and where it exists in the measurements. Our calculated uncertainty using this approach is actually much less than the 25 percent uncertainty previously accepted.

2007 Direct Gamma Radiation Exposures and Calculated Dose Equivalents

In the six tables below are the results of Vermont Department of Health thermoluminescent dosimeter measurements of direct gamma radiation at the Vermont Yankee Nuclear Power Station site boundary (Tables 5a and 5b), in the immediate area around the station (Tables 6a and 6b) and, to establish a background radiation level, in parts of Windham County distant from the station (Tables 7a and 7b).

Tables 5a and 5b list the results for 2007 for what we call the site boundary. It must be noted, that in 12 locations the thermoluminescent dosimeter is on the fence that surrounds the station, but not actually at the site boundary. Four of the 12 are on the east side of the plant on the Connecticut River. The remaining eight fence line dosimeters, DR-53, VY Parking Lot, VY Parking Lot #2, DR-51, DR-07, DR-41, T05 and T06 are all located on the west side of the site 350 feet or more closer to the station's sources of direct gamma

radiation than the actual site boundary. Nevertheless, because the fence line was originally more coincident with the actual site boundary, the fence line has been used to assess compliance to the Vermont Department of Health limits for direct gamma radiation. This may be appropriate, too, because the land between the fence line and the actual site boundary (primarily open fields and some limited patches of trees) is not restricted from public access.

From Table 5a, there are three Vendor 1 thermoluminescent dosimeters and five AREVA NP dosimeters that measured direct gamma radiation exposure in excess of 20 milliroentgen. Applying the 0.60 millirem per milliroentgen dose conversion factor as recommended in the Oak Ridge Report in Table 5b, you can see that none of the Vendor 1 or AREVA NP thermoluminescent dosimeters exceeded the 20 millirem dose equivalent per year limit., All the exposure results in Table 5a were arrived at by subtracting the mean exposure from the 34 background dosimeters from the net exposure results for each of the site boundary dosimeters. The physical locations of these 34 background dosimeters, and the net results for each of them, are found in Table 7a.

The actual biological dose equivalent results in Table 5b were calculated by multiplying the exposure results in Table 5a by the 0.60 millirem per milliroentgen dose conversion factor appropriate for gamma radiation energies at the site boundary from *American National Standards Institute Standard ANSI/ANS-6.1.1-1991, Neutron and Gamma-ray Fluence-to-dose Factors*. The error for the annual results is the total propagated error at the 95 percent confidence level.

The plant area exposures were arrived at in the same way. The mean background exposure results from the 34 background thermoluminescent dosimeters was subtracted from the net plant area dosimeter measurements. The results are found in Table 6a. The dose equivalents are calculated using the ANSI Standard dose conversion factor and presented in Table 6b.

Note that the exposure and dose equivalent results for the Vernon Elementary School are less than half the exposure and dose equivalent values for the plant's western site boundary or fence line. The Vernon Elementary School measurement locations are listed as Vernon School Nurse, VDH DR06, Vernon School A/S and Vernon School Pole. The Vernon School Nurse measurement site is inside the school, while the other locations are outside the building. The location called Governor Hunt Road #39 is a telephone pole immediately between the plant site boundary and the school.

The net background exposure and dose equivalent results are displayed in Tables 7a and 7b, respectively. Like the results in Tables 5a and 5b, 6a and 6b, these results are net measurements, meaning that the mean of the 34 background dosimeter exposures was subtracted from each of the individual measurements. That is why some of the measurements are close to zero.

Maps 4, 5, 6 and 7 depict the physical locations of the site boundary, plant area and background dosimeters, respectively. The ID numbers on the maps may be matched to the locations in Tables 5, 6 and 7.

Table 5a. Net VYNPS Site Boundary TLD Exposure Results for 2007 in Milliroentgen

	Vendor 1 TLDs										AREVA, NP TLDs									
Location	Q 1 Net	2 SD Error	Q 2 Net	2 SD Error	Q 3 Net	2 SD Error	Q 4 Net	2 SD Error	2007 Net	2 SD Error	Q 1 Net	2 SD Error	Q 2 Net	2 SD Error	Q 3 Net	2 SD Error	Q 4 Net	2 SD Error	2007 Net	2 SD Error
VDH T01	0.0	0.0	0.4	0.0	1.4	1.1	0.0	1.1	1.7	1.6	0.0	0.0	0.8	0.0	0.6	1.1	0.5	0.0	1.9	1.1
VDH T02	0.0	2.3	2.4	0.0	0.0	1.1	0.0	2.3	2.4	3.4	0.1	2.3	0.6	0.0	1.0	1.1	0.4	1.1	2.1	2.7
VDH T03	0.4	1.1	1.0	1.1	0.0	0.0	0.0	3.0	1.4	3.4	0.0	1.1	0.9	1.1	0.6	0.0	0.9	2.3	2.4	2.8
VDH T04	1.1	0.0	0.0	1.1	1.4	1.1	1.4	0.0	3.8	1.6	1.2	0.0	1.5	1.1	1.5	1.1	0.6	2.0	4.8	2.5
VDH T05	0.1	5.7	1.7	0.0	2.4	3.0	1.4	0.0	5.5	5.9	1.3	5.7	2.6	0.0	2.3	3.0	2.0	2.0	8.3	6.2
VDH T06	0.4	1.1	2.0	2.0	5.4	0.0	3.7	4.1	11.5	4.7	2.2	1.1	2.9	2.0	3.6	0.0	2.3	2.3	10.9	3.2
VDH DR07	1.4	1.1	3.0	1.1	4.0	1.1	4.7	1.1	13.2	2.2	4.0	1.1	4.8	1.1	3.7	1.1	3.7	2.0	16.1	2.7
VDH DR08	2.4	1.1	5.7	1.1	6.4	1.1	5.4	2.0	19.8	2.7	5.7	1.1	5.2	1.1	6.2	1.1	6.3	1.1	23.4	2.2
VDH DR41	0.7	0.0	2.0	1.4	0.4	1.1	0.0	1.1	3.2	2.1	1.7	0.0	1.8	1.4	2.0	1.1	1.3	2.3	6.8	2.9
VY SW Fence	0.0	1.1	0.0	2.3	0.0	0.0	0.0	1.1	0.0	2.8	0.0	1.1	0.1	2.3	0.6	0.0	0.2	1.1	0.8	2.8
VY SW Fence #2	0.0	1.1	0.7	2.0	0.0	0.0	0.0	1.1	0.7	2.5	0.2	1.1	0.6	2.0	0.7	0.0	0.3	1.1	1.8	2.5
VDH DR42	0.0	0.0	0.7	1.1	0.7	1.1	0.0	1.1	1.4	1.9	0.6	0.0	0.6	1.1	1.1	1.1	0.4	1.1	2.7	1.9
VDH DR43	1.4	0.0	2.4	1.4	3.4	1.1	3.4	3.9	10.5	4.3	2.5	0.0	2.8	1.4	2.6	1.1	2.8	1.1	10.6	2.1
VDH DR44	4.4	1.1	5.0	1.1	5.4	4.1	5.0	1.1	19.8	2.8	6.6	1.1	5.7	1.1	6.3	4.1	7.7	1.1	26.3	2.8
VDH DR45	10.7	3.0	17.7	1.1	14.7	2.3	21.0	4.1	64.2	5.4	17.8	3.0	18.4	1.1	19.8	2.3	22.4	2.0	78.4	4.0
VDH DR46	3.7	2.0	4.0	2.0	5.7	2.0	5.0	1.1	18.5	3.3	6.3	2.0	5.6	2.0	7.2	2.0	6.4	1.1	25.5	3.3
VDH DR47	1.1	1.1	2.7	0.0	3.0	2.0	1.7	1.1	8.5	2.1	3.1	1.1	2.8	0.0	5.7	2.0	1.9	2.0	13.5	2.7
VDH DR48	1.4	1.1	2.4	1.1	0.7	1.1	2.7	3.0	7.2	3.6	0.6	1.1	1.6	1.1	1.4	1.1	0.7	1.1	4.3	2.2
VY North Fence	0.2	1.4	1.7	0.0	0.7	1.1	1.4	2.0	4.0	2.6	0.0	1.4	0.8	0.0	1.7	1.1	1.2	0.0	3.7	1.7
VY North Fence #2	0.7	0.0	0.7	1.1	0.0	1.1	0.7	1.1	2.1	1.9	1.0	0.0	1.1	1.1	1.4	1.1	1.2	0.0	4.7	1.6
VDH DR49	0.0	1.1	0.0	1.1	0.0	3.0	0.7	3.0	0.7	3.8	0.0	1.1	0.0	1.1	0.8	3.0	0.0	1.1	0.8	2.6
VDH DR51	3.4	0.0	3.7	1.1	4.4	0.0	5.0	4.1	16.5	4.2	4.1	0.0	5.3	1.1	6.5	0.0	4.6	1.1	20.4	1.6
VDH DR52	4.1	1.1	5.4	0.0	4.4	2.3	5.4	2.8	19.2	3.4	7.2	1.1	6.3	0.0	7.9	2.3	7.6	1.1	29.0	2.2
VY Parking Lot	4.7	1.1	4.4	2.3	5.7	2.0	5.7	4.5	20.5	5.4	5.2	1.1	6.8	2.3	8.8	2.0	5.9	1.1	26.8	3.1
VY Parking Lot #2	4.7	1.1	6.0	0.0	8.0	1.1	6.4	2.0	25.2	2.5	5.0	1.1	7.1	0.0	8.1	1.1	6.8	2.3	27.0	2.7
VDH DR53	4.7	1.1	6.0	1.1	6.4	0.0	5.0	1.1	22.2	2.0	7.1	1.1	7.2	1.1	8.2	0.0	6.7	1.1	29.2	2.0

Table 5b. Net VYNPS Site Boundary Dose Equivalent Results for 2007 in Millirem

	Vendor 1 TLDs										AREVA, NP TLDs									
Location	Q 1 Net	2 SD Error	Q 2 Net	2 SD Error	Q 3 Net	2 SD Error	Q 4 Net	2 SD Error	2007 Net	2 SD Error	Q 1 Net	2 SD Error	Q 2 Net	2 SD Error	Q 3 Net	2 SD Error	Q 4 Net	2 SD Error	2007 Net	2 SD Error
VDH T01	0.0	0.0	0.2	0.0	0.8	0.7	0.0	0.7	1.0	0.9	0.0	0.0	0.5	0.0	0.4	0.7	0.3	0.0	1.2	0.6
VDH T02	0.0	1.4	1.4	0.0	0.0	0.7	0.0	1.4	1.4	2.0	0.1	1.4	0.3	0.0	0.6	0.7	0.3	0.7	1.2	1.6
VDH T03	0.2	0.7	0.6	0.7	0.0	0.0	0.0	1.8	0.9	2.0	0.0	0.7	0.5	0.7	0.4	0.0	0.5	1.4	1.4	1.7
VDH T04	0.6	0.0	0.0	0.7	0.8	0.7	0.8	0.0	2.3	0.9	0.7	0.0	0.9	0.7	0.9	0.7	0.4	1.2	2.9	1.5
VDH T05	0.0	3.4	1.0	0.0	1.4	1.8	0.8	0.0	3.3	3.6	0.8	3.4	1.6	0.0	1.4	1.8	1.2	1.2	5.0	3.7
VDH T06	0.2	0.7	1.2	1.2	3.2	0.0	2.2	2.4	6.9	2.8	1.3	0.7	1.7	1.2	2.2	0.0	1.4	1.4	6.6	1.9
VDH DR07	0.8	0.7	1.8	0.7	2.4	0.7	2.8	0.7	7.9	1.3	2.4	0.7	2.9	0.7	2.2	0.7	2.2	1.2	9.7	1.6
VDH DR08	1.4	0.7	3.4	0.7	3.8	0.7	3.2	1.2	11.9	1.6	3.4	0.7	3.1	0.7	3.7	0.7	3.8	0.7	14.1	1.3
VDH DR41	0.4	0.0	1.2	0.8	0.2	0.7	0.0	0.7	1.9	1.2	1.0	0.0	1.1	0.8	1.2	0.7	0.8	1.4	4.1	1.7
VY SW Fence	0.0	0.7	0.0	1.4	0.0	0.0	0.0	0.7	0.0	1.7	0.0	0.7	0.0	1.4	0.3	0.0	0.1	0.7	0.5	1.7
VY SW Fence #2	0.0	0.7	0.4	1.2	0.0	0.0	0.0	0.7	0.4	1.5	0.1	0.7	0.3	1.2	0.4	0.0	0.2	0.7	1.1	1.5
VDH DR42	0.0	0.0	0.4	0.7	0.4	0.7	0.0	0.7	0.8	1.2	0.4	0.0	0.4	0.7	0.7	0.7	0.3	0.7	1.6	1.2
VDH DR43	0.8	0.0	1.4	0.8	2.0	0.7	2.0	2.4	6.3	2.6	1.5	0.0	1.7	0.8	1.6	0.7	1.7	0.7	6.4	1.2
VDH DR44	2.6	0.7	3.0	0.7	3.2	2.4	3.0	0.7	11.9	1.7	4.0	0.7	3.4	0.7	3.8	2.4	4.6	0.7	15.8	1.7
VDH DR45	6.4	1.8	10.6	0.7	8.8	1.4	12.6	2.4	38.5	3.2	10.7	1.8	11.0	0.7	11.9	1.4	13.5	1.2	47.1	2.4
VDH DR46	2.2	1.2	2.4	1.2	3.4	1.2	3.0	0.7	11.1	2.0	3.8	1.2	3.4	1.2	4.3	1.2	3.8	0.7	15.3	2.0
VDH DR47	0.6	0.7	1.6	0.0	1.8	1.2	1.0	0.7	5.1	1.3	1.9	0.7	1.7	0.0	3.4	1.2	1.2	1.2	8.1	1.6
VDH DR48	0.8	0.7	1.4	0.7	0.4	0.7	1.6	1.8	4.3	2.1	0.4	0.7	0.9	0.7	0.9	0.7	0.4	0.7	2.6	1.3
VY North Fence	0.1	0.8	1.0	0.0	0.4	0.7	0.8	1.2	2.4	1.6	0.0	0.8	0.5	0.0	1.0	0.7	0.7	0.0	2.2	1.0
VY North Fence #2	0.4	0.0	0.4	0.7	0.0	0.7	0.4	0.7	1.3	1.2	0.6	0.0	0.7	0.7	0.8	0.7	0.7	0.0	2.8	0.9
VDH DR49	0.0	0.7	0.0	0.7	0.0	1.8	0.4	1.8	0.4	2.3	0.0	0.7	0.0	0.7	0.5	1.8	0.0	0.7	0.5	1.6
VDH DR51	2.0	0.0	2.2	0.7	2.6	0.0	3.0	2.4	9.9	2.5	2.4	0.0	3.2	0.7	3.9	0.0	2.7	0.7	12.2	1.0
VDH DR52	2.4	0.7	3.2	0.0	2.6	1.4	3.2	1.7	11.5	2.0	4.3	0.7	3.8	0.0	4.7	1.4	4.6	0.7	17.4	1.3
VY Parking Lot	2.8	0.7	2.6	1.4	3.4	1.2	3.4	2.7	12.3	3.2	3.1	0.7	4.1	1.4	5.3	1.2	3.5	0.7	16.1	1.9
VY Parking Lot #2	2.8	0.7	3.6	0.0	4.8	0.7	3.8	1.2	15.1	1.5	3.0	0.7	4.3	0.0	4.8	0.7	4.1	1.4	16.2	1.6
VDH DR53	2.8	0.7	3.6	0.7	3.8	0.0	3.0	0.7	13.3	1.2	4.2	0.7	4.3	0.7	4.9	0.0	4.0	0.7	17.5	1.2

Map 3

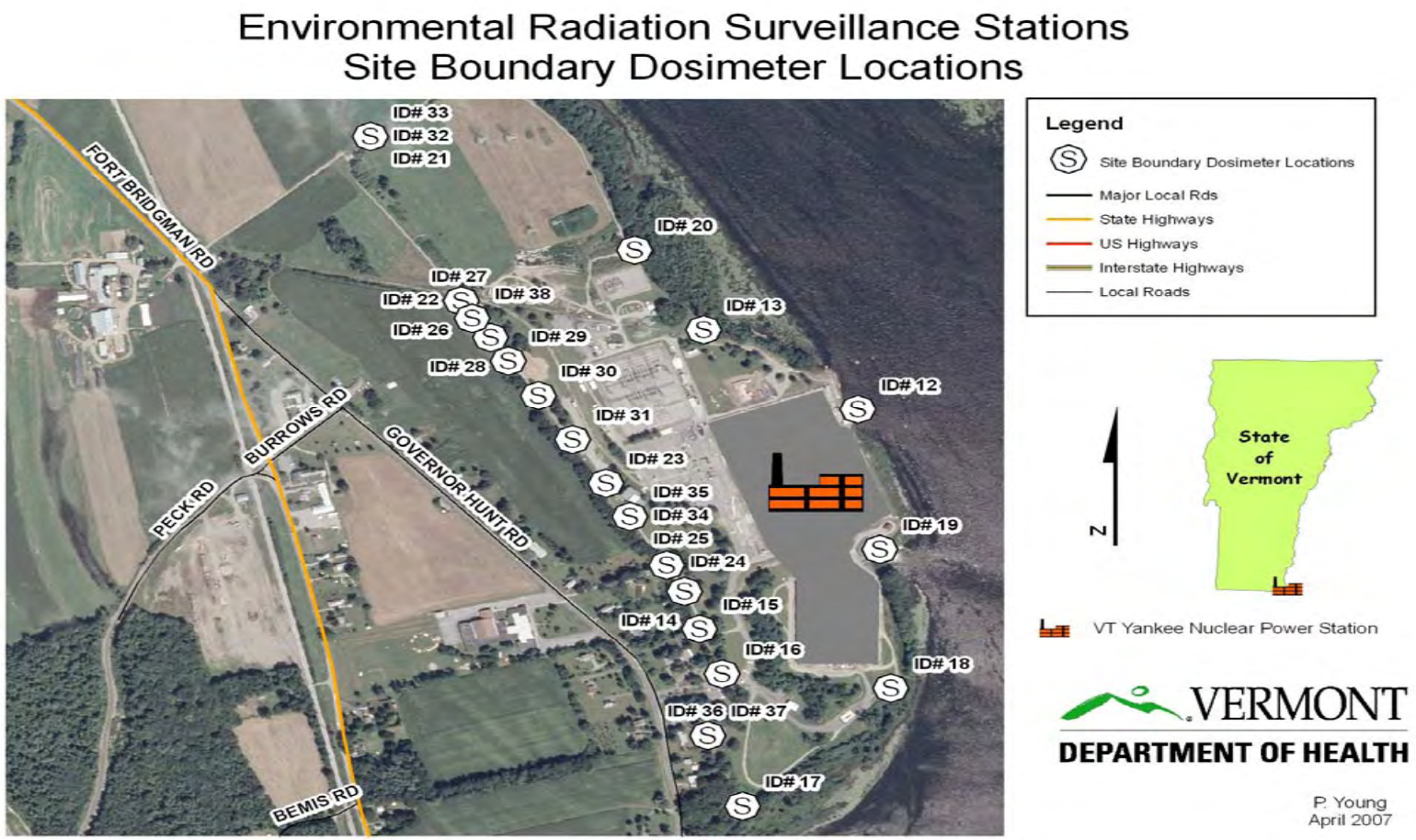

Environmental Radiation Surveillance Stations
Site Boundary Dosimeter Locations
ID# 33
ID# 32
ID# 21
ID# 20
ID# 27
ID# 22
ID# 38
ID# 26
ID# 29
ID# 28
ID# 30
ID# 13
ID# 12
ID# 31
ID# 23
ID# 35
ID# 34
ID# 25
ID# 24
ID# 19
ID# 15
ID# 14
ID# 16
ID# 18
ID# 36
ID# 37
ID# 17
FORT BRIDGMAN RD
BURROWS RD
GOVERNOR HUNT RD
PECK RD
BEMIS RD
Legend
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

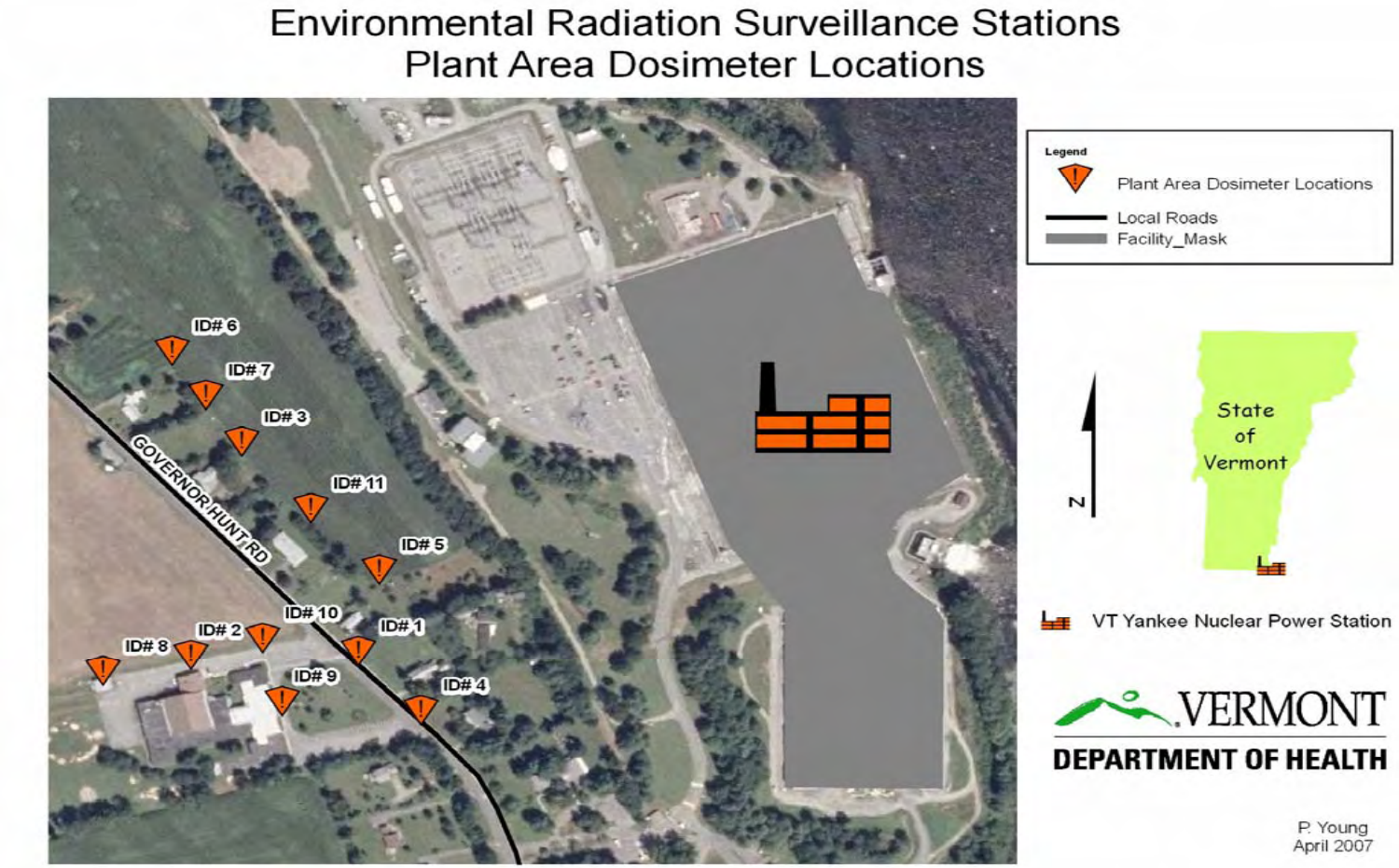
Table 6a. VYNPS Net Plant Area TLD Exposure Results for 2007 in Milliroentgen

	Vendor 1 TLDs										AREVA, NP TLDs									
	Q 1	2 SD	Q 2	2 SD	Q 3	2 SD	Q 4	2 SD	2007	2 SD	Q 1	2 SD	Q 2	2 SD	Q 3	2 SD	Qr4	2 SD	2007	2 SD
Location	Net	Error	Net	Error	Net	Error	Net	Error	Net	Error	Net	Error	Net	Error	Net	Error	Net	Error	Net	Error
VDH T07A	2.4	0.0	2.0	2.0	1.0	2.0	1.4	0.0	6.8	2.4	2.6	0.0	1.9	2.0	2.0	2.0	2.1	1.1	8.6	2.7
VDH T07B	0.0	2.0	2.4	3.0	3.7	2.3	1.4	2.3	7.4	4.5	1.3	2.0	2.0	3.0	1.8	2.3	1.9	1.1	7.1	4.0
VDH DR51A	0.0	1.1	1.7	1.1	2.7	0.0	2.4	2.8	6.8	3.2	2.3	1.1	2.2	1.1	2.6	0.0	2.4	1.1	9.4	2.0
VY PARKING LOT A	2.7	1.1	4.7	1.1	2.4	1.1	3.4	5.2	13.2	5.5	2.7	1.1	3.5	1.1	3.4	1.1	4.1	2.0	13.7	2.7
VDH DR53A	2.1	1.1	3.7	2.0	4.4	0.0	0.0	0.0	10.1	2.3	3.4	1.1	3.9	2.0	5.0	0.0	4.6	0.0	16.9	2.3
Gov Hunt Road # 39	1.4	1.1	2.0	1.1	3.7	1.1	1.4	1.1	8.5	2.2	2.2	1.1	2.1	1.1	3.1	1.1	2.3	2.0	9.5	2.7
Vernon School Nurse	3.1	1.1	2.7	1.1	1.4	1.1	2.4	1.1	9.5	2.2	3.6	1.1	3.1	1.1	2.6	1.1	3.2	1.1	12.5	2.2
VDH DR06	0.0	0.0	1.0	0.0	0.7	1.1	2.4	1.1	4.1	1.6	0.7	0.0	1.1	0.0	1.6	1.1	0.8	2.3	4.3	2.5
Vernon School A/S	0.0	0.0	1.0	1.1	0.7	1.1	0.4	1.1	2.1	1.9	0.6	0.0	0.8	1.1	1.2	1.1	0.9	1.1	3.5	1.9
VSH DR52A	0.7	1.1	0.4	0.0	0.7	1.1	2.4	2.0	4.2	2.5	3.5	1.1	2.7	0.0	3.3	1.1	2.7	1.1	12.3	1.9
Vernon School Pole	1.7	1.1	3.7	1.4	1.7	2.3	2.4	1.1	9.5	2.6	0.6	1.1	0.6	1.4	2.2	2.3	0.7	2.0	4.1	3.1

Table 6b. VYNPS Net Plant Area Dose Equivalent Results for 2007 in Millirem

	Vendor 1 TLDs										AREVA, NP TLDs									
	Q 1	2 SD	Q 2	2 SD	Q 3	2 SD	Q 4	2 SD	2007	2 SD	Q 1	2 SD	Q 2	2 SD	Q 3	2 SD	Q 4	2 SD	2007	2 SD
Location	Net	Error	Net	Error	Net	Error	Net	Error	Net	Error	Net	Error	Net	Error	Net	Error	Net	Error	Net	Error
VDH T07A	1.4	0.0	1.2	1.2	0.6	1.2	0.8	0.0	4.1	1.4	1.6	0.0	1.2	1.2	1.2	1.2	1.2	0.7	5.1	1.6
VDH T07B	0.0	1.2	1.4	1.8	2.2	1.4	0.8	1.4	4.5	2.7	0.8	1.2	1.2	1.8	1.1	1.4	1.2	0.7	4.2	2.4
VDH DR51A	0.0	0.7	1.0	0.7	1.6	0.0	1.4	1.7	4.1	1.9	1.4	0.7	1.3	0.7	1.5	0.0	1.5	0.7	5.7	1.2
VY PARKING LOT A	1.6	0.7	2.8	0.7	1.4	0.7	2.0	3.1	7.9	3.3	1.6	0.7	2.1	0.7	2.0	0.7	2.4	1.2	8.2	1.6
VDH DR53A	1.2	0.7	2.2	1.2	2.6	0.0	0.0	0.0	6.1	1.4	2.0	0.7	2.3	1.2	3.0	0.0	2.8	0.0	10.2	1.4
Gov Hunt Road # 39	0.8	0.7	1.2	0.7	2.2	0.7	0.8	0.7	5.1	1.3	1.3	0.7	1.2	0.7	1.8	0.7	1.4	1.2	5.7	1.6
Vernon School Nurse	1.8	0.7	1.6	0.7	0.8	0.7	1.4	0.7	5.7	1.3	2.2	0.7	1.8	0.7	1.6	0.7	1.9	0.7	7.5	1.3
VDH DR06	0.0	0.0	0.6	0.0	0.4	0.7	1.4	0.7	2.5	0.9	0.4	0.0	0.7	0.0	1.0	0.7	0.5	1.4	2.6	1.5
Vernon School A/S	0.0	0.0	0.6	0.7	0.4	0.7	0.2	0.7	1.3	1.2	0.3	0.0	0.5	0.7	0.7	0.7	0.6	0.7	2.1	1.2
VSH DR52A	0.4	0.7	0.2	0.0	0.4	0.7	1.4	1.2	2.5	1.5	2.1	0.7	1.6	0.0	2.0	0.7	1.6	0.7	7.4	1.2
Vernon School Pole	1.0	0.7	2.2	0.8	1.0	1.4	1.4	0.7	5.7	1.6	0.4	0.7	0.3	0.8	1.3	1.4	0.4	1.2	2.4	1.8

