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U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555-0001

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Serial No.	18-175
MPS Lic/GJC	R0
Docket Nos.	50-245
	50-336
	50-423
License Nos.	DPR-21
	DPR-65
	NPF-49

DOMINION ENERGY NUCLEAR CONNECTICUT, INC.
MILLSTONE POWER STATION UNITS 1, 2, AND 3
2017 ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

This letter transmits the Annual Radiological Environmental Operating Report for the Millstone Power Station, for the period January 2017 through December 2017. This satisfies the provisions of Section 5.7.2 of Millstone Power Station Unit 1 Permanently Defueled Technical Specifications (PDTS), and Sections 6.9.1.6a and 6.9.1.3 of the Millstone Power Station Units 2 and 3 Technical Specifications, respectively.

If you have any questions or require additional information, please contact Mr. Mr. Jeffry A. Langan at (860) 444-5544.

Sincerely,

M. J. O'Connor
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IE25
NRR

Attachments: 1

Commitments made in this letter:

1. None.

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NPF-49

ATTACHMENT 1

2017 ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

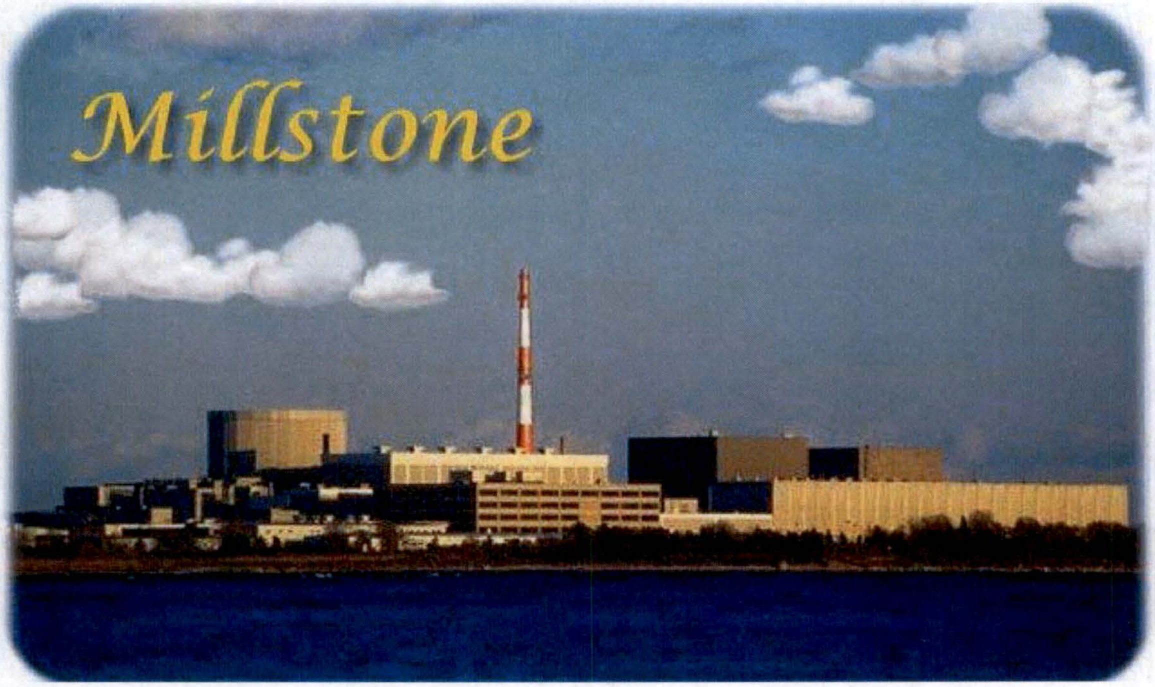
MILLSTONE POWER STATION UNITS 1, 2, AND 3
DOMINION ENERGY NUCLEAR CONNECTICUT, INC. (DENC)

Millstone Power Station

2017

Radiological Environmental Operating Report

January 1, 2017 – December 31, 2017



Dominion Nuclear Connecticut, Inc.

Unit	License	Docket
1	DPR-21	50-245
2	DPR-65	50-336
3	NPF-49	50-423

Dominion Energy

ANNUAL
RADIOLOGICAL ENVIRONMENTAL
OPERATING REPORT

MILLSTONE POWER STATION

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

2017

Millstone Power Station Unit 1, DOCKET NO. 50-245
Millstone Power Station Unit 2, DOCKET NO. 50-336
Millstone Power Station Unit 3, DOCKET NO. 50-423

Dominion Nuclear Connecticut, Inc.
Waterford, Connecticut

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EXECUTIVE SUMMARY

INTRODUCTION

This report summarizes the results of the Radiological Environmental Monitoring Program (REMP) conducted in the vicinity of the Millstone Nuclear Power Station (MPS) during the period from January 1 to December 31, 2017. This document has been prepared in accordance with the requirements of the separate MPS Unit 1 (MPS1) Permanently Defueled Technical Specifications and the Technical Specifications for Millstone Units 2 and 3 (MPS2 and MPS3).

The REMP has been established to monitor the radiation and radioactivity released to the environment as a result of MPS's operation. This program, initiated in April 1967, includes the collection, analysis, and evaluation of radiological data in order to assess the impact of MPS on the environment and on the general public.

SAMPLING AND ANALYSIS

The environmental sampling media collected in the vicinity of MPS and at distant locations included aquatic, atmospheric, and terrestrial samples. These samples were air particulate filters, charcoal cartridges, soil, cow and goat milk, well water, broadleaf vegetation, fruits and vegetables, seawater, bottom sediment, aquatic flora, fish, oysters, clams, and lobster.

During 2017, there were 485 samples collected from the atmospheric, aquatic, and terrestrial environments. In addition, 155 exposure measurements were obtained using environmental thermoluminescent dosimeters (TLDs). A discussion of all discrepancies from the sample collection requirements in the MPS Radiological Effluent Monitoring and Offsite Dose Calculation Manual (REMODCM) is given in Section 2.3 of this report. Teledyne Brown Engineering, Inc. of Knoxville, Tennessee performed the sample analyses and Environmental Dosimetry Company of Sterling, Massachusetts performed the TLD analyses.

LAND USE CENSUS

The annual land use census in the vicinity of MPS was conducted as required by the MPS REMODCM. Typically the cow milk locations are identified by a review of the annual registration information obtained from the State of Connecticut Department of Agriculture. The nearest garden has been conservatively assumed to be located at the nearest residence. Although broadleaf sampling was performed and may be used in lieu of a garden census, gardens were included in the 2017 census. Only vegetable gardens having an area of more than 500 square feet need to be identified. Due to the difficulty of measuring individual gardens, the nearest garden within each directional sector identified by a drive-by survey is listed. However, for dose calculation, garden distances are based on nearest resident assuming that a resident may plant a new garden. This gives a more conservative dose result. The American Dairy Goat Association list and drive by inspection are used to in the selection process of goats for the Goat Pathway. For 2017 only one goat was available and this goat provided milk for sampling.

RADIOLOGICAL IMPACT TO THE ENVIRONMENT

The radionuclides detected in some samples were from non-station, naturally occurring radionuclides.

All terrestrial samples collected as part of the MPS REMP did not show any station related isotopes.

The seawater exiting the stations quarry is monitored for tritium, a station generated radionuclide. Monitoring of seawater in the area of the discharge indicated the presence of tritium, a station related radionuclide. Tritium was only found in seawater onsite inside the mixing zone of the quarry discharge at levels that were expected from routine station operation.

Offsite ambient radiation measurements using environmental TLDs beyond the site boundary ranged between 40 - 102 milliRoentgens (mrem) per year. The range of ambient radiation levels observed with the TLDs is consistent with natural background radiation levels for Connecticut.

RADIOLOGICAL IMPACT TO THE GENERAL PUBLIC

During 2017, radiation doses to the general public as a result of Millstone's operation continued to be well below the federal limits and much less than the dose due to other sources of man-made (e.g., X-rays, medical) and naturally-occurring (e.g., cosmic, radon) radiation.

The calculated total body (whole body) dose to the maximally exposed member of the general public from radioactive effluents and ambient radiation resulting from MPS operations for 2017 was approximately 0.31 mrem* for the year. This conservative estimate is well below the Environmental Protection Agency's (EPA) annual dose limit to any member of the general public and is a fraction of a percent of the typical dose received from natural and other sources of man-made radiation.

CONCLUSIONS

The 2017 REMP for MPS resulted in the collection and analysis of 640 environmental samples and measurements. The data obtained were used to determine the impact of Millstone's operation on the environment and on the general public.

An evaluation of direct radiation measurements, environmental sample analyses, and dose calculations indicates all applicable federal criteria were met with margin. Furthermore, radiation levels and the consequential dose from station operation were small in comparison to those attributed to naturally occurring and man-made background radiation.

* Based on this information, there is no significant radiological impact on the environment or on the general public due to Millstone's operation. The term 'mrem' used in this report is a unit of radiation dose. The letter 'm' is for 'milli', or one-thousandth of a 'rem.' The word 'rem' is an acronym for roentgen equivalent man. One rem is equal to a rad multiplied by factors to account for type of radiation and distribution within the body. The word 'rad' is an acronym for radiation absorbed dose. One rad is equal to the absorption of 100 ergs of energy per gram of tissue.

1. INTRODUCTION

This section provides an overview of the MPS REMP. It also includes background information to allow a reader to have an informed understanding of radiation and nuclear power operation.

1.1 Overview

The REMP for 2017 performed by Dominion Energy Nuclear Connecticut (DENC) for MPS is discussed in this report. Since the operation of a nuclear power station results in the release of small amounts of radioactivity and low levels of radiation, the Nuclear Regulatory Commission (NRC) requires by regulations and technical specifications that a program be established to monitor radiation and radioactivity in the environment (References 1, 6, 9, 10, & 11). This report, published annually per Millstone's Technical Specifications (section 5.7.2 for MPS1, section 6.9.1.6A for MPS2 and Section 6.9.1.3 for MPS3), summarizes the results of measurements of radiation and radioactivity in the environment in the vicinity of the MPS and at distant locations during the period January 1 to December 31, 2017.

The REMP consists of taking radiation measurements and collecting samples from the environment, analyzing them for radioactivity content, and interpreting the results. With emphasis on the critical radiation exposure pathways to humans, samples from the aquatic, atmospheric, and terrestrial environments are collected. These samples include, but are not limited to: air, soil, cow and goat milk, well water, broadleaf vegetation, fruits, vegetables, seawater, bottom sediment, aquatic flora, fish, oysters, clams and lobster. Thermoluminescent dosimeters (TLDs) are placed in the environment to measure gamma radiation levels. The TLDs are processed and the environmental samples are analyzed to measure the very low levels of radiation and radioactivity present in the environment as a result of MPS operation and other natural and man-made sources. These results are reviewed by Millstone's radiological staff and have been reported semiannually or annually to the NRC and others for over 30 years.

In order to more fully understand how a nuclear power station impacts humans and the environment, background information on radiation and radioactivity, natural and man-made sources of radiation, reactor operations, radioactive effluent controls, and radiological impact on humans is provided. It is believed that this information will assist the reader in understanding the radiological impact on the environment and humans from the operation of Millstone.

1.2 Radiation and Radioactivity

All matter is made of atoms. Nuclear radiation is energy or particles that are given off from atoms in an excited state (e.g., unstable, radioactive atoms).

Radioactive material exists naturally and has always been a part of our environment. The earth's crust, for example, contains radioactive uranium, radium, thorium, and potassium. Some radioactivity is a result of fallout from nuclear weapons testing. Examples of radioactive fallout that could be present in environmental samples are cesium-137 and strontium-90. Some examples of radioactive materials released from a nuclear power station are hydrogen-3 (tritium), cesium-137, iodine-131, strontium-90, and cobalt-60.

Radiation is measured in units of mrem, much like temperature is measured in degrees. A mrem is a measure of the biological effect of the energy deposited in tissue. The letter 'm' is for 'milli', or one-thousandth of a 'rem'. The word 'rem' is an acronym for roentgen equivalent man. One rem is equal to a 'rad' multiplied by factors to account for type of radiation and distribution within the body. The word 'rad' is an acronym for radiation absorbed dose. One rad is equal to the absorption of 100 ergs of energy per gram of tissue. The natural and man-made radiation dose received in one year by the average American is 300 to 600 mrem (References 2, 3, 4 & 5). The per capita dose has increased since the early 1980's because of the increased usage of medical procedures involving exposure to radiation (see Reference 3).

Radioactivity is measured in Curies. Levels of radioactivity commonly seen in the environment are typically a small fraction of a Curie, therefore radioactivity in the environment is typically measured in picocuries. One picocurie (pCi) is one-trillionth of a Curie and is equal to 0.037 disintegrations per second (2.22 disintegrations per minute).

1.3 Sources of Radiation

As mentioned previously, naturally occurring radioactivity has always been a part of our environment. Table 1.3 shows the sources and doses of radiation from natural and man-made sources.

Table 1.3
Radiation Sources and Corresponding Approximate Doses (1)

NATURAL		**MAN-MADE**	
Source	Radiation Dose (mrem/year)	Source	Radiation Dose (mrem/year)
Internal, inhalation(2)	228	Medical(3)	300
External, space	33	Consumer(4)	13
Internal, ingestion	29	Industrial, security, educational, research	0.3
External, terrestrial	21	Occupational	0.5
		Weapons Fallout	< 1
		Nuclear Power Stations	< 1
Approximate Total	311	Approximate Total	314

(1) information from References 3 and 4
(2) from radon and thoron
(3) includes computerized tomography (147 mrem), nuclear medicine (77 mrem), interventional fluoroscopy (43 mrem) and conventional radiography and fluoroscopy (33 mrem)
(4) primarily from cigarette smoking (4.6 mrem), commercial air travel (3.4 mrem), building materials (3.5 mrem) and mining and agriculture (0.8 mrem)

Cosmic radiation (external, space) from the sun and outer space penetrates the earth's atmosphere and continuously bombards us with rays and charged particles. Some of this cosmic radiation interacts with gases and particles in the atmosphere, making them radioactive. These radioactive byproducts from cosmic ray bombardment are referred to as cosmogenic radionuclides. Isotopes such as beryllium-7 and carbon-14 are formed in this way. Exposure to cosmic and cosmogenic sources of radioactivity results in about 33 mrem of radiation dose per year.