Map 4


Environmental Radiation Surveillance Stations
Plant Area Dosimeter Locations
ID# 6
ID# 7
ID# 3
ID# 11
ID# 5
ID# 10
ID# 1
ID# 2
ID# 8
ID# 9
ID# 4
GOVERNOR HUNT RD
Legend
Plant Area Dosimeter Locations
Local Roads
Facility_Mask
N
State of Vermont
VT Yankee Nuclear Power Station
VERMONT
DEPARTMENT OF HEALTH
P. Young
April 2007

Map 5

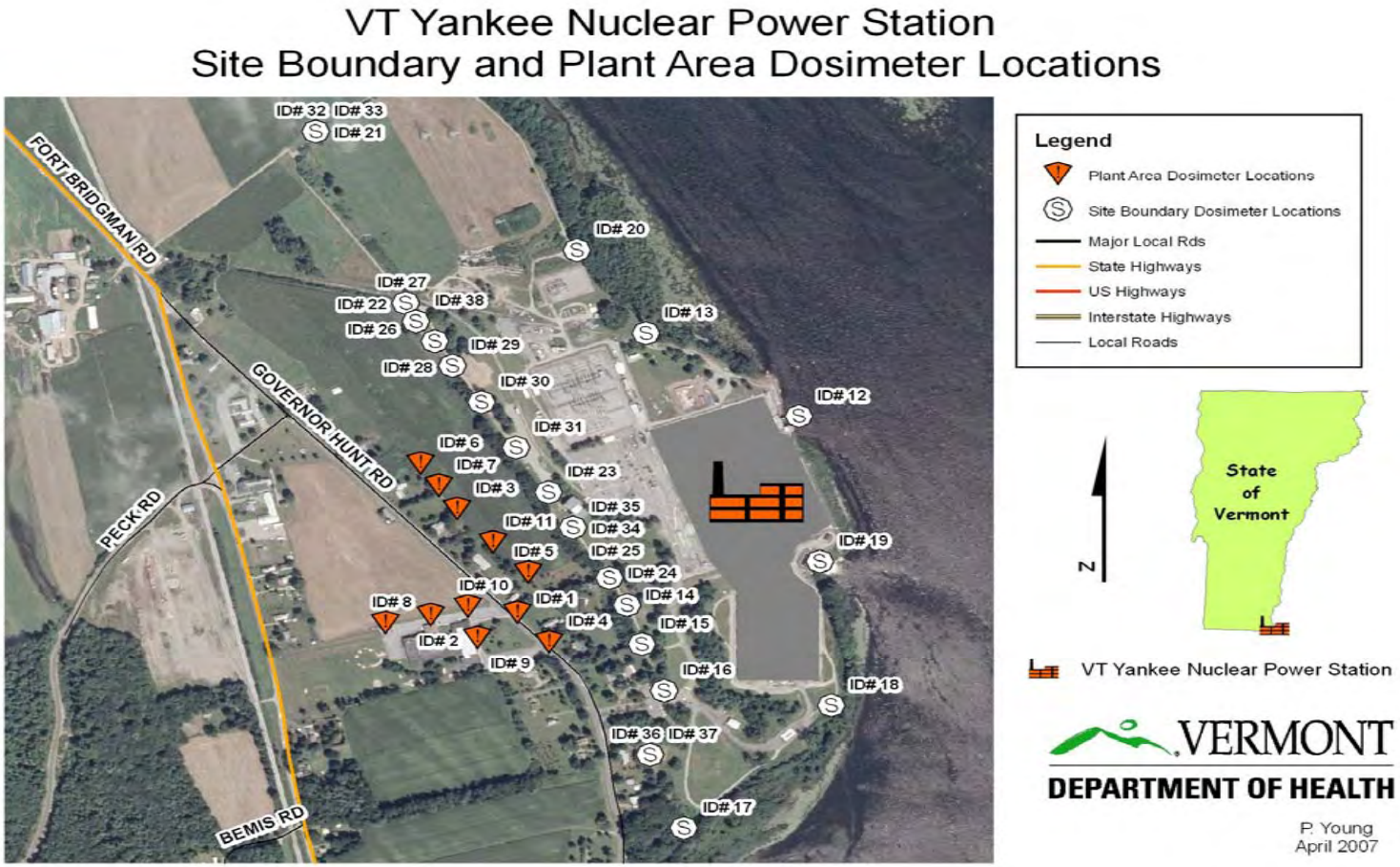

VT Yankee Nuclear Power Station
Site Boundary and Plant Area Dosimeter Locations
FORT BRIDGMAN RD
GOVERNOR HUNT RD
PECK RD
BEMIS RD
ID# 32
ID# 33
ID# 21
ID# 20
ID# 27
ID# 22
ID# 38
ID# 26
ID# 29
ID# 28
ID# 30
ID# 13
ID# 12
ID# 31
ID# 6
ID# 7
ID# 23
ID# 3
ID# 35
ID# 11
ID# 34
ID# 5
ID# 25
ID# 24
ID# 19
ID# 10
ID# 14
ID# 8
ID# 1
ID# 4
ID# 15
ID# 2
ID# 9
ID# 16
ID# 18
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

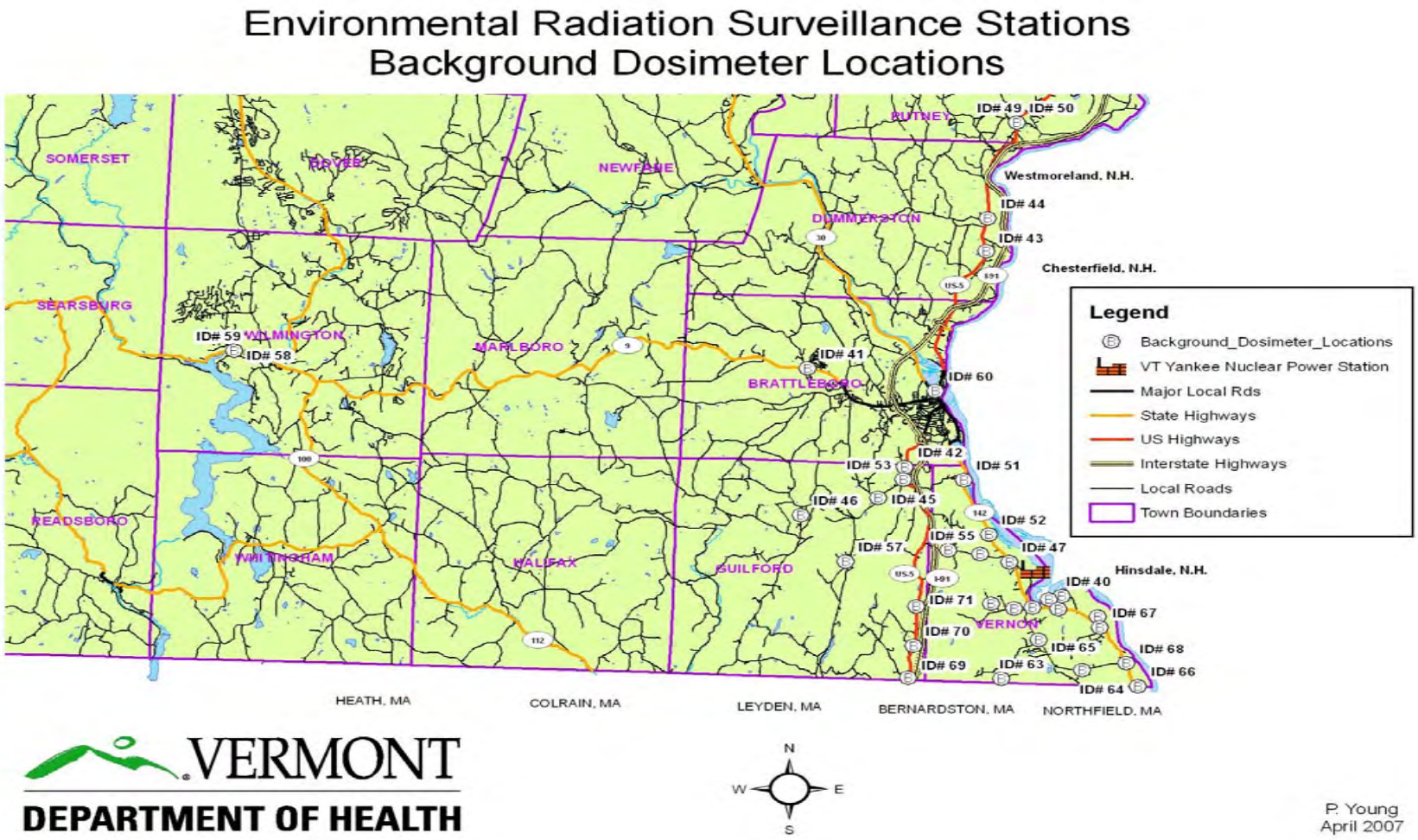
Table 7a Net VYNPS Background TLD Exposure Results for 2007 in Milliroentgen

	Vendor 1 TLDs										AREVA, NP TLDs									
Location	Q 1	Error	Q 2	Error	Q 3	Error	Q 4	Error	2007	Error	Q 1	Error	Q 2	Error	Q 3	Error	Q 4	Error	2007	Error
Putney Town Clerk	0.0	1.1	0.0	1.1	0.0	1.1	0.0	4.5	0.0	4.9	0.0	1.1	0.0	1.1	0.0	1.1	0.0	1.1	0.0	2.2
Putney Pole	0.7	1.1	1.4	1.1	0.7	0.0	0.4	1.1	3.2	2.0	1.2	1.1	0.0	1.1	0.0	0.0	0.9	1.1	2.1	2.0
Dummerston School	0.4	1.1	0.4	1.4	0.4	1.1	0.0		1.1	2.1	0.0	1.1	1.4	1.4	0.8	1.1	0.0	2.0	2.2	2.9
Dummerston IFO	0.7	1.1	0.0	1.1	0.4	1.1	0.4	1.1	1.5	2.3	0.5	1.1	0.5	1.1	1.0	1.1	0.3	2.3	2.4	3.0
Windham County Court	0.0	0.0	0.0	0.0	0.0	1.1	0.0	2.0	0.0	2.3	0.0	0.0	0.4	0.0	0.6	1.1	0.0	0.0	0.9	1.1
Renaud Brothers	0.1	1.1	0.7	2.0	0.4	1.4	1.4	0.0	2.5	2.7	0.2	1.1	0.0	2.0	0.0	1.4	1.9	2.0	2.1	3.2
Rt 142 N Trans Lines	1.7	2.0	0.0	1.1	0.4	1.1	0.4	2.0	2.5	3.2	1.2	2.0	1.3	1.1	1.6	1.1	0.4	1.1	4.4	2.7
Tyler Hill Road	0.4	1.1	1.0	3.4	1.0	1.1	5.4	1.1	7.8	3.9	0.0	1.1	0.0	3.4	0.0	1.1	0.0	1.1	0.0	3.9
Miller Farm	0.1	1.1	0.0	0.0	0.0	0.0	0.0	3.0	0.1	3.2	0.0	1.1	0.0	0.0	0.7	0.0	0.0	1.1	0.7	1.6
142/Pond Road North	0.0	2.3	0.0	0.0	0.0	3.0	0.0	1.1	0.0	3.9	0.0	2.3	0.0	0.0	0.0	3.0	0.0	3.0	0.0	4.1
Fairman Road	0.0	1.1	0.0	1.1	0.0	2.0	0.0	0.0	0.0	2.5	0.0	1.1	0.0	1.1	0.0	2.0	0.0	2.0	0.0	2.9
West Road/Edgewood	0.0	0.0	0.0	1.1	0.0	2.0	0.0	1.1	0.0	2.5	0.0	0.0	0.0	1.1	0.0	2.0	0.0	1.1	0.0	2.1
Vernon Fire Station	0.1	4.5	0.0	1.1	0.0	2.3	0.4	1.1	0.4	5.3	0.0	4.5	0.0	1.1	0.0	2.3	0.0	1.1	0.0	5.0
Power Line R Crsng	0.0	1.1	0.0	2.3	0.4	0.0	0.0	1.1	0.4	2.8	0.3	1.1	0.0	2.3	0.0	0.0	0.1	1.1	0.4	2.8
A&M Auto/Smead	1.4	1.1	0.0	1.1	2.0	0.0	0.4	1.1	3.8	2.0	0.0	1.1	0.5	1.1	0.3	0.0	0.0	2.3	0.7	2.8
Blodgett Farm	0.7	1.1	1.0	0.0	1.0	2.0	0.4	0.0	3.2	2.3	1.4	1.1	0.0	0.0	0.1	2.0	1.1	1.1	2.6	2.1
Rt 142/Newtron Rd	0.0	2.0	0.0	1.1	0.0	1.1	0.0	1.1	0.0	2.8	0.0	2.0	0.3	1.1	0.6	1.1	0.0	1.1	0.9	2.7
Rt 142/Pond Rd S	1.1	1.1	0.0	1.1	0.0	0.0	0.4	1.1	1.4	2.0	0.3	1.1	0.0	1.1	0.0	0.0	0.0	2.0	0.3	2.5
Rt 142/Depot Street	0.4	1.1	0.4	1.1	0.0	0.0	0.4	2.0	1.1	2.5	0.2	1.1	0.0	1.1	0.0	0.0	0.2	1.1	0.4	2.0
Pond Rd/Houghton	0.1	2.3	0.7	1.1	0.7	1.1	0.0	1.1	1.5	3.0	0.2	2.3	0.1	1.1	0.7	1.1	0.0	1.1	1.0	3.0
Pond Rd/Vernon Rec	0.0	2.0	0.0	2.0	0.0	1.1	0.0	1.1	0.0	3.2	0.0	2.0	0.0	2.0	0.2	1.1	0.0	1.1	0.2	3.2
Huckle Hill Rd.VT Line	1.1	2.3	2.0	2.0	4.0	1.4	1.4	1.1	8.5	3.5	2.2	2.3	0.0	2.0	0.0	1.4	2.4	2.3	4.6	3.9
Route 5/Wolosko	1.4	2.0	6.0	1.4	2.7	1.1	2.4	1.1	12.5	2.9	1.7	2.0	3.4	1.4	3.3	1.1	2.3	0.0	10.7	2.6
Rt 5/Andrews Cemetary	0.0	0.0	0.7	0.0	1.7	2.3	1.4	2.0	3.8	3.0	0.0	0.0	2.6	0.0	3.0	2.3	0.9	2.0	6.5	2.5
Rt 5/Tkaczyk Farm Rd	0.1	1.1	0.7	0.0	0.4	0.0	0.0	1.1	1.1	1.6	0.4	1.1	1.0	0.0	0.3	0.0	0.4	1.1	2.2	1.6
Tyler Rd/Franklin Rd	0.0	1.1	2.0	2.0	1.4	1.1	1.4	1.1	4.8	2.8	0.6	1.1	0.7	2.0	0.1	1.1	1.1	1.1	2.6	2.7
D&E Tree, Guilford	0.0	1.1	0.0	1.1	0.0	2.0	0.0	2.3	0.0	3.4	0.0	1.1	0.7	1.1	2.5	2.0	0.0	2.0	3.1	2.9
Rt 5 & Guilford Ctr Rd	0.1	1.1	0.0	1.1	0.0	1.1	0.0	0.0	0.1	2.0	0.1	1.1	0.0	1.1	0.0	1.1	0.0	1.1	0.1	2.2
Guilfor Ctr & Tater Rds	0.0	1.1	0.4	1.1	0.0	0.0	0.0	2.0	0.4	2.5	0.0	1.1	0.0	1.1	0.0	0.0	0.0	2.0	0.0	2.5
Weatherhead Hllw Rd	0.0	2.0	0.0	1.1	0.0	1.1	0.0	2.0	0.0	3.2	0.0	2.0	0.3	1.1	0.0	1.1	0.0	2.0	0.3	3.2
Guilford Town Garage	1.1	2.3	0.7	1.1	0.0	1.1	1.4	1.1	3.2	3.0	1.2	2.3	0.0	1.1	0.0	1.1	0.9	0.0	2.1	2.7
West Brattleboro SP	0.0	0.0	0.0	1.1	0.0	1.1	0.0	1.4	0.0	2.1	0.0	0.0	0.7	1.1	0.0	1.1	0.0	1.1	0.7	1.9
Wilmington AOT Pole	0.0	1.1	0.0	1.1	1.0	1.1	1.4	1.1	2.4	2.3	0.3	1.1	0.0	1.1	0.0	1.1	0.8	0.0	1.1	1.9
Wilmington AOT A/S	1.1	1.1	2.0	2.0	2.4	1.1	2.4	1.1	7.8	2.8	2.1	1.1	0.2	2.0	0.7	1.1	2.8	1.1	5.7	2.7

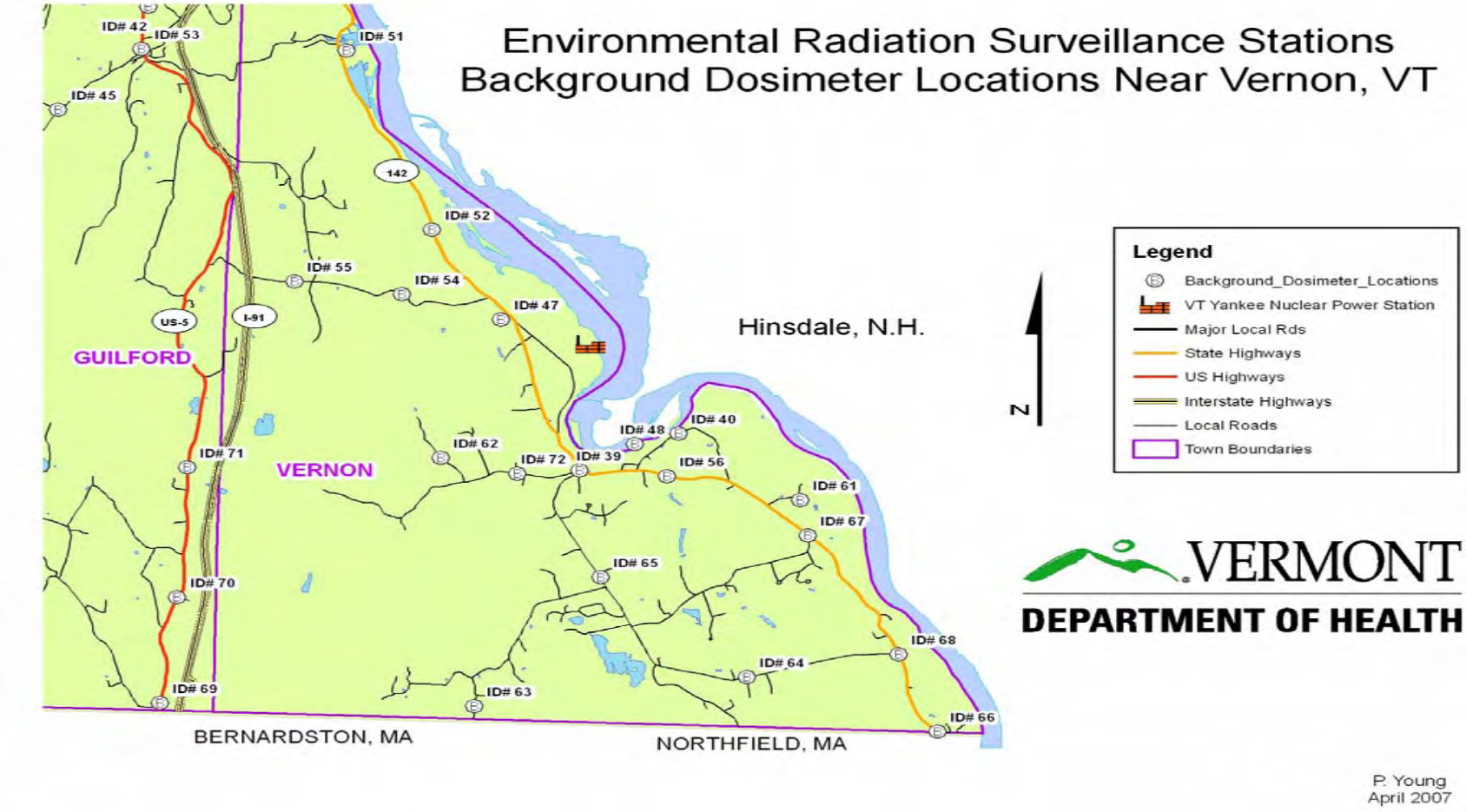
Table7b. VYNPS Net Background Dose Equivalent Results for 2007 in Millirem

	Global Dosimetry TLDs										AREVA, NP TLDs									
Location	Q 1	Error	Q 2	Error	Q 3	Error	Q 4	Error	2007	Error	Q 1	Error	Q 2	Error	Q 3	Error	Q 4	Error	2007	Error
Putney Town Clerk	0.0	0.7	0.0	0.7	0.0	0.7	0.0	2.7	0.0	3.0	0.0	0.7	0.0	0.7	0.0	0.7	0.0	0.7	0.0	1.3
Putney Pole	0.4	0.7	0.0	0.7	0.0	0.0	0.2	0.7	0.7	1.2	0.7	0.7	0.0	0.7	0.0	0.0	0.5	0.7	1.3	1.2
Dummerston School	0.2	0.7	0.8	0.8	0.4	0.7	0.0	0.0	1.5	1.2	0.0	0.7	0.8	0.8	0.5	0.7	0.0	1.2	1.3	1.7
Dummerston IFO	0.4	0.7	0.2	0.7	0.2	0.7	0.2	0.7	1.1	1.3	0.3	0.7	0.3	0.7	0.6	0.7	0.2	1.4	1.4	1.8
Windham County Court	0.0	0.0	0.0	0.0	0.2	0.7	0.0	1.2	0.2	1.3	0.0	0.0	0.2	0.0	0.3	0.7	0.0	0.0	0.6	0.6
Renaud Brothers	0.0	0.7	0.0	1.2	0.0	0.8	0.8	0.0	0.9	1.5	0.1	0.7	0.0	1.2	0.0	0.8	1.2	1.2	1.3	1.9
Rt 142 N Trans Lines	1.0	1.2	0.4	0.7	0.2	0.7	0.2	1.2	1.9	1.9	0.7	1.2	0.8	0.7	0.9	0.7	0.2	0.7	2.7	1.6
Tyler Hill Road	0.2	0.7	0.0	2.0	0.2	0.7	3.2	0.7	3.7	2.3	0.0	0.7	0.0	2.0	0.0	0.7	0.0	0.7	0.0	2.3
Miller Farm	0.0	0.7	0.6	0.0	0.6	0.0	0.0	1.8	1.3	1.9	0.0	0.7	0.0	0.0	0.4	0.0	0.0	0.7	0.4	1.0
142/Pond Road North	0.0	1.4	0.0	0.0	0.0	1.8	0.0	0.7	0.0	1.8	0.0	1.4	0.0	0.0	0.0	1.8	0.0	1.8	0.0	2.5
Fairman Road	0.0	0.7	0.0	0.7	0.0	1.2	0.0	0.0	0.0	1.3	0.0	0.7	0.0	0.7	0.0	1.2	0.0	1.2	0.0	1.7
West Road/Edgewood	0.0	0.0	0.0	0.7	0.0	1.2	0.0	0.7	0.0	1.3	0.0	0.0	0.0	0.7	0.0	1.2	0.0	0.7	0.0	1.3
Vernon Fire Station	0.0	2.7	0.0	0.7	0.0	1.4	0.2	0.7	0.3	3.0	0.0	2.7	0.0	0.7	0.0	1.4	0.0	0.7	0.0	3.0
Power Line R Crsng	0.0	0.7	0.0	1.4	0.0	0.0	0.0	0.7	0.0	1.7	0.2	0.7	0.0	1.4	0.0	0.0	0.0	0.7	0.2	1.7
A&M Auto/Smead	0.8	0.7	0.0	0.7	0.2	0.0	0.2	0.7	1.3	1.2	0.0	0.7	0.3	0.7	0.2	0.0	0.0	1.4	0.4	1.7
Blodgett Farm	0.4	0.7	0.0	0.0	1.2	1.2	0.2	0.0	1.9	1.1	0.9	0.7	0.0	0.0	0.0	1.2	0.6	0.7	1.5	1.3
Rt 142/Newtron Rd	0.0	1.2	0.6	0.7	0.6	0.7	0.0	0.7	1.2	1.6	0.0	1.2	0.2	0.7	0.3	0.7	0.0	0.7	0.5	1.6
Rt 142/Pond Rd S	0.6	0.7	0.0	0.7	0.0	0.0	0.2	0.7	0.9	1.2	0.2	0.7	0.0	0.7	0.0	0.0	0.0	1.2	0.2	1.5
Rt 142/Depot Street	0.2	0.7	0.0	0.7	0.0	0.0	0.2	1.2	0.5	1.5	0.1	0.7	0.0	0.7	0.0	0.0	0.1	0.7	0.3	1.2
Pond Rd/Houghton	0.0	1.4	0.2	0.7	0.0	0.7	0.0	0.7	0.3	1.8	0.1	1.4	0.1	0.7	0.4	0.7	0.0	0.7	0.6	1.8
Pond Rd/Vernon Rec	0.0	1.2	0.4	1.2	0.4	0.7	0.0	0.7	0.8	1.9	0.0	1.2	0.0	1.2	0.1	0.7	0.0	0.7	0.1	1.9
Huckle Hill Rd.VT Line	0.6	1.4	0.0	1.2	0.0	0.8	0.8	0.7	1.5	2.0	1.3	1.4	0.0	1.2	0.0	0.8	1.5	1.4	2.8	2.4
Route 5/Wolosko	0.8	1.2	1.2	0.8	2.4	0.7	1.4	0.7	5.9	1.7	1.0	1.2	2.1	0.8	2.0	0.7	1.4	0.0	6.4	1.6
Rt 5/Andrews Cemetary	0.0	0.0	3.6	0.0	1.6	1.4	0.8	1.2	6.1	1.5	0.0	0.0	1.6	0.0	1.8	1.4	0.5	1.2	3.9	1.5
Rt 5/Tkaczyk Farm Rd	0.0	0.7	0.4	0.0	1.0	0.0	0.0	0.7	1.5	1.0	0.2	0.7	0.6	0.0	0.2	0.0	0.3	0.7	1.3	1.0
Tyler Rd/Franklin Rd	0.0	0.7	0.4	1.2	0.2	0.7	0.8	0.7	1.5	1.6	0.4	0.7	0.4	1.2	0.1	0.7	0.7	0.7	1.5	1.6
D&E Tree, Guilford	0.0	0.7	1.2	0.7	0.8	1.2	0.0	1.4	2.0	1.9	0.0	0.7	0.4	0.7	1.5	1.2	0.0	1.2	1.9	1.7
Rt 5 & Guilford Ctr Rd	0.0	0.7	0.0	0.7	0.0	0.7	0.0	0.0	0.0	1.2	0.1	0.7	0.0	0.7	0.0	0.7	0.0	0.7	0.1	1.3
Guilfor Ctr & Tater Rds	0.0	0.7	0.0	0.7	0.0	0.0	0.0	1.2	0.0	1.5	0.0	0.7	0.0	0.7	0.0	0.0	0.0	1.2	0.0	1.5
Weatherhead Hllw Rd	0.0	1.2	0.2	0.7	0.0	0.7	0.0	1.2	0.2	1.9	0.0	1.2	0.2	0.7	0.0	0.7	0.0	1.2	0.2	1.9
Guilford Town Garage	0.6	1.4	0.0	0.7	0.0	0.7	0.8	0.7	1.5	1.8	0.7	1.4	0.0	0.7	0.0	0.7	0.6	0.0	1.3	1.6
West Brattleboro SP	0.0	0.0	0.4	0.7	0.0	0.7	0.0	0.8	0.4	1.2	0.0	0.0	0.4	0.7	0.0	0.7	0.0	0.7	0.4	1.2
Wilmington AOT Pole	0.0	0.7	0.0	0.7	0.0	0.7	0.8	0.7	0.8	1.3	0.2	0.7	0.0	0.7	0.0	0.7	0.5	0.0	0.7	1.2
Wilmington AOT A/S	0.6	0.7	0.0	1.2	0.6	0.7	1.4	0.7	2.7	1.6	1.3	0.7	0.1	1.2	0.4	0.7	1.7	0.7	3.4	1.6

Map 6


Environmental Radiation Surveillance Stations
Background Dosimeter Locations
SOMERSET
ROYER
NEWFANE
PUTNEY
ID# 49
ID# 50
Westmoreland, N.H.
ID# 44
DUMMERSTON
ID# 43
Chesterfield, N.H.
SEARSBURG
ID# 59
WILMINGTON
ID# 58
MARLBORO
ID# 41
BRATTLEBORO
ID# 60
ID# 42
ID# 53
ID# 51
ID# 46
ID# 45
ID# 52
READSBORO
ID# 55
ID# 57
ID# 47
WHITINGHAM
HALIFAX
GUILFORD
Hinsdale, N.H.
ID# 40
ID# 71
ID# 67
VERNON
ID# 70
ID# 65
ID# 68
ID# 69
ID# 63
ID# 66
ID# 64
HEATH, MA
COLRAIN, MA
LEYDEN, MA
BERNARDSTON, MA
NORTHFIELD, MA
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
N
W
E
S
P. Young
April 2007

Map 7


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# 72
ID# 39
ID# 56
ID# 71
VERNON
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

Air Sampling Results

Using nine air sampling stations, the Vermont Department of Health assesses radioactivity in the air around Vermont Yankee. The locations of the air samplers are shown on Map 8 below. The ID numbers on the map may be matched with those on Tables 8, 9, 10 and 11. The sampling apparatus uses a mechanical pump to pull environmental air through sample media. Between the pump and sample media is positioned an in-line flow meter. The flow meter tracks the volume of air drawn through the sample media. The air samplers run continuously, and the air samples collected there are retrieved and analyzed at least monthly.