Additionally, natural radioactivity is in our body and in the food we eat (about 29 mrem/year), the ground we walk on (about 21 mrem/year) and the air we breathe (about 228 mrem/year). The majority of a person's annual dose results from exposure to radon and thoron in the air we breathe. These gases and their radioactive decay products arise from the decay of naturally occurring uranium, thorium and radium in the soil and building products such as brick, stone, and concrete. Radon and thoron levels vary greatly with location, primarily due to changes in the concentration of uranium and thorium in the soil. Residents at some locations in Colorado, New York, Pennsylvania, New Jersey and even Connecticut have a higher annual dose as a result of higher levels of radon/thoron gases in these areas. In total, these various sources of naturally-occurring radiation and radioactivity contribute to a total dose of about 311 mrem per year.

In addition to natural radiation, we are normally exposed to radiation from a number of man-made sources. The single largest doses from man-made sources result from therapeutic and diagnostic applications of x-rays and radiopharmaceuticals. The annual dose to an individual in the United States from medical and dental exposure is approximately 300 mrem. Consumer products/uses, such as cigarettes, building materials and commercial air travel contribute about 13 mrem/year. Much smaller doses result from weapons fallout (less than 1 mrem/year) and nuclear power stations (less than 1 mrem/year). Typically, the average person in the United States receives approximately 314 mrem per year from man-made sources.

1.4 Nuclear Reactor Operations

MPS generates about 2100 megawatts of electricity at full power, which provides approximately one-third of the power consumed in the State of Connecticut. MPS2 and MPS3 are pressurized water reactors (MPS1, which is permanently shutdown, was a boiling water reactor). The nuclear station is located on an approximate 500-acre site about 5 kilometers (three miles) west of New London, Connecticut. Commercial operation of MPS2 began in December 1975 and MPS3 in May 1986.

MPS was operational during most of 2017, with the exception of refueling outages in April for MPS2 and October/November for MPS3. The annual capacity factor for MPS2 was 89.0% and for MPS3 was 91.7%.

Nuclear-generated electricity is produced by many of the same techniques used for conventional oil and coal-generated electricity. Both systems use heat to boil water in order to produce steam. The steam turns a turbine, which turns a generator, producing electricity. In both cases, the steam passes through a condenser where it changes back into water and re-circulates back through the system (see Figure 1.4-1). The cooling water source for MPS is the Niantic Bay.

The key difference between nuclear power and conventional power is the source of heat used to boil the water. Conventional stations burn fossil fuels in a boiler, while nuclear stations use uranium fission in a nuclear reactor.

Inside the reactor, a nuclear reaction called fission takes place. Particles, called neutrons, strike the nucleus of a uranium-235 atom, causing it to split into fragments called radioactive fission products. The splitting of the atoms releases both heat and more neutrons. The newly-released neutrons then collide with and split other uranium atoms, thus making more heat and releasing even more neutrons, and on and on until the uranium fuel is depleted or spent. This process is called a chain reaction. When this chain reaction is self-sustaining, the reactor is called "critical."

The operation of a nuclear reactor results in the release of small amounts of radioactivity and low levels of radiation. The radioactivity originates from two major sources, radioactive fission products and radioactive activation products. Radioactive fission products, as illustrated in Figure 1.4-1, originate from the fissioning of the nuclear fuel. These fission products get into the reactor coolant from their release by minute amounts of uranium on the outside surfaces of the fuel cladding, by diffusion through the fuel pellets and cladding and, on occasion, through defects or failures in the fuel cladding. These fission products circulate along with the reactor coolant water and will deposit on the internal surfaces of pipes and equipment. The radioactive fission products on the pipes and equipment emit radiation. Examples of some fission products are krypton-85 (Kr-85), strontium-90 (Sr-90), iodine-131 (I-131), xenon-133 (Xe-133), and cesium-137 (Cs-137).

SIMPLIFIED DIAGRAM OF A PRESSURIZED WATER REACTOR

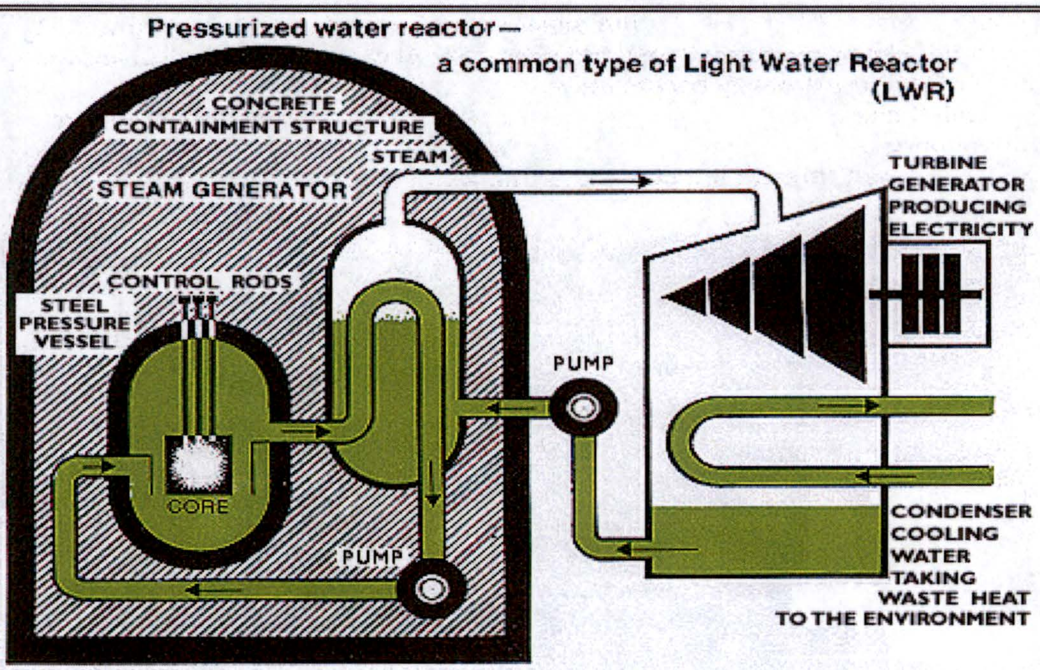


Figure 1.4-1

Nuclear Fission

Fission is the splitting of atoms (e.g., uranium-235) by a neutron to release heat and more neutrons, creating a chain reaction. Radiation and fission products are by-products of the process (see Figure 1.4-2).

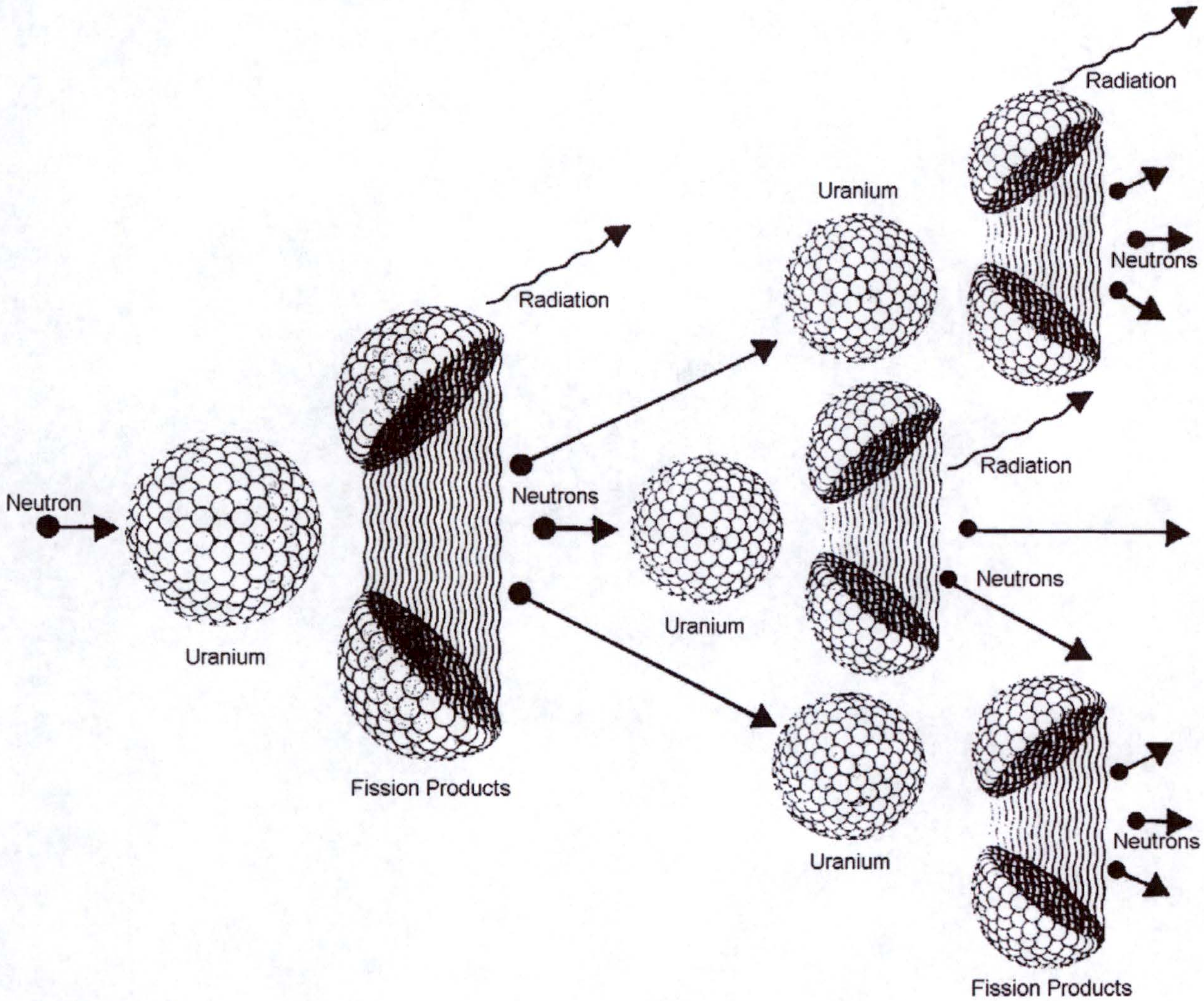


Figure 1.4-2
Radioactive Fission Product Formation

Radioactive activation products (see Figure 1.4-3), on the other hand, originate from two sources. The first is by neutron bombardment of the hydrogen, oxygen and other gas (helium, argon, nitrogen) molecules in the reactor cooling water. The second is a result of the fact that the internals of any piping system or component are subject to minute yet constant corrosion from the reactor cooling water. These minute metallic particles (for example: nickel, iron, cobalt, or magnesium) are transported through the reactor core into the fuel region, where neutrons may react with the nuclei of these particles, producing radioactive products. So, activation products are nothing more than ordinary naturally-occurring atoms that are made unstable or radioactive by neutron bombardment. These activation products circulate along with the reactor coolant water and will deposit on the internal surfaces of pipes and equipment. The radioactive activation products on the pipes and equipment emit radiation. Examples of some activation products are manganese-54 (Mn-54), iron-59 (Fe-59), cobalt-60 (Co-60), and zinc-65 (Zn-65).

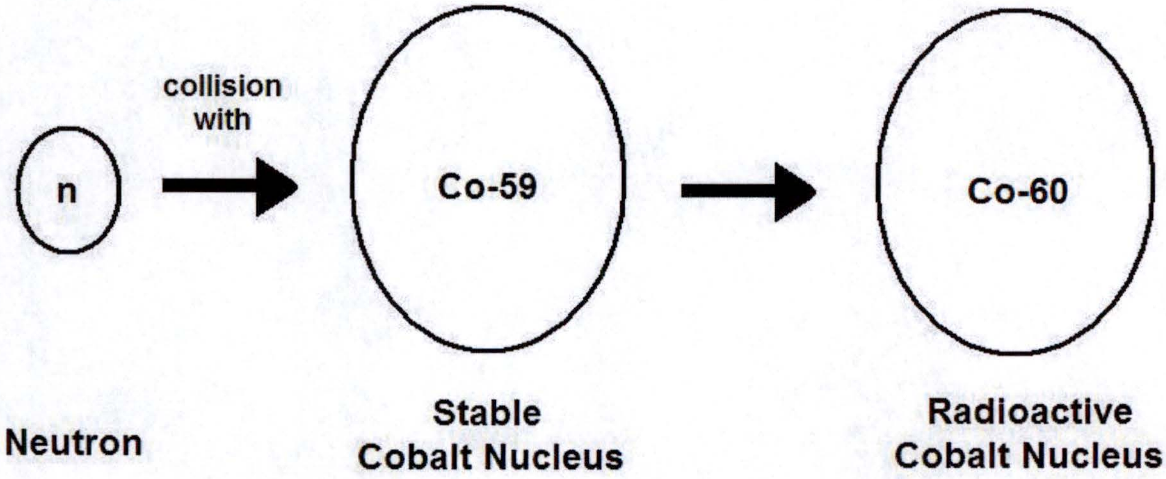


Figure 1.4-3
Radioactive Activation Product Formation

At MPS there are five independent protective barriers that confine these radioactive materials. These five barriers are:

- fuel pellets;
- fuel cladding;
- reactor vessel and associated piping and equipment;
- primary containment and,
- secondary containment (enclosure building).

The ceramic uranium fuel pellets provide the first barrier. Most of the radioactive fission products are either physically trapped or chemically bound between the uranium atoms, where they will remain. However, a few fission products that are volatile or gaseous may diffuse through the fuel pellets into small gaps between the pellets and the fuel cladding.

The second barrier, the fuel cladding, consists of zirconium alloy tubes that confine the fuel pellets. The small gaps between the fuel and the cladding contain the noble gases and volatile iodines that are types of radioactive fission products. This radioactivity can diffuse to a small extent through the fuel cladding into the reactor coolant water. Radioactivity can also escape into coolant water through cladding defects and failures.

The third barrier consists of the reactor pressure vessel, steel piping and equipment that confine the reactor cooling water. The reactor pressure vessel, which holds the reactor fuel, is typically a steel tank 40 feet high by 14 feet in diameter with walls about five to nine inches thick. These vessels and associated piping provide containment for radioactivity in the primary coolant and the reactor core. However, during the course of operations and maintenance, small amounts of radioactive fission and activation products can escape through valve leaks or upon breaching of the primary coolant system for maintenance.

The fourth barrier is the primary containment. It is a cylindrical enclosure with approximately five-foot thick steel reinforced concrete walls lined by steel on the inside. During operation the containment is closed but small amounts of radioactivity may be released from primary containment by venting during operation to maintain proper containment pressure. During maintenance and refueling outages containment is open and small amounts of radioactivity is released during this time when the fuel has been moved out of the reactor cavity in containment.