The air samplers use two different sample media to capture airborne radioactivity. One is a glass fiber filter. This filter collects particulate material. The air filter is analyzed by the Vermont Department of Health Laboratory in Burlington, which reports the results as total alpha radioactivity and total beta radioactivity. Alpha radioactivity is a measure of radioactive materials that emit alpha radiation, while beta radioactivity is a measure of radioactive materials that emit beta radiation. The air filters are also counted for gamma radioactivity in what are called the quarterly composites. An example of a natural radioactive particulate is beryllium-7. A radioactive particulate only associated with human activity is cesium-137.

The second media is a charcoal cartridge treated with triethylenediamine (TEDA). This cartridge has an affinity for radioactive iodine. As air passes through the cartridge, radioactive iodine gets trapped in the charcoal cartridge. The radioactive iodine is measured at the Vermont Department of Health Laboratory. In addition, other radioactive gases and vapors may be trapped in the charcoal cartridge. These, too, are analyzed by the laboratory. A radioactive iodine of particular interest is iodine-131. The lab reports the iodine-131 radioactivity, and identifies any other radioactive gases or vapors that were collected on the cartridge.

Alpha and beta radioactivity on the glass fiber filters is measured using a gas flow proportional counter. This analysis is particularly useful with environmental levels of radioactivity, and allows easy discrimination between alpha and beta radioactivity. The charcoal cartridges are analyzed for radioactive iodine and other gamma radiation emitting radioactive materials with a gamma spectrometer system using a reverse electrode germanium detector. This instrument can detect hundreds of different radioisotopes and identify them individually by their unique gamma radiation energy signatures. The instruments used at the Vermont Department of Health Laboratory are very sensitive and subject to significant quality controls. Still, each instrument has a limit of detection. When a sample is analyzed and no radioactivity is detected, the result is not recorded as zero, but it is recorded as less than the lower limit of detection. The lower limit of detection for iodine-131, for example is 0.0038 pCi/m^3

Total alpha, total beta, and iodine-131 radioactivity is reported in picocuries per cubic meter. A picocurie (pCi) is a measure of radioactivity. One pCi is one trillionth of a curie, and one curie is the amount of radioactivity in one gram of radium-226. A cubic meter (m^3) is a measure of volume, so the number of pCi/m^3 in these air samples is a measure of the airborne radioactivity concentration. Table 8 presents the total alpha radioactivity results from the 2007 air sample filters. Table 9 presents the total beta radioactivity from these filters. Table 10 presents the radioactive iodine-131 results following analysis of the charcoal cartridge samples, while Table 11 presents the gamma spectrometry results for the analysis of these charcoal cartridges.

Results for 2007 are that 1) alpha radioactivity is within the historical range of less than the lower limits of detection to 0.0071 pCi/m^3; 2) that beta radioactivity is within the historical range of less than the lower limits of detection to 0.0251 pCi/m^3; 3) that iodine-131 samples were all less than the limit of detection; and 4) that all gamma radioactivity detected was of natural origin. Specific concentrations for alpha radioactivity ranged from 0.000038 pCi/m^3 to 0.00456 pCi/m^3 while the specific concentrations for beta radioactivity ranged from 0.000458 pCi/m^3 to 0.0194 pCi/m^3.

Each calendar quarter, the air filter samples from all nine air sample locations are analyzed together in what is called a quarterly composite. The quarterly composite corrects for radioactive decay over the calendar quarter. The filters are analyzed with the gamma spectrometer system used to evaluate the air cartridges for radioactive materials. Table 12 presents the quarterly composite results.

In the graph in Figure 1, the mean alpha radioactivity for each of the nine Vermont Department of Health air sample stations is plotted. The graph indicates that there is little difference between results at locations close to Vermont Yankee Nuclear Power Station, for example at the Vernon Elementary School, and at locations far from the plant, for example the Windham County Courthouse in Brattleboro. As with alpha radioactivity, a look at the mean air sample total beta radioactivity indicates no significant difference between air sample results for locations near the plant as compared to locations further from the plant. These mean air sample beta radioactivity results from the nine air sample stations are plotted in the graph in Figure 2.

Table 10 presents the monthly results of iodine-131 sample analysis. No iodine-131 above the lower limit of detection was identified at any of the nine air sampling stations. The lower limit of detection is 0.0038 picocuries per cubic meter (pCi/m^3).

In Table 11 is presented the gamma spectroscopy results for air sample charcoal cartridges for the nine air samplers in the Vermont Yankee Nuclear Power Station area. All of the results indicate only naturally occurring radioactive materials were detected. Table 13 provides a list of some of the naturally occurring radioactive materials commonly found in gamma spectroscopy at the Vermont Department of Health Laboratory. Table 14 is a list of radioactive materials that may be identified through gamma spectroscopy that are predominantly associated with nuclear facilities.

Table 12 presents the quarterly air sample composite analysis. The quarterly composites are analyses of all air filters collected from the nine air sampling stations over the three-

month calendar quarter. The 27 filters are analyzed by gamma spectroscopy, which can identify any radioactivity that emits gamma radiation. The analysis of these filters indicated only naturally occurring beryllium-7 present in excess of the lower limit of detection. Beryllium-7 is a cosmogenic radioactive material. Cosmogenic radioactive materials are created by cosmic radiation interactions in the earth's atmosphere. The beryllium-7 accumulates on the surface of the earth when washed out of the atmosphere by precipitation.

In summary, gamma spectroscopy of air sample cartridges and filters around Vermont Yankee showed no evidence of radioactivity from the station. The alpha and beta radioactivity measurements are within the historical range and are considered most likely only associated with natural radioactive materials in the air.

Map 8

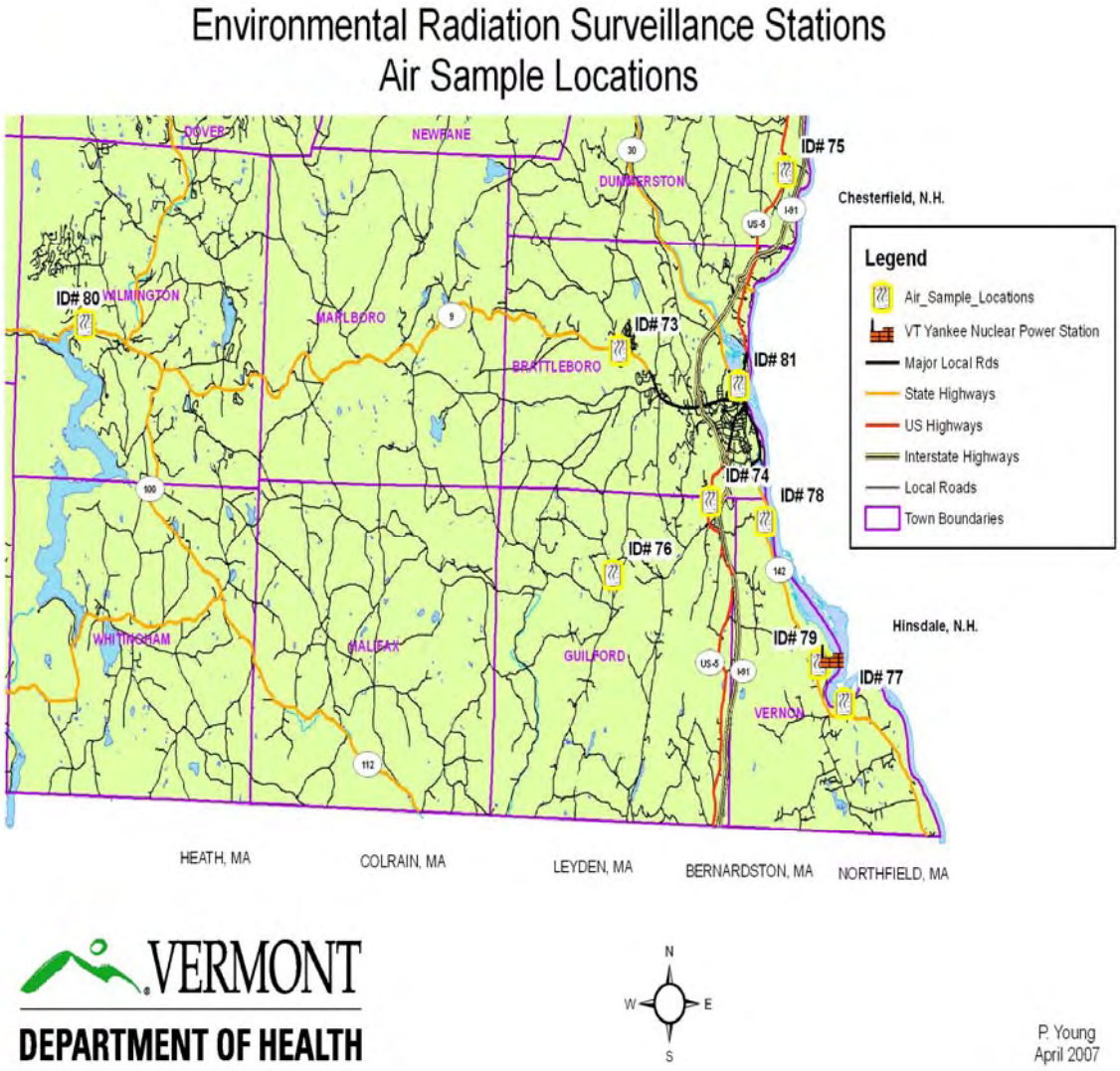

Environmental Radiation Surveillance Stations
Air Sample Locations
ID# 75
Chesterfield, N.H.
ID# 80
WILMINGTON
MARLBORO
ID# 73
BRATTLEBORO
ID# 81
ID# 74
ID# 78
ID# 76
Hinsdale, N.H.
ID# 79
ID# 77
WHITINGHAM
MALLEAX
GUILFORD
VERNON
HEATH, MA
COLRAIN, MA
LEYDEN, MA
BERNARDSTON, MA
NORTHFIELD, MA
Legend
Air_Sample_Locations
VT Yankee Nuclear Power Station
Major Local Rds
State Highways
US Highways
Interstate Highways
Local Roads
Town Boundaries
VERMONT
DEPARTMENT OF HEALTH
N
W
E
S
P. Young
April 2007

Table 8. 2007 Air Sample Alpha Radioactivity Results

Sample Date	Sample Location	Map ID No.	Results pCi/m^3	Error pCi/m^3
1/29/2007	Brattleboro State Police	73	0.00237	0.00073
1/29/2007	D & E Tree	74	0.00194	0.00069
1/29/2007	Dummerston State Garage	75	0.00207	0.00073
1/29/2007	Guilford Town Garage	76	0.00229	0.00074
1/29/2007	Power Line River Crossing	77	0.00376	0.001
1/29/2007	Renauld Brothers	78	0.00172	0.00066
1/29/2007	Vernon Elementary School	79	0.0028	0.00084
1/29/2007	Wilmington State Garage	80	0.00221	0.00072
1/29/2007	Windham County Court	81	0.00271	0.00074
2/27/2007	Brattleboro State Police	73	0.00237	0.00073
2/27/2007	D & E Tree	74	0.00264	0.00095
2/27/2007	Dummerston State Garage	75	0.00268	0.00098
2/27/2007	Guilford Town Garage	76	0.00176	0.00056
2/27/2007	Power Line River Crossing	77	0.00321	0.00112
2/27/2007	Renauld Brothers	78	0.00185	0.00084
2/27/2007	Vernon Elementary School	79	0.00336	0.00109
2/27/2007	Wilmington State Garage	80	0.00235	0.00091
2/27/2007	Windham County Court	81	0.00265	0.00089
3/20/2007	Brattleboro State Police	73	0.00314	0.00099
3/20/2007	D & E Tree	74	0.00157	0.00052
3/20/2007	Dummerston State Garage	75	0.0000794	0.000259
3/20/2007	Guilford Town Garage	76	0.00204	0.00074
3/20/2007	Power Line River Crossing	77	0.00254	0.00069
3/20/2007	Renauld Brothers	78	0.0000431	0.000236
3/20/2007	Vernon Elementary School	79	0.00153	0.00052
3/20/2007	Wilmington State Garage	80	0.00139	0.0005
3/20/2007	Windham County Court	81	0.00151	0.00048
4/30/2007	Brattleboro State Police	73	0.00156	0.00051
4/30/2007	D & E Tree	74	0.00237	0.00073
4/30/2007	Dummerston State Garage	75	0.00194	0.00069
4/30/2007	Guilford Town Garage	76	0.00207	0.00073
4/30/2007	Power Line River Crossing	77	0.00229	0.00074
4/30/2007	Renauld Brothers	78	0.00376	0.001
4/30/2007	Vernon Elementary School	79	0.00172	0.00066
4/30/2007	Wilmington State Garage	80	0.0028	0.00084
4/30/2007	Windham County Court	81	0.00221	0.00072

Table 8. 2007 Air Sample Alpha Radioactivity (continued)

Sample Date	Sample Location	Map ID No	Results pCi/m^3	Error pCi/m^3
5/29/2007	Brattleboro State Police	73	0.000291	0.000412
5/29/2007	D & E Tree	74	0.00087	0.000556
5/29/2007	Dummerston State Garage	75	0.00204	0.00074
5/29/2007	Guilford Town Garage	76	0.00214	0.00077
5/29/2007	Power Line River Crossing	77	0.000198	0.000404
5/29/2007	Renauld Brothers	78	0.00205	0.00072
5/29/2007	Vernon Elementary School	79	0.000388	0.000442
5/29/2007	Wilmington State Garage	80	0.0000387	0.000309
5/29/2007	Windham County Court	81	0.000184	0.000375
6/29/2007	Brattleboro State Police	73	0.000695	0.000482
6/29/2007	D & E Tree	74	0.00187	0.00071
6/29/2007	Dummerston State Garage	75	0.000571	0.000467
6/29/2007	Guilford Town Garage	76	0.00234	0.00077
6/29/2007	Power Line River Crossing	77	0.00322	0.00085
6/29/2007	Renauld Brothers	78	0.000532	0.000434
6/29/2007	Vernon Elementary School	79	0.00245	0.00076
6/29/2007	Wilmington State Garage	80	0.00154	0.00059
6/29/2007	Windham County Court	81	0.00279	0.00079
7/31/2007	Brattleboro State Police	73	0.000441	0.000299
7/31/2007	D & E Tree	74	0.00192	0.00052
7/31/2007	Dummerston State Garage	75	0.00249	0.00057
7/31/2007	Guilford Town Garage	76	0.00223	0.00055
7/31/2007	Power Line River Crossing	77	0.00338	0.00064
7/31/2007	Renauld Brothers	78	0.00178	0.00047
7/31/2007	Vernon Elementary School	79	0.00272	0.00058
7/31/2007	Wilmington State Garage	80	0.00191	0.00042
7/31/2007	Windham County Court	81	0.00244	0.00055
8/30/2007	Brattleboro State Police	73	0.000369	0.000384
8/30/2007	D & E Tree	74	0.00269	0.0008
8/30/2007	Dummerston State Garage	75	0.00224	0.00074
8/30/2007	Guilford Town Garage	76	0.00181	0.00067
8/30/2007	Power Line River Crossing	77	0.00324	0.00083
8/30/2007	Renauld Brothers	78	0.000136	0.000271
8/30/2007	Vernon Elementary School	79	0.00381	0.0009
8/30/2007	Wilmington State Garage	80	0.00191	0.00042
8/30/2007	Windham County Court	81	0.00239	0.00072

Table 8. 2007 Air Sample Alpha Radioactivity (continued)

Sample Date	Sample Location	Map ID No.	Results pCi/m^3	Error pCi/m^3
9/25/2007	Brattleboro State Police	73	0.00335	0.00095
9/25/2007	D & E Tree	74	0.00386	0.00097
9/25/2007	Dummerston State Garage	75	0.00307	0.00085
9/25/2007	Guilford Town Garage	76	0.00413	0.00085
9/25/2007	Power Line River Crossing	77	0.00383	0.00087
9/25/2007	Renauld Brothers	78	0.00389	0.00097
9/25/2007	Vernon Elementary School	79	0.00359	0.0008
9/25/2007	Wilmington State Garage	80	0.00212	0.00065
9/25/2007	Windham County Court	81	0.00265	0.00071
10/30/2007	Brattleboro State Police	73	0.0031	0.00078
10/30/2007	D & E Tree	74	0.00456	0.00089
10/30/2007	Dummerston State Garage	75	0.00314	0.00074
10/30/2007	Guilford Town Garage	76	0.00413	0.00085
10/30/2007	Power Line River Crossing	77	0.00295	0.00051
10/30/2007	Renauld Brothers	78	0.00373	0.0008
10/30/2007	Vernon Elementary School	79	0.00333	0.00088
10/30/2007	Wilmington State Garage	80	0.00209	0.00075
10/30/2007	Windham County Court	81	0.0024	0.0008
11/30/2007	Brattleboro State Police	73	0.00317	0.00094
11/30/2007	D & E Tree	74	0.00264	0.0008
11/30/2007	Dummerston State Garage	75	0.000057	0.00041
11/30/2007	Guilford Town Garage	76	0.00253	0.00078
11/30/2007	Power Line River Crossing	77	0.00295	0.00051
11/30/2007	Renauld Brothers	78	0.00249	0.00076
11/30/2007	Vernon Elementary School	79	0.00305	0.00101
11/30/2007	Wilmington State Garage	80	0.00267	0.00097
11/30/2007	Windham County Court	81	0.000624	0.000568
12/20/2007	Brattleboro State Police	73	0.00403	0.00124
12/20/2007	D & E Tree	74	0.00401	0.00113
12/20/2007	Dummerston State Garage	75	0.000397	0.00118
12/20/2007	Guilford Town Garage	76	0.00323	0.00102
12/20/2007	Power Line River Crossing	77	0.00235	0.00085
12/20/2007	Renauld Brothers	78	0.0032	0.00098
12/20/2007	Vernon Elementary School	79	0.00335	0.00095
12/20/2007	Wilmington State Garage	80	0.00386	0.00097
12/20/2007	Windham County Court	81	0.00307	0.00085

Figure 1, 2007 Mean Alpha Radioactivity in Air Around VYNPS

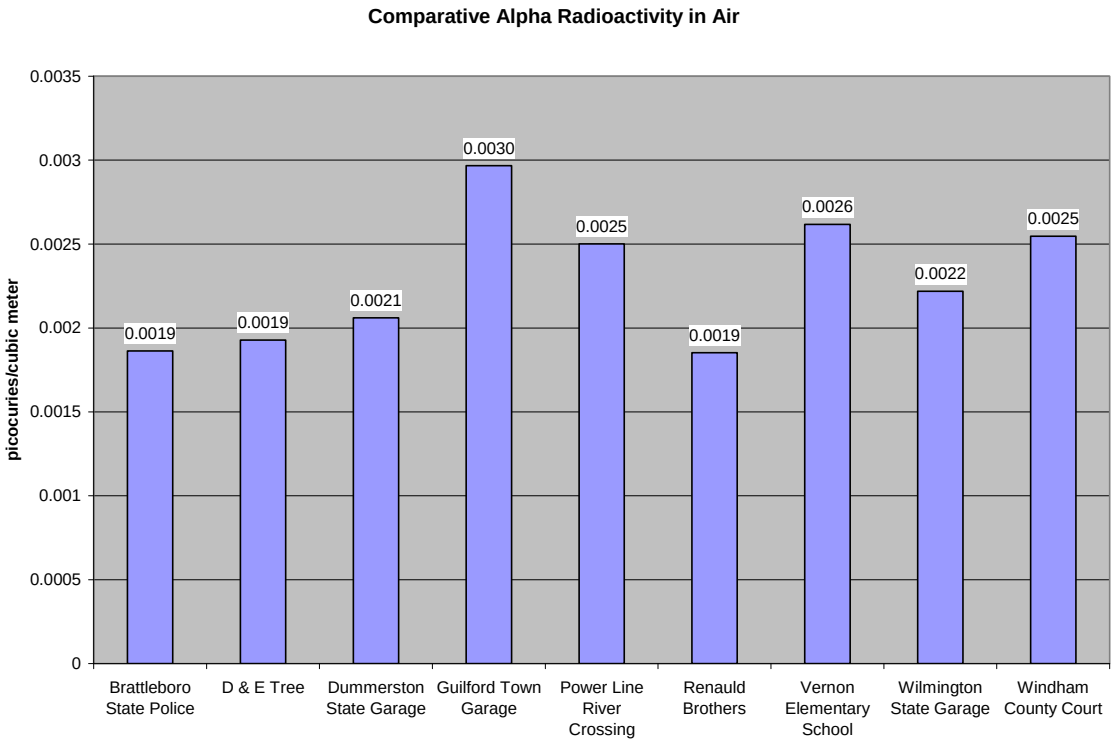


Table 9. 2007 Air Sample Beta Radioactivity Results

Sample Date	Sample Location	Map ID No.	Results pCi/m^3	Error pCi/m^3
1/29/2007	Brattleboro State Police	73	0.00116	0.00047
1/29/2007	D & E Tree	74	0.00845	0.00095
1/29/2007	Dummerston State Garage	75	0.00905	0.00097
1/29/2007	Guilford Town Garage	76	0.0146	0.0013
1/29/2007	Power Line River Crossing	77	0.00473	0.00075
1/29/2007	Renauld Brothers	78	0.0188	0.0021
1/29/2007	Vernon Elementary School	79	0.006	0.00081
1/29/2007	Wilmington State Garage	80	0.0106	0.001
1/29/2007	Windham County Court	81	0.0132	0.0013
2/27/2007	Brattleboro State Police	73	0.0116	0.0013
2/27/2007	D & E Tree	74	0.0103	0.0012
2/27/2007	Dummerston State Garage	75	0.01	0.0012
2/27/2007	Guilford Town Garage	76	0.0172	0.0016
2/27/2007	Power Line River Crossing	77	0.00665	0.00101
2/27/2007	Renauld Brothers	78	0.0161	0.0015
2/27/2007	Vernon Elementary School	79	0.00863	0.0011
2/27/2007	Wilmington State Garage	80	0.0124	0.0012
2/27/2007	Windham County Court	81	0.0132	0.0013
3/20/2007	Brattleboro State Police	73	0.012	0.0015
3/20/2007	D & E Tree	74	0.0113	0.0015
3/20/2007	Dummerston State Garage	75	0.00689	0.00085
3/20/2007	Guilford Town Garage	76	0.0163	0.0019
3/20/2007	Power Line River Crossing	77	0.00911	0.00139
3/20/2007	Renauld Brothers	78	0.0137	0.0017
3/20/2007	Vernon Elementary School	79	0.00908	0.00137
3/20/2007	Wilmington State Garage	80	0.00933	0.0013
3/20/2007	Windham County Court	81	0.0118	0.0015
4/30/2007	Brattleboro State Police	73	0.00711	0.00084
4/30/2007	D & E Tree	74	0.000722	0.000457
4/30/2007	Dummerston State Garage	75	0.00689	0.00085
4/30/2007	Guilford Town Garage	76	0.00912	0.00101
4/30/2007	Power Line River Crossing	77	0.000458	0.000412
4/30/2007	Renauld Brothers	78	0.00721	0.00086
4/30/2007	Vernon Elementary School	79	0.00657	0.00082
4/30/2007	Wilmington State Garage	80	0.00696	0.00079
4/30/2007	Windham County Court	81	0.00737	0.00084

Table 9. 2007 Air Sample Beta Radioactivity Results (continued)

Sample Date	Sample Location	Map ID No.	Results pCi/m^3	Error pCi/m^3
5/29/2007	Brattleboro State Police	73	0.00092	0.000643
5/29/2007	D & E Tree	74	0.00515	0.001
5/29/2007	Dummerston State Garage	75	0.00959	0.00124
5/29/2007	Guilford Town Garage	76	0.0109	0.0013
5/29/2007	Power Line River Crossing	77	0.000616	0.00064
5/29/2007	Renauld Brothers	78	0.00976	0.00122
5/29/2007	Vernon Elementary School	79	0.0011	0.0067
5/29/2007	Wilmington State Garage	80	0.000973	0.000584
5/29/2007	Windham County Court	81	0.0011	0.00064
6/29/2007	Brattleboro State Police	73	0.000917	0.000553
6/29/2007	D & E Tree	74	0.00958	0.00119
6/29/2007	Dummerston State Garage	75	0.00214	0.00068
6/29/2007	Guilford Town Garage	76	0.0113	0.00113
6/29/2007	Power Line River Crossing	77	0.0135	0.0013
6/29/2007	Renauld Brothers	78	0.00188	0.00062
6/29/2007	Vernon Elementary School	79	0.0123	0.0013
6/29/2007	Wilmington State Garage	80	0.00937	0.00107
6/29/2007	Windham County Court	81	0.0112	0.0012
7/31/2007	Brattleboro State Police	73	0.0012	0.00069
7/31/2007	D & E Tree	74	0.00941	0.00128
7/31/2007	Dummerston State Garage	75	0.01	0.0013
7/31/2007	Guilford Town Garage	76	0.0103	0.0013
7/31/2007	Power Line River Crossing	77	0.0115	0.0013
7/31/2007	Renauld Brothers	78	0.0114	0.0013
7/31/2007	Vernon Elementary School	79	0.0116	0.0009
7/31/2007	Wilmington State Garage	80	0.0054	0.00059
7/31/2007	Windham County Court	81	0.0118	0.0013
8/30/2007	Brattleboro State Police	73	0.000771	0.000697
8/30/2007	D & E Tree	74	0.0102	0.0013
8/30/2007	Dummerston State Garage	75	0.00823	0.0012
8/30/2007	Guilford Town Garage	76	0.0103	0.0013
8/30/2007	Power Line River Crossing	77	0.015	0.0014
8/30/2007	Renauld Brothers	78	0.00128	0.00065
8/30/2007	Vernon Elementary School	79	0.0147	0.0014
8/30/2007	Wilmington State Garage	80	0.0054	0.00059
8/30/2007	Windham County Court	81	0.0122	0.0013

Table 9. 2007 Air Sample Beta Radioactivity Results (continued)

Sample Date	Sample Location	Map ID No.	Results pCi/m^3	Error pCi/m^3
9/25/2007	Brattleboro State Police	73	0.0157	0.0015
9/25/2007	D & E Tree	74	0.0117	0.0014
9/25/2007	Dummerston State Garage	75	0.0109	0.0015
9/25/2007	Guilford Town Garage	76	0.0104	0.0014
9/25/2007	Power Line River Crossing	77	0.0144	0.0015
9/25/2007	Renauld Brothers	78	0.0141	0.0015
9/25/2007	Vernon Elementary School	79	0.0167	0.0013
9/25/2007	Wilmington State Garage	80	0.0126	0.0013
9/25/2007	Windham County Court	81	0.0141	0.0015
10/30/2007	Brattleboro State Police	73	0.0159	0.0013
10/30/2007	D & E Tree	74	0.00956	0.0011
10/30/2007	Dummerston State Garage	75	0.0112	0.0012
10/30/2007	Guilford Town Garage	76	0.0132	0.0013
10/30/2007	Power Line River Crossing	77	0.0156	0.0013
10/30/2007	Renauld Brothers	78	0.0139	0.0012
10/30/2007	Vernon Elementary School	79	0.0167	0.0013
10/30/2007	Wilmington State Garage	80	0.0114	0.0008
10/30/2007	Windham County Court	81	0.0141	0.0012
11/30/2007	Brattleboro State Police	73	0.013	0.0013
11/30/2007	D & E Tree	74	0.0107	0.0012
11/30/2007	Dummerston State Garage	75	0.012	0.0013
11/30/2007	Guilford Town Garage	76	0.0131	0.0014
11/30/2007	Power Line River Crossing	77	0.0147	0.0014
11/30/2007	Renauld Brothers	78	0.00164	0.00066
11/30/2007	Vernon Elementary School	79	0.0141	0.0013
11/30/2007	Wilmington State Garage	80	0.0114	0.0008
11/30/2007	Windham County Court	81	0.0145	0.0013
12/20/2007	Brattleboro State Police	73	0.0164	0.0018
12/20/2007	D & E Tree	74	0.0129	0.0017
12/20/2007	Dummerston State Garage	75	0.00317	0.00102
12/20/2007	Guilford Town Garage	76	0.0172	0.002
12/20/2007	Power Line River Crossing	77	0.0179	0.0019
12/20/2007	Renauld Brothers	78	0.0194	0.002
12/20/2007	Vernon Elementary School	79	0.0184	0.0019
12/20/2007	Wilmington State Garage	80	0.0127	0.0015
12/20/2007	Windham County Court	81	0.0166	0.0017

Figure 2

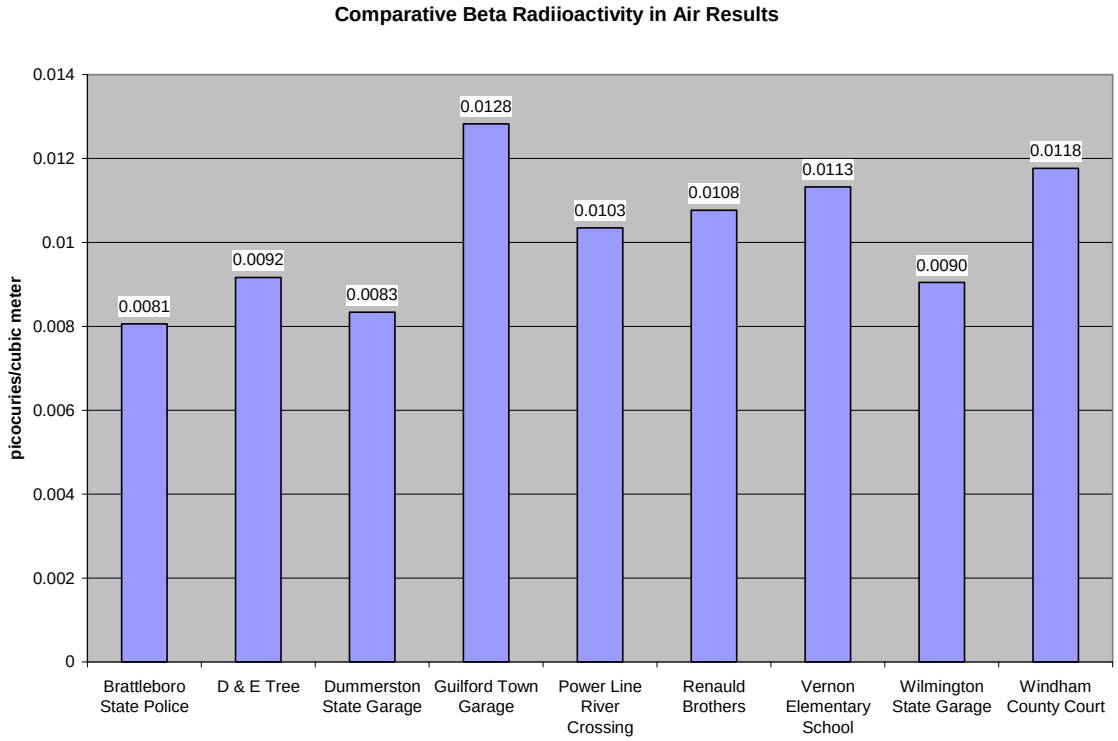

Comparative Beta Radiioactivity in Air Results
picocuries/cubic meter
0.014
0.012
0.01
0.008
0.006
0.004
0.002
0
0.0081
0.0092
0.0083
0.0128
0.0103
0.0108
0.0113
0.0090
0.0118
Brattleboro State Police
D & E Tree
Dummerston State Garage
Guilford Town Garage
Power Line River Crossing
Renauld Brothers
Vernon Elementary School
Wilmington State Garage
Windham County Court

Table 10. 2007 Air Sample Radioactive Iodine-131 Results

Sample Date	Sample Location	Map ID No.	Results pCi/m^3
1/29/2007	Brattleboro State Police	73	<0.02
1/29/2007	D & E Tree	74	<0.02
1/29/2007	Dummerston State Garage	75	<0.02
1/29/2007	Guilford Town Garage	76	<0.02
1/29/2007	Power Line River Crossing	77	<0.02
1/29/2007	Renauld Brothers	78	<0.02
1/29/2007	Vernon Elementary School	79	<0.02
1/29/2007	Wilmington State Garage	80	<0.02
1/29/2007	Windham County Court	81	<0.02
2/27/2007	Brattleboro State Police	73	<0.02
2/27/2007	D & E Tree	74	<0.02
2/27/2007	Dummerston State Garage	75	<0.02
2/27/2007	Guilford Town Garage	76	<0.02
2/27/2007	Power Line River Crossing	77	<0.02
2/27/2007	Renauld Brothers	78	<0.02
2/27/2007	Vernon Elementary School	79	<0.02
2/27/2007	Wilmington State Garage	80	<0.02
2/27/2007	Windham County Court	81	<0.02
3/20/2007	Brattleboro State Police	73	<0.02
3/20/2007	D & E Tree	74	<0.02
3/20/2007	Dummerston State Garage	75	<0.02
3/20/2007	Guilford Town Garage	76	<0.02
3/20/2007	Power Line River Crossing	77	<0.02
3/20/2007	Renauld Brothers	78	<0.02
3/20/2007	Vernon Elementary School	79	<0.02
3/20/2007	Wilmington State Garage	80	<0.02
3/20/2007	Windham County Court	81	<0.02
4/30/2007	Brattleboro State Police	73	<0.02
4/30/2007	D & E Tree	74	<0.02
4/30/2007	Dummerston State Garage	75	<0.02
4/30/2007	Guilford Town Garage	76	<0.02
4/30/2007	Power Line River Crossing	77	<0.02
4/30/2007	Renauld Brothers	78	<0.02
4/30/2007	Vernon Elementary School	79	<0.02
4/30/2007	Wilmington State Garage	80	<0.02
4/30/2007	Windham County Court	81	<0.02

Table 10. 2007 Air Sample Radioactive Iodine-131 Results (continued)

Sample Date	Sample Location	Map ID No.	Results pCi/m^3
5/29/2007	Brattleboro State Police	73	<0.02
5/29/2007	D & E Tree	74	<0.02
5/29/2007	Dummerston State Garage	75	<0.02
5/29/2007	Guilford Town Garage	76	<0.02
5/29/2007	Power Line River Crossing	77	<0.02
5/29/2007	Renauld Brothers	78	<0.02
5/29/2007	Vernon Elementary School	79	<0.02
5/29/2007	Wilmington State Garage	80	<0.02
5/29/2007	Windham County Court	81	<0.02
6/29/2007	Brattleboro State Police	73	<0.02
6/29/2007	D & E Tree	74	<0.02
6/29/2007	Dummerston State Garage	75	<0.02
6/29/2007	Guilford Town Garage	76	<0.02
6/29/2007	Power Line River Crossing	77	<0.02
6/29/2007	Renauld Brothers	78	<0.02
6/29/2007	Vernon Elementary School	79	<0.02
6/29/2007	Wilmington State Garage	80	<0.02
6/29/2007	Windham County Court	81	<0.02
7/31/2007	Brattleboro State Police	73	<0.02
7/31/2007	D & E Tree	74	<0.02
7/31/2007	Dummerston State Garage	75	<0.02
7/31/2007	Guilford Town Garage	76	<0.02
7/31/2007	Power Line River Crossing	77	<0.02
7/31/2007	Renauld Brothers	78	<0.02
7/31/2007	Vernon Elementary School	79	<0.02
7/31/2007	Wilmington State Garage	80	<0.02
7/31/2007	Windham County Court	81	<0.02
8/27/2007	Brattleboro State Police	73	<0.02
8/27/2007	D & E Tree	74	<0.02
8/27/2007	Dummerston State Garage	75	<0.02
8/27/2007	Guilford Town Garage	76	<0.02
8/27/2007	Power Line River Crossing	77	<0.02
8/27/2007	Renauld Brothers	78	<0.02
8/27/2007	Vernon Elementary School	79	<0.02
8/27/2007	Wilmington State Garage	80	<0.02
8/27/2007	Windham County Court	81	<0.02

Table 10. 2007 Air Sample Radioactive Iodine-131 Results (continued)

Sample Date	Sample Location	Map ID No.	Results pCi/m^3
9/25/2007	Brattleboro State Police	73	<0.02
9/25/2007	D & E Tree	74	<0.02
9/25/2007	Dummerston State Garage	75	<0.02
9/25/2007	Guilford Town Garage	76	<0.02
9/25/2007	Power Line River Crossing	77	<0.02
9/25/2007	Renauld Brothers	78	<0.02
9/25/2007	Vernon Elementary School	79	<0.02
9/25/2007	Wilmington State Garage	80	<0.02
9/25/2007	Windham County Court	81	<0.02
10/30/2007	Brattleboro State Police	73	<0.02
10/30/2007	D & E Tree	74	<0.02
10/30/2007	Dummerston State Garage	75	<0.02
10/30/2007	Guilford Town Garage	76	<0.02
10/30/2007	Power Line River Crossing	77	<0.02
10/30/2007	Renauld Brothers	78	<0.02
10/30/2007	Vernon Elementary School	79	<0.02
10/30/2007	Wilmington State Garage	80	<0.02
10/30/2007	Windham County Court	81	<0.02
11/30/2007	Brattleboro State Police	73	<0.02
11/30/2007	D & E Tree	74	<0.02
11/30/2007	Dummerston State Garage	75	<0.02
11/30/2007	Guilford Town Garage	76	<0.02
11/30/2007	Power Line River Crossing	77	<0.02
11/30/2007	Renauld Brothers	78	<0.02
11/30/2007	Vernon Elementary School	79	<0.02
11/30/2007	Wilmington State Garage	80	<0.02
11/30/2007	Windham County Court	81	<0.02
12/20/2007	Brattleboro State Police	73	<0.02
12/20/2007	D & E Tree	74	<0.02
12/20/2007	Dummerston State Garage	75	<0.02
12/20/2007	Guilford Town Garage	76	<0.02
12/20/2007	Power Line River Crossing	77	<0.02
12/20/2007	Renauld Brothers	78	<0.02
12/20/2007	Vernon Elementary School	79	<0.02
12/20/2007	Wilmington State Garage	80	<0.02
12/20/2007	Windham County Court	81	<0.02

Table 11. 2007 Air Sample Gamma Radioactivity Results

Sample Date	Sample Location	Map ID No.	Results pCi/m^3
1/29/2007	Brattleboro State Police	73	Natural
1/29/2007	D & E Tree	74	Natural
1/29/2007	Dummerston State Garage	75	Natural
1/29/2007	Guilford Town Garage	76	Natural
1/29/2007	Power Line River Crossing	77	Natural
1/29/2007	Renauld Brothers	78	Natural
1/29/2007	Vernon Elementary School	79	Natural
1/29/2007	Wilmington State Garage	80	Natural
1/29/2007	Windham County Court	81	Natural
2/27/2007	Brattleboro State Police	73	Natural
2/27/2007	D & E Tree	74	Natural
2/27/2007	Dummerston State Garage	75	Natural
2/27/2007	Guilford Town Garage	76	Natural
2/27/2007	Power Line River Crossing	77	Natural
2/27/2007	Renauld Brothers	78	Natural
2/27/2007	Vernon Elementary School	79	Natural
2/27/2007	Wilmington State Garage	80	Natural
2/27/2007	Windham County Court	81	Natural
3/20/2007	Brattleboro State Police	73	Natural
3/20/2007	D & E Tree	74	Natural
3/20/2007	Dummerston State Garage	75	Natural
3/20/2007	Guilford Town Garage	76	Natural
3/20/2007	Power Line River Crossing	77	Natural
3/20/2007	Renauld Brothers	78	Natural
3/20/2007	Vernon Elementary School	79	Natural
3/20/2007	Wilmington State Garage	80	Natural
3/20/2007	Windham County Court	81	Natural
4/30/2007	Brattleboro State Police	73	Natural
4/30/2007	D & E Tree	74	Natural
4/30/2007	Dummerston State Garage	75	Natural
4/30/2007	Guilford Town Garage	76	Natural
4/30/2007	Power Line River Crossing	77	Natural
4/30/2007	Renauld Brothers	78	Natural
4/30/2007	Vernon Elementary School	79	Natural
4/30/2007	Wilmington State Garage	80	Natural
4/30/2007	Windham County Court	81	Natural

Table 11. 2007 Air Sample Gamma Radioactivity Results (continued)

Sample Date	Sample Location	Map ID No.	Results pCi/m^3
5/29/2007	Brattleboro State Police	73	Natural
5/29/2007	D & E Tree	74	Natural
5/29/2007	Dummerston State Garage	75	Natural
5/29/2007	Guilford Town Garage	76	Natural
5/29/2007	Power Line River Crossing	77	Natural
5/29/2007	Renauld Brothers	78	Natural
5/29/2007	Vernon Elementary School	79	Natural
5/29/2007	Wilmington State Garage	80	Natural
5/29/2007	Windham County Court	81	Natural
6/29/2007	Brattleboro State Police	73	Natural
6/29/2007	D & E Tree	74	Natural
6/29/2007	Dummerston State Garage	75	Natural
6/29/2007	Guilford Town Garage	76	Natural
6/29/2007	Power Line River Crossing	77	Natural
6/29/2007	Renauld Brothers	78	Natural
6/29/2007	Vernon Elementary School	79	Natural
6/29/2007	Wilmington State Garage	80	Natural
6/29/2007	Windham County Court	81	Natural
7/31/2007	Brattleboro State Police	73	Natural
7/31/2007	D & E Tree	74	Natural
7/31/2007	Dummerston State Garage	75	Natural
7/31/2007	Guilford Town Garage	76	Natural
7/31/2007	Power Line River Crossing	77	Natural
7/31/2007	Renauld Brothers	78	Natural
7/31/2007	Vernon Elementary School	79	Natural
7/31/2007	Wilmington State Garage	80	Natural
7/31/2007	Windham County Court	81	Natural
8/27/2007	Brattleboro State Police	73	Natural
8/27/2007	D & E Tree	74	Natural
8/27/2007	Dummerston State Garage	75	Natural
8/27/2007	Guilford Town Garage	76	Natural
8/27/2007	Power Line River Crossing	77	Natural
8/27/2007	Renauld Brothers	78	Natural
8/27/2007	Vernon Elementary School	79	Natural
8/27/2007	Wilmington State Garage	80	Natural
8/27/2007	Windham County Court	81	Natural

Table 11. 2007 Air Sample Gamma Radioactivity Results (continued)

Sample Date	Sample Location	Map ID No.	Results pCi/m^3
9/25/2007	Brattleboro State Police	73	Natural
9/25/2007	D & E Tree	74	Natural
9/25/2007	Dummerston State Garage	75	Natural
9/25/2007	Guilford Town Garage	76	Natural
9/25/2007	Power Line River Crossing	77	Natural
9/25/2007	Renauld Brothers	78	Natural
9/25/2007	Vernon Elementary School	79	Natural
9/25/2007	Wilmington State Garage	80	Natural
9/25/2007	Windham County Court	81	Natural
10/30/2007	Brattleboro State Police	73	Natural
10/30/2007	D & E Tree	74	Natural
10/30/2007	Dummerston State Garage	75	Natural
10/30/2007	Guilford Town Garage	76	Natural
10/30/2007	Power Line River Crossing	77	Natural
10/30/2007	Renauld Brothers	78	Natural
10/30/2007	Vernon Elementary School	79	Natural
10/30/2007	Wilmington State Garage	80	Natural
10/30/2007	Windham County Court	81	Natural
11/30/2007	Brattleboro State Police	73	Natural
11/30/2007	D & E Tree	74	Natural
11/30/2007	Dummerston State Garage	75	Natural
11/30/2007	Guilford Town Garage	76	Natural
11/30/2007	Power Line River Crossing	77	Natural
11/30/2007	Renauld Brothers	78	Natural
11/30/2007	Vernon Elementary School	79	Natural
11/30/2007	Wilmington State Garage	80	Natural
11/30/2007	Windham County Court	81	Natural
12/20/2007	Brattleboro State Police	73	Natural
12/20/2007	D & E Tree	74	Natural
12/20/2007	Dummerston State Garage	75	Natural
12/20/2007	Guilford Town Garage	76	Natural
12/20/2007	Power Line River Crossing	77	Natural
12/20/2007	Renauld Brothers	78	Natural
12/20/2007	Vernon Elementary School	79	Natural
12/20/2007	Wilmington State Garage	80	Natural
12/20/2007	Windham County Court	81	Natural

Table 12. 2007 Air Sample Quarterly Composite Results

Sample Date	Sample Location	Results pCi/m^3	Error pCi/m^3	Sample Comment
3/31/2006	All 9 Vermont Yankee Filters for Quarter 1	4140	370	Be-7
6/30/2006	All 8 Vermont Yankee Filters for Quarter 2	6540	500	Be-7
10/31/2006	All 9 Vermont Yankee Filters for Quarter 3	4520	430	Be-7
12/31/2006	All 9 Vermont Yankee Filters for Quarter 4	3800	350	Be-7

Table 13. Common Natural Gamma Radiation Emitters

Actinium-228	Americium-241	Beryllium-7
Bismuth-212	Bismuth-214	Lead-210
Lead-212	Lead-214	Polonium-210
Potassium-40	Protactinium-234m	Radium-224
Radium-226	Radium-228	Radon-222
Technetium-99	Thallium-208	Thorium-228
Thorium-229	Thorium-230	Thorium-231
Thorium-232	Thorium-234	Uranium-233
Uranium-234	Uranium-235	Uranium-238

Table 14. Nuclear Facility Gamma Radiation Emitters

Antimony-124	Antimony-126	
Barium-140/Lanthanum-140	Cerium-139	Cerium-140
Cerium-144/promethium-144	Cobalt-56	Cobalt-60
Chromium-51	Cesium-134	Cesium-136
Cesium-137	Iodine-131	Iodine-132
Iodine-133	Iodine-135	Krypton-85
Krypton-88	Manganese-54	Plutonium-239
Plutonium-240	Ruthenium-103	Ruthenium-106
Strontium-85	Strontium-89	Strontium-90
Tellurium-132	Xenon-133	Xenon-133m
Xenon-135	Zinc-65	Zirconium-95/Niobium-95

Water Sampling Results

Water is sampled each month at 10 locations. Six are sample locations in the Connecticut River. Of these six Connecticut River locations, two samples are taken monthly in the pool where the plant discharges cooling water, two are taken monthly downstream of the station in the pool just below the Vernon dam, and two are taken from the river upstream of the station in Brattleboro. The remaining four sample locations include one representing the Brattleboro municipal water supply, and one each from groundwater wells that serve the Miller and Blodgett Farms in Vernon and the Vernon Elementary School. Results are in Tables 15 - 18. New for this year, we have included analyses of samples from the White River Junction area of Vermont for comparison purposes.

Each of the water samples undergoes four different analyses. The first three analyses are like those for the air samples: analysis for alpha radioactivity, analysis for beta radioactivity, and analysis for all radionuclides by gamma spectroscopy. The fourth analysis is unique to water samples. It is an analysis for tritium, the common name for the radioisotope hydrogen-3. Some of the water samples were also analyzed specifically for uranium and radium.

The concerns about alpha, beta and gamma radiation were discussed earlier. Tritium is a source of very weak beta radiation. Tritium is created when water passes through the reactor core. The reactor coolant water at Vermont Yankee, as is the case at all nuclear power stations, becomes tritiated as the hydrogen atoms in water molecules are activated by neutron radiation in the reactor core. Tritiated water may leave the plant site any way non-radioactive water leaves the plant - in the air, in groundwater and through discharges into surface waters like the Connecticut River. Unmonitored tritium releases from nuclear facilities have always been a source of concern. Tritium monitoring by the Vermont Department of Health may help identify releases if they develop.

A map showing the routine water sample locations around the Vermont Yankee site, Map 9, is below. Tables 15, 16, 17 and 18 present the water sample results. The tables list the

map identification numbers so the locations can be seen on Map 9. Sample locations 84A and 86 are in the Connecticut River downstream. These are labeled in Tables 15 to 18 as Connecticut River, Station 3-3 and Connecticut River Downstream. Sample locations 84B and 84D are in the basin where Vermont Yankee Nuclear Power Station discharges water from the plant into the Connecticut River. The tables identify them as Connecticut River, Station 3-4 and Discharge Forebay. Samples 84C and 87 are in the Connecticut River upstream of the plant. They are identified as Connecticut River, Station 3-8 and Connecticut River Upstream in Tables 15, 16, 17 and 18.

In addition to showing the individual analysis results over the course of 2007, we have taken the mean results of each of the samples at the 10 water sample locations, and plotted them in graphs. Figures 3 and 4 allow comparisons of the mean alpha and mean beta radioactivity results for the 10 locations. These figures also depict the analytical results for three other sites in Vermont. The Vermont Department of Health is collecting samples and analyzing them throughout Vermont as part of our emergency preparedness program, and including the analytical results in our annual Vermont Yankee environmental surveillance report. We hope these sample measurements will help us better understand the specific results around Vermont Yankee, as well as the general nature of radioactivity in Vermont as a whole. These sites are depicted in Maps 10 and 11.

Also new for 2007, the Department of Health analyzed ground water samples from the Miller Farm, Blodgett Farm and Vernon Elementary School for radium and uranium. This was done to help identify the source of some of the elevated alpha and beta radioactivity found in ground water samples over the years. We believed that the elevated alpha and beta radioactivity measurements in ground water samples as compared to Brattleboro municipal water was due to radium, uranium and other natural radioactive materials being filtered from the water at the Brattleboro water treatment facility. We also believed if the ground water samples had higher alpha and beta radioactivity as compared to surface water samples because of the atmospheric release of radon gas from the surface

water. Precursors of radon - uranium, radium and thorium, the radon gas itself and the particulate radon decay products are often found in groundwater but not surface water. These new analyses are needed to test these hypotheses.

Alpha Radioactivity Analyses

The alpha radioactivity measured in all samples is within the historical range for alpha radioactivity. In particular, alpha radioactivity measurements around Vermont Yankee over the past 35 years of operations and environmental surveillance have ranged from below the lower limit of detection for alpha radioactivity up to 15 picocuries per liter (pCi). The 2007 results for all samples ranged from -1.12 to 8.07 pCi/l and are shown in Table 15. The mean results, shown in Figure 3, indicate the Blodgett Farm and the Vernon Elementary School have the highest natural alpha emitters in their water.

The mean Connecticut River upstream sample results of 0.357 to 0.533 picocuries per liter (pCi/l) may be useful as a sort of background relative to water samples taken in the Connecticut River near the Vermont Yankee Nuclear Power Station discharge area and downstream in the Connecticut River. The upstream samples are taken near Brattleboro. The samples more likely to be affected by Vermont Yankee Nuclear Power Station operations, near the discharge and downstream of the plant discharge have mean sample results in the range of 0.405 to 0.578 pCi/l and 0.312 to 0.578 pCi/l, respectively. Considering the results with their uncertainty at the 95 percent confidence level, there is no statistical difference between water samples in the discharge basin and downstream of Vermont Yankee Nuclear Power Station as compared to water samples upstream of Vermont Yankee. The Brattleboro municipal water supply mean results of 0.341 pCi/l are also not significantly different from samples obtained from the Connecticut River upstream of the nuclear power station.

While there are elevated measurements of alpha radioactivity at the Blodgett Farm and at the Vernon elementary School, the same results were not found at the Miller Farm. Given the Miller Farm samples do show elevated beta radioactivity (see below) and traces of

uranium and radium, it is thought that the Miller Farm geology consists of more natural beta radiation emitting radioactive materials and less natural alpha emitting radioactive materials as compared to the Blodgett Farm and Vernon Elementary School. This characteristic is not unique to the Miller Farm, as indicated in Figures 3 and 4. These graphs show similarly low alpha radioactivity measurements and elevated beta radioactivity measurements at Dewey Mills and Lake Pineo Beach in Quechee, Vermont and the Meacham Farm in Hartland, Vermont.

Beta Radioactivity Analysis

The beta radioactivity analysis results are found in Table 16. The results were all well within the historical range of less than the lower limit of detection and 15 picocuries per liter. Specifically, the measurements in Table 16 range from -0.79 to 8.45 picocuries per liter. Taking the mean results for each of the sample sites and plotting them gives us the graph in Figure 4. In this graph, some of the characteristic results observed in the alpha radioactivity analyses are also seen with beta radioactivity. Specifically, the river water samples contain significantly less radioactivity as compared to the groundwater samples. Also like the alpha radioactivity sample results, the samples from the Connecticut River near the Vermont Yankee Nuclear Power Station discharge area and downstream of the plant, ranging from 1.373 to 1.403 pCi/l and from 0.928 to 1.623 pCi/l, respectively, are not significantly different from the samples from the Connecticut River upstream of the station where the sample means ranged between 0.880 and 1.370 pCi/l. Another similarity is seen in the Brattleboro municipal water sample: the mean beta radioactivity measured over the year is not significantly different from other mean beta radioactivity measurements, including in the Connecticut River upstream of Vermont Yankee.

One difference between the alpha and beta radioactivity measurements is what is seen in the groundwater measurements. While the Blodgett Farm and the Vernon Elementary School alpha radioactivity samples were significantly higher than the Miller Farm alpha radioactivity results, the beta radioactivity measurements for the three sites fed by well water are not significantly different. As mentioned above, the elevated beta radioactivity

at Miller Farm is not coincident with elevated alpha radioactivity, and this characteristic is shared with the samples taken from bodies of surface water near Quechee, Vermont and from ground water from a farm in Hartland, Vermont. These features are thought to be due to the different geological attributes at each of the sites causing the expression of certain natural radioactive materials and not others.

Analysis of Natural Radioactivity in Water

There are a relatively small number of naturally occurring radioactive materials. They are found in the soil and sediments that cover the Earth and they are always found in minute quantities in the air and waters that flow around, over and through the Earth. A list of some of these naturally occurring radioactive materials is found in Table 13 above. The natural isotopes uranium-235, uranium-238 and thorium-232 are very important because as they undergo radioactive decay to shed the excess energy in their nuclei, these three isotopes generate many other prominent radioactive materials including radium 226, radium 228 and radon-222. Each of these decays to create other radioactive materials. Most of them emit beta and gamma radiation, and most of the heaviest isotopes, those heavier than lead, emit alpha radiation. The Vermont Department of Health Laboratory can analyze water samples for radium-226, radium-228 and total uranium to assess the relative risk to members of the public from these radioisotopes and their precursor and daughter decay products.

In Figures 5, 6 and 7, the mean of radium and uranium measurements for the Miller and Blodgett Farms and for the Vernon Elementary School are presented. While the bars in the charts seem to indicate a lot of natural radioactivity, note that the values in picocuries per liter and milligrams per liter are quite small. To put them into context, the United States Environmental Protection Agency and the State of Vermont have limits on these three radioactive contaminants to help manage risk. Radium-226 and radium-228 radioactivity are limited to 5 picocuries per liter (pCi/l), while total uranium is limited to 20 milligrams per liter (mg/l). None of the sample natural radioactivity measurements from the Blodgett Farm, the Miller Farm or the Vernon Elementary School are near these

limits. The mean radium-226 results shown in Figure 5 range from 0.04 to 0.82 pC/l); the mean radium-228 results shown in Figure 6 range from 0.23 to 0.46 pCi/l; and the mean uranium results shown in Figure 7 range from 0.001 to 0.006 mg/l.

Gamma Spectroscopy

Gamma spectroscopy is a technique that allows for the identification and quantification of any radioactive material that emits gamma radiation. Most of the water samples, 87 of them, were found to be less than the lower limit of detection. Gamma radiation-emitting radioactive materials were identified in the remaining 33 samples, but all were naturally occurring radioactive materials. The gamma spectroscopy results for the water samples are found in Table 17. The lower limits of detection for water samples are listed in Table 19 below. The commonly identified natural radioactive materials that emit gamma radiation may be found listed in Table 13 above.

Tritium Measurement Results

No tritium above the laboratory instrumentation lower limit of detection, approximately 300 pCi/l, was identified in any of the groundwater, surface water or municipal water samples obtained by the Vermont Department of Health in 2006. The tritium analysis results are presented in Table 18.