The fifth barrier is the secondary containment or enclosure building. The enclosure building is a steel building that surrounds the primary containment. This barrier is an additional safety feature at Millstone's reactor units to contain radioactivity that may escape from the primary containment. This enclosure building is equipped with a filtered ventilation system that is used when needed to reduce the radioactivity that escapes from the primary containment.

The five barriers confine most of the radioactive fission and activation products. However, small amounts of radioactivity do escape via mechanical failures and maintenance on valves, piping, and equipment associated with the reactor cooling water system. The small amounts of radioactive liquids and gases that do escape the various containment systems are further controlled by the liquid purification and ventilation filtration systems. The control of radioactive effluents at MPS will be discussed in more detail in the next section.

1.5 Radioactive Effluent Control

The small amounts of radioactive liquids and gases that might escape the first two barriers are processed in the liquid and gaseous waste treatment systems, then monitored for radioactivity, and released only if the radioactivity levels are below the federal release limits.

Radioactivity released from the liquid effluent system to the environment is limited, controlled, and monitored by a variety of systems and procedures which include:

- reactor water cleanup system;
- liquid radioactive waste treatment system;
- sampling and analysis of the liquid radioactive waste tanks; and,
- liquid waste effluent discharge radioactivity monitor.

The purpose of the reactor water cleanup system is to continuously purify the reactor cooling water by removing radioactive atoms and non-radioactive impurities that may become activated by neutron bombardment. A slip stream of the reactor coolant water is diverted from the primary coolant system and is directed through ion exchange resins where radioactive elements, dissolved and suspended in the water, are removed through chemical processes. The net effect is a substantial reduction of the radioactive material that is present in the primary coolant water and consequently the amount of radioactive material that might escape from the system.

Reactor cooling water that might escape the primary cooling system and other radioactive water sources are collected in floor and equipment drains. These drains direct this radioactive liquid waste to large holdup tanks. The liquid waste collected in the tanks is purified again using the liquid radioactive waste treatment system, which consists of a filter and ion exchange resins.

Processing of liquid radioactive waste results in large reductions of radioactivity in liquids discharged into Niantic Bay. Wastes processed through liquid radioactive waste treatment can be purified and, in some cases, re-used in station systems.

Prior to release, the radioactivity in any liquid radioactive waste tank is sampled and analyzed to determine if the level of radioactivity is below the release limits and to quantify the total amount of radioactive liquid effluent that will be released. If the levels are below the federal release limits, the tank is drained to the liquid effluent discharge header.

This liquid waste effluent discharge line is provided with a shielded radioactivity monitor. This detector is connected to a radiation level meter and a recorder in the Control Room. The radiation alarm is set so that the detector will alarm before radioactivity levels exceed the release limits. In addition to the alarm function the radiation monitor also signals both discharge valves to close thus terminating the discharge release to the environment. Gamma spectroscopy analysis, tritium analysis and the effluent radiation monitors prevent any liquid radioactivity from being released in excess of release rate and total activity limits. An audible alarm notifies the Control Room operator that this has occurred.

Some liquid waste sources, which have a low potential for containing radioactivity, and/or may contain very low levels of contamination, may be discharged directly to the environment. One such source of liquid is the turbine building sump. However, periodic representative samples are collected for analysis of radioactivity content to track the amounts of radioactivity being discharged.

The preceding discussion illustrates that many controls exist to reduce the radioactive liquid effluents released to the environment to as far below the release limits as is reasonably achievable.

Radioactive releases from the radioactive gaseous effluent system to the environment are limited, controlled, and monitored by a variety of systems and procedures which include:

- containment building ventilation system;
- containment building radioactivity monitors;
- sampling and analysis of containment building vent and purge effluents;
- process gas treatment system;
- auxiliary building (and engineered safeguards and fuel building for MPS3) ventilation system;
- MPS stack and units' vent effluent radioactivity monitors;
- sampling and analysis of MPS stack and units' vent effluents;
- process radiation monitors; and
- steam jet air ejector (SJAE) monitor

The primary sources of gaseous radioactive waste are degassing of the primary coolant, gaseous liquid drains, and gaseous vents. Additional sources of gaseous waste activity include ventilation air released from the auxiliary building and purging and venting of the containment building. The radiation level meter and recorders for the effluent radioactivity monitors are located in the Control Room. The station process computer aids in tracking the monitor readings. To supplement the information continuously provided by the detector, air samples are taken periodically from the units' containments, MPS stack and units' vents. These samples are analyzed to quantify the total amount of radioactive gases, radioactive iodines, radioactive particulate and tritium released in gaseous effluents.

Gases from the primary coolant are held up in waste gas decay tanks for decay at MPS2. Gaseous waste at MPS3 is purified through a process gas system, consisting of high-efficiency particulate air filters and charcoal absorber beds. Gases from periodic venting of the MPS2 containment are released through a similar process system (Enclosure Building Filtration System) while gases from the MPS3 containment vacuum pumps are released without treatment. If necessary, MPS3 containment air can be filtered by an internal particulate and charcoal treatment system. Containment purges (purge is the forced ventilation process while containment vents are pressure releases) for MPS2 are filtered by high-efficiency particulate filters while at MPS3 these are not normally filtered. If necessary, particulate and charcoal filters can be used for these purges.

Normally, for MPS2, the air released from the unit vent is from the ventilation of the auxiliary (which includes the fuel pool), service and enclosure buildings. For MPS2, fuel pool and enclosure building ventilation can be redirected to the MPS Site Stack. Normally, for MPS3, the air released from the unit vent is from the ventilation of the auxiliary, fuel, service, waste disposal and enclosure buildings. For MPS3, enclosure building ventilation can be redirected to the MPS Site Stack.

Therefore, for both liquid and gaseous releases, radioactive effluent control systems exist to collect and purify the radioactive effluents in order to reduce releases to the environment to as low as is reasonably achievable. The effluents are always monitored, sampled and analyzed to make sure that radioactivity levels are below the release limits. If the release limits are being approached, isolation valves are closed to stop the release and ensure that federal regulatory limits are always met.

1.6 Radiological Impact on Humans

The final step in the effluent control process is the determination of the radiological dose impact to humans and comparison with the federal dose limits to the public. As mentioned previously, the purpose of continuous radiation monitoring and periodic sampling and analysis is to measure the quantities of radioactivity being released to determine compliance with the radioactivity release limits. This is the first stage for assessing releases to the environment.

The second stage is calculation of the dose impact to the general public from MPS's radioactive effluents. The purpose of this calculation is to periodically assess the dose to the general public resulting from radioactive effluents to ensure that the dose is being maintained as far below the federal dose limit as is reasonably achievable. This is the second stage for assessing releases to the environment.

The types and quantities of radioactive liquid and gaseous effluents released from MPS during each year are reported to the NRC annually in the Radiological Effluent Release Report (RERR). Similar to this report, the RERR is submitted annually to the NRC. The liquid and gaseous effluents were well below the federal release limits and were a small percentage of the MPS REMODCM effluent control limits.

The measurements of the physical and chemical nature of the effluents are used to determine how the radionuclides will interact with the environment and how they can result in radiation exposure to humans. The environmental interaction mechanisms depend upon factors such as the hydrological (water) and meteorological (atmospheric) characteristics in the area. Information on the water flow, wind speed, wind direction, and atmospheric mixing characteristics are used to estimate how radioactivity will distribute and disperse in the ocean and the atmosphere.

The most important type of information that is used to evaluate the radiological impact on humans is data on the use of the environment. Information on fish and shellfish consumption, boating usage, beach usage, locations of cows and goats, locations of residences, locations of gardens, and other usage information are utilized to estimate the amount of radiation and radioactivity received by the general public.

The radiation exposure pathway to humans is the path radioactivity takes from its release point at MPS to its effect on man. The movement of radioactivity through the environment and its transport to humans is portrayed in Figure 1.6.

EXAMPLES OF MPS's RADIATION EXPOSURE PATHWAYS

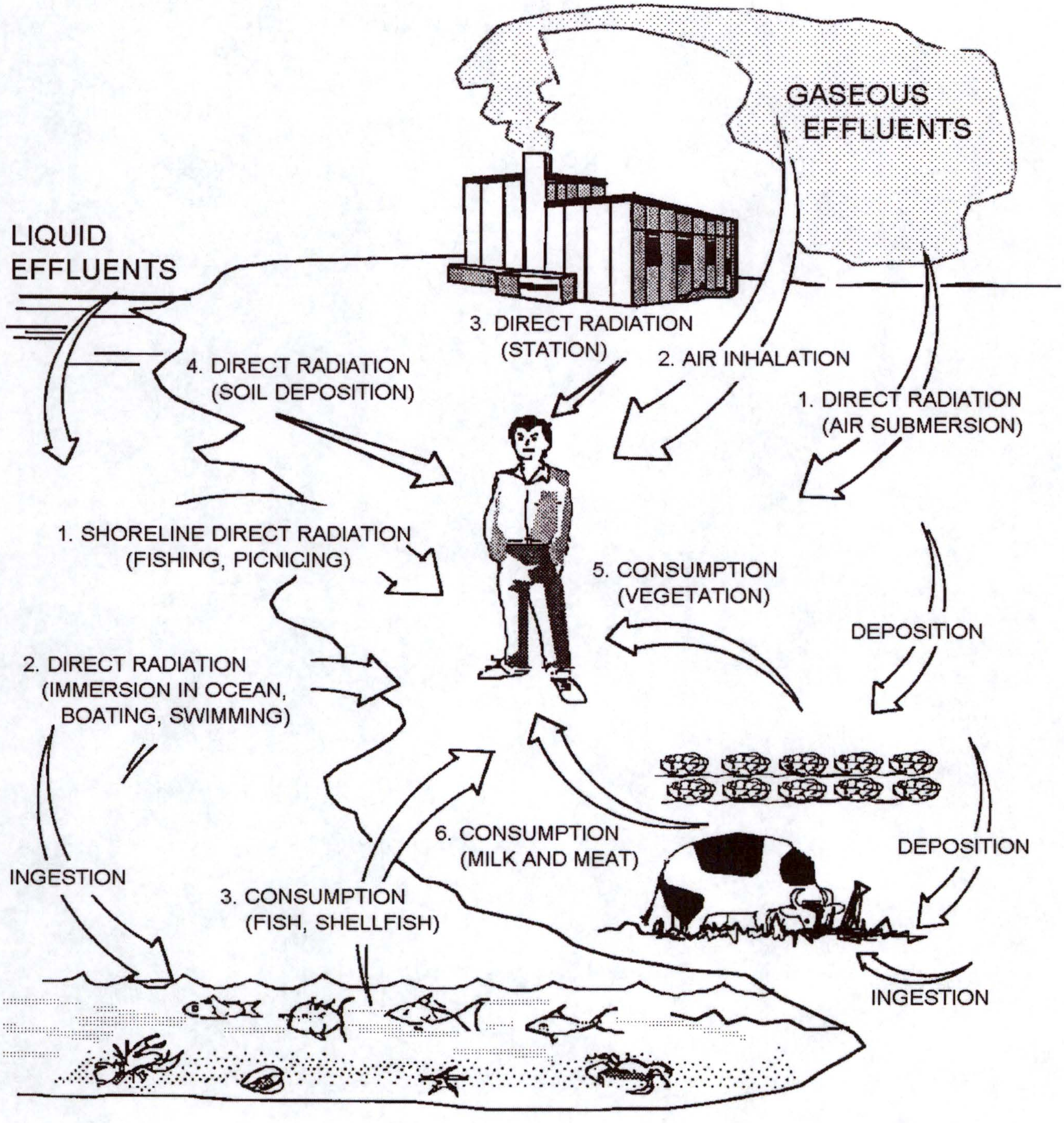


Figure 1.6 Radiation Exposure Pathways

There are four pathways in which liquid effluents affect humans:

- external radiation from liquid effluents that deposit and accumulate on the shoreline;
- external radiation during boating from radioactivity in ocean water;
- external radiation from immersion in ocean water containing radioactivity; and,
- internal radiation from consumption of fish and shellfish containing radioactivity absorbed from the liquid effluents.

There are six major pathways in which gaseous effluents affect humans:

- external radiation from immersion in an airborne plume of radioactivity;
- external radiation from shine from an overhead, airborne plume of radioactivity;
- internal radiation from inhalation of airborne radioactivity;
- external radiation from deposition of radioactive effluents on the ground;
- internal radiation from consumption of vegetation containing radioactivity deposited on the vegetation from airborne deposition and absorbed from the soil due to ground deposition of radioactive effluents; and,
- internal radiation from consumption of milk and meat containing radioactivity deposited on forage that is eaten by cattle and other livestock.

Drinking water is not a pathway of exposure for radioactivity released in liquid or gaseous effluents from Millstone. All liquid effluents are released to either Long Island Sound or Niantic Bay. Both are salt water bodies which are not used as sources of drinking water. The closest reservoir is Lake Konomoc, 6.5 miles from Millstone. Radioactivity deposited in the reservoir from MPS gaseous effluents would not yield a significant dose to the public compared to doses from the six major pathways listed.

Ambient (direct) radiation emitted from sources of radioactivity at MPS comes from low-level radioactive waste being processed and stored at the site prior to shipping and disposal. Also, the operation of the Independent Spent Fuel Storage Installation (ISFSI) which began in 2005 results in a small amount of direct radiation at the site boundary.

The radiological dose impact on humans is based both on effluent analyses and modeling and on direct measurements of radiation and radioactivity in the environment. However, the operation of MPS results in releases of only small amounts of radioactivity, and, as a result of dilution in the atmosphere and ocean, even the most sensitive radioactivity measurement and analysis techniques cannot usually detect these tiny amounts of radioactivity above that which is naturally present in the environment. Therefore, radiation doses are calculated using radioactive effluent release data and computerized dose calculations that are based on conservative NRC-recommended models that tend to result in over-estimates of the resulting dose. These computerized dose calculations are performed by DNC personnel. These computer codes use the guidelines and methodology set forth by the NRC in Regulatory Guide 1.109 (Reference 7). The dose calculations are specified in the Millstone's REMODCM (Reference 8), which has been reviewed by the NRC.

It should be emphasized that the conservative assumptions made in the computer code calculations; the maximum hypothetical dose to an individual is considerably higher than the dose that would actually be received by a real individual.

After dose calculations are performed, the results are compared to the dose limits for the public as specified in NRC's technical specifications for MPS (References 9-11).

The technical specifications limits for the dose to a member of the general public from radioactive material in liquid effluents released to unrestricted areas are:

- less than or equal to 3 mrem per year to the total body; and,
- less than or equal to 10 mrem per year to any organ.