Figure 3

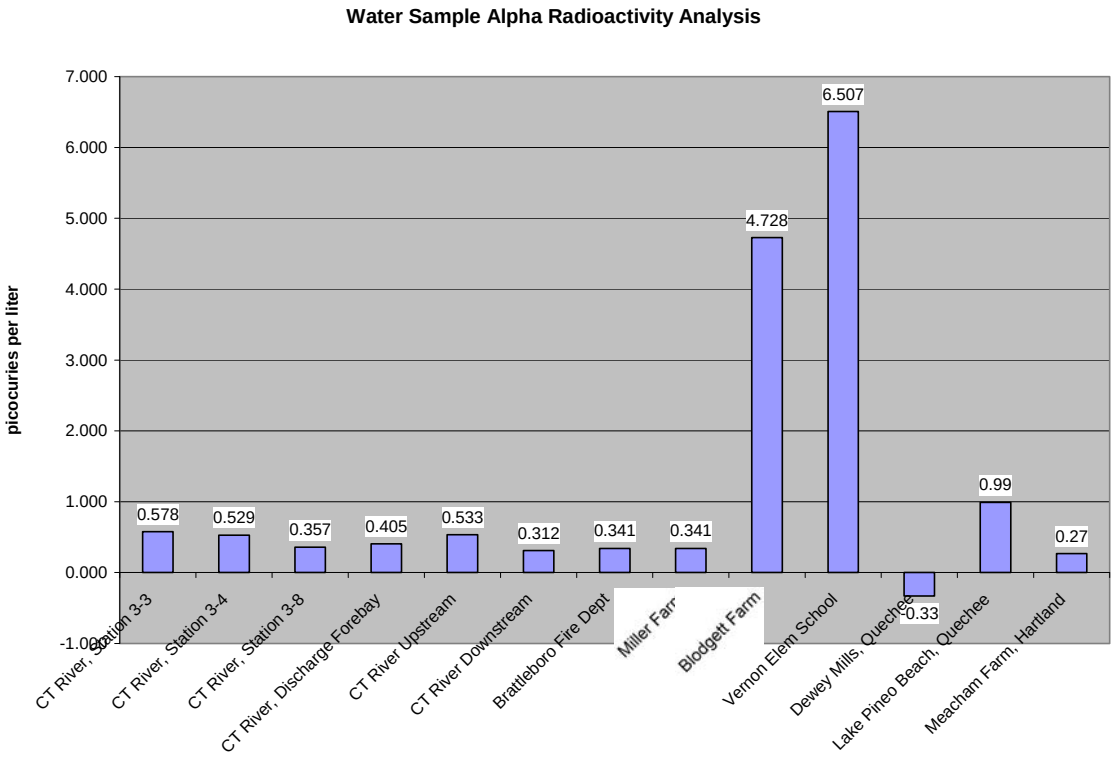

Water Sample Alpha Radioactivity Analysis
picocuries per liter
7.000
6.000
5.000
4.000
3.000
2.000
1.000
0.000
-1.000
0.578
0.529
0.357
0.405
0.533
0.312
0.341
0.341
4.728
6.507
-0.33
0.99
0.27
CT River, Station 3-3
CT River, Station 3-4
CT River, Station 3-8
CT River, Discharge Forebay
CT River Upstream
CT River Downstream
Brattleboro Fire Dept
Miller Farm
Blodgett Farm
Vernon Elem School
Dewey Mills, Quechee
Lake Pineo Beach, Quechee
Meacham Farm, Hartland

Figure 4

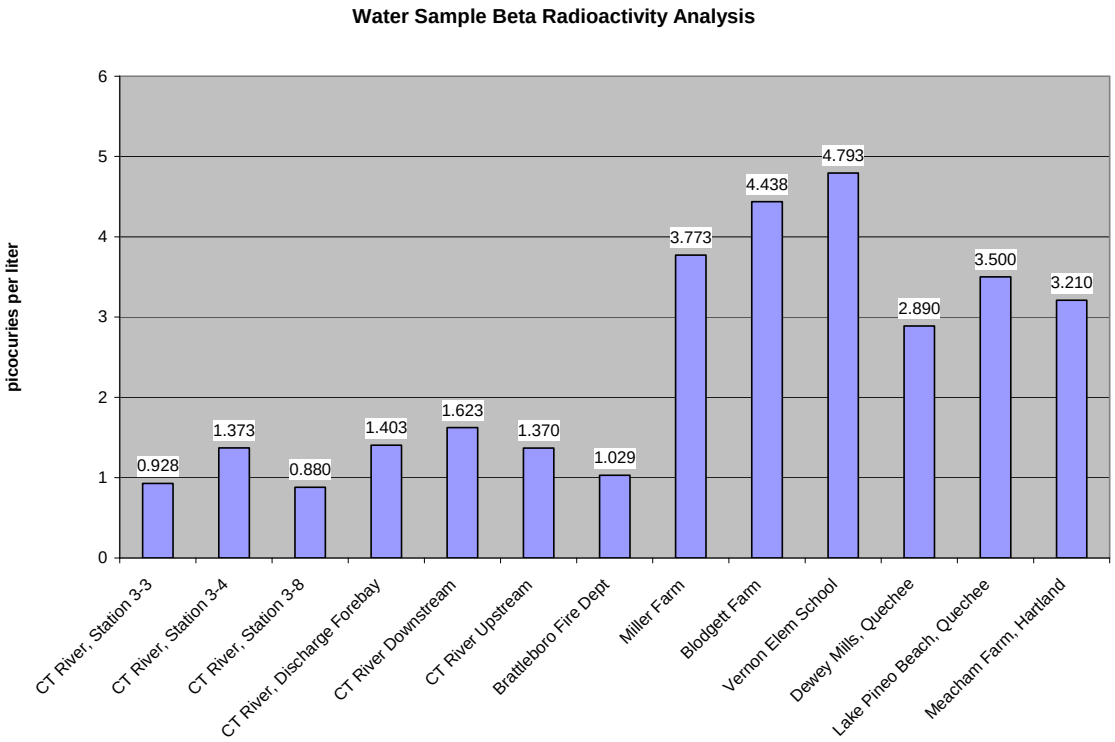


Figure 5

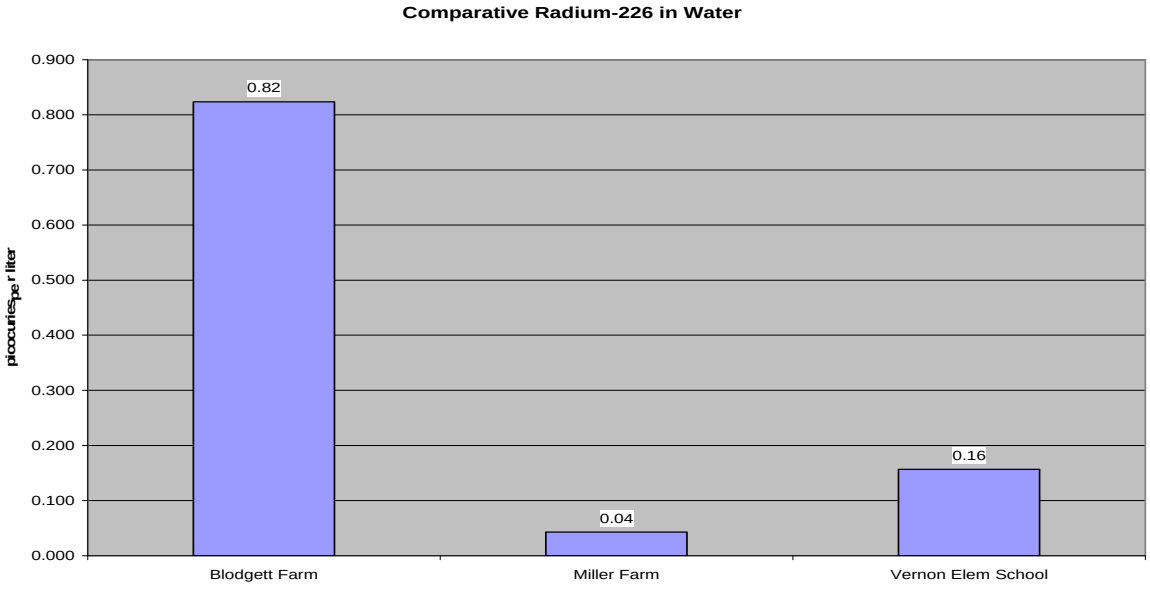


Figure 6

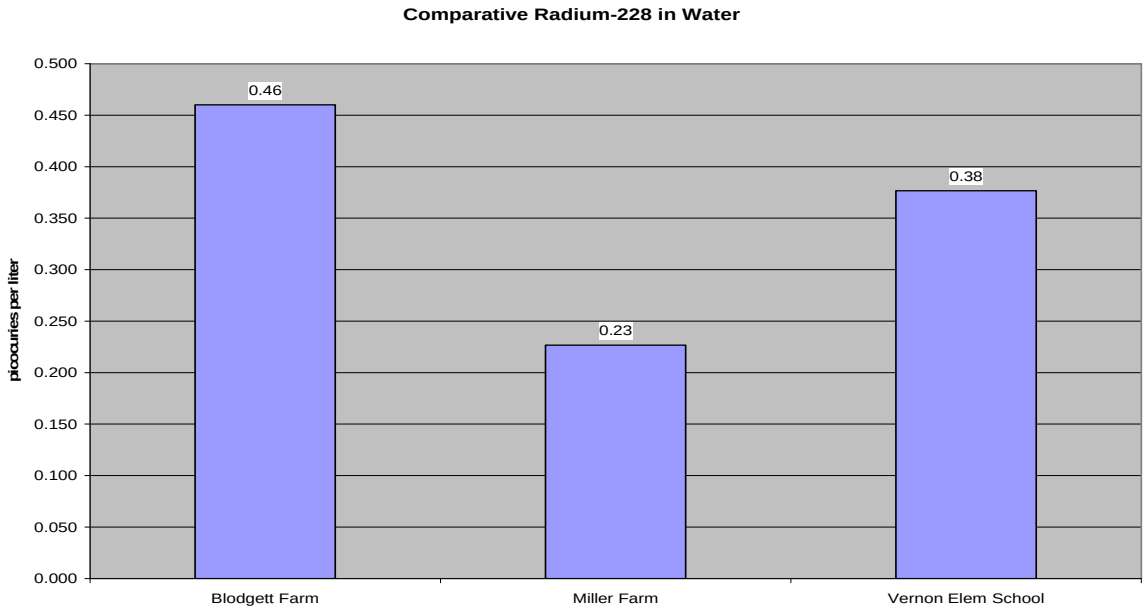
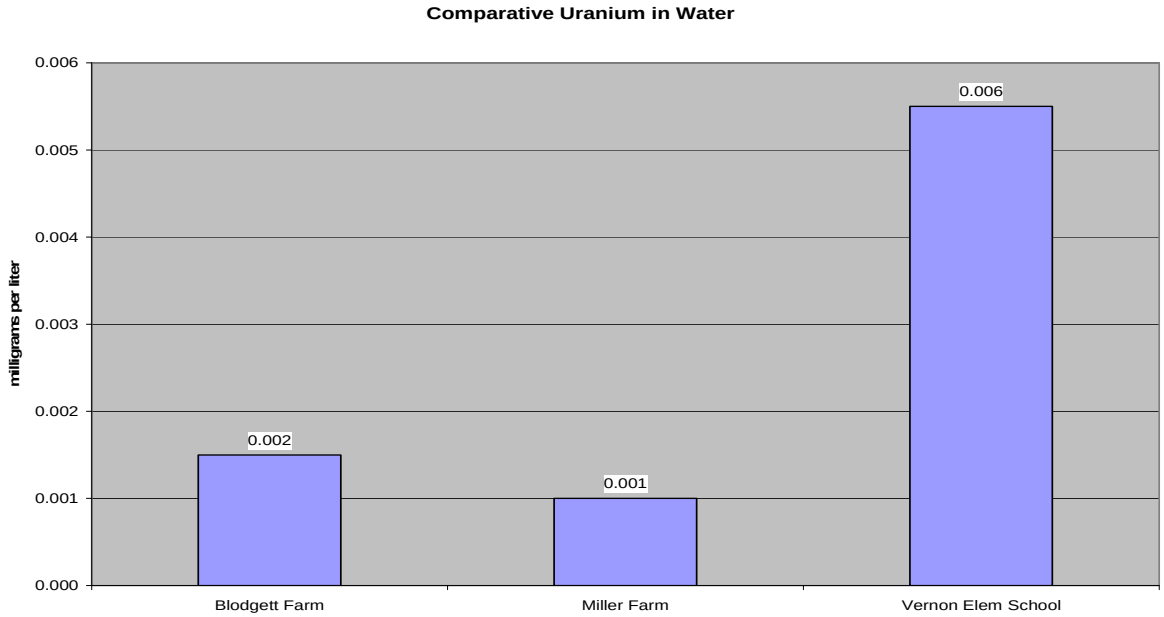
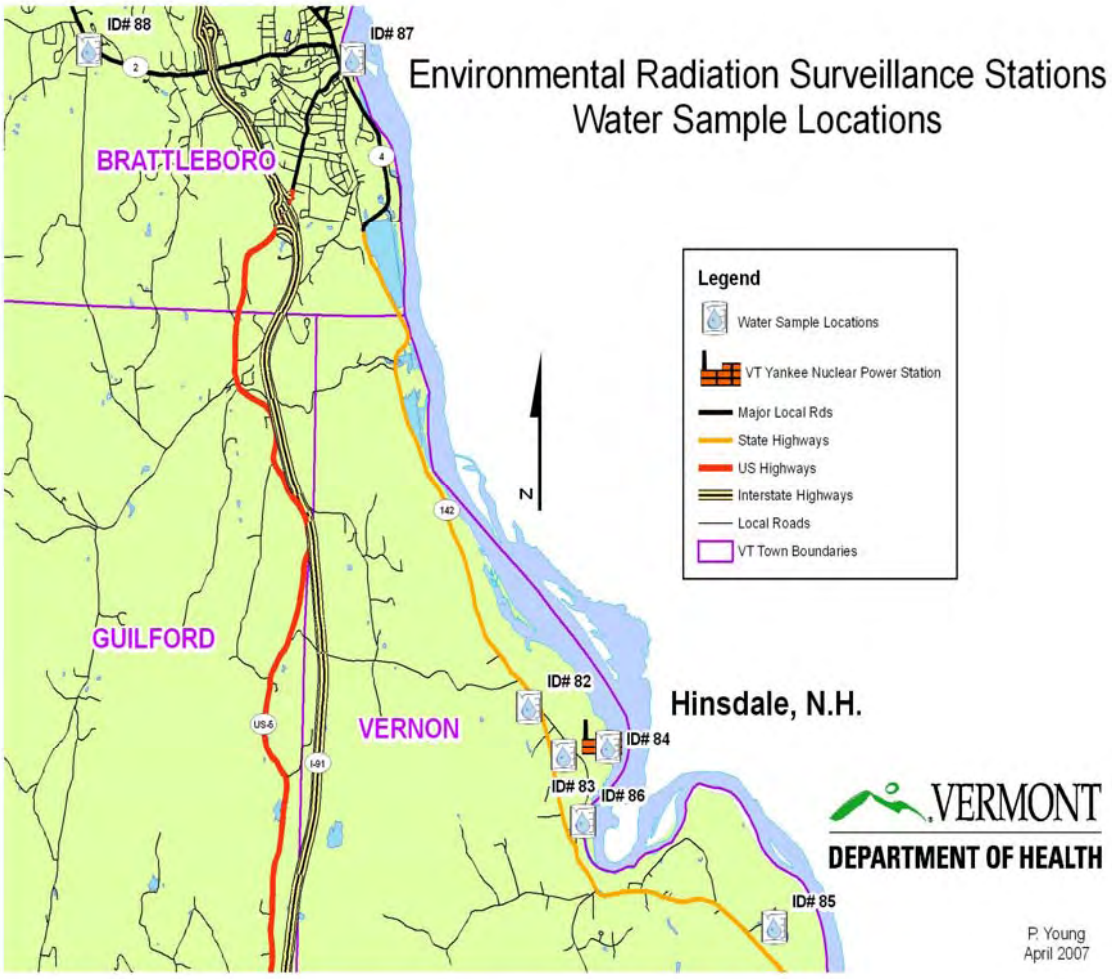


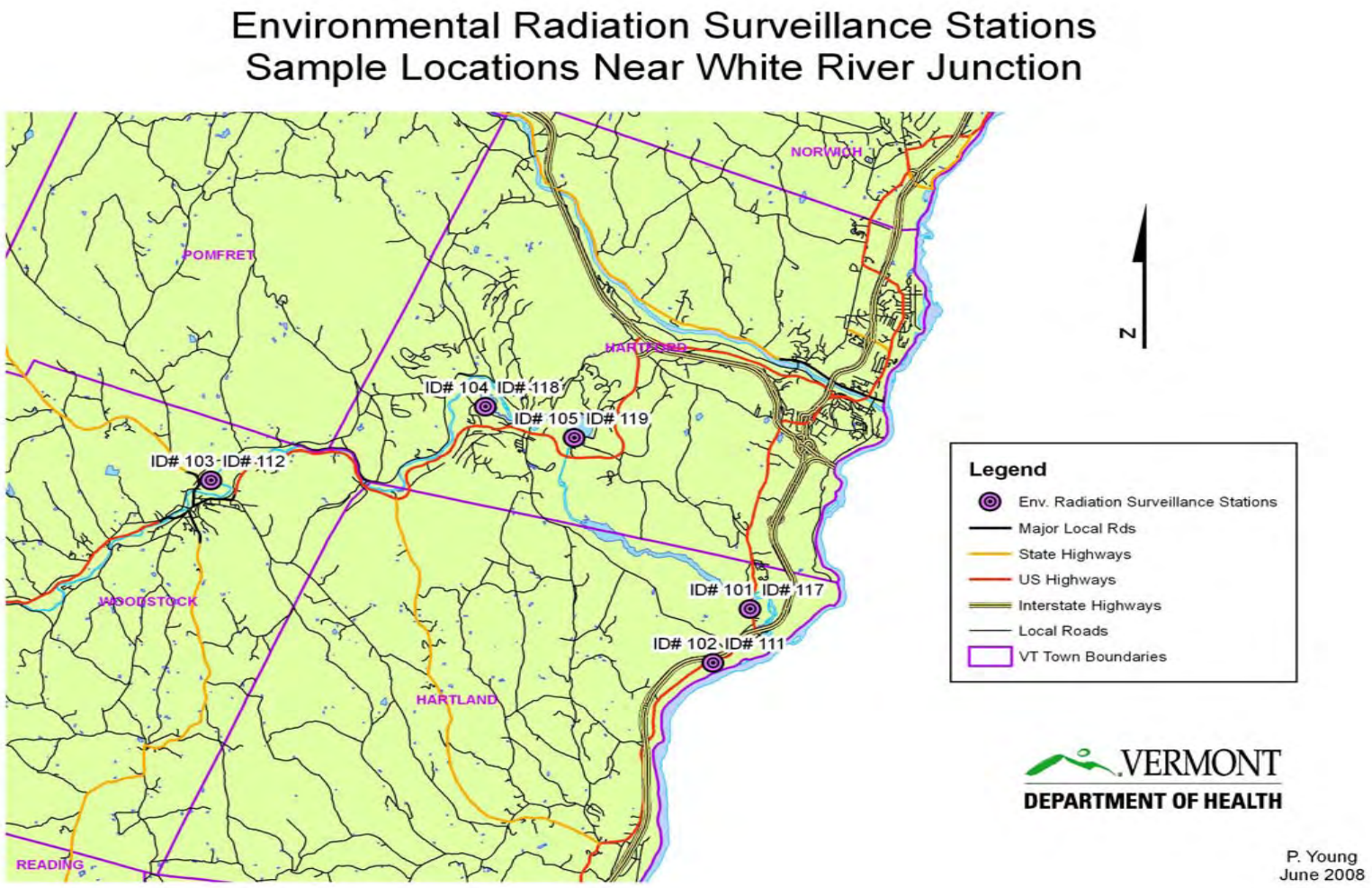
Figure 7



Map 9


Environmental Radiation Surveillance Stations
Water Sample Locations
ID# 88
ID# 87
BRATTLEBORO
GUILFORD
VERNON
ID# 82
Hinsdale, N.H.
ID# 84
ID# 83
ID# 86
ID# 85
Legend
Water Sample Locations
VT Yankee Nuclear Power Station
Major Local Rds
State Highways
US Highways
Interstate Highways
Local Roads
VT Town Boundaries
N
VERMONT
DEPARTMENT OF HEALTH
P. Young
April 2007

Map 10, Special Sampling Locations for 2007, Central Vermont



Map 11, Special Sampling Sites for 2007, Southern Vermont

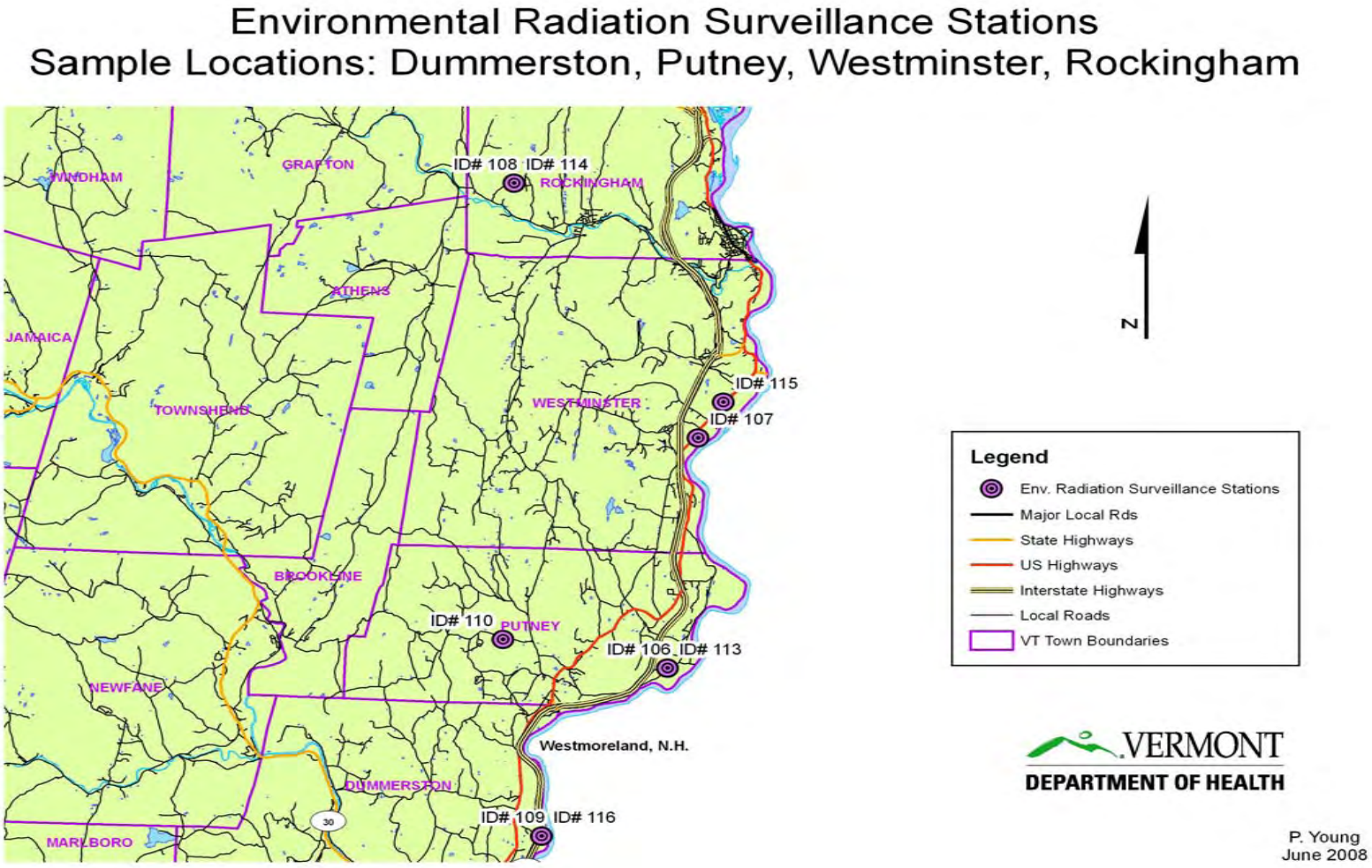


Table 15. 2007 Water Sample Alpha Radioactivity Results

Sample Date	Sample Location	Map ID No.	Results pCi/l	Error pCi/l	Analysis Method
1/16/2007	CT River, Station 3-3	84A	1.07	0.85	EPA 900
1/16/2007	CT River, Station 3-4	84B	0.61	0.82	EPA 900
1/16/2007	CT River, Station 3-8	84C	N/A	N/A	N/A
1/29/2007	Discharge Forebay	84D	0.62	0.83	EPA 900
1/29/2007	Blodgett Farm	85	4.5	1.04	EERF 00-02
1/29/2007	Brattleboro Fire Dept	88	1.6	1.47	EPA 900
1/29/2007	Conn River Downstream	86	0	1.41	EPA 900
1/29/2007	Conn River Upstream	87	0.82	1.45	EPA 900
1/29/2007	Miller Farm	82	0.55	0.73	EERF 00-02
1/29/2007	Vernon Elem School	83	6.06	1.14	EERF 00-02
2/13/2007	CT River, Station 3-3	84A	-0.55	1.53	EPA 900
2/13/2007	CT River, Station 3-4	84B	-1.12	1.51	EPA 900
2/13/2007	CT River, Station 3-8	84C	-0.55	0.74	EPA 900
2/13/2007	Discharge Forebay	84D	-0.84	1.53	EPA 900
2/27/2007	Blodgett Farm	85	4.9	1.07	EERF 00-02
2/27/2007	Brattleboro Fire Dept	88	-0.94	0.83	EPA 900
2/27/2007	Conn River Downstream	86	0	1.56	EPA 900
2/27/2007	Conn River Upstream	87	0.27	1.42	EPA 900
2/27/2007	Miller Farm	82	0.69	0.74	EERF 00-02
2/27/2007	Vernon Elem School	83	7.46	1.22	EERF 00-02
3/14/2007	CT River, Station 3-3	84A	1.12	1.52	EPA 900
3/14/2007	CT River, Station 3-4	84B	0.82	1.47	EPA 900
3/14/2007	CT River, Station 3-8	84C	0.19	0.51	EPA 900
3/14/2006	Discharge Forebay	84D	1.91	1.52	EPA 900
3/20/2007	Blodgett Farm	85	5.08	1.05	EERF 00-02
3/20/2007	Brattleboro Fire Dept	88	0.16	0.83	EPA 900
3/20/2007	Conn River Downstream	86	0.54	1.44	EPA 900
3/20/2007	Conn River Upstream	87	N/A	N/A	N/A
3/20/2007	Miller Farm	82	-0.07	0.63	EERF 00-02
3/20/2007	Vernon Elem School	83	7.09	1.18	EERF 00-02
4/13/2007	CT River, Station 3-3	84A	0.76	1.35	EPA 900
4/13/2007	CT River, Station 3-4	84B	1.85	1.48	EPA 900
4/13/2007	CT River, Station 3-8	84C	-0.27	1.33	EPA 900
4/13/2007	Discharge Forebay	84D	0.54	1.41	EPA 900
4/30/2007	Blodgett Farm	85	4.73	1.05	EERF 00-02
4/30/2007	Brattleboro Fire Dept	88	0.77	1.35	EPA 900
4/30/2007	Conn River Downstream	86	0.85	0.78	EPA 900
4/30/2007	Conn River Upstream	87	1.27	0.81	EPA 900
4/30/2007	Miller Farm	82	-0.21	0.72	EERF 00-02
4/30/2007	Vernon Elem School	83	6.89	1.19	EERF 00-02

Table 15. 2007 Water Sample Alpha Radioactivity Results (continued)

Sample Date	Sample Location	Map ID No.	Results pCi/l	Error pCi/l	Analysis Method
5/15/2007	CT River, Station 3-3	84A	0.31	0.82	EPA 900
5/15/2007	CT River, Station 3-4	84B	0.28	1.46	EPA 900
5/15/2007	CT River, Station 3-8	84C	0.16	0.85	EPA 900
5/15/2007	Discharge Forebay	84D	0	1.41	EPA 900
5/29/2007	Blodgett Farm	85	3.9	1	EERF 00-02
5/29/2007	Brattleboro Fire Dept	88	0.45	0.81	EPA 900
5/29/2007	Conn River Downstream	86	0.47	0.83	EPA 900
5/29/2007	Conn River Upstream	87	0.46	0.82	EPA 900
5/29/2007	Miller Farm	82	0.89	0.77	EERF 00-02
5/29/2007	Vernon Elem School	83	6.1	1.14	EERF 00-02
6/13/2007	CT River, Station 3-3	84A	0.93	0.89	EPA 900
6/13/2007	CT River, Station 3-4	84B	0.81	1.5	EPA 900
6/13/2007	CT River, Station 3-8	84C	3.36	1.74	EPA 900
6/13/2007	Discharge Forebay	84D	0.27	1.45	EPA 900
6/29/2007	Blodgett Farm	85	4.37	1.05	EERF 00-02
6/29/2007	Brattleboro Fire Dept	88	-0.33	0.86	EPA 900
6/29/2007	Conn River Downstream	86	0.56	1.54	EPA 900
6/29/2007	Conn River Upstream	87	0.89	1.67	EPA 900
6/29/2007	Miller Farm	82	0.2	0.73	EERF 00-02
6/29/2007	Vernon Elem School	83	5.53	1.12	EERF 00-02
7/16/2007	CT River, Station 3-3	84A	0.83	1.41	EPA 900
7/16/2007	CT River, Station 3-4	84B	0.27	1.35	EPA 900
7/16/2007	CT River, Station 3-8	84C	1.1	0.48	EPA 900
7/16/2007	Discharge Forebay	84D	0.27	1.36	EPA 900
7/31/2007	Blodgett Farm	85	4.5	1.03	EERF 00-02
7/31/2007	Brattleboro Fire Dept	88	0.31	0.77	EPA 900
7/31/2007	Conn River Downstream	86	-0.87	1.36	EPA 900
7/31/2007	Conn River Upstream	87	1.13	1.46	EPA 900
7/31/2007	Miller Farm	82	0.48	0.72	EERF 00-02
7/31/2007	Vernon Elem School	83	5.12	1.07	EERF 00-02
8/16/2007	CT River, Station 3-3	84A	0.88	1.42	EPA 900
8/16/2007	CT River, Station 3-4	84B	0	1.39	EPA 900
8/16/2007	CT River, Station 3-8	84C	-0.88	1.31	EPA 900
8/16/2007	Discharge Forebay	84D	0	1.33	EPA 900
8/27/2007	Blodgett Farm	85	4.55	1.04	EERF 00-02
8/27/2007	Brattleboro Fire Dept	88	0	1.22	EPA 900
8/27/2007	Conn River Downstream	86	0.59	1.4	EPA 900
8/27/2007	Conn River Upstream	87	-0.62	1.4	EPA 900
8/27/2007	Miller Farm	82	0.28	0.7	EERF 00-02
8/27/2007	Vernon Elem School	83	8.07	1.25	EERF 00-02

Table 15. 2007 Water Sample Alpha Radioactivity Results (continued)

Sample Date	Sample Location	Map ID No.	Results pCi/l	Error pCi/l	Analysis Method
9/13/2007	CT River, Station 3-3	84A	0.82	1.4	EPA 900
9/13/2007	CT River, Station 3-4	84B	1.35	1.42	EPA 900
9/13/2007	CT River, Station 3-8	84C	0.56	1.4	EPA 900
9/13/2007	Discharge Forebay	84D	1.67	1.48	EPA 900
9/25/2007	Blodgett Farm	85	5.98	1.11	EERF 00-02
9/25/2007	Brattleboro Fire Dept	88	0.51	1.27	EPA 900
9/25/2007	Conn River Downstream	86	1.62	1.43	EPA 900
9/25/2007	Conn River Upstream	87	0.81	1.38	EPA 900
9/25/2007	Miller Farm	82	0.21	0.66	EERF 00-02
9/25/2007	Vernon Elem School	83	6.4	1.14	EERF 00-02
10/15/2007	CT River, Station 3-3	84A	-0.56	1.44	EPA 900
10/15/2007	CT River, Station 3-4	84B	-0.56	1.44	EPA 900
10/15/2007	CT River, Station 3-8	84C	0.28	1.49	EPA 900
10/15/2007	Discharge Forebay	84D	-0.28	1.46	EPA 900
10/30/2007	Blodgett Farm	85	3.96	0.99	EERF 00-02
10/30/2007	Brattleboro Fire Dept	88	0.26	1.39	EPA 900
10/30/2007	Conn River Downstream	86	0.26	1.38	EPA 900
10/30/2007	Conn River Upstream	87	0	1.58	EPA 900
10/30/2007	Miller Farm	82	-0.14	0.65	EERF 00-02
10/30/2007	Vernon Elem School	83	6.21	1.14	EERF 00-02
11/16/2007	CT River, Station 3-3	84A	-0.27	1.47	EPA 900
11/16/2007	CT River, Station 3-4	84B	0.15	0.86	EPA 900
11/16/2007	CT River, Station 3-8	84C	-0.15	0.84	EPA 900
11/16/2007	Discharge Forebay	84D	0.16	0.87	EPA 900
11/30/2007	Blodgett Farm	85	5.15	1.09	EERF 00-02
11/30/2007	Brattleboro Fire Dept	88	0	0.79	EPA 900
11/30/2007	Conn River Downstream	86	0	0.82	EPA 900
11/30/2007	Conn River Upstream	87	0.3	0.84	EPA 900
11/30/2007	Miller Farm	82	0	0.7	EERF 00-02
11/30/2007	Vernon Elem School	83	6.59	1.18	EERF 00-02
12/13/2007	CT River, Station 3-3	84A	1.59	1.33	EPA 900
12/13/2007	CT River, Station 3-4	84B	1.89	1.37	EPA 900
12/13/2007	CT River, Station 3-8	84C	0.13	0.63	EPA 900
12/13/2007	Discharge Forebay	84D	0.54	1.29	EPA 900
12/21/2006	Blodgett Farm	85	5.11	1.08	EERF 00-02
12/21/2006	Brattleboro Fire Dept	88	1.3	1.29	EPA 900
12/21/2006	Conn River Downstream	86	-0.28	1.29	EPA 900
11/30/2007	Conn River Downstream	87	N/A	N/A	N/A
12/21/2006	Miller Farm	82	-0.07	0.67	EERF 00-02
12/21/2006	Vernon Elem School	83	6.56	1.17	EERF 00-02

Table 16. 2007 Water Sample Beta Radioactivity Results

Sample Date	Sample Location	Map ID No.	Results pCi/l	Error pCi/l	Analysis Method
1/16/2007	CT River, Station 3-3	84A	0.95	0.94	EPA 900
1/16/2007	CT River, Station 3-4	84B	1.03	0.94	EPA 900
1/16/2007	CT River, Station 3-8	84C	N/A	N/A	N/A
1/29/2007	Discharge Forebay	84D	1.51	0.96	EPA 900
1/29/2007	Blodgett Farm	85	3.99	1.94	EPA 900
1/29/2007	Brattleboro Fire Dept	88	0.32	1.84	EPA 900
1/29/2007	CT River Downstream	86	2.06	1.89	EPA 900
1/29/2007	Conn River Upstream	87	1.27	1.87	EPA 900
1/29/2007	Miller Farm	82	3.34	1.92	EPA 900
1/29/2007	Vernon Elem School	83	2.7	1.91	EPA 900
2/13/2007	CT River, Station 3-3	84A	2.03	1.76	EPA 900
2/13/2007	CT River, Station 3-4	84B	2.34	1.77	EPA 900
2/13/2007	CT River, Station 3-8	84C	1.32	0.89	EPA 900
2/13/2007	Discharge Forebay	84D	3.43	1.79	EPA 900
2/27/2007	Blodgett Farm	85	5.33	1.85	EPA 900
2/27/2007	Brattleboro Fire Dept	88	1.95	0.9	EPA 900
2/27/2007	CT River Downstream	86	3.27	1.79	EPA 900
2/27/2007	Conn River Upstream	87	N/A	N/A	N/A
2/27/2007	Miller Farm	82	4.68	1.83	EPA 900
2/27/2007	Vernon Elem School	83	5.78	1.86	EPA 900
3/14/2007	CT River, Station 3-3	84A	0.91	1.77	EPA 900
3/14/2007	CT River, Station 3-4	84B	1.66	1.79	EPA 900
3/14/2006	CT River, Station 3-8	84C	1.06	0.61	EPA 900
3/20/2007	Discharge Forebay	84D	0.45	1.76	EPA 900
3/20/2007	Blodgett Farm	85	5.01	1.88	EPA 900
3/20/2007	Brattleboro Fire Dept	88	1.06	0.9	EPA 900
3/20/2007	CT River Downstream	86	3.48	1.83	EPA 900
3/20/2007	Conn River Upstream	87	N/A	N/A	N/A
3/20/2007	Miller Farm	82	6.06	1.89	EPA 900
3/20/2007	Vernon Elem School	83	4.86	1.87	EPA 900
4/13/2007	CT River, Station 3-3	84A	2.85	1.71	EPA 900
4/13/2007	CT River, Station 3-4	84B	3.9	1.74	EPA 900
4/13/2007	CT River, Station 3-8	84C	0.6	1.65	EPA 900
4/30/2007	Discharge Forebay	84D	2.4	1.7	EPA 900
4/30/2007	Blodgett Farm	85	8.45	1.85	EPA 900
4/30/2007	Brattleboro Fire Dept	88	3.3	1.72	EPA 900
4/30/2007	CT River Downstream	86	3.16	0.9	EPA 900
4/30/2007	Conn River Upstream	87	3.61	0.91	EPA 900
4/30/2007	Miller Farm	82	7.08	1.82	EPA 900
4/30/2007	Vernon Elem School	83	7.38	1.83	EPA 900

Table 16. 2007 Water Sample Beta Radioactivity Results (continued)

Sample Date	Sample Location	Map ID No.	Results pCi/l	Error pCi/l	Analysis Method
5/15/2007	CT River, Station 3-3	84A	1.06	0.88	EPA 900
5/15/2007	CT River, Station 3-4	84B	1.06	1.46	EPA 900
5/15/2007	CT River, Station 3-8	84C	1.37	0.89	EPA 900
5/15/2007	Discharge Forebay	84D	1.21	1.74	EPA 900
5/29/2007	Blodgett Farm	85	4.28	1.83	EPA 900
5/29/2007	Brattleboro Fire Dept	88	1.37	0.89	EPA 900
5/29/2007	CT River Downstream	86	1.44	0.889	EPA 900
5/29/2007	Conn River Upstream	87	1.6	0.9	EPA 900
5/29/2007	Miller Farm	82	3.96	1.81	EPA 900
5/29/2007	Vernon Elem School	83	5.95	1.86	EPA 900
6/13/2007	CT River, Station 3-3	84A	-0.77	0.89	EPA 900
6/13/2007	CT River, Station 3-4	84B	-0.46	1.79	EPA 900
6/13/2007	CT River, Station 3-8	84C	0.31	1.81	EPA 900
6/13/2007	Discharge Forebay	84D	-0.15	1.8	EPA 900
6/29/2007	Blodgett Farm	85	1.39	1.86	EPA 900
6/29/2007	Brattleboro Fire Dept	88	0.61	0.92	EPA 900
6/29/2007	CT River Downstream	86	1.22	1.83	EPA 900
6/29/2007	Conn River Upstream	87	0.46	1.82	EPA 900
6/29/2007	Miller Farm	82	1.07	1.83	EPA 900
6/29/2007	Vernon Elem School	83	3.22	1.89	EPA 900
7/16/2007	CT River, Station 3-3	84A	1.75	1.83	EPA 900
7/16/2007	CT River, Station 3-4	84B	0.95	1.81	EPA 900
7/16/2007	CT River, Station 3-8	84C	0.48	1.8	EPA 900
7/16/2007	Discharge Forebay	84D	1.91	1.84	EPA 900
7/31/2007	Blodgett Farm	85	3.05	1.88	EPA 900
7/31/2007	Brattleboro Fire Dept	88	1.11	0.92	EPA 900
7/31/2007	CT River Downstream	86	1.27	1.82	EPA 900
7/31/2007	Conn River Upstream	87	0.16	1.79	EPA 900
7/31/2007	Miller Farm	82	2.23	1.85	EPA 900
7/31/2007	Vernon Elem School	83	4.95	1.92	EPA 900
8/16/2007	CT River, Station 3-3	84A	0.16	1.87	EPA 900
8/16/2007	CT River, Station 3-4	84B	0.64	1.88	EPA 900
8/16/2007	CT River, Station 3-8	84C	0.64	1.88	EPA 900
8/16/2007	Discharge Forebay	84D	0.64	1.88	EPA 900
8/27/2007	Blodgett Farm	85	3.72	1.97	EPA 900
8/27/2007	Brattleboro Fire Dept	88	-0.16	1.86	EPA 900
8/27/2007	CTn River Downstream	86	0.48	1.88	EPA 900
8/27/2007	Conn River Upstream	87	-0.16	1.86	EPA 900
8/27/2007	Miller Farm	82	3.38	1.95	EPA 900
8/27/2007	Vernon Elem School	83	4.19	1.97	EPA 900

Table 16. 2007 Water Sample Beta Radioactivity Results (continued)

Sample Date	Sample Location	Map ID No.	Results pCi/l	Error pCi/l	Analysis Method
9/15/2006	CT River, Station 3-3	84A	1.24	1.83	EPA 900
9/15/2006	CT River, Station 3-4	84B	1.55	1.84	EPA 900
9/15/2006	CT River, Station 3-8	84C	0.31	1.81	EPA 900
9/15/2006	Discharge Forebay	84D	1.55	1.84	EPA 900
9/27/2006	Blodgett Farm	85	4.06	1.91	EPA 900
9/27/2006	Brattleboro Fire Dept	88	0.15	1.8	EPA 900
9/27/2006	CT River Downstream	86	0.15	1.8	EPA 900
9/27/2006	CT River Upstream	87	1.08	1.83	EPA 900
9/27/2006	Miller Farm	82	2.17	1.86	EPA 900
9/27/2006	Vernon Elem School	83	3.58	1.89	EPA 900
10/13/2006	CT River, Station 3-3	84A	1.28	1.84	EPA 900
10/13/2006	CT River, Station 3-4	84B	1.6	1.84	EPA 900
10/13/2006	CT River, Station 3-8	84C	2.08	1.86	EPA 900
10/13/2006	Discharge Forebay	84D	1.76	1.85	EPA 900
10/27/2006	Blodgett Farm	85	4.35	1.92	EPA 900
10/27/2006	Brattleboro Fire Dept	88	2.56	1.87	EPA 900
10/27/2006	CT River Downstream	86	1.28	1.84	EPA 900
10/27/2006	CT River Upstream	87	2.72	1.87	EPA 900
10/27/2006	Miller Farm	82	5.79	1.95	EPA 900
10/27/2006	Vernon Elem School	83	5.78	1.95	EPA 900
11/15/2006	CT River, Station 3-3	84A	-0.79	1.86	EPA 900
11/15/2006	CT River, Station 3-4	84B	0.8	0.96	EPA 900
11/15/2006	CT River, Station 3-8	84C	1.04	0.96	EPA 900
11/15/2006	Discharge Forebay	84D	1.04	0.97	EPA 900
11/22/2006	Blodgett Farm	85	3.36	1.97	EPA 900
11/22/2006	Brattleboro Fire Dept	88	-0.08	0.94	EPA 900
11/22/2006	CT River Downstream	86	1.19	0.97	EPA 900
11/22/2006	CT River Upstream	87	1.59	0.98	EPA 900
11/22/2006	Miller Farm	82	3.03	1.96	EPA 900
11/22/2006	Vernon Elem School	83	3.67	1.97	EPA 900
12/15/2006	CT River, Station 3-3	84A	0.47	1.81	EPA 900
12/15/2006	CT River, Station 3-4	84B	1.4	1.83	EPA 900
12/15/2006	CT River, Station 3-8	84C	0.47	0.91	EPA 900
12/15/2006	Discharge Forebay	84D	1.09	1.83	EPA 900
12/21/2006	Blodgett Farm	85	6.26	1.96	EPA 900
12/21/2006	Brattleboro Fire Dept	88	0.16	1.8	EPA 900
12/21/2006	CT River Downstream	86	0.47	1.81	EPA 900
12/21/2006	CT River Upstream	87	N/A	N/A	N/A
12/21/2006	Miller Farm	82	2.49	1.86	EPA 900
12/21/2006	Vernon Elem School	83	5.46	1.94	EPA 900

Table 17. 2007 Water Sample Gamma Radioactivity Results

Sample Date	Sample Location	Map ID No.	Results pCi/l
1/16/2007	CT River, Station 3-3	84A	< LLD
1/16/2007	CT River, Station 3-4	84B	< LLD
1/16/2007	CT River, Station 3-8	84C	< LLD
1/16/2007	Discharge Forebay	84D	< LLD
1/29/2007	Blodgett Farm	85	Natural
1/29/2007	Brattleboro Fire Dept	88	< LLD
1/29/2007	CT River Downstream	86	< LLD
1/29/2007	CT River Upstream	87	< LLD
1/29/2007	Miller Farm	82	Natural
1/29/2007	Vernon Elem School	83	Natural
2/13/2007	CT River, Station 3-3	84A	< LLD
2/13/2007	CT River, Station 3-4	84B	< LLD
2/13/2007	CT River, Station 3-8	84C	< LLD
2/13/2007	Discharge Forebay	84D	< LLD
2/27/2007	Blodgett Farm	85	Natural
2/27/2007	Brattleboro Fire Dept	88	< LLD
2/27/2007	CT River Downstream	86	< LLD
2/27/2007	CT River Upstream	87	< LLD
2/27/2007	Miller Farm	82	Natural
2/27/2007	Vernon Elem School	83	Natural
3/14/2007	CT River, Station 3-3	84A	< LLD
3/14/2007	CT River, Station 3-4	84B	< LLD
3/14/2007	CT River, Station 3-8	84C	< LLD
3/14/2006	Discharge Forebay	84D	< LLD
3/20/2007	Blodgett Farm	85	Natural
3/20/2007	Brattleboro Fire Dept	88	< LLD
3/20/2007	CT River Downstream	86	< LLD
3/20/2007	CT River Upstream	87	< LLD
3/20/2007	Miller Farm	82	Natural
3/20/2007	Vernon Elem School	83	Natural
4/13/2007	CT River, Station 3-3	84A	< LLD
4/13/2007	CT River, Station 3-4	84B	< LLD
4/13/2007	CT River, Station 3-8	84C	< LLD
4/13/2007	Discharge Forebay	84D	< LLD
4/30/2007	Blodgett Farm	85	Natural
4/30/2007	Brattleboro Fire Dept	88	< LLD
4/30/2007	CT River Downstream	86	< LLD
4/30/2007	CT River Upstream	87	< LLD
4/30/2007	Miller Farm	82	Natural
4/30/2007	Vernon Elem School	83	Natural

LLD: Lower limits of detection

Table 17. 2007 Water Sample Gamma Radioactivity Results (continued)

Sample Date	Sample Location	Map ID No.	Results pCi/l
5/15/2007	CT River, Station 3-3	84A	< LLD
5/15/2007	CT River, Station 3-4	84B	< LLD
5/15/2007	CT River, Station 3-8	84C	< LLD
5/15/2007	Discharge Forebay	84D	< LLD
5/29/2007	Blodgett Farm	85	Natural
5/29/2007	Brattleboro Fire Dept	88	< LLD
5/29/2007	CT River Downstream	86	< LLD
5/29/2007	CT River Upstream	87	< LLD
5/29/2007	Miller Farm	82	Natural
5/29/2007	Vernon Elem School	83	Natural
6/13/2007	CT River, Station 3-3	84A	< LLD
6/13/2007	CT River, Station 3-4	84B	< LLD
6/13/2007	CT River, Station 3-8	84C	< LLD
6/13/2007	Discharge Forebay	84D	< LLD
6/29/2007	Blodgett Farm	85	Natural
6/29/2007	Brattleboro Fire Dept	88	< LLD
6/29/2007	CT River Downstream	86	< LLD
6/29/2007	CT River Upstream	87	< LLD
6/29/2007	Miller Farm	82	Natural
6/29/2007	Vernon Elem School	83	Natural
7/16/2007	CT River, Station 3-3	84A	< LLD
7/16/2007	CT River, Station 3-4	84B	< LLD
7/16/2007	CT River, Station 3-8	84C	< LLD
7/16/2007	Discharge Forebay	84D	< LLD
7/31/2007	Blodgett Farm	85	Natural
7/31/2007	Brattleboro Fire Dept	88	< LLD
7/31/2007	CT River Downstream	86	< LLD
7/31/2007	CT River Upstream	87	< LLD
7/31/2007	Miller Farm	82	Natural
7/31/2007	Vernon Elem School	83	Natural
8/16/2007	CT River, Station 3-3	84A	< LLD
8/16/2007	CT River, Station 3-4	84B	< LLD
8/16/2007	CT River, Station 3-8	84C	< LLD
8/16/2007	Discharge Forebay	84D	< LLD
8/27/2007	Blodgett Farm	85	Natural
8/27/2007	Brattleboro Fire Dept	88	< LLD
8/27/2007	CT River Downstream	86	< LLD
8/27/2007	CT River Upstream	87	< LLD
8/27/2007	Miller Farm	82	Natural
8/27/2007	Vernon Elem School	83	Natural

LLD: Lower limits of detection

Table 17. 2007 Water Sample Gamma Radioactivity Results (continued)

Sample Date	Sample Location	Map ID No.	Results pCi/l
9/13/2007	CT River, Station 3-3	84A	< LLD
9/13/2007	CT River, Station 3-4	84B	< LLD
9/13/2007	CT River, Station 3-8	84C	< LLD
9/13/2007	Discharge Forebay	84D	< LLD
9/25/2007	Blodgett Farm	85	Natural
9/25/2007	Brattleboro Fire Dept	88	< LLD
9/25/2007	CT River Downstream	86	< LLD
9/25/2007	CT River Upstream	87	< LLD
9/25/2007	Miller Farm	82	Natural
9/25/2007	Vernon Elem School	83	Natural
10/15/2007	CT River, Station 3-3	84A	< LLD
10/15/2007	CT River, Station 3-4	84B	< LLD
10/15/2007	CT River, Station 3-8	84C	< LLD
10/15/2007	Discharge Forebay	84D	< LLD
10/30/2007	Blodgett Farm	85	Natural
10/30/2007	Brattleboro Fire Dept	88	< LLD
10/30/2007	CT River Downstream	86	< LLD
10/30/2007	CT River Upstream	87	< LLD
10/30/2007	Miller Farm	82	Natural
10/30/2007	Vernon Elem School	83	Natural
11/16/2007	CT River, Station 3-3	84A	< LLD
11/16/2007	CT River, Station 3-4	84B	< LLD
11/16/2007	CT River, Station 3-8	84C	< LLD
11/16/2007	Discharge Forebay	84D	< LLD
11/30/2007	Blodgett Farm	85	Natural
11/30/2007	Brattleboro Fire Dept	88	< LLD
11/30/2007	CT River Downstream	86	< LLD
11/30/2007	CT River Upstream	87	< LLD
11/30/2007	Miller Farm	82	Natural
11/30/2007	Vernon Elem School	83	Natural
12/13/2007	CT River, Station 3-3	84A	< LLD
12/13/2007	CT River, Station 3-4	84B	< LLD
12/13/2007	CT River, Station 3-8	84C	< LLD
12/13/2007	Discharge Forebay	84D	< LLD
12/21/2006	Blodgett Farm	85	Natural
12/21/2006	Brattleboro Fire Dept	88	< LLD
12/21/2006	CT River Downstream	86	< LLD
12/21/2006	CT River Upstream	87	< LLD
12/21/2006	Miller Farm	82	Natural
12/21/2006	Vernon Elem School	83	Natural

LLD: Lower limits of detection

Table 18. 2007 Water Sample Tritium Results

Sample Date	Sample Location	Map ID No.	Results pCi/l
1/16/2007	CT River, Station 3-3	84A	< 300
1/16/2007	CT River, Station 3-4	84B	< 300
1/16/2007	CT River, Station 3-8	84C	< 300
1/16/2007	Discharge Forebay	84D	< 300
1/29/2007	Blodgett Farm	85	< 300
1/29/2007	Brattleboro Fire Dept	88	< 300
1/29/2007	CT River Downstream	86	< 300
1/29/2007	CT River Upstream	87	< 300
1/29/2007	Miller Farm	82	< 300
1/29/2007	Vernon Elem School	83	< 300
2/13/2007	CT River, Station 3-3	84A	< 300
2/13/2007	CT River, Station 3-4	84B	< 300
2/13/2007	CT River, Station 3-8	84C	< 300
2/13/2007	Discharge Forebay	84D	< 300
2/27/2007	Blodgett Farm	85	< 300
2/27/2007	Brattleboro Fire Dept	88	< 300
2/27/2007	CT River Downstream	86	< 300
2/27/2007	CT River Upstream	87	< 300
2/27/2007	Miller Farm	82	< 300
2/27/2007	Vernon Elem School	83	< 300
3/14/2007	CT River, Station 3-3	84A	< 300
3/14/2007	CT River, Station 3-4	84B	< 300
3/14/2007	CT River, Station 3-8	84C	< 300
3/14/2006	Discharge Forebay	84D	< 300
3/20/2007	Blodgett Farm	85	< 300
3/20/2007	Brattleboro Fire Dept	88	< 300
3/20/2007	CT River Downstream	86	< 300
3/20/2007	CT River Upstream	87	< 300
3/20/2007	Miller Farm	82	< 300
3/20/2007	Vernon Elem School	83	< 300
4/13/2007	CT River, Station 3-3	84A	< 300
4/13/2007	CT River, Station 3-4	84B	< 300
4/13/2007	CT River, Station 3-8	84C	< 300
4/13/2007	Discharge Forebay	84D	< 300
4/30/2007	Blodgett Farm	85	< 300
4/30/2007	Brattleboro Fire Dept	88	< 300
4/30/2007	CT River Downstream	86	< 300
4/30/2007	CT River Upstream	87	< 300
4/30/2007	Miller Farm	82	< 300
4/30/2007	Vernon Elem School	83	< 300

Table 18. 2007 Water Sample Tritium Results (continued)

Sample Date	Sample Location	Map ID No.	Results pCi/l
5/15/2007	CT River, Station 3-3	84A	< 300
5/15/2007	CT River, Station 3-4	84B	< 300
5/15/2007	CT River, Station 3-8	84C	< 300
5/15/2007	Discharge Forebay	84D	< 300
5/29/2007	Blodgett Farm	85	< 300
5/29/2007	Brattleboro Fire Dept	88	< 300
5/29/2007	CT River Downstream	86	< 300
5/29/2007	CT River Upstream	87	< 300
5/29/2007	Miller Farm	82	< 300
5/29/2007	Vernon Elem School	83	< 300
6/13/2007	CT River, Station 3-3	84A	< 300
6/13/2007	CT River, Station 3-4	84B	< 300
6/13/2007	CT River, Station 3-8	84C	< 300
6/13/2007	Discharge Forebay	84D	< 300
6/29/2007	Blodgett Farm	85	< 300
6/29/2007	Brattleboro Fire Dept	88	< 300
6/29/2007	CT River Downstream	86	< 300
6/29/2007	CT River Upstream	87	< 300
6/29/2007	Miller Farm	82	< 300
6/29/2007	Vernon Elem School	83	< 300
7/16/2007	CT River, Station 3-3	84A	< 300
7/16/2007	CT River, Station 3-4	84B	< 300
7/16/2007	CT River, Station 3-8	84C	< 300
7/16/2007	Discharge Forebay	84D	< 300
7/31/2007	Blodgett Farm	85	< 300
7/31/2007	Brattleboro Fire Dept	88	< 300
7/31/2007	CT River Downstream	86	< 300
7/31/2007	CT River Upstream	87	< 300
7/31/2007	Miller Farm	82	< 300
7/31/2007	Vernon Elem School	83	< 300
8/16/2007	CT River, Station 3-3	84A	< 300
8/16/2007	CT River, Station 3-4	84B	< 300
8/16/2007	CT River, Station 3-8	84C	< 300
8/16/2007	Discharge Forebay	84D	< 300
8/27/2007	Blodgett Farm	85	< 300
8/27/2007	Brattleboro Fire Dept	88	< 300
8/27/2007	CT River Downstream	86	< 300
8/27/2007	CT River Upstream	87	< 300
8/27/2007	Miller Farm	82	< 300
8/27/2007	Vernon Elem School	83	< 300

Table 18. 2007 Water Sample Tritium Results (continued)

Sample Date	Sample Location	Map ID No.	Results pCi/l
9/15/2006	CT River, Station 3-3	84A	< 300
9/15/2006	CT River, Station 3-4	84B	< 300
9/15/2006	CT River, Station 3-8	84C	< 300
9/15/2006	Discharge Forebay	84D	< 300
9/27/2006	Blodgett Farm	85	< 300
9/27/2006	Brattleboro Fire Dept	88	< 300
9/27/2006	CT River Downstream	86	< 300
9/27/2006	CT River Upstream	87	< 300
9/27/2006	Miller Farm	82	< 300
9/27/2006	Vernon Elem School	83	< 300
10/13/2006	CT River, Station 3-3	84A	< 300
10/13/2006	CT River, Station 3-4	84B	< 300
10/13/2006	CT River, Station 3-8	84C	< 300
10/13/2006	Discharge Forebay	84D	< 300
10/27/2006	Blodgett Farm	85	< 300
10/27/2006	Brattleboro Fire Dept	88	< 300
10/27/2006	CT River Downstream	86	< 300
10/27/2006	CT River Upstream	87	< 300
10/27/2006	Miller Farm	82	< 300
10/27/2006	Vernon Elem School	83	< 300
11/15/2006	CT River, Station 3-3	84A	< 300
11/15/2006	CT River, Station 3-4	84B	< 300
11/15/2006	CT River, Station 3-8	84C	< 300
11/15/2006	Discharge Forebay	84D	< 300
11/22/2006	Blodgett Farm	85	< 300
11/22/2006	Brattleboro Fire Dept	88	< 300
11/22/2006	CT River Downstream	86	< 300
11/22/2006	CT River Upstream	87	< 300
11/22/2006	Miller Farm	82	< 300
11/22/2006	Vernon Elem School	83	< 300
12/15/2006	CT River, Station 3-3	84A	< 300
12/15/2006	CT River, Station 3-4	84B	< 300
12/15/2006	CT River, Station 3-8	84C	< 300
12/15/2006	Discharge Forebay	84D	< 300
12/21/2006	Blodgett Farm	85	< 300
12/21/2006	Brattleboro Fire Dept	88	< 300
12/21/2006	CT River Downstream	86	< 300
12/21/2006	CT River Upstream	87	< 300
12/21/2006	Miller Farm	82	< 300
12/21/2006	Vernon Elem School	83	< 300

Food Chain Sampling Results

Monitoring of the food chain involves direct monitoring of some foods such as milk, cultivated vegetation and fish. It also involves monitoring of the soil and sediment that support land and aquatic species, and natural vegetation like grass, ferns, and fungi that serves as feed to land animals.