The technical specifications limits for dose due to release of radioactivity in gaseous effluents is restricted to:

- less than or equal to 10 mrad per year for gamma radiation from noble gases,
- less than or equal to 20 mrad per year for beta radiation from noble gases and
- less than or equal to 15 mrem per year to any organ from iodine-131, iodine-133, tritium, and all particulate radionuclides with half-lives greater than 8 days.

The Technical Specifications limits for total dose from all three MPS units due to release of radioactivity in gaseous and liquid effluents and direct radiation is restricted to:

- less than or equal to 25 mrem per year to the total body;
- less than or equal to 75 mrem per year to the thyroid; and,
- less than or equal to 25 mrem per year to any other organ.

2. PROGRAM DESCRIPTION

2.1 Sampling Schedule and Locations

The sample locations and the sample types and frequency of analysis are given in Tables 2-1 and 2-2 and shown in Figures 2.1 and 2.2. The program as described on Table 2-2 only lists the required samples as specified in the REMODCM. However, in order to identify the locations of the extra samples, all locations (both required and extra) are listed in Table 2-1.

Table 2-1 Environmental Monitoring Program Sampling Types and Locations

No.-Type*	Location Name	Distance, Direction From Release Point**	Sample Media
1-I	Onsite – NAP Parking Lot N	0.6 Mi, NNW	TLD, Air Particulate, Iodine, Vegetation
2-I	Onsite - Weather Shack	0.3 Mi, S	TLD, Air Particulate, Iodine
3-I	Onsite - Bird Sanctuary	0.3 Mi, NE	TLD, Air Particulate, Iodine, Soil
4-I	Onsite - Albacore Drive	1.0 Mi, N	TLD, Air Particulate, Iodine, Soil
5-I	Onsite – Quarry East	0.1 Mi, SSE	TLD
6-I	Onsite - Quarry Discharge	0.3 Mi, SSE	TLD
7-I	Onsite – Env. Lab Dock	0.3 Mi, SE	TLD
8-I	Onsite – Env. Lab	0.3 Mi, SE	TLD
9-I	Onsite - Bay Point Beach	0.4 Mi, W	TLD
10-I	Goshen Fire Dept.	1.2 Mi, E	TLD, Air Particulate, Iodine, Vegetation
11-I	Great Neck Country Club	1.6 Mi, ENE	TLD, Air Particulate, Iodine
13-C	Mystic, CT	11.5 Mi, ENE	TLD
14-C	Ledyard, CT	12.0 Mi, NE	TLD, Soil
15-C	Norwich, CT	14.0 Mi, N	TLD, Air Particulate, Iodine
16-C	Old Lyme, CT – Halls Rd.	8.8 Mi, W	TLD
17-I	Site Boundary	0.5 Mi, NE	Vegetation
25-I,X	Fruits & Vegetables	< 10 Miles	Vegetation
26-C, X	Fruits & Vegetables	> 10 Miles	Vegetation
27-I	East Lyme Police Dept.	1.7 Mi, WNW	TLD, Air Particulate, Iodine
28-I	Two Tree Island	0.8 Mi, SSE	Fish[1]
29-I,X	West Jordan Cove	≤0.5 Mi, ENE to ESE 0.4 Mi, ENE-ESE	Clams, Fucus, Fish[1]
31-I	Niantic Shoals	1.8 Mi, NW	Bottom Sediment, Clams
32-I	Vicinity of Discharge		Bottom Sediment, Fish[1], Seawater, Fucus
33-I	Seaside Point	1.8 Mi, ESE	Bottom Sediment
35-I, X	Niantic Bay	≤0.5 Mi, SSW to W	Lobster, Fucus, Fish[1]
36-C, X	Black Point	2.7 Mi, WSW	Fucus
37-C	Giant's Neck	3.5 Mi, WSW	Bottom Sediment, Seawater
41-I	Waterford - Myrock Avenue	3.2 Mi, ENE	TLD
42-I	East Lyme - Billow Road	2.4 Mi, WSW	TLD
43-I	East Lyme–Old Black Point	2.6 Mi, SW	TLD
44-I	Onsite – Schoolhouse	0.1 Mi, NNE	TLD
45-I	Onsite - Access Road #1	0.5 Mi, NNW	TLD
46-I	Old Lyme - Hillcrest Ave.	4.6 Mi, WSW	TLD
47-I	East Lyme - W. Main St.	4.5 Mi, W	TLD
48-I	East Lyme – Corey&Roxbury Rd.	3.4 Mi, WNW	TLD
49-I	East Lyme - Society Rd.	3.6 Mi, NW	TLD
50-I	East Lyme – Manwaring/Terrace	2.1 Mi, W	TLD
51-I	East Lyme - Smith Ave.	1.5 Mi, NW	TLD
52-I	Waterford - River Rd.	1.1 Mi, NNW	TLD
53-I	Waterford - Gardiners Wood Rd	1.4 Mi, NNE	TLD
55-I	Waterford - Magonk Point	1.8 Mi, ESE	TLD
56-I	New London – Ocean&Mott Ave.	3.7 Mi, E	TLD
57-I	New London - Ocean Ave.	3.6 Mi, ENE	TLD
59-I	Waterford -Miner Ave.	3.4 Mi, NNE	TLD
60-I	Waterford-Parkway South&Cross	4.0 Mi, N	TLD
61-I	Waterford–Oil Mill&Boston Post	4.3 Mi, NNW	TLD

Table 2-1 Environmental Monitoring Program Sampling Types and Locations (Continues)

No.-Typ	Location Name	Distance, Direction From Release Point[2]	Sample Media
62-I	East Lyme - Columbus Ave.	1.9 Mi, WNW	TLD
63-I	Waterford - Gardiners Wood & Jordon Cove	0.8 Mi, NE	TLD
64-I	Waterford - Shore Rd.	1.1 Mi, ENE	TLD
65-I	Waterford – Boston Post Rd.	3.2 Mi, NE	TLD
66-X	NAP Parking Lot - Fit Center	0.4 Mi, NW	TLD
71-I	1-MW-XFMR-03	Onsite	Well Water
72-I	MW-GPI-1	Onsite	Well Water
73-X	Site Switchyard Fence	0.3 Mi, N	TLD
74-X	Ball Field Foul Pole	0.6 Mi, N	TLD
75-X	Waterford – Windward Way & Shotgun	0.5 Mi, NE	TLD
76-X	ISFSI-1	Up-gradient of ISFSI	Well Water
77-X	ISFSI-2	Down-gradient of ISFSI	Well Water
78-X	ISFSI-3	Down-gradient of ISFSI	Well Water
79-I	M3-MW-1	Onsite	Well Water
81-I	S2-MW-1	Onsite	Well Water
82-I	MW-6B	Onsite	Well Water
89-C	Aquatic background	>4 Mi of discharge	Lobster
90-X	Thames River	4 Mi, E	Fucus

1. Fish required to be sampled from one of three other locations (#28, #29 or #32).
2. Vicinity of discharge includes the Quarry and shoreline area from Fox Island to western point of Red Barn recreation Area and Offshore out to 500 feet.

Footnotes:
Key: **I** - Indicator **C** - Control **X** - Extra - sample not required by the REMODCM

* **I** = Indicator; **C** = Control.
** = The release points are the MPS Stack for terrestrial location and the end of the quarry for aquatic location.

Table 2-2 Required Sampling Frequency & Type of Analysis

	Exposure Pathway and/or Sample	No. of Locations	Sampling & Collection Frequency	Type of Analysis
1.	Gamma Dose - Environmental TLD	39[1]	Quarterly	Gamma Dose - Quarterly
2.	Airborne Particulate	8	Continuous sampler - filter change every two weeks	Gross Beta – Every two weeks Gamma Spectrum - Quarterly on composite (by location), and on individual sample if gross beta is greater than 10 times the mean of the weekly control station's gross beta results
3.	Airborne Iodine	8	Continuous sampler – canister change every two weeks	I-131 – Every two weeks
4.	Vegetation	5	One sample near middle and one near end of growing season	Gamma Isotopic on each sample
5.	Reserved			
6.	Sea Water	2	Continuous sampler with a monthly collection at indicator location. Quarterly at control location - Composite of 6 weekly grab samples.	Gamma Isotopic and Tritium on each sample.
7.	Well Water	6	Semiannual	Gammalsotopic and Tritium on each sample
8.	Bottom Sediment	5	Semiannual	Gamma Isotopic on each sample
9.	Soil	3	Annually	Gamma Isotopic on each sample
10.	Fin Fish (edible portion)	2	Quarterly Semiannual beginning 4th quarter	Gamma Isotopic on each sample
11.	Aquatic flora (fucus)	4	Quarterly beginning 4th quarter	Gamma isotopic on each sample
13.	Clams (edible portion)	2	Quarterly Semiannual beginning 4th quarter	Gamma Isotopic on each sample
14.	Lobster (edible portion)	2	Quarterly Semiannual beginning 4th quarter	Gamma Isotopic on each sample

Footnotes
1. Two or more TLDs or TLD with two or more elements per location.
   Oysters were previously 12. REMODCM revision 27.

Figure 2.1, "Inner TLD, Air, Grass, Soil, and Aquatic Locations"

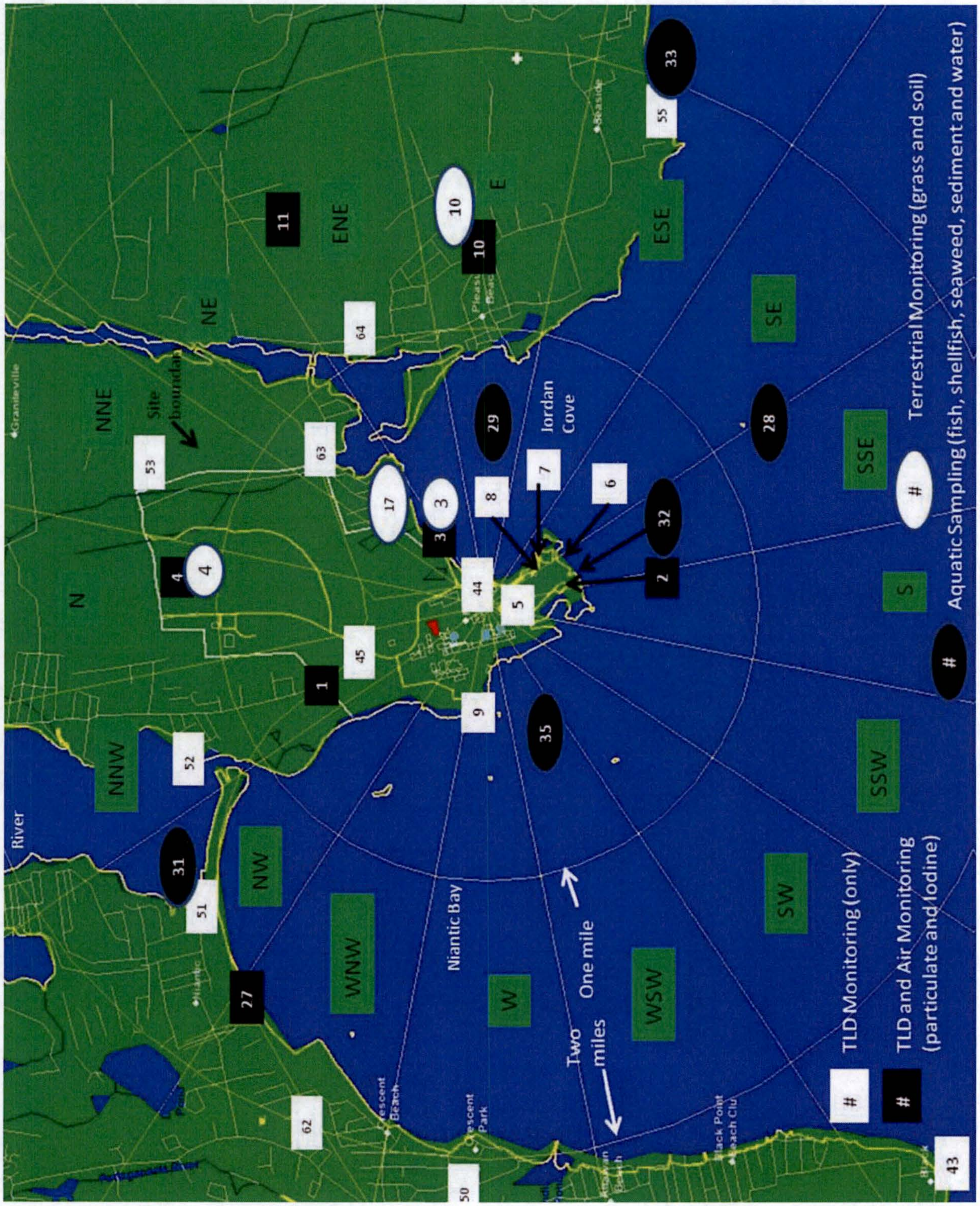
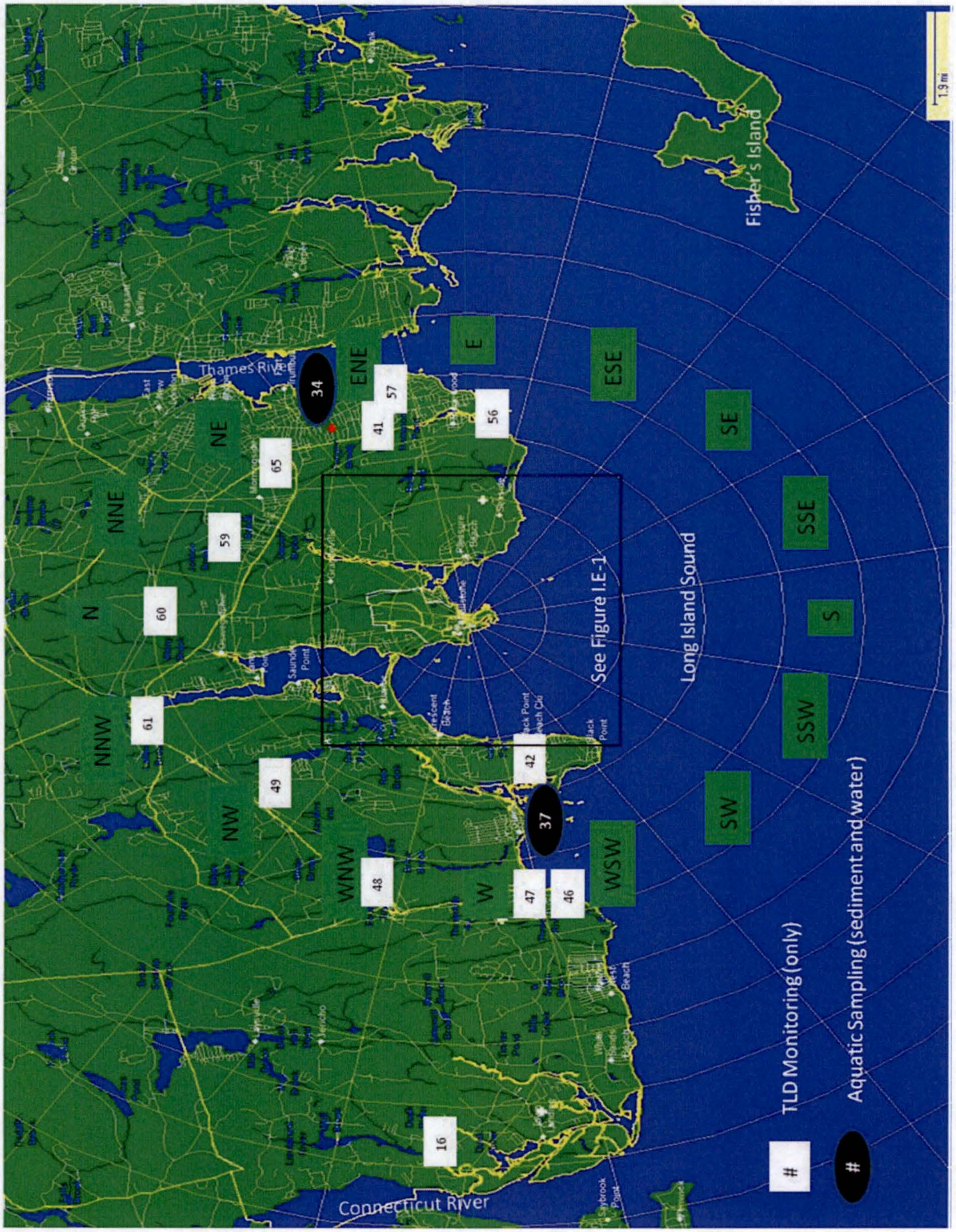


Figure 2.2, "Outer TLD and Aquatic Locations"



2.2 Samples Collected During Report Period

The following table summarizes the number of samples of each type collected and analyzed during 2017:

Sample Type	Number of Technical Specification Required Samples	Number of Technical Specification Required Samples Analyzed	Number of Extra Samples Analyzed
Gamma Exposure (Environmental TLD)	156	155	16
Air Particulates	208	208	0
Air Iodine	208	208	0
Soil	3	3	0
Milk (cow)	0	0	8
Milk (goat)	0	0	8
Well Water	12	12	24
Fruits & Vegetables	4	4	0
Broadleaf vegetation	8	8	0
Sea Water	16	16	0
Bottom Sediment	10	10	11
Aquatic Flora	4	4	12
Fish	4	4	0
Oysters	0	0	4
Clams	4	4	0
Lobster	4	4	0
Total All Types	641	640	83

2.3 Required Samples Not Collected During the Report Period

During 2017 there was one required sample deviation from the sampling schedule. The fourth quarter Quarry Discharge TLD was lost during construction activities on the discharge quarry. This issue has been corrected in the first quarter of 2018.

The air sample volume collected on November 14, 2017 for particulates (Table 2) and iodine (Table 3) was half the normal volume because of a loss of power at the sampler and sample pump failures for that two week sample period. The volume collected was still sufficient to attain the required minimum analyses sensitivities for the samples.

3. RADIOCHEMICAL RESULTS

3.1 Summary Table

In accordance with the REMODCM, Section I.F.1, a summary table of the radiochemical results has been prepared and is presented on the following pages. The mean and range recorded are based only upon detectable measurements.

A more detailed analysis of the data is given in Section 4.0 where a discussion of the variations in the data explains many aspects that are not evident in the Summary Table because of the basic limitation of data summaries. The data summaries include the extra ("X") samples collected throughout the year. These samples are taken to enhance the monitoring program or replace samples from required locations when they are not available.

RADIOLOCIAL ENVIRONMENT MONITORING PROGRAM SUMMARY
MILLSTONE POWER STATION
Dockets 50-245, 50-336 & 50-423 2017

Medium or Pathway Sampled (Units)	Analysis Type	Total Number	LLD*	Indicator Locations	Location with Highest Mean			Control Locations
				Number Mean (Range)	Location Number	Distance Direction	Number Mean (Range)	Number Mean (Range)
Direct Radiation *TLD (uR/hr)*	**Gamma Dose**	171	NA	155 7.7 (4.6-11.6)	02	0.3 Mi. S	4 11 (10.4-11.4)	16 7.9 **(5.9-9.4)**
Air Iodine *(pCi/m^3)*	I-131	208	0.07	182 <LLD	NA	NA	<LLD	**26** **<LLD**
Air Particulate *(pCi/m^3)*	**GR-B**	208	0.01	182 0.0124 (0.0045/0.0199)	15	14.0 Mi. N	26 0.0130 (0.0054/0.0199)	**26** **0.0130** **(0.0054/0.0199)**
	GAMMA	32						
	BE-7		NA	28 0.119 (0.084-0.176)	02	0.3 Mi. S	4 0.135 (0.115-0.165)	**4** **0.108** (0.069-0.137)
	Other Gammas		Note 2	<LLD	NA	NA	<LLD	<LLD
Soil *(pCi/g dry)*	**GAMMA**	3						
	K-40		NA	2 14.74 (13.59-15.88)	14C	12 Mi. NE	1 16.89 (<LLD-16.89)	1 16.89 (<LLD-16.89)
	CS-137		0.18	2 0.26 (.20-.32)	4	1.0 Mi. N	2 0.32 (<LLD-0.32)	1 <LLD
	Other Gammas		Note 3	<LLD	NA	NA	<LLD	<LLD
Cow Milk *(pCi/l)*	SR-89	3	10	3 <LLD	NA	NA	<LLD	NA
	SR-90	3	2	3 <LLD	NA	NA	<LLD	NA
	GAMMA	8						
	K-40		NA	8 1326 (1155/1457)	22	10.5 Mi. WNW	8 1326 (1155/1457)	NA
	Other Gammas		Note 4	<LLD	NA	NA	<LLD	<LLD

RADIOLOCIAL ENVIRONMENT MONITORING PROGRAM SUMMARY
MILLSTONE POWER STATION
Dockets 50-245, 50-336 & 50-423 2017

Medium or Pathway Sampled (Units)	Analysis Type	Total Number	LLD*	Indicator Locations	Location with Highest Mean			Control Locations
				Number Mean (Range)	Location Number	Distance Direction	Number Mean (Range)	Number Mean (Range)
Goat Milk *(pCi/l)*	SR-89	3	10	3 <LLD	NA	NA	<LLD	NA
	SR-90	3	2	3 <LLD	NA	NA	<LLD	NA
	GAMMA	8						
	K-40		NA	8 1608 (1337/1934)	23	11.9 Mi. NNW	8 1608 (1337/1934)	NA
	Other Gammas		Note 4	<LLD	NA	NA	<LLD	<LLD
Well Water *(pCi/l)*	H-3	36	2000	36 <LLD	NA	NA	<LLD	NA
	GAMMA	36						
	K-40		NA	36 <LLD	NA	NA	<LLD	NA
	Other Gammas		Note 5	<LLD	NA	NA	<LLD	NA
Fruits & Vegetables *(pCi/g wet)*	**GAMMA**	8						
	K-40		NA	4 1.080 (0.483-1.401)	26	> 10 Milles	4 1.167 (0.543-2.036)	4 1.167 (0.543-2.036)
	Other Gammas		Note 6	<LLD	NA	NA	<LLD	<LLD
Broad Leaf Vegetation *(pCi/g wet)*	**GAMMA**	8						
	BE-7		NA	5/6 1.337 (0.859-1.906)	1	0.6 Mi. NNW	1/2 1.906 (<LLD-1.906)	2 1.205 (0.955-1.454)
	K-40		NA	6 3.908 (3.418-4.850)	1	0.6 Mi. NNW	2 4.536 (4.221-4.850)	2 4.894 (4.217-5.570)
	Ac-228		NA	1/6 0.130 (<LLD-0.130)	10	1.2 Mi. E	1/6 0.130 (<LLD-0.130)	2 <LLD
	Other Gammas		Note 7	<LLD	NA	NA	<LLD	<LLD

RADIOLOCIAL ENVIRONMENT MONITORING PROGRAM SUMMARY
MILLSTONE POWER STATION
Dockets 50-245, 50-336 & 50-423 2017

Medium or Pathway Sampled (Units)	Analysis Type	Total Number	LLD*	Indicator Locations Number Mean (Range)	Location with Highest Mean Location Number	Distance Direction	Number Mean (Range)	Control Locations Number Mean (Range)
Sea Water *(pCi/l)*	**H-3**	16	3000	7/12 808 (346/1990)	32	< 0.1 Mi	7/12 808 (346/1990)	4 <LLD
	GAMMA	16						
	K-40		NA	11/12 295 (227/403)	32	< 0.1 Mi	11/12 295 (227/403)	4 264 (217/346)
	Other Gammas		Note 5	<LLD	NA	NA	<LLD	<LLD
Bottom Sediment *(pCi/g dry)*	**GAMMA K-40**	10	NA	8 18.39 (16.06-22.76)	32	< 0.1 Mi	2 19.52 (16.27-22.76)	2 14.92 (14.77-15.07)
	Other Gammas		Note 3	<LLD	NA	NA	<LLD	<LLD
Flora *(pCi/g wet)*	**GAMMA BE-7**	20	NA	3/20 0.351 (0.206-0.513)	90	4.0 Mi. E	1/2 0.513 (<LLD-0.513)	NA
	K-40		NA	20 6.678 (4.567-1.925)	32	< 0.1 Mi	4 7.674 (6.732-9.125)	NA
	I-131		0.06	1/20 0.044 (<LLD-0.044)	90	4.0 Mi. E	1/20 0.044 (<LLD-0.044)	NA
	Ac-228		NA	3/20 0.138 (0.091-0.192)	29	0.4 Mi. NNE	1/4 0.194 (<LLD-0.192)	NA
	Other Gammas		Note 6	<LLD	NA	NA	<LLD	NA

RADIOLOCIAL ENVIRONMENT MONITORING PROGRAM SUMMARY
MILLSTONE POWER STATION
Dockets 50-245, 50-336 & 50-423 2017

Medium or Pathway Sampled (Units)	Analysis Type	Total Number	LLD*	Indicator Locations	Location with Highest Mean			Control Locations
				Number Mean (Range)	Location Number	Distance Direction	Number Mean (Range)	Number Mean (Range)
Fish - Other *(pCi/g wet)*	**GAMMA** **K-40**	4	NA 3.150 (3.037-3.196)	4	32	< 0.1 Mi 3.193 (3.189-3.196)	2	NA
	Other Gammas		Note 9	<LLD	NA	NA	<LLD	NA
Oysters *(pCi/g wet)*	**GAMMA** **K-40**	4	NA	4 2.256 (1.617-3.098)	89	> 4.0 Mi. of Discharge	2 2.702 (2.305-3.098)	NA
	Other Gammas		Note 9	<LLD	NA	NA	<LLD	NA
Clams *(pCi/g wet)*	**GAMMA** **K-40**	4	NA	4 2.058 (1.558-2.643)	29	0.4 Mi. ENE-ESE	2 2.356 (2.068-2.643)	NA
	Other Gammas		Note 9	<LLD	NA	NA	<LLD	NA
Lobster *(pCi/g wet)*	**GAMMA** **K-40**	4	NA 3.007 (2.027-3.987)	2	35 SSW-W	<0.5 Mi.	2 3.007 (2.027-3.987)	2 2.401 (2.306-2.496)
	Other Gammas		Note 9	<LLD	NA	NA	<LLD	NA

NOTES FOR SUMMARY TABLE

1 - The required LLD. LLD is the smallest concentration of radioactivity that will be detected with 95% confidence that the activity is real. See detailed discussion below.
2 - LLDs for air particulate gamma are 0.05 pCi/M^3 for Cs-134 and 0.06 pCi/M^3 for Cs-137.
3 - LLD for soil and sediment gamma is 0.15 pCi/g for Cs-134.
4 - LLDs for milk gamma are 1 pCi/l for I-131, 15 pCi/l for Cs-134, 18 pCi/l for Cs-137, 70 pCi/l for Ba-140 and 25 pCi/l for La-140.
5 - LLDs for water gamma are 15 pCi/l for Mn-54, Co-58, Co-60, Nb-95, I-131, Cs-134 and La-140; 30 pCi/l for Fe-59, Zn-65 and Zr-95; 18 pCi/l for Cs-137 and 60 pCi/l for Ba-140.
6 - LLDs for fruits & vegetables, broadleaf vegetation and aquatic flora for gamma are 0.06 pCi/M^3 for I-131, 0.06 pCi/M^3 for Cs-134 and 0.08 pCi/M^3 for Cs-137.
7 - LLDs for other gamma are 0.06 pCi/g for Cs-134 and I-131.
8 - Aquatic flora locations were extra, non-required samples for the first three quarters of 2017. For the fourth quarter aquatic flora added as a requirement to the REMODCM with Locations 29, 32 and 35 treated as indicators and Location 36 as a control. Location 90 is an extra, non-required location which is downstream from the New London water treatment plant. Although it is not influenced by any MPS releases, at times it will detect radioactivity released from the water treatment plant.
9 - LLDs for fish and shellfish for gammas are 0.13 pCi/g for Mn-54, Co-58, Co-60 and Cs-134; 0.26 pCi/g for Fe-59 and Zn-65; and 0.15 pCi/g for Cs-137.

Discussion of LLD

The LLD at a confidence level of 95% is the smallest concentration of radioactive material in a sample that will be detected with a 5% probability of falsely concluding that a blank observation represents a "real" signal.