Milk Sample Results for 2007

Cow's raw milk is sampled monthly from two farms in Vernon. One farm is about one-half mile north of Vermont Yankee Nuclear Power Station and the other is about three miles south of the plant. Map 12 shows the location of these two dairy farms.

Milk is analyzed for all gamma radiation-emitting radioactive materials, and a separate assessment for iodine-131 is conducted. Table 20 shows the iodine-131 results. The analyses found no iodine-131 greater than the lower limit of detection, which is 2.53 picocuries per liter (pCi/l).

As recorded in Table 21, the gamma spectroscopy of milk also revealed no nuclear facility-generated radioactive materials in excess of the counting system's lower limits of detection. The lower limits of detection for radioactive materials in milk are listed in Table 19.

The one radioactive material that was detected above its lower limit of detection was potassium-40, a primordial radioactive material. Primordial radioactive materials are those created with the formation of the earth and other cosmic features. Potassium-40 has a half-life of 1,280,000,000 years. The gamma spectroscopy results are presented in Table 21. The potassium-40 results for all milk samples, ranging from 1380 to 1670 pCi/l, fall within the historical range for potassium-40 of 1,200 to 2,000 pCi/l.

Vegetation Sample Results for 2007

A variety of natural and cultivated plants are sampled to verify that no Vermont Yankee Nuclear Power Station radioactive materials are accumulating in the human and animal food chains. None of the sample results were outside of the historical range for vegetation samples. The historical range for gamma radioactivity in vegetation varies for the specific kind of plant, but, generally, the range is from the lower limit of detection to 20,400 picocuries per kilogram (pCi/kg). The specific values for 2007 are found in Table 23.

In May 2007, members of the Vermont Emergency Management Radiological Sampling Team, composed of employees from the Vermont Department of Health, the Agency for Natural Resources and the Agency of Agriculture, conducted one of their biannual Vermont Yankee emergency preparedness drills in the White River Junction area of Vermont. During the drill, many environmental samples were collected and several of them were counted by the Vermont Department of Health Laboratory. From this May 2007 drill, samples of hay and alfalfa were analyzed. These results from Queechee and Hartland, Vermont help serve as a background for comparison to samples near Vermont Yankee. Map 10 above shows where all of the environmental samples were taken. Table 23 lists two of the sites from Map 10 where vegetation samples were taken, the Billings Farm and the Green Acres Farm. They are identification numbers 111 and 112 on Map 10.

In September 2007, members of the same team conducted additional sampling activities in Dummerston, Putney, Westminster and Rockingham. Along with soil and water samples, broccoli, grass, apple, hay and alfalfa samples were taken from this drill and analyzed by the Vermont Department of Health Laboratory. The sample sites are found on Map 10 above, and the vegetation sample sites are identification numbers 110, 113, 114, 115 and 116. The gamma radioactivity measurement results are found in Table 23. The sites are Green Mountain Orchard, Stoneholm Farm, Saxton River Orchard, Westminster Farm and Walker Farm. In June of 2007, additional grass samples from three sites in Vernon were obtained and analyzed in the same fashion as in past years.

These sites are depicted on Map 13 below. Table 23 presents the results of the gamma radioactivity analyses conducted on these samples.

The gamma radioactivity results in picocuries per kilogram for the 2007 vegetation samples are shown in Figures 8 and 9. Figure 8 shows the beryllium-7 results, while Figure 9 shows the potassium-40 results. The graphs show something interesting. Note how the vegetation at Stoneholm Farm in Figure 8 indicates more beryllium-7 than samples at the other sample sites. It is actually not the farm that is different, it is the sample media, the plant that was sampled that caused the difference. The sample from Stoneholm Farm was hay. In Figure 9, this same hay sample also had an elevated potassium-40 concentration, as compared to most of the other samples. Given that the hay at Billings Museum also showed elevated potassium-40 concentrations, one might conclude that hay takes up and holds more naturally occurring radioactivity from the soil than do the other vegetation types reported on here.

Remember that these radioactive materials, potassium-40 and beryllium-7, are purely naturally-occurring radioactive materials, Remember, too, that these concentrations are within the historical range for vegetation samples which has been as high as 20,400 picocuries per kilogram.

Soil Sample Results for 2007

Soil samples were also collected in the same fashion as with the vegetation samples – at two Sampling Team drills in the spring and fall of 2007 and as in past years in Vernon during the summer. The locations of the May 2007 samples in the White River Junction area are shown on Map 10 above; the southern Vermont locations for soil samples are shown on Map 11, also above; and, the Vernon soil sample sites are depicted on Map 14 below. The table of soil sample results is Table 24. The Map 10 identification numbers on Table 24 corresponding to Map 10 are 101, 102 and 103; the Map 11 identification numbers for the Dummerston, Putney, Westminster and Rockingham soil samples are

106, 107, 108 and 109; the Map 14 identification numbers for the Vernon area are 95, 96, 97 and 98.

With one exception, all sample results were within the historical range of less than the lower limit of detection to 500 picocuries per kilogram for cesium-137, and from 7,000 to 20,000 picocuries per kilogram for potassium-40. The one exception was for potassium-40 at the Green Acres Farm in Hartland, Vermont. At 32,400 picocuries per kilogram, the concentration is nearly double the historical range (see Figure 10). But potassium-40 is a purely natural radioactive mineral. This measurement is taken only as an indication of the wide natural variability in the concentration of this mineral in Vermont, not as any kind of public health concern. As more samples are obtained throughout Vermont, we will be able to better characterize anomalous results such as this one.

Unlike potassium-40, cesium-137 exists only due to human activity. Figure 11 shows the samples with cesium-137 activity. As can be seen, cesium-137 may be found in central Vermont near White River Junction and in southern Vermont near Westminster, as well as in southeastern Vermont near Vermont Yankee. In past reports, we have explained this in terms of residual radioactivity from above ground nuclear weapons testing fallout and from fallout from the plume that sent radioactivity around the world for several weeks following the nuclear reactor explosion and fire at Chernobyl in the former Soviet Union. The graph in Figure 11 shows that cesium-137 from these sources is widely distributed in Vermont, and samples from other parts of Vermont should demonstrate this further.

Sediment Sample Results for 2007

Sediment samples are taken from the bottom of the Connecticut River by an environmental contractor. The samples in this report are analyzed by the Vermont Department of Health Laboratory. The sediment samples are taken from four areas of the Connecticut River. The first is near what is called the North Storm Drain. It is an area where radioactive sedimentary contaminants from Vermont Yankee Nuclear Power

Station were discovered prior to 1998, and it is an area just east of the plant stack. Sample 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 are from this North Storm Drain area. These sample locations are shown in an illustration included as Figure 12.

The second location is in the pool upstream of the Vernon Dam, near the primary plant discharge at the south end of the plant property near the cooling towers. In Table 25, the samples for location 3-4 are from this part of the Connecticut River. The third location, 3-3, is south of the Vernon Dam in the pool created downstream of the hydroelectric facility there. The final sample location, 3-8, is well upstream of the plant where the Route 9 highway bridge crosses the Connecticut River north of Brattleboro.

Two sets of samples are obtained, one set in the spring and one set in the fall. A sediment sample is taken with a mass ranging from 0.75 to 1.25 kilograms. At the Vermont Department of Health Laboratory, the sample is dried, weighed on a top-loaded balance and placed in a 500 milliliter high density polyethylene bottle. The sample is counted on the gamma spectrometer system using a reverse germanium detector. A normal spectrum will include naturally occurring, primordial radioactive materials such as potassium-40, cosmogenic, naturally occurring radioactive materials such as beryllium-7, and archival cesium-137 from past atmospheric nuclear weapons testing and the releases from Chernobyl. North Storm Drain samples in the past included trace amounts of cobalt-60. Cobalt-60 is radioactive material of only human origin.

For 2007, primordial potassium-40 is within the historical range of 6,000 – 26,000 pCi/kg at 9,370 – 20,900 pCi/kg. The archival cesium-137 is within the historical range of the lower limit of detection to 500 pCi/kg at 51.6 – 153 pCi/kg. There were no other radioactive materials in excess of the counting system's lower limits of detection including cobalt-60. The lower limits of detection for sediment are the same as those for soil, and shown in Table 22. The potassium-40 results are graphed in Figure 12, while the cesium-137 are graphed in Figure 13.

Fish Sample Results for 2007

Table 26 presents the results of gamma spectroscopy of fish samples. The fish were obtained from the Connecticut River by an environmental contractor. The fish samples were analyzed by the Vermont Department of Health Laboratory. Table 25 shows that the only results in excess of the counting system's lower limits of detection were for naturally occurring, cosmogenic potassium-40. Potassium-40 in 2007, ranging from 2,450 to 2,790 pCi/kg falls within the historical range for these samples: 1,000 – 5,000 pCi/kg.

Location 3-4 in the table above corresponds with the Vernon Pond, the basin formed by the Vernon Dam on the Connecticut River just downstream from Vermont Yankee Nuclear Power Station. Location 3-8 is near the Route 9 highway bridge north of Brattleboro. Fish are captured via an electroshock method. The fish are frozen whole, weighed and chopped or blended for loading into a reentrant beaker. The sample of about one kilogram is then analyzed with a gamma spectrometer system using a reverse electrode germanium detector.

Table 19. Gamma Spectroscopy Lower Limits of Detection for Milk, Water, Vegetation and Fish Samples

Radioactive material	Lower Limit of Detection
Cadmium-109	45.96 pCi/l
Cobalt-58	1.78 pCi/l
Cerium-139	2.13 pCi/l
Mercury-203	2.48 pCi/l
Tin-113	3.46 pCi/l
Cesium-137	2.75 pCi/l
Yttrium-88	2.03 & 3.00 pCi/l
Cobalt-60	2.56 & 2.61 pCi/l
Beryllium-7	20.55 pCi/l
Potassium-40	41.66 pCi/l
Barium-133	3.30 pCi/l
Cesium-134	2.78 pCi/l
Iodine-131	2.53 pCi/l
Zinc-65	5.31 pCi/l
Manganese-54	2.76 pCi/l
Silver-110m	2.56 pCi/l
Cerium-144	14.68 pCi/l
Cerium-141	3.54 pCi/l
Chromium-51	20.34 pCi/l
Antimony-126	2.47 pCi/l
Ruthenium-103	2.47 pCi/l
Strontium-90	2.87 pCi/l
Antimony-124	2.67 pCi/l
Ruthenium-106	25.19 pCi/l
Cesium-136	2.56 pCi/l
Cobalt-58	2.63 pCi/l

Map 12

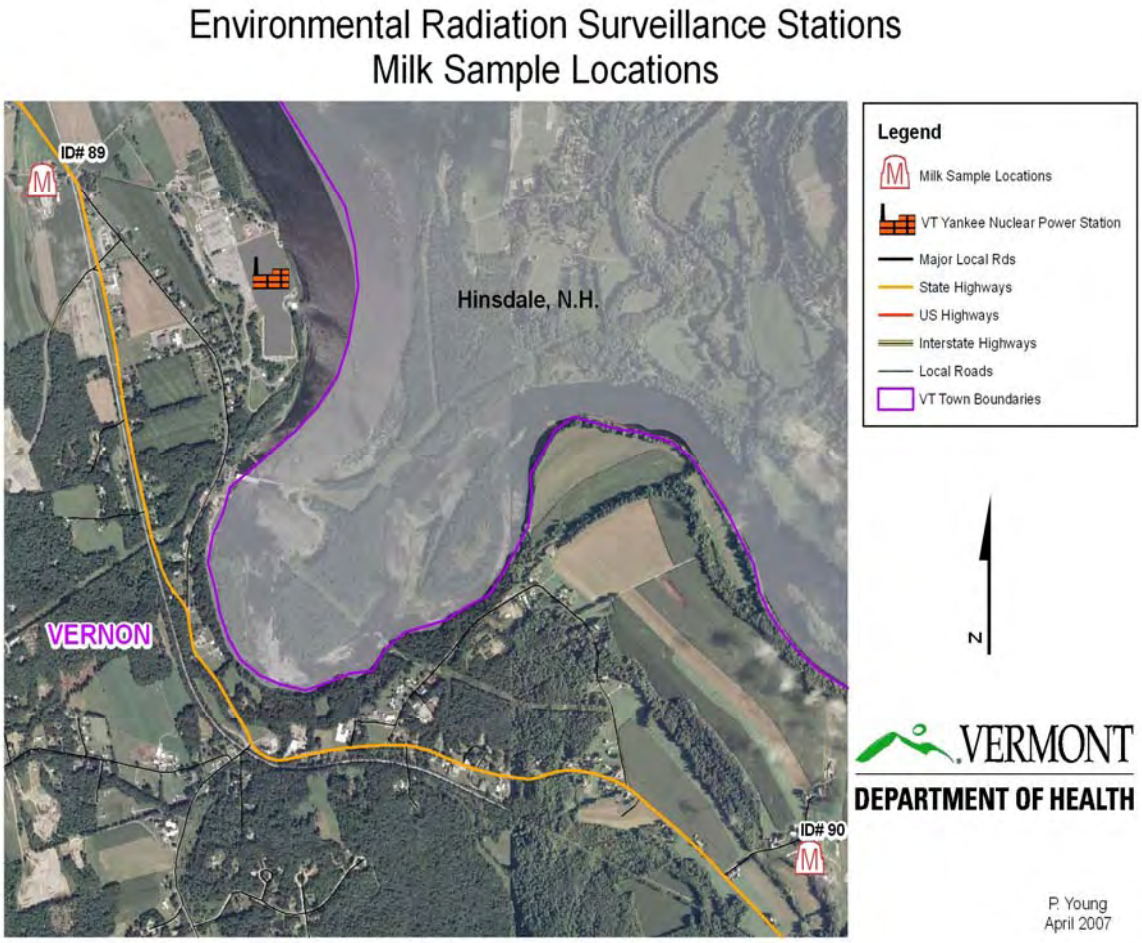

Environmental Radiation Surveillance Stations
Milk Sample Locations
ID# 89
Hinsdale, N.H.
VERNON
ID# 90
Legend
Milk Sample Locations
VT Yankee Nuclear Power Station
Major Local Rds
State Highways
US Highways
Interstate Highways
Local Roads
VT Town Boundaries
N
VERMONT
DEPARTMENT OF HEALTH
P. Young
April 2007

Table 20. 2007 Milk Sample Iodine-131 Results

Sample Date	Sample Location	Map ID No.	Results Nuclides	Results pCi/l	Error pCi/l
1/29/2007	Blodgett Farm	90	I-131	< 2.26	N/A
1/29/2007	Miller Farm	89	I-131	< 2.26	N/A
2/27/2007	Blodgett Farm	90	I-131	< 2.26	N/A
2/27/2007	Miller Farm	89	I-131	< 2.26	N/A
3/20/2007	Blodgett Farm	90	I-131	< 2.26	N/A
3/20/2007	Miller Farm	89	I-131	< 2.26	N/A
4/30/2007	Blodgett Farm	90	I-131	< 2.26	N/A
4/30/2007	Miller Farm	89	I-131	< 2.26	N/A
5/29/2007	Blodgett Farm	90	I-131	< 2.26	N/A
5/29/2007	Miller Farm	89	I-131	< 2.26	N/A
6/29/2007	Blodgett Farm	90	I-131	< 2.26	N/A
6/29/2007	Miller Farm	89	I-131	< 2.26	N/A
7/31/2007	Blodgett Farm	90	I-131	< 2.26	N/A
7/31/2007	Miller Farm	89	I-131	< 2.26	N/A
8/27/2007	Blodgett Farm	90	I-131	< 2.26	N/A
8/27/2007	Miller Farm	89	I-131	< 2.26	N/A
9/25/2007	Blodgett Farm	90	I-131	< 2.26	N/A
9/25/2007	Miller Farm	89	I-131	< 2.26	N/A
10/30/2007	Blodgett Farm	90	I-131	< 2.26	N/A
10/30/2007	Miller Farm	89	I-131	< 2.26	N/A
11/30/2007	Blodgett Farm	90	I-131	< 2.26	N/A
11/30/2007	Miller Farm	89	I-131	< 2.26	N/A
12/20/2007	Blodgett Farm	90	I-131	< 2.26	N/A
12/20/2007	Miller Farm	89	I-131	< 2.26	N/A

Table 21. 2007 Milk Sample Gamma Radioactivity Results

Sample Date	Sample Location	Map ID No.	Results Nuclides	Results pCi/l	Error pCi/l
1/29/2007	Blodgett Farm	90	K-40	1480	110
1/29/2007	Miller Farm	89	K-40	1550	110
2/27/2007	Blodgett Farm	90	K-40	1280	90
2/27/2007	Miller Farm	89	K-40	1530	120
3/20/2007	Blodgett Farm	90	K-40	1430	100
3/20/2007	Miller Farm	89	K-40	1510	110
4/30/2007	Blodgett Farm	90	K-40	1540	100
4/30/2007	Miller Farm	89	K-40	1510	110
5/29/2007	Blodgett Farm	90	K-40	1550	100
5/29/2007	Miller Farm	89	K-40	1500	100
6/29/2007	Blodgett Farm	90	K-40	1540	110
6/29/2007	Miller Farm	89	N/A	N/A	N/A
7/31/2007	Blodgett Farm	90	K-40	1620	110
7/31/2007	Miller Farm	89	K-40	1440	100
8/27/2007	Blodgett Farm	90	K-40	1570	100
8/27/2007	Miller Farm	89	K-40	1550	110
9/25/2007	Blodgett Farm	90	K-40	1490	100
9/25/2007	Miller Farm	89	N/A	N/A	N/A
10/30/2007	Blodgett Farm	90	K-40	1570	110
10/30/2007	Miller Farm	89	K-40	1500	100
11/30/2007	Blodgett Farm	90	K-40	1640	110
11/30/2007	Miller Farm	89	K-40	1460	100
12/20/2007	Blodgett Farm	90	K-40	1630	110
12/20/2007	Miller Farm	89	K-40	1430	100

Table 22. Lower Limits of Detection for Soil and Sediment Samples

Radioactive material	Lower Limit of Detection
Cadmium-109	272.28 pCi/l
Cobalt-57	10.62 pCi/l
Cerium-139	12.79 pCi/l
Mercury-203	15.08 pCi/l
Tin-113	21.27 pCi/l
Cesium-137	17.37 pCi/l
Yttrium-88	19.30 & 13.28 pCi/l
Cobalt-60	17.04 & 16.83 pCi/l
Beryllium-7	127.61 pCi/l
Potassium-40	274.20 pCi/l
Barium-133	20.26 pCi/l
Cesium-134	17.46 pCi/l
Iodine-131	15.51 pCi/l
Zinc-65	34.64 pCi/l
Manganese-54	17.66 pCi/l
Silver-110m	16.17 pCi/l
Cerium-144	87.76 pCi/l
Cerium-141	21.21 pCi/l
Chromium-51	124.42 pCi/l
Antimony-126	15.24 pCi/l
Ruthenium-103	15.34 pCi/l
Strontium-90	17.89 pCi/l
Antimony-124	16.77 pCi/l
Ruthenium-106	158.59 pCi/l
Cesium-136	16.43 pCi/l
Cobalt-58	16.84 pCi/l

Table 23. 2007 Vegetation Gamma Radioactivity Results

Sample Date	Sample Location	Map ID No.	Results pCi/kg	Error pCi/kg	Results Nuclides	Comment
5/17/2007	Billings Museum	112	17500	1600	K-40	Hay
5/17/2007	Green Acres Farm	111	4730	500	K-40	Alfalfa
5/17/2007	Green Acres Farm	111	837	182	Be-7	Alfalfa
6/29/2007	Power Line River Crossing	92	523	166	Be-7	Grass
6/29/2007	Power Line River Crossing	92	5470	480	K-40	Grass
6/29/2007	Vernon Elementary School	93	6210	530	K-40	Grass
6/29/2007	Vernon Elementary School	93	928	202	Be-7	Grass
6/29/2007	Blodgett Farm	94	7000	600	K-40	Grass
6/29/2007	CT River Downstream	98	5430	580	K-40	Grass
9/20/200/	Walker Farm	116	1970	200	K-40	Broccoli
9/20/2007	Westminster Farm	115	1430	280	Be-7	Grass
9/20/200/	Westminster Farm	115	5770	530	K-40	Grass
9/20/2007	Saxtons Orchard	114	1400	120	K-40	Apple
9/20/2007	Green Mountain Orchard	110	1140	110	K-40	Apple
9/20/200/	Stoneholm Farm	113	18600	1100	K-40	Hay
9/20/2007	Stoneholm Farm	113	4590	410	Be-7	Hay
9/20/200/	Stoneholm Farm	113	6820	470	K-40	Alfalfa
9/20/2007	Stoneholm Farm	113	469	146	Be-7	Alfalfa

Figure 8

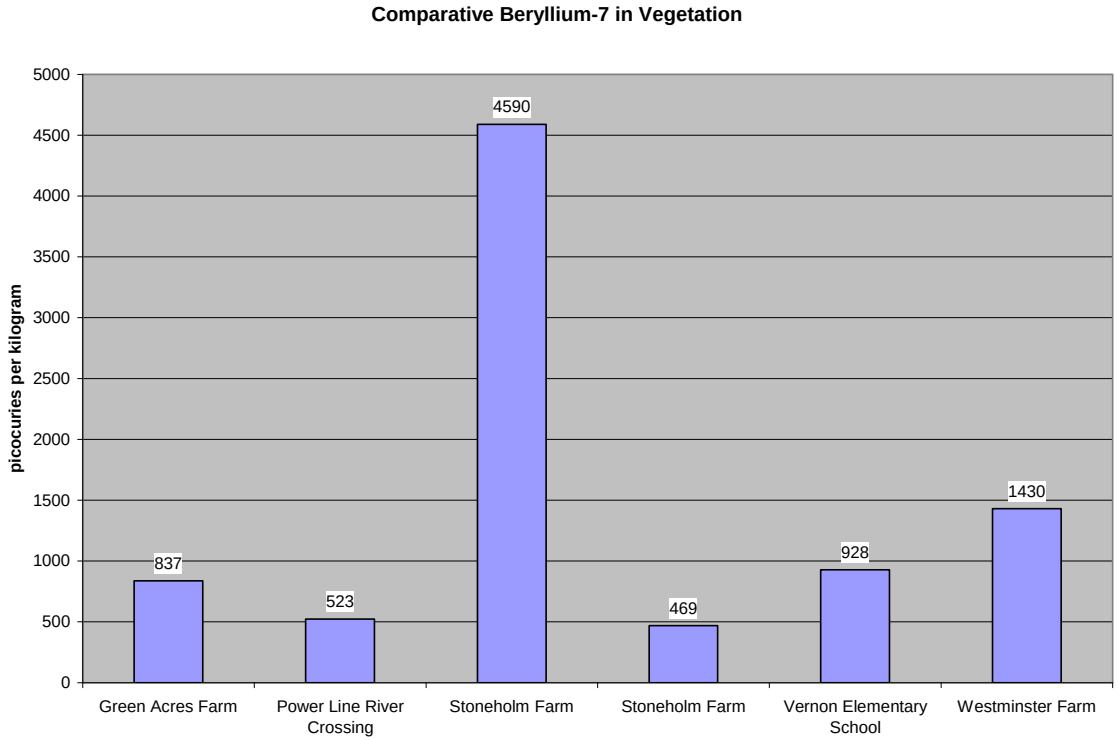
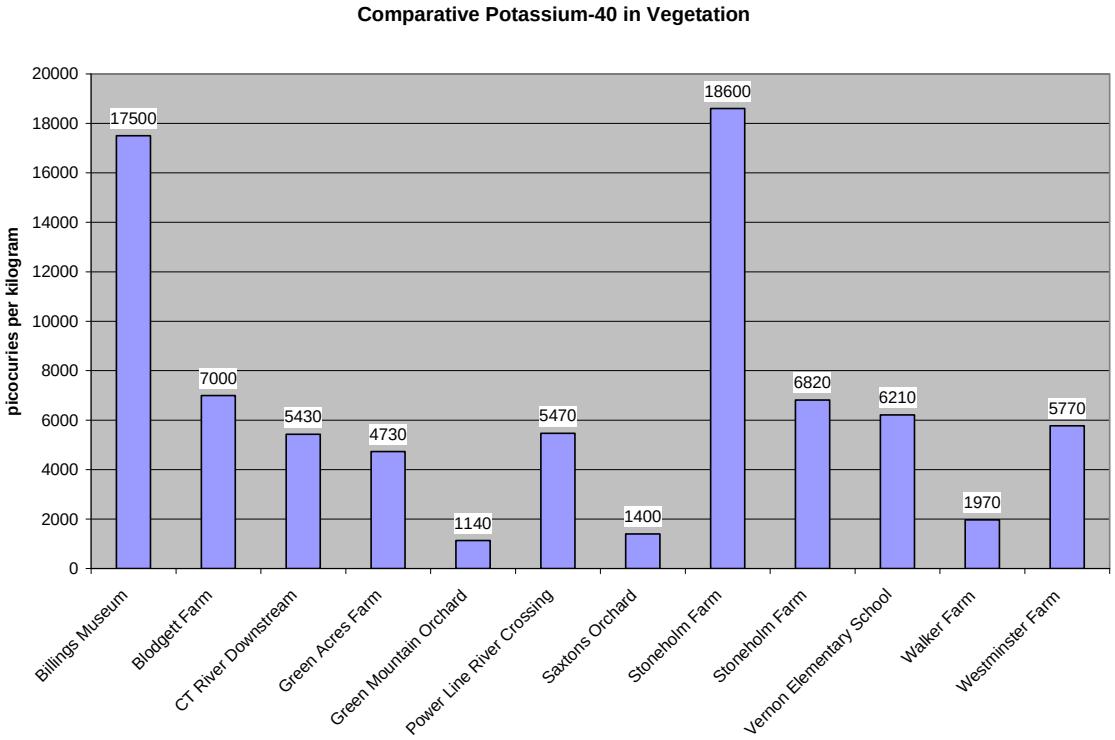

Comparative Beryllium-7 in Vegetation
picocuries per kilogram
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
837
523
4590
469
928
1430
Green Acres Farm
Power Line River Crossing
Stoneholm Farm
Stoneholm Farm
Vernon Elementary School
Westminster Farm

Figure 9


Comparative Potassium-40 in Vegetation
picocuries per kilogram
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
17500
7000
5430
4730
1140
5470
1400
18600
6820
6210
1970
5770
Billings Museum
Blodgett Farm
CT River Downstream
Green Acres Farm
Green Mountain Orchard
Power Line River Crossing
Saxtons Orchard
Stoneholm Farm
Stoneholm Farm
Vernon Elementary School
Walker Farm
Westminster Farm