For a particular measurement system (which may include radiochemical separation):

$$LLD = \frac{4.66\, S_b}{E * V * 2.22 * Y * \exp(-\lambda \Delta t)}$$

LLD	is the lower limit of detection as defined above (as pCi per unit mass or volume)
S_b	is the standard deviation of the background counting rate or of the counting rate of a blank sample as appropriate (as counts per minute)
E	is the counting efficiency (as counts per transformation)
V	is the sample size (in units of mass or volume)
2.22	is the number of transformation per minute per picoCurie
Y	is the fractional radiochemical yield (when applicable)
λ	is the radioactive decay constant for the particular radionuclide
Δt	is the elapsed time between sample collection (or end of the sample collection period) and time of counting

The LLD is defined as "a priori" (before the fact) limit representing the capability of a measurement system and not an "a posteriori" (after the fact) limit for a particular measurement.
(continue on next page)

Analyses were performed in such a manner that the stated LLDs were achieved under routine conditions. Occasionally background fluctuations, unavoidably small sample sizes, the presence of interfering nuclides, or other uncontrollable circumstances may have rendered these a priori LLDs unachievable. In such cases, the contributing factors are identified and described in this report. As shown in the equation above, for composite samples taken over a period of time, the LLD is decayed to the end of the sample period.

3.2 Data Tables

The data reported in this section are results of analyses on all samples. All gamma exposure rates (Table 1) and air beta results (Table 2) are positive because of natural radioactivity. For all other results positive results are shown as bolded type. Results are considered positive when the measured value exceeds 1.5 times the listed 2σ error (i.e., the measured value exceeds 3σ). The reported error is two times the standard deviation (2σ) of the net activity. Unless otherwise noted, the overall error (counting, sample size, chemistry, errors, etc.) is estimated to be 2 to 5 times that listed. Because of counting statistics, negative values, zeros and numbers below the Minimum Detectable Level (MDL) are statistically valid pieces of data. For the purposes of this report, in order to indicate any background biases, all the valid data are presented. This practice was recommended by Health and Safety Laboratory (HASL) ("Reporting of Analytical Results from HASL," letter by Leo B. Higginbotham), NUREG 0475 and NUREG/CR-4007 (Sept. 1984).

Data are given according to sample type as indicated below.

1. Gamma Exposure Rate
2. Air Particulates, Gross Beta Radioactivity
3. Air Particulates, Airborne I-131
4. Air Particulates, Gamma Spectra
5. Soil
6. Milk
7. Well Water
8. Fruits & Vegetables
9. Broad Leaf Vegetation
10. Seawater
11. Bottom Sediment
12. Aquatic Flora (Fucus)
13. Fin Fish
14. Oysters
15. Clams
16. Lobster

TABLE 1
QUARTERLY
GAMMA EXPOSURE RATE
(μR/hr)*

LOCATIONS

PERIOD	1	(+/-)	2	(+/-)	3	(+/-)	4	(+/-)	5	(+/-)	6	(+/-)	7	(+/-)	8	(+/-)	9	(+/-)	10	(+/-)	11	(+/-)
1Q	7.6	0.5	10.4	0.5	7.0	0.3	7.2	0.7	9.1	0.9	8.4	0.5	5.4	0.3	10.4	0.5	9.9	0.4	8.4	0.4	6.3	0.5
2Q	8.0	0.5	11.1	0.8	7.2	0.4	7.3	0.4	9.2	0.6	8.7	0.5	4.6	0.6	10.7	0.6	11.0	0.7	8.8	0.9	6.9	0.4
3Q	8.2	0.6	11.4	0.7	7.6	0.6	7.5	0.6	9.7	0.6	8.4	0.6	4.6	0.5	11.0	1.0	11.4	0.8	8.8	1.3	7.2	0.8
4Q	8.5	0.7	11.3	1.2	7.7	0.7	8.1	0.6	9.7	1.2	(a)		5.0	0.4	11.6	1.2	11.2	1.0	9.2	0.7	7.3	0.6

PERIOD	13C	(+/-)	14C	(+/-)	15C	(+/-)	16C	(+/-)	27	(+/-)	41	(+/-)	42	(+/-)	43	(+/-)	44	(+/-)	45	(+/-)	46	(+/-)
1Q	8.7	0.4	8.8	0.4	7.3	0.4	5.9	0.4	7.1	0.4	6.4	0.4	7.3	0.6	7.1	0.6	6.9	0.7	6.8	0.3	7.8	0.7
2Q	8.2	0.5	9.1	0.8	7.6	0.5	5.9	0.6	7.6	0.6	6.5	0.7	7.3	0.4	7.2	0.5	7.7	0.6	7.0	0.4	8.3	0.5
3Q	9.0	0.9	9.4	0.6	8.0	0.6	6.3	0.5	7.5	0.5	6.8	0.7	7.5	0.6	7.2	0.4	8.2	0.6	7.2	1.0	8.5	0.7
4Q	9.1	0.9	9.2	1.0	7.8	1.0	6.1	0.5	7.6	0.7	6.7	0.6	7.7	0.7	7.7	0.7	8.2	0.6	7.2	0.8	8.6	0.8

PERIOD	47	(+/-)	48	(+/-)	49	(+/-)	50	(+/-)	51	(+/-)	52	(+/-)	53	(+/-)	55	(+/-)	56	(+/-)	57	(+/-)	59	(+/-)
1Q	7.6	0.5	8.8	0.5	6.3	0.4	7.0	0.3	6.2	0.4	6.8	0.4	6.8	0.7	7.1	0.3	6.8	0.5	6.9	0.6	7.3	0.5
2Q	7.6	0.8	9.0	0.6	6.4	0.3	7.8	0.6	6.3	0.5	6.7	0.5	7.2	0.6	7.4	0.4	6.8	0.6	7.2	0.4	7.7	0.5
3Q	7.9	1.0	9.7	0.9	7.1	0.6	7.6	0.9	6.5	0.5	6.8	0.6	7.3	0.7	7.5	0.6	7.4	0.6	7.3	0.5	8.1	0.6
4Q	7.8	0.6	9.4	0.7	6.6	0.5	7.9	1.0	6.4	0.8	7.3	0.7	7.4	0.6	7.6	0.7	7.1	0.8	7.4	0.7	8.1	0.9

PERIOD	60	(+/-)	61	(+/-)	62	(+/-)	63	(+/-)	64	(+/-)	65	(+/-)	66	(+/-)	73	(+/-)	74	(+/-)	75	(+/-)
1Q	6.2	0.3	6.3	0.4	7.3	0.3	7.8	0.7	7.1	0.3	7.3	0.6	6.8	0.4	7.6	0.4	7.3	0.4	6.2	0.5
2Q	6.4	0.4	6.4	0.5	7.9	0.6	8.3	0.9	7.1	0.5	7.7	0.6	7.3	0.7	8.2	0.5	7.2	0.5	6.6	0.4
3Q	6.8	0.6	6.5	0.4	8.1	0.9	8.4	0.6	7.7	0.5	7.8	0.5	7.7	0.5	8.1	0.8	7.6	0.6	6.9	0.4
4Q	6.5	0.6	6.4	0.6	8.5	0.7	9.0	0.7	7.4	0.6	7.5	0.6	7.7	0.7	7.5	0.6	7.9	0.8	6.7	0.5

* READINGS ARE THE AVERAGE OF MULTI $CaSo_4$™ PHOSPHOR ELEMENTS WITHIN ONE PANASONIC TLD BADGE ERRORS ARE TWO SIGMA AND INCLUDE COUNTING, TRANSIT, READER AND FADE UNCERTAINTIES

C = Control location, Background location

(a) Lost TLD

TABLE 2
AIR PARTICULATES
GROSS BETA RADIOACTIVITY
(pCi/m^3)

LOCATIONS

PERIOD ENDING	01	(+/-)	02	(+/-)	03	(+/-)	04	(+/-)	10	(+/-)	11	(+/-)	27	(+/-)	15C	(+/-)
01/10/17	0.010	0.002	0.011	0.002	0.010	0.002	0.010	0.002	0.011	0.002	0.010	0.002	0.010	0.002	0.012	0.002
01/24/17	0.012	0.002	0.013	0.002	0.013	0.002	0.014	0.002	0.014	0.002	0.013	0.002	0.013	0.002	0.012	0.002
02/07/17	0.011	0.002	0.011	0.002	0.013	0.002	0.012	0.002	0.011	0.002	0.011	0.002	0.011	0.002	0.011	0.002
02/21/17	0.013	0.002	0.013	0.002	0.014	0.002	0.013	0.002	0.013	0.002	0.012	0.002	0.013	0.002	0.013	0.002
03/07/17	0.014	0.002	0.014	0.002	0.015	0.002	0.016	0.002	0.014	0.002	0.015	0.002	0.015	0.002	0.016	0.002
03/21/17	0.014	0.002	0.013	0.002	0.013	0.002	0.013	0.002	0.014	0.002	0.012	0.002	0.012	0.002	0.013	0.002
04/04/17	0.010	0.002	0.009	0.002	0.010	0.002	0.010	0.002	0.016	0.002	0.010	0.002	0.010	0.002	0.013	0.002
04/18/17	0.010	0.002	0.011	0.002	0.011	0.002	0.009	0.002	0.011	0.002	0.010	0.002	0.010	0.002	0.011	0.002
05/02/17	0.005	0.001	0.007	0.002	0.008	0.002	0.005	0.001	0.008	0.002	0.007	0.002	0.008	0.002	0.007	0.002
05/16/17	0.006	0.002	0.005	0.001	0.007	0.002	0.006	0.001	0.006	0.001	0.006	0.002	0.005	0.001	0.005	0.002
05/30/17	0.008	0.002	0.010	0.002	0.008	0.002	0.008	0.002	0.008	0.002	0.008	0.002	0.009	0.002	0.008	0.002
06/13/17	0.008	0.002	0.008	0.002	0.009	0.002	0.009	0.002	0.010	0.002	0.010	0.002	0.007	0.001	0.008	0.002
06/27/17	0.015	0.002	0.011	0.002	0.014	0.002	0.012	0.002	0.013	0.002	0.013	0.002	0.014	0.002	0.012	0.002
07/11/17	0.013	0.002	0.012	0.002	0.011	0.002	0.012	0.002	0.012	0.002	0.012	0.002	0.012	0.002	0.012	0.002
07/25/17	0.013	0.002	0.012	0.002	0.015	0.002	0.014	0.002	0.014	0.002	0.016	0.002	0.014	0.002	0.016	0.002
08/08/17	0.010	0.002	0.007	0.002	0.011	0.002	0.011	0.002	0.010	0.002	0.011	0.002	0.010	0.002	0.011	0.002
08/22/17	0.018	0.002	0.017	0.002	0.017	0.002	0.017	0.002	0.015	0.002	0.017	0.002	0.018	0.002	0.017	0.002
09/05/17	0.013	0.002	0.014	0.002	0.012	0.002	0.015	0.002	0.014	0.002	0.015	0.002	0.013	0.002	0.014	0.002
09/18/17	0.016	0.002	0.014	0.002	0.015	0.002	0.016	0.002	0.014	0.002	0.015	0.002	0.016	0.002	0.015	0.002
10/03/17	0.013	0.002	0.010	0.002	0.014	0.002	0.013	0.002	0.012	0.002	0.013	0.002	0.013	0.002	0.013	0.002
10/17/17	0.012	0.002	0.013	0.002	0.011	0.002	0.014	0.002	0.012	0.002	0.013	0.002	0.012	0.002	0.014	0.002
10/31/17	0.016	0.002	0.018	0.002	0.018	0.002	0.016	0.002	0.019	0.002	0.020	0.003	0.018	0.002	0.018	0.002
11/14/17	0.015	0.002	0.015	0.002	0.015	0.002	0.016	0.002	0.016	0.002	0.015	0.002	0.013	0.002	0.020	0.003
11/28/17	0.013	0.002	0.014	0.002	0.014	0.002	0.013	0.002	0.014	0.002	0.016	0.002	0.014	0.002	0.016	0.002
12/12/17	0.016	0.002	0.015	0.002	0.017	0.002	0.018	0.002	0.018	0.002	0.015	0.002	0.014	0.002	0.019	0.002
12/26/17	0.013	0.002	0.013	0.002	0.013	0.002	0.013	0.002	0.011	0.002	0.011	0.002	0.014	0.002	0.011	0.002

C= Control Location, Background Location

TABLE 3
AIRBORNE IODINE
(pCi/m^3)

LOCATIONS

PERIOD ENDING	01	(+/-)	02	(+/-)	03	(+/-)	04	(+/-)	10	(+/-)	11	(+/-)	27	(+/-)	15C	(+/-)
01/10/17	0.026	0.026		0.026		0.028		0.022		0.022		0.023		0.019		0.023
01/24/17	0.000	0.013		0.012		0.013		0.011		0.020		0.021		0.019		0.020
02/07/17	0.014	0.013		0.013		0.014		0.012		0.012		0.013		0.011		0.012
02/21/17	0.001	0.020		0.021		0.021		0.019		0.027		0.024		0.025		0.025
03/07/17	0.021	0.022		0.022		0.023		0.008		0.024		0.022		0.023		0.023
03/21/17	0.010	0.020		0.021		0.022		0.020		0.019		0.017		0.018		0.018
04/04/17	-0.005	0.015		0.015		0.015		0.014		0.015		0.013		0.014		0.014
04/18/17	-0.006	0.016		0.016		0.016		0.015		0.016		0.015		0.016		0.016
05/02/17	-0.004	0.020		0.021		0.020		0.018		0.015		0.015		0.016		0.016
05/16/17	0.006	0.016		0.016		0.016		0.015		0.012		0.013		0.013		0.014
05/30/17	0.006	0.019		0.019		0.021		0.019		0.016		0.017		0.015		0.017
06/13/17	0.000	0.016		0.016		0.018		0.016		0.012		0.013		0.012		0.013
06/27/17	0.002	0.017		0.017		0.019		0.017		0.018		0.020		0.018		0.020
07/11/17	0.004	0.020		0.021		0.022		0.020		0.016		0.017		0.015		0.017
07/25/17	0.015	0.016		0.016		0.017		0.015		0.015		0.016		0.015		0.017
08/08/17	0.001	0.029		0.029		0.031		0.027		0.020		0.022		0.020		0.022
08/22/17	0.032	0.030		0.030		0.032		0.029		0.018		0.019		0.018		0.020
09/05/17	0.001	0.019		0.019		0.020		0.018		0.014		0.015		0.011		0.015
09/18/17	0.012	0.021		0.021		0.018		0.020		0.018		0.019		0.018		0.020
10/03/17	0.007	0.025		0.025		0.022		0.023		0.019		0.020		0.018		0.020
10/17/17	0.002	0.015		0.015		0.013		0.014		0.018		0.018		0.017		0.018
10/31/17	0.001	0.017		0.017		0.014		0.016		0.019		0.020		0.016		0.018
11/14/17	-0.011	0.024		0.024		0.020		0.022		0.022		0.024		0.021		0.041
11/28/17	-0.015	0.018		0.018		0.015		0.017		0.009		0.010		0.009		0.009
12/12/17	0.002	0.015		0.015		0.012		0.014		0.015		0.016		0.015		0.015
12/26/17	0.008	0.022		0.021		0.010		0.020		0.019		0.020		0.019		0.019

C= Control Location, Background Location

TABLE 4
AIR PARTICULATES
(pCi/m^3)

GAMMA SPECTRA - QTR 1 (12/27/16 - 04/04/17)

LOCATION	Be-7		Mn-54		Co-58		Co-60		Zn-65		Nb-95		Zr-95	
		(+/-)		(+/-)		(+/-)		(+/-)		(+/-)		(+/-)		(+/-)
01	**0.1519**	**0.0351**	0.0008	0.0014	-0.0005	0.0023	-0.0004	0.0012	-0.0003	0.0028	0.0006	0.0020	-0.0017	0.0034
02	**0.1147**	**0.0263**	0.0008	0.0013	-0.0007	0.0020	0.0000	0.0011	0.0004	0.0033	0.0009	0.0023	0.0002	0.0042
03	**0.1023**	**0.0296**	-0.0004	0.0010	-0.0022	0.0016	0.0004	0.0013	0.0017	0.0024	-0.0003	0.0018	0.0004	0.0036
04	**0.1340**	**0.0298**	-0.0001	0.0012	0.0005	0.0019	0.0001	0.0011	-0.0010	0.0029	0.0008	0.0020	0.0004	0.0038
10	**0.1762**	**0.0381**	0.0007	0.0015	0.0009	0.0020	-0.0003	0.0016	0.0012	0.0027	-0.0028	0.0025	0.0037	0.0037
11	**0.1179**	**0.0259**	0.0005	0.0011	0.0006	0.0016	0.0003	0.0010	-0.0006	0.0025	0.0016	0.0020	-0.0017	0.0035
27	**0.1048**	**0.0302**	-0.0002	0.0011	0.0013	0.0020	0.0007	0.0013	-0.0009	0.0028	-0.0005	0.0022	0.0009	0.0032
15C	**0.1214**	**0.0444**	0.0000	0.0017	0.0029	0.0026	0.0006	0.0016	-0.0008	0.0043	0.0002	0.0030	-0.0011	0.0052

LOCATION	Ru-103		Ru-106		Cs-134		Cs-137		Ba-140		Ce-141		Ce-144	
		(+/-)		(+/-)		(+/-)		(+/-)		(+/-)		(+/-)		(+/-)
01	0.0003	0.0031	0.0073	0.0112	-0.0007	0.0015	-0.0005	0.0012	0.0749	0.1275	0.0000	0.0045	-0.0020	0.0058
02	-0.0289	0.0053	-0.0094	0.0126	0.0005	0.0014	0.0003	0.0012	0.0038	0.1178	0.0012	0.0063	0.0048	0.0083
03	-0.0004	0.0027	-0.0110	0.0104	0.0010	0.0014	-0.0007	0.0010	0.0401	0.0870	-0.0008	0.0036	-0.0038	0.0048
04	-0.0264	0.0049	-0.0037	0.0117	0.0008	0.0012	0.0005	0.0012	-0.0156	0.1053	0.0030	0.0058	-0.0009	0.0076
10	0.0007	0.0032	-0.0065	0.0116	0.0002	0.0013	-0.0010	0.0011	-0.0683	0.1198	-0.0029	0.0049	0.0063	0.0059
11	0.0002	0.0025	0.0009	0.0103	0.0006	0.0011	0.0012	0.0010	0.0187	0.0946	0.0007	0.0036	0.0002	0.0050
27	0.0021	0.0026	0.0048	0.0107	-0.0002	0.0012	0.0004	0.0011	0.0708	0.0866	-0.0025	0.0040	-0.0020	0.0053
15C	-0.0010	0.0039	0.0160	0.0147	-0.0003	0.0016	0.0004	0.0016	0.0195	0.1504	-0.0033	0.0061	0.0025	0.0083

C= Control location, Background location Results in bold type are positive.

TABLE 4
AIR PARTICULATES
(pCi/m^3)

GAMMA SPECTRA – QTR 2 (04/04/17 – 06/27/17)

LOCATION	Be-7	(+/-)	Mn-54	(+/-)	Co-58	(+/-)	Co-60	(+/-)	Zn-65	(+/-)	Nb-95	(+/-)	Zr-95	(+/-)
01	**0.1277**	**0.0316**	0.0000	0.0020	-0.0002	0.0028	0.0025	0.0018	0.0009	0.0052	0.0004	0.0028	-0.0013	0.0052
02	**0.1646**	**0.0369**	0.0001	0.0018	0.0003	0.0026	-0.0006	0.0015	0.0003	0.0043	0.0005	0.0026	0.0031	0.0051
03	**0.1215**	**0.0349**	-0.0007	0.0016	-0.0001	0.0024	0.0006	0.0015	0.0014	0.0038	0.0012	0.0022	-0.0038	0.0041
04	**0.1010**	**0.0235**	0.0000	0.0010	0.0004	0.0016	0.0001	0.0008	0.0019	0.0026	-0.0004	0.0017	0.0002	0.0027
10	**0.1123**	**0.0361**	0.0001	0.0013	-0.0011	0.0023	0.0004	0.0011	0.0000	0.0030	0.0005	0.0020	0.0022	0.0037
11	**0.0946**	**0.0354**	-0.0008	0.0014	0.0000	0.0021	0.0004	0.0011	0.0007	0.0035	-0.0008	0.0022	-0.0009	0.0038
27	**0.1165**	**0.0316**	0.0008	0.0015	0.0000	0.0020	-0.0009	0.0011	0.0024	0.0031	0.0010	0.0018	0.0012	0.0029
15C	**0.1374**	**0.0515**	0.0006	0.0023	0.0012	0.0028	0.0016	0.0020	0.0014	0.0050	-0.0014	0.0039	0.0014	0.0060

LOCATION	Ru-103	(+/-)	Ru-106	(+/-)	Cs-134	(+/-)	Cs-137	(+/-)	Ba-140	(+/-)	Ce-141	(+/-)	Ce-144	(+/-)
01	0.0016	0.0045	0.0035	0.0170	-0.0015	0.0021	0.0002	0.0017	-0.1520	0.1522	-0.0006	0.0062	-0.0044	0.0090
02	0.0018	0.0033	-0.0013	0.0158	-0.0009	0.0016	-0.0005	0.0015	0.0738	0.1395	0.0018	0.0049	-0.0022	0.0065
03	-0.0274	0.0057	-0.0045	0.0149	-0.0006	0.0017	0.0010	0.0014	-0.0551	0.1346	0.0019	0.0066	0.0021	0.0088
04	0.0027	0.0025	0.0003	0.0096	-0.0009	0.0010	-0.0001	0.0009	0.0237	0.0775	-0.0002	0.0036	-0.0028	0.0053
10	-0.0010	0.0025	-0.0005	0.0106	-0.0011	0.0013	0.0010	0.0011	0.0402	0.0943	-0.0010	0.0040	-0.0021	0.0049
11	0.0005	0.0028	-0.0091	0.0119	-0.0008	0.0012	0.0005	0.0011	-0.0868	0.0973	0.0043	0.0044	-0.0001	0.0061
27	0.0003	0.0028	-0.0063	0.0104	-0.0009	0.0013	0.0007	0.0010	0.0334	0.0700	-0.0007	0.0038	-0.0040	0.0051
15C	0.0029	0.0044	-0.0135	0.0168	-0.0012	0.0022	0.0002	0.0018	0.0555	0.1414	-0.0078	0.0058	-0.0056	0.0077

C= Control location, Background location Results in bold type are positive.

TABLE 4
AIR PARTICULATES
(pCi/m^3)

GAMMA SPECTRA - QTR 3 (06/27/17 - 10/03/17)

LOCATION	Be-7	(+/-)	Mn-54	(+/-)	Co-58	(+/-)	Co-60	(+/-)	Zn-65	(+/-)	Nb-95	(+/-)	Zr-95	(+/-)
01	**0.1192**	**0.0352**	-0.0011	0.0019	0.0037	0.0032	-0.0005	0.0019	0.0004	0.0047	-0.0006	0.0036	-0.0055	0.0070
02	**0.1337**	**0.0304**	0.0000	0.0010	-0.0009	0.0018	0.0006	0.0011	-0.0002	0.0032	-0.0013	0.0019	-0.0013	0.0034
03	**0.1055**	**0.0472**	0.0001	0.0014	0.0004	0.0021	-0.0009	0.0010	-0.0016	0.0029	0.0010	0.0026	0.0043	0.0051
04	**0.1399**	**0.0347**	0.0013	0.0018	0.0026	0.0031	0.0013	0.0014	-0.0005	0.0043	0.0000	0.0030	0.0006	0.0054
10	**0.0899**	**0.0335**	0.0004	0.0011	0.0005	0.0019	0.0004	0.0009	0.0006	0.0025	-0.0005	0.0020	0.0005	0.0031
11	**0.1138**	**0.0350**	0.0004	0.0015	-0.0003	0.0023	0.0007	0.0012	-0.0016	0.0031	-0.0010	0.0022	0.0016	0.0048
27	**0.1497**	**0.0313**	-0.0004	0.0009	0.0005	0.0016	-0.0007	0.0011	0.0030	0.0027	0.0004	0.0018	-0.0017	0.0032
15C	**0.1047**	**0.0281**	-0.0011	0.0012	-0.0012	0.0017	0.0000	0.0010	0.0008	0.0024	0.0002	0.0016	-0.0007	0.0029

LOCATION	**Ru-103**	(+/-)	**Ru-106**	(+/-)	**Cs-134**	(+/-)	**Cs-137**	(+/-)	**Ba-140**	(+/-)	**Ce-141**	(+/-)	**Ce-144**	(+/-)
01	-0.0019	0.0056	-0.0002	0.0189	-0.0005	0.0021	0.0009	0.0018	0.1572	0.3029	-0.0011	0.0066	0.0011	0.0071
02	0.0001	0.0028	0.0021	0.0086	0.0002	0.0012	0.0001	0.0010	-0.0763	0.1647	-0.0037	0.0046	-0.0016	0.0056
03	0.0027	0.0038	0.0043	0.0101	-0.0005	0.0012	0.0014	0.0011	0.1422	0.1835	-0.0007	0.0059	-0.0012	0.0055
04	-0.0010	0.0056	-0.0032	0.0167	-0.0013	0.0017	-0.0007	0.0015	-0.0360	0.3291	0.0004	0.0084	-0.0065	0.0085
10	-0.0007	0.0034	0.0040	0.0095	0.0006	0.0012	0.0006	0.0008	0.0978	0.1809	-0.0025	0.0048	0.0013	0.0050
11	0.0005	0.0040	0.0165	0.0123	-0.0006	0.0014	0.0017	0.0013	0.0141	0.2212	0.0023	0.0060	0.0027	0.0058
27	-0.0016	0.0028	-0.0031	0.0080	-0.0005	0.0011	0.0004	0.0009	0.1149	0.1835	-0.0013	0.0044	-0.0001	0.0044
15C	-0.0005	0.0027	-0.0019	0.0079	-0.0001	0.0009	0.0001	0.0008	-0.0635	0.1538	-0.0001	0.0043	-0.0026	0.0046

C= Control location, Background location Results in bold type are positive.

TABLE 4
AIR PARTICULATES
(pCi/m^3)

GAMMA SPECTRA – QTR 4 (10/03/17 – 12/26/17)

LOCATION	Be-7	(+/-)	Mn-54	(+/-)	Co-58	(+/-)	Co-60	(+/-)	Zn-65	(+/-)	Nb-95	(+/-)	Zr-95	(+/-)
01	**0.0974**	**0.0485**	0.0008	0.0019	0.0011	0.0037	-0.0009	0.0024	0.0005	0.0048	-0.0024	0.0042	0.0081	0.0082
02	**0.1251**	**0.0383**	0.0012	0.0012	-0.0023	0.0020	0.0012	0.0013	0.0017	0.0034	0.0007	0.0025	0.0011	0.0039
03	**0.0849**	**0.0332**	-0.0003	0.0014	-0.0012	0.0020	0.0001	0.0011	-0.0008	0.0028	0.0010	0.0022	-0.0008	0.0034
04	**0.1254**	**0.0332**	0.0003	0.0021	-0.0006	0.0033	0.0018	0.0021	0.0029	0.0048	0.0012	0.0036	-0.0054	0.0065
10	**0.1011**	**0.0294**	0.0002	0.0012	-0.0002	0.0022	-0.0006	0.0014	0.0020	0.0030	0.0024	0.0025	-0.0037	0.0041
11	**0.0843**	**0.0296**	0.0013	0.0016	-0.0013	0.0022	0.0002	0.0013	-0.0006	0.0030	-0.0007	0.0029	0.0009	0.0049
27	**0.1129**	**0.0297**	-0.0005	0.0014	-0.0001	0.0018	-0.0010	0.0014	-0.0010	0.0037	0.0005	0.0022	0.0001	0.0038
15C	**0.0692**	**0.0267**	-0.0002	0.0012	-0.0019	0.0019	0.0002	0.0013	0.0020	0.0023	-0.0001	0.0017	-0.0017	0.0025

LOCATION	Ru-103	(+/-)	Ru-106	(+/-)	Cs-134	(+/-)	Cs-137	(+/-)	Ba-140	(+/-)	Ce-141	(+/-)	Ce-144	(+/-)
01	0.0048	0.0057	-0.0273	0.0211	-0.0025	0.0029	0.0001	0.0018	-0.0734	0.2663	0.0044	0.0076	0.0038	0.0080
02	-0.0011	0.0031	-0.0008	0.0111	-0.0006	0.0011	-0.0001	0.0012	0.0991	0.1259	0.0004	0.0053	-0.0020	0.0058
03	-0.0020	0.0031	-0.0035	0.0118	-0.0003	0.0013	-0.0010	0.0011	-0.0688	0.1871	-0.0014	0.0048	-0.0031	0.0055
04	-0.0045	0.0069	0.0055	0.0190	-0.0016	0.0021	0.0010	0.0018	-0.0965	0.2385	0.0012	0.0089	-0.0030	0.0112
10	0.0009	0.0032	0.0034	0.0120	-0.0012	0.0015	-0.0006	0.0012	0.0284	0.1533	0.0006	0.0050	-0.0039	0.0059
11	-0.0183	0.0052	-0.0173	0.0150	-0.0012	0.0015	-0.0012	0.0014	-0.0285	0.1770	0.0018	0.0081	-0.0018	0.0097
27	0.0017	0.0037	0.0030	0.0116	0.0003	0.0013	0.0007	0.0012	-0.0859	0.1533	0.0035	0.0053	-0.0021	0.0062
15C	-0.0001	0.0029	-0.0003	0.0100	-0.0016	0.0013	0.0006	0.0010	0.0020	0.1299	-0.0002	0.0047	-0.0024	0.0055

C= Control location, Background location Results in bold type are positive.