Map 13

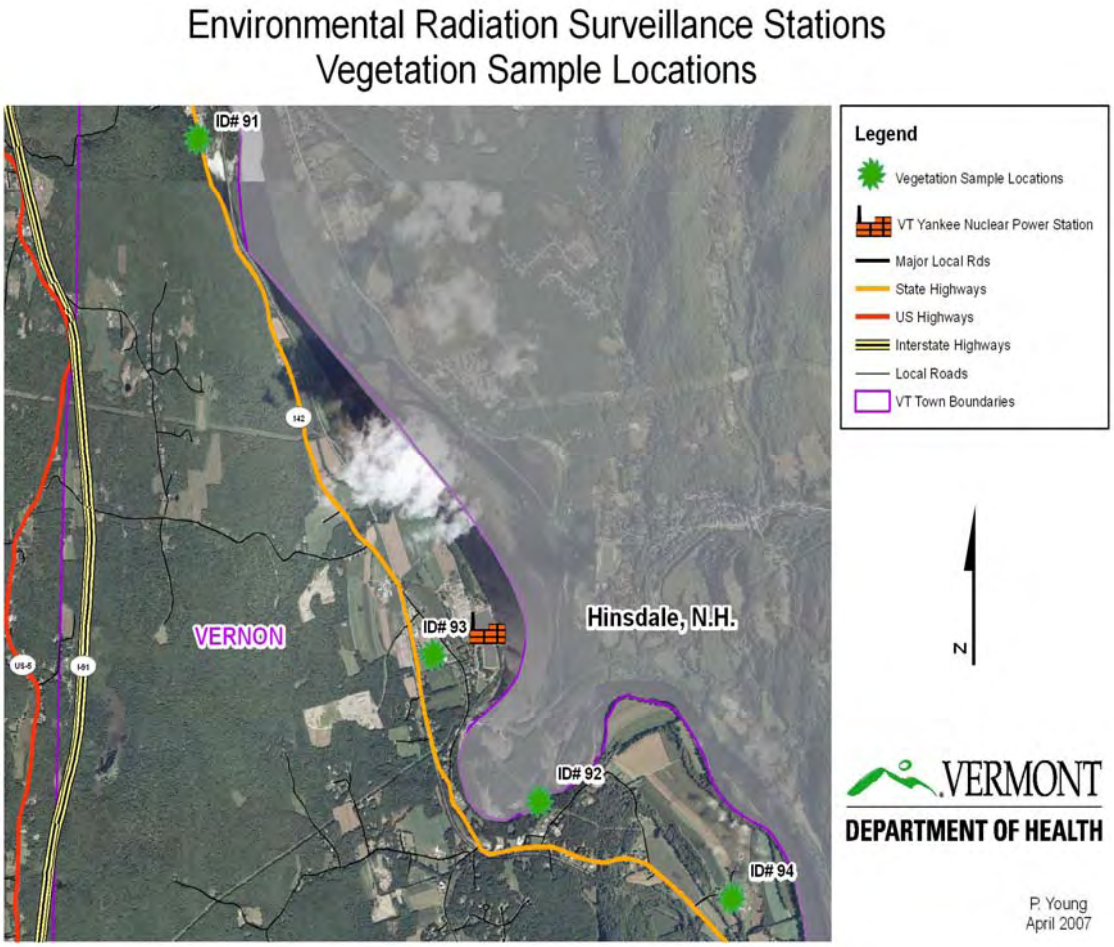

Environmental Radiation Surveillance Stations
Vegetation Sample Locations
ID# 91
VERNON
ID# 93
Hinsdale, N.H.
ID# 92
ID# 94
Legend
Vegetation Sample Locations
VT Yankee Nuclear Power Station
Major Local Rds
State Highways
US Highways
Interstate Highways
Local Roads
VT Town Boundaries
N
VERMONT
DEPARTMENT OF HEALTH
P. Young
April 2007

Table 24. 2007 Soil Sample Gamma Radioactivity Results

Sample Date	Sample Location	Map ID No.	Results pCi/kg	Error pCi/kg	Results Nuclides
5/17/2007	Meacham Farm	101	14900	1000	K-40
5/17/2007	Meacham Farm	101	125	34	Cs-137
5/17/2007	Green Acres Farm	102	32400	1800	K-40
5/17/2007	Billings Farm	103	11100	800	K-40
5/17/2007	Lake Pineo Beach	104	10400	700	K-40
5/17/2007	Dewey Mills	105	9050	630	K-40
6/29/2007	Vernon Elementary School	96	12400	800	K-40
5/16/2006	Vernon Elementary School	96	68.5	25.7	Cs-137
6/29/2007	Power Line River Crossing	95	10400	700	K-40
6/29/2007	Blodgett Farm	97	11100	700	K-40
6/29/2007	Blodgett Farm	97	80.6	22.3	Cs-137
6/29/2007	Conn River Downstream	98	12900	800	K-40
9/20/2007	Stoneholm Farm	106	12600	800	K-40
9/20/2007	Stoneholm Farm	106	128	33	Cs-137
9/20/2007	Harlows Farm	107	16100	1000	K-40
9/20/2007	Harlows Farm	107	97.4	24	Cs-137
9/20/2007	Saxton River Orchard	108	10400	700	K-40
9/20/2007	Walker Farm	109	13600	900	K-40

Figure 10

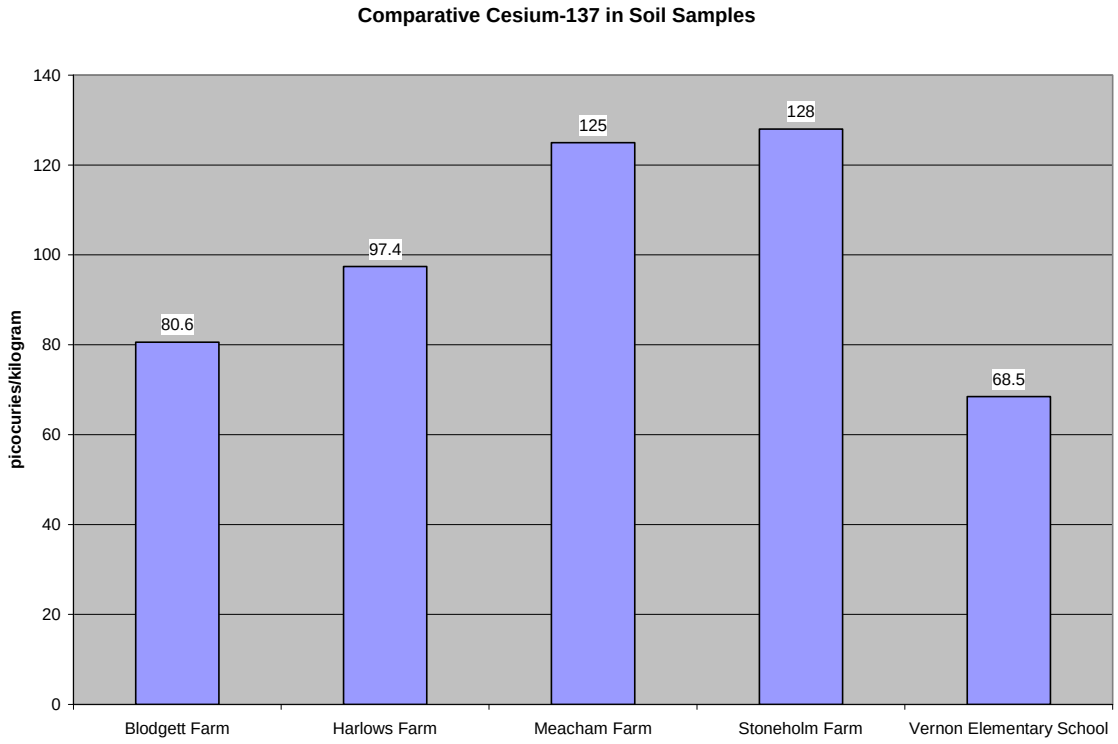
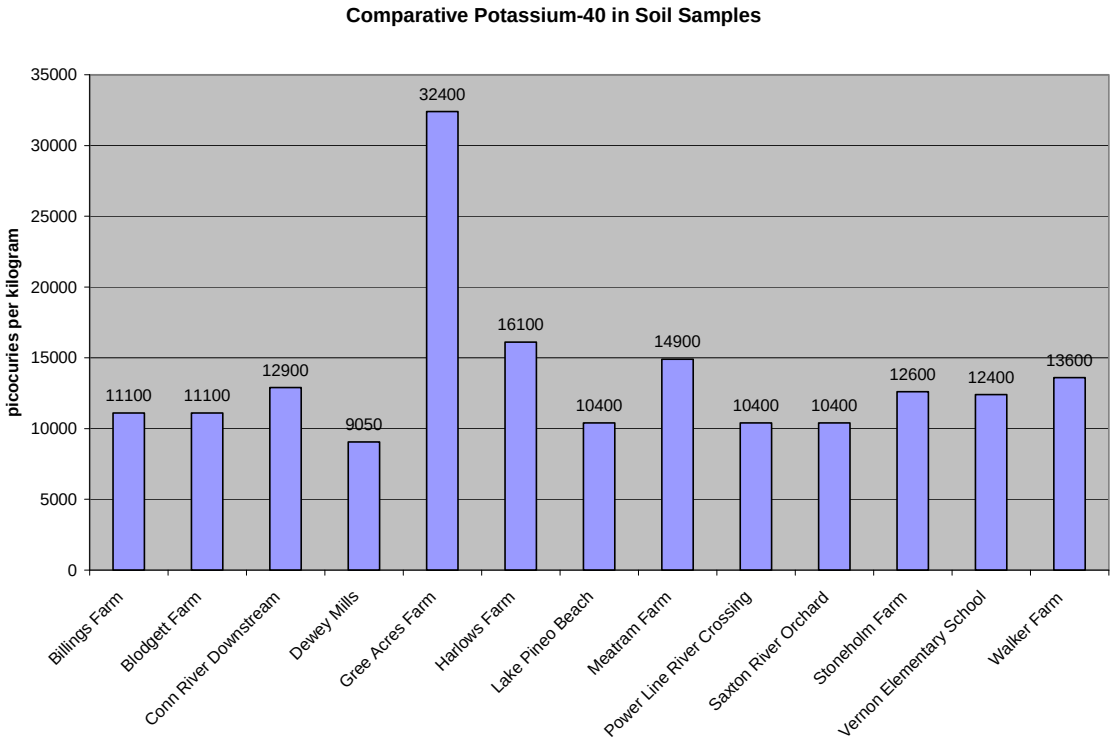

Comparative Cesium-137 in Soil Samples
picocuries/kilogram
140
120
100
80
60
40
20
0
80.6
97.4
125
128
68.5
Blodgett Farm
Harlows Farm
Meacham Farm
Stoneholm Farm
Vernon Elementary School

Figure 11


Comparative Potassium-40 in Soil Samples
picocuries per kilogram
35000
30000
25000
20000
15000
10000
5000
0
11100
11100
12900
9050
32400
16100
10400
14900
10400
10400
12600
12400
13600
Billings Farm
Blodgett Farm
Conn River Downstream
Dewey Mills
Gree Acres Farm
Harlows Farm
Lake Pineo Beach
Meatram Farm
Power Line River Crossing
Saxton River Orchard
Stoneholm Farm
Vernon Elementary School
Walker Farm

Map 14

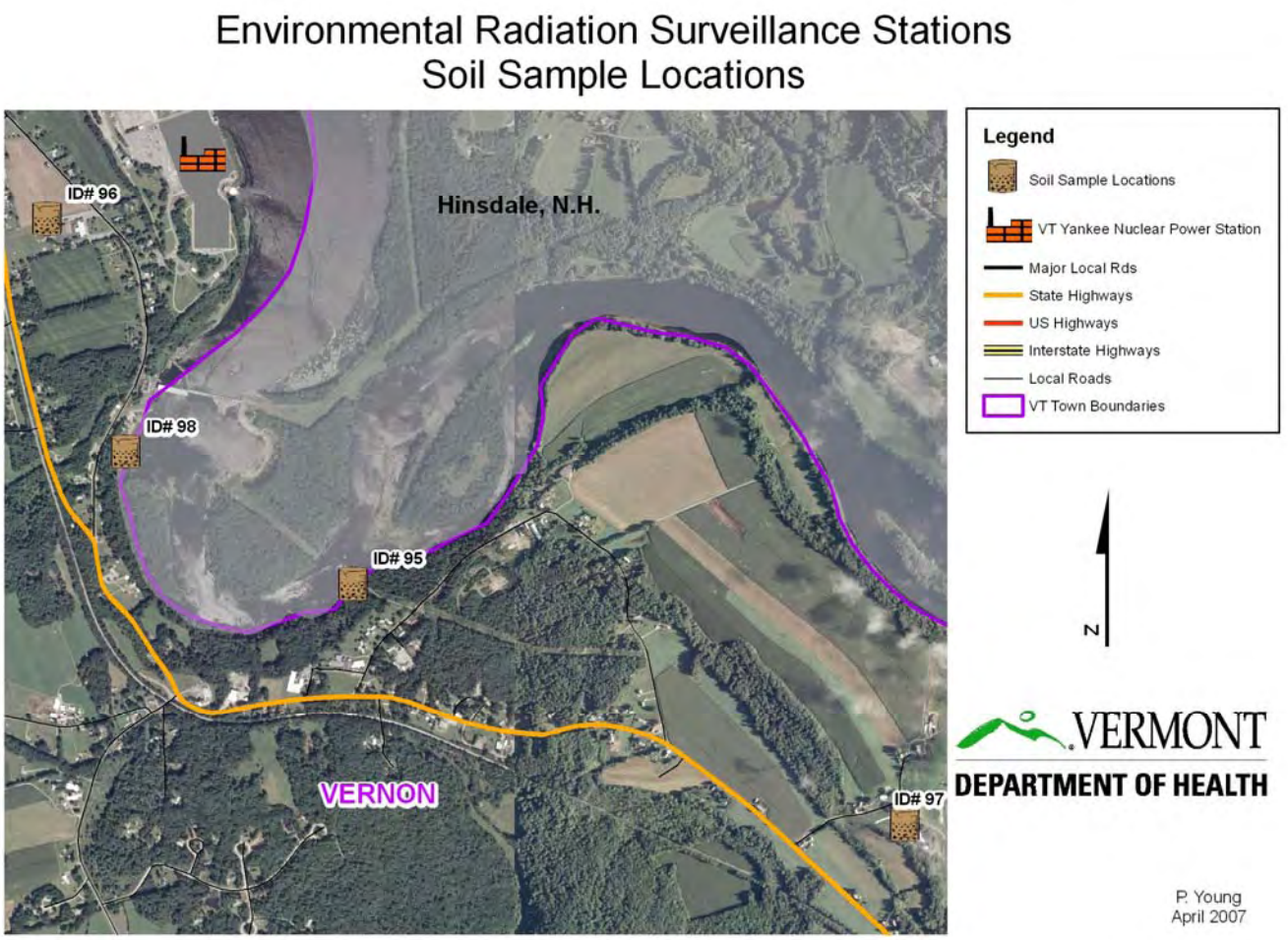

Environmental Radiation Surveillance Stations
Soil Sample Locations
ID# 96
Hinsdale, N.H.
ID# 98
ID# 95
VERNON
ID# 97
Legend
Soil Sample Locations
VT Yankee Nuclear Power Station
Major Local Rds
State Highways
US Highways
Interstate Highways
Local Roads
VT Town Boundaries
N
VERMONT
DEPARTMENT OF HEALTH
P. Young
April 2007

Figure 12, Sediment Sample Locations

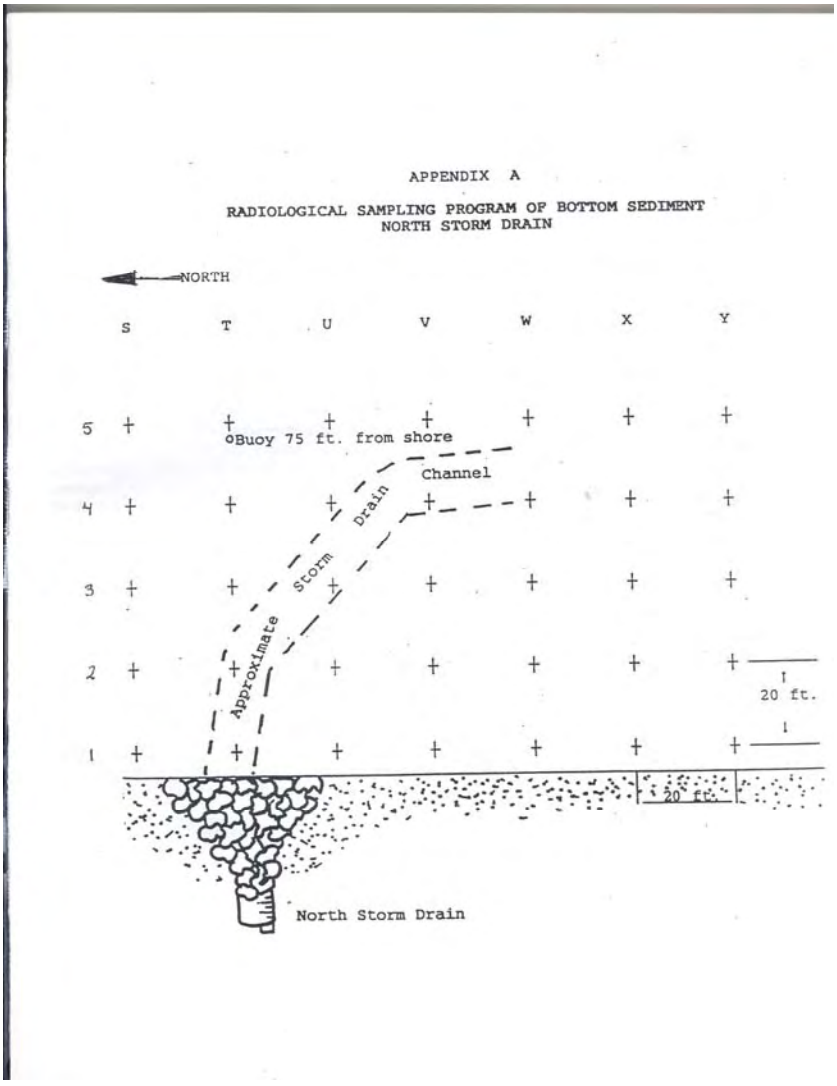


Figure 13

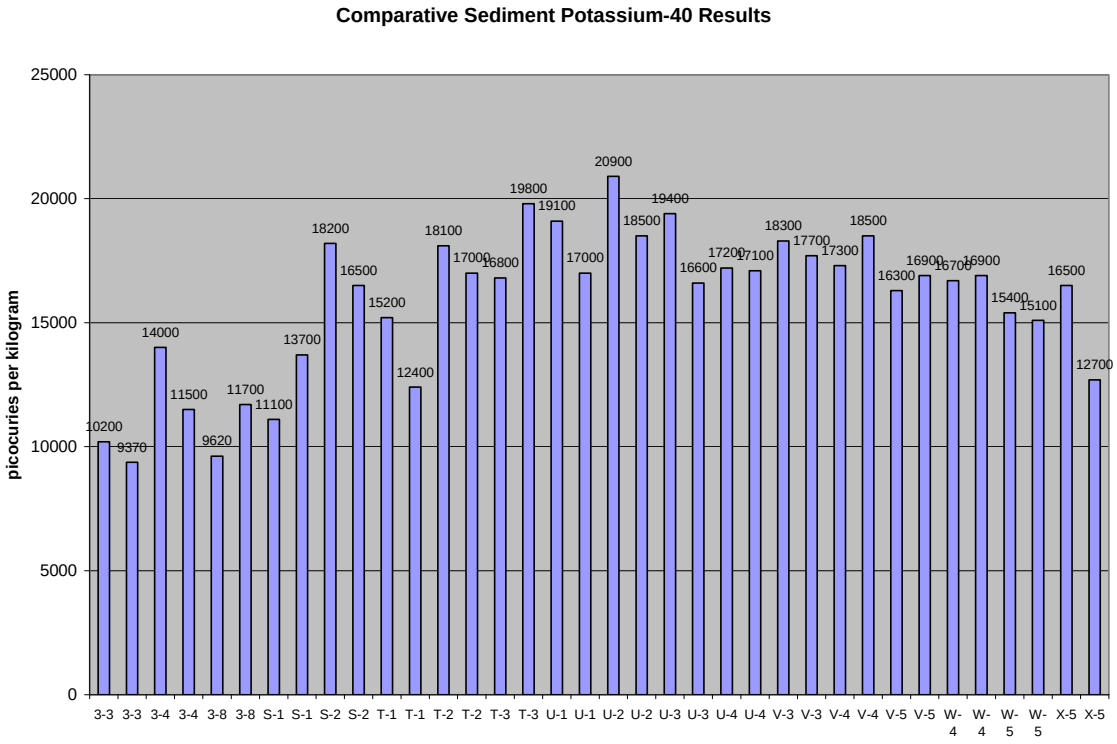

Comparative Sediment Potassium-40 Results
picocuries per kilogram
25000
20000
15000
10000
5000
0
10200
9370
14000
11500
9620
11700
11100
13700
18200
16500
15200
12400
18100
17000
16800
19800
19100
17000
20900
18500
19400
16600
17200
17100
18300
17700
17300
18500
16300
16900
16700
16900
15400
15100
16500
12700
3-3 3-3 3-4 3-4 3-8 3-8 S-1 S-1 S-2 S-2 T-1 T-1 T-2 T-2 T-3 T-3 U-1 U-1 U-2 U-2 U-3 U-3 U-4 U-4 V-3 V-3 V-4 V-4 V-5 V-5 W-4 W-4 W-5 W-5 X-5 X-5

Figure 14

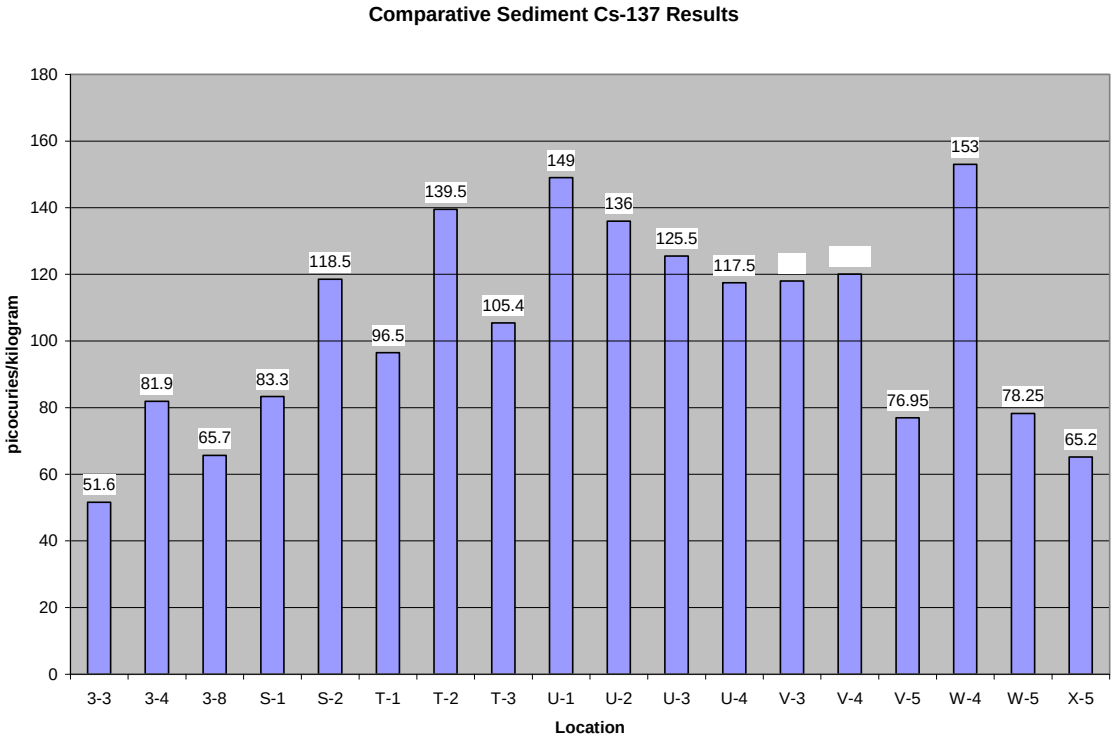

Comparative Sediment Cs-137 Results
picocuries/kilogram
180
160
140
120
100
80
60
40
20
0
51.6
81.9
65.7
83.3
118.5
96.5
139.5
105.4
149
136
125.5
117.5
153
76.95
78.25
65.2
3-3
3-4
3-8
S-1
S-2
T-1
T-2
T-3
U-1
U-2
U-3
U-4
V-3
V-4
V-5
W-4
W-5
X-5
Location

Table 25. 2007 Sediment Sample Gamma Radioactivity Results

Sample Date	Sample Location	Results Nuclides	Results pCi/kg	Error pCi/kg	Comment
5/15/2007	3-4	K-40	14000	900	Natural
5/15/2007	3-4	Cs-137	103	30	
5/15/2007	3-8	K-40	9620	640	Natural
5/15/2007	3-8	Cs-137	50.6	18	
5/15/2007	S-1	K-40	11100	800	Natural
5/15/2007	S-1	Cs-137	90.5	24	
5/15/2007	S-2	K-40	18200	1200	Natural
5/15/2007	S-2	Cs-137	123	42	
5/15/2007	T-1	K-40	15200	1100	Natural
5/15/2007	T-1	Cs-137	111	30	
5/15/2007	T-2	K-40	18100	1100	Natural
5/15/2007	T-2	Cs-137	131	27	
5/15/2007	T-3	K-40	16800	1100	Natural
5/15/2007	T-3	Cs-137	93.8	33.8	
5/15/2007	U-1	K-40	19100	1600	Natural
5/15/2007	U-1	Cs-137	148	50	
5/15/2007	U-2	K-40	20900	1300	Natural
5/15/2007	U-2	Cs-137	130	35	
5/15/2007	U-3	K-40	19400	1300	Natural
5/15/2007	U-3	Cs-137	151	43	
5/15/2007	U-4	K-40	17200	1200	Natural
5/15/2007	U-4	Cs-137	124	34	
5/15/2007	V-3	K-40	18300	1200	Natural
5/15/2007	V-3	Cs-137	123	32	
5/15/2007	V-4	K-40	17300	1200	Natural
5/15/2007	V-4	Cs-137	90.2	31.4	
5/15/2007	V-5	K-40	16300	1100	Natural
5/15/2007	V-5	Cs-137	79.1	28.8	
5/15/2007	W-4	K-40	16700	1200	Natural
5/15/2007	W-4	Cs-137	190	52	
5/15/2007	W-5	K-40	15400	1000	Natural
5/15/2007	W-5	Cs-137	85.3	33.9	
5/15/2007	X-5	K-40	16500	1100	Natural
5/15/2007	X-5	Cs-137	71.1	31.5	
5/24/2007	3-3	K-40	10200	700	Natural
5/24/2007	3-3	Cs-137	46.8	14.4	

Table 25. 2007 Sediment Sample Gamma Radioactivity Results (continued)

Sample Date	Sample Location	Results Nuclides	Results pCi/kg	Error pCi/kg	Comment
10/26/2007	3-8	K-40	11700	800	Natural
10/26/2007	3-8	Cs-137	80.8	22.9	
10/26/2007	T-1	K-40	12400	900	Natural
10/26/2007	T-1	Cs-137	82	25.1	
10/26/2007	T-2	K-40	17000	1100	Natural
10/26/2007	T-2	Cs-137	148	37	
10/26/2007	U-3	K-40	16600	1100	Natural
10/26/2007	U-3	Cs-137	100	36	
10/26/2007	3-4	K-40	11500	700	Natural
10/26/2007	3-4	Cs-137	60.8	23.3	
10/26/2007	S-2	K-40	16500	1100	Natural
10/26/2007	S-2	Cs-137	114	28	
10/26/2007	S-1	K-40	13700	900	Natural
10/26/2007	S-1	Cs-137	76.1	22.1	
10/26/2007	X-5	K-40	12700	800	Natural
10/26/2007	X-5	Cs-137	59.3	26.5	
10/26/2007	T-3	K-40	19800	1200	Natural
10/26/2007	T-3	Cs-137	117	34	
10/26/2007	V-4	K-40	18500	1200	Natural
10/26/2007	V-4	Cs-137	150	53	
10/26/2007	3-3	K-40	9370	640	Natural
10/26/2007	3-3	Cs-137	56.4	16.8	
10/26/2007	V-5	K-40	16900	1100	Natural
10/26/2007	V-5	Cs-137	74.8	29.8	
10/26/2007	W-5	K-40	15100	1000	Natural
10/26/2007	W-5	Cs-137	71.2	22.7	
10/26/2007	W-4	K-40	16900	1100	Natural
10/26/2007	W-4	Cs-137	116	40	
10/26/2007	V-3	K-40	17700	1100	Natural
10/26/2007	V-3	Cs-137	113	31	
10/26/2007	U-2	K-40	18500	1200	Natural
10/26/2007	U-2	Cs-137	142	31	
10/26/2007	U-4	K-40	17100	1100	Natural
10/26/2007	U-4	Cs-137	111	29	
10/26/2007	U-1	K-40	17000	1100	Natural
10/26/2007	U-1	Cs-137	150	36	

Table 26. 2007 Fish Sample Gamma Radioactivity Results

Sample Date	Sample Location	Results pCi/kg	Error pCi/kg	Results Nuclides
5/10/2007	3-4	2680	230	K-40
5/14/2007	3-8	2790	210	K-40
10/220/2007	3-4	2450	220	K-40
11/2/2007	3-8	2590	190	K-40

List of Tables, Figures and Maps

Tables

Tables (Continued)

Figures

Maps