TABLE 5
SOIL
(pCi/g dry wt.)

COLLECTION LOCATION	DATE	Be-7	(+/-)	K-40	(+/-)	Cr-51	(+/-)	Mn-54	(+/-)	Co-58	(+/-)	Fe-59	(+/-)
03	05/23/17	0.022	0.325	**15.880**	**1.652**	0.057	0.298	-0.012	0.035	-0.025	0.038	0.057	0.086
04	05/24/17	0.370	0.365	**13.590**	**1.527**	0.078	0.387	0.019	0.042	-0.019	0.036	-0.059	0.083
14C	05/23/17	0.254	0.470	**16.890**	**1.840**	0.151	0.488	0.031	0.058	-0.023	0.050	0.022	0.113

LOCATION	COLLECTION DATE	Co-60	(+/-)	Zn-65	(+/-)	Nb-95	(+/-)	Zr-95	(+/-)	Ru-103	(+/-)	Ru-106	(+/-)
03	05/23/17	0.018	0.035	0.010	0.093	0.008	0.042	0.046	0.070	0.010	0.039	-0.116	0.328
04	05/24/17	-0.028	0.041	-0.010	0.083	0.012	0.044	0.044	0.075	0.027	0.039	0.044	0.340
14C	05/23/17	0.037	0.053	0.086	0.138	0.010	0.057	0.053	0.100	-0.020	0.056	0.112	0.448

LOCATION	COLLECTION DATE	Sb-125	(+/-)	Cs-134	(+/-)	Cs-137	(+/-)	Ce-141	(+/-)	Ce-144	(+/-)	Ac-228	(+/-)
03	05/23/17	0.087	0.087	0.018	0.045	**0.203**	**0.090**	0.012	0.057	-0.031	0.194	0.844	0.275
04	05/24/17	-0.019	0.111	0.052	0.039	**0.317**	**0.090**	-0.024	0.065	-0.099	0.243	0.015	0.370
14C	05/23/17	0.028	0.148	0.090	0.060	0.039	0.061	0.027	0.098	0.192	0.360	0.972	0.328

C= Control location, Background location Results in bold type are positive.

TABLE 6
MILK
(pCi/l)

LOCATION	COLLECTION DATE	I-131	(+/-)	Sr-89	(+/-)	Sr-90	(+/-)	K-40	(+/-)	Cs-134	(+/-)	Cs-137	(+/-)	Ba-140	(+/-)	La-140	(+/-)
22	01/18/17	0.123	0.392					**1307**	**159**	-1.276	5.061	-0.054	5.381	-6.568	15.66	0.099	4.119
Cow	02/08/17	-0.242	0.430					**1372**	**157**	4.731	4.674	-1.575	4.576	-9.858	17.26	0.084	3.501
	03/23/17	0.109	0.234	7.1	5.6	1.7	1.2	**1155**	**172**	0.970	5.643	-1.413	5.122	6.861	20.34	-2.169	5.886
	04/19/17	0.186	0.488					**1296**	**168**	-1.658	6.748	4.863	6.375	3.144	28.86	-0.642	7.351
	05/16/17	-0.063	0.073					**1404**	**114**	0.060	3.201	1.345	2.903	-3.128	14.37	0.920	3.578
	06/21/17	-0.380	0.433	0.9	4.6	0.6	0.8	**1457**	**181**	-1.408	6.732	0.658	5.719	7.898	21.12	-3.934	6.371
	07/18/17	-0.066	0.288					**1246**	**174**	3.513	4.158	5.301	4.904	-7.927	14.43	-5.005	4.994
	08/15/17	0.015	0.364	-1.3	6.0	0.7	1.2	**1368**	**192**	-0.724	5.900	2.086	5.435	2.317	17.90	-4.665	4.881
23	03/09/17	-0.262	0.469	3.1	5.0	0.8	0.5	**1384**	**218**	-2.968	6.851	-5.959	6.595	1.464	23.77	1.465	7.544
Goat	04/05/17	0.001	0.101					**1337**	**140**	0.741	3.722	1.598	3.368	-4.393	13.04	-2.302	4.066
	05/03/17	0.227	0.408					**1624**	**195**	3.781	6.012	3.775	5.284	-7.376	23.82	0.646	6.434
	06/07/17	-0.227	0.304	-6.3	5.4	1.2	1.3	**1843**	**179**	-6.906	6.876	4.217	6.262	2.485	25.94	1.571	5.978
	07/05/17	-0.054	0.373					**1698**	**204**	0.275	4.571	5.855	5.192	21.07	19.01	-1.237	5.818
	08/01/17	0.094	0.286					**1453**	**197**	-0.535	5.884	4.325	5.822	-12.27	27.20	-2.415	5.657
	09/05/17	0.045	0.395	6.9	6.9	0.5	1.0	**1588**	**84.9**	0.081	2.013	0.010	2.099	5.701	12.35	-0.025	3.493
	10/03/17	-0.080	0.452					**1934**	**189**	0.777	6.377	2.229	5.976	-12.41	27.61	-0.824	7.178

Results in bold type are positive

TABLE 7
WELL WATER
(pCi/l)

LOCATION	DATE	H-3	(+/-)	Be-7	(+/-)	K-40	(+/-)	Cr-51	(+/-)	Mn-54	(+/-)	Co-58	(+/-)	Fe-59	(+/-)	Co-60	(+/-)
71	03/20/17	186	538	-13.4	34.7	-43.6	67.4	25.0	38.1	4.07	3.75	-1.70	5.01	3.98	7.91	0.43	4.13
	05/17/17	545	698	19.2	28.6	41.7	59.3	7.80	32.9	-1.89	3.13	-1.37	2.91	-3.50	6.46	0.02	2.84
	08/23/17	201	497	24.8	33.4	-1.21	58.6	-12.9	43.6	0.39	3.82	1.17	4.37	-3.13	8.96	-4.14	3.86
	11/08/17	-182	649	-13.5	32.6	27.6	58.1	-0.20	33.7	-0.97	3.63	-0.39	3.97	1.19	7.70	-1.86	3.64
72	03/13/17	-323	513	20.4	26.6	31.6	40.2	-8.19	29.4	-0.60	2.92	-0.38	3.15	4.89	5.25	0.63	2.66
	05/17/17	149	555	-35.5	30.6	54.2	59.2	-22.7	35.5	-0.23	3.73	-2.50	3.14	2.81	7.78	0.49	3.52
	08/23/17	-86	474	13.0	36.8	4.49	71.5	-17.4	43.4	0.84	3.71	2.52	3.64	-1.45	7.35	-0.20	3.45
	11/08/17	257	657	-14.2	33.1	-65.2	59.3	-31.7	38.7	-0.03	4.46	1.74	4.06	-1.10	9.82	2.17	4.35
76	03/08/17	183	550	8.79	37.0	31.1	63.5	45.0	40.5	1.50	3.93	-2.48	4.06	-6.55	8.07	-0.42	4.18
	05/15/17	23	560	-9.54	24.8	9.64	46.5	7.80	26.6	0.89	2.95	1.93	2.67	-3.08	5.68	0.32	2.93
	08/23/17	-6	485	26.6	40.5	-33.7	64.9	40.3	44.4	0.00	4.22	-2.70	4.24	7.89	8.69	1.70	3.92
	11/07/17	-139	651	-7.77	36.3	20.3	49.0	3.58	30.8	-1.09	3.85	-0.10	3.75	1.79	6.54	-2.29	3.45
77	03/08/17	344	569	-20.2	44.3	44.7	78.5	16.5	46.0	-0.34	5.61	2.78	5.72	-8.41	9.88	3.66	4.57
	05/15/17	-122	556	-23.0	31.4	-2.68	46.6	-0.95	37.7	-2.10	3.71	1.00	3.76	0.40	7.16	-0.91	3.37
	08/23/17	6	481	-5.23	33.6	-17.9	46.1	27.8	39.2	0.36	3.77	-0.76	4.02	6.21	6.77	0.41	3.64
	11/07/17	225	655	36.1	35.4	2.54	63.0	12.8	38.8	-1.71	3.94	-6.16	3.82	-0.41	7.51	3.64	3.65
78	03/08/17	-7	543	-37.6	44.5	69.3	77.6	17.3	46.8	-2.72	4.68	-3.20	4.50	-5.19	8.18	-0.49	3.47
	05/15/17	-119	546	5.66	27.3	-58.2	42.8	-10.4	31.3	0.65	3.08	1.34	3.02	0.22	7.41	-0.83	3.50
	08/23/17	-29	482	-8.84	33.2	-13.6	45.1	-22.1	39.5	0.62	3.21	-2.90	3.58	-0.31	6.80	-1.19	3.26
	11/07/17	32	651	11.1	36.8	23.1	63.8	10.8	37.8	-0.71	4.00	-1.46	4.02	-4.49	7.61	3.17	3.79
79	03/20/17	442	557	-8.22	26.4	52.5	52.6	-14.3	33.2	0.61	2.85	-1.04	2.92	-2.65	6.73	0.95	3.79
	05/18/17	141	553	-33.8	40.5	33.1	101	7.57	41.7	2.26	4.67	-1.61	5.36	12.1	10.6	-0.86	6.07
	08/24/17	329	510	-32.5	40.6	5.90	68.0	-35.5	44.7	2.72	4.09	-0.86	4.30	-0.78	8.23	3.43	4.25
	11/08/17	481	682	13.4	33.2	11.4	70.3	1.21	36.7	2.15	3.30	-4.02	3.93	0.47	8.23	6.52	4.77
81	03/13/17	243	558	4.46	29.1	16.2	72.9	17.5	29.9	-2.27	3.61	-1.11	3.62	1.24	7.03	-1.85	3.67
	05/17/17	323	582	-5.30	37.4	55.8	71.5	7.21	39.5	-1.44	3.95	5.46	4.17	0.07	8.70	-2.33	3.44
	08/24/17	563	525	2.55	34.6	41.3	65.7	-2.28	37.0	1.35	3.88	-0.01	3.97	-0.46	7.95	0.11	3.88
	11/08/17	298	668	0.89	43.4	108	77.9	-27.6	48.7	0.63	4.59	-1.65	4.74	-6.91	9.73	1.35	4.45
82	03/13/17	85	541	-1.22	35.3	33.2	71.1	-16.2	39.1	-3.33	3.66	-3.54	3.79	-6.29	7.39	1.97	3.41
	05/17/17	-118	529	-8.86	35.6	41.9	71.8	-36.3	44.5	-2.06	3.76	-6.71	4.24	-0.99	9.00	-1.26	4.67
	08/24/17	255	496	-26.4	42.4	-31.1	47.6	-11.0	46.1	-4.72	4.70	-2.67	4.83	3.55	9.65	4.37	4.65
	11/08/17	369	667	-36.1	44.5	93.9	85.2	25.7	48.9	-1.20	4.32	1.20	5.40	-4.45	9.47	-4.35	4.69
83	03/20/17	197	534	-9.45	39.7	45.8	73.9	6.61	44.2	1.51	3.45	-0.87	3.61	-1.45	7.76	1.57	3.37
	05/17/17	-82	541	-32.7	37.6	-14.6	67.5	-8.59	42.9	0.86	4.57	-1.70	4.57	1.86	9.57	2.01	4.43
	08/24/17	238	506	25.2	40.9	-18.7	64.0	25.5	41.9	-1.06	5.43	-0.97	4.55	9.59	10.3	-0.54	4.16
	11/08/17	75	665	7.50	45.5	51.5	94.3	-32.8	45.1	0.56	4.95	-2.39	4.27	10.6	8.33	2.61	5.91

TABLE 7
WELL WATER
(pCi/l)

LOCATION	DATE	Zn-65	(+/-)	Nb-95	(+/-)	Zr-95	(+/-)	Ru-103	(+/-)	Ru-106	(+/-)	Sb-125	(+/-)	I-131	(+/-)	Cs-134	(+/-)
71	03/20/17	-5.17	10.9	5.14	4.92	0.89	9.26	1.19	4.65	0.85	38.5	0.81	10.5	3.69	8.12	2.05	4.91
	05/17/17	0.97	7.81	0.04	2.97	1.06	5.56	-0.19	3.50	-11.2	26.6	1.06	8.16	1.44	6.43	3.07	3.15
	08/23/17	-12.2	10.1	-0.92	4.11	0.87	7.19	-4.39	4.33	-31.2	39.2	-3.66	11.5	-7.26	9.22	1.96	4.13
	11/08/17	-4.18	8.91	0.90	4.23	-1.72	6.13	-1.30	3.66	-3.78	31.5	1.54	10.8	2.61	5.84	2.50	3.98
72	03/13/17	-13.7	7.66	3.44	3.32	-0.79	5.56	-0.90	3.45	-6.66	26.5	8.50	8.43	4.71	5.66	-1.32	3.68
	05/17/17	-7.29	8.32	3.30	3.77	-4.93	6.44	-0.30	3.80	1.61	33.0	-4.49	10.1	4.11	6.53	-1.17	3.96
	08/23/17	9.01	7.98	1.91	4.37	-3.40	7.41	1.17	4.80	16.5	40.5	1.19	11.6	-10.6	9.28	0.89	4.34
	11/08/17	-0.41	10.5	0.04	4.18	3.34	6.95	-0.71	5.03	25.8	33.1	-4.44	13.2	1.84	7.14	3.08	4.45
76	03/08/17	5.80	8.52	3.12	4.29	-2.75	6.72	-0.95	4.85	-12.4	35.1	16.9	10.9	-2.64	6.38	2.38	4.58
	05/15/17	3.56	6.81	7.31	3.36	0.93	4.59	-1.11	3.02	-1.44	24.8	5.83	8.78	0.10	4.30	0.80	3.21
	08/23/17	-1.16	9.03	5.01	4.36	2.24	5.99	-0.76	4.56	27.1	37.5	7.57	12.0	1.30	8.83	5.61	4.73
	11/07/17	3.53	7.23	1.90	4.50	-1.59	5.76	-2.27	3.61	20.5	27.0	6.47	11.2	-2.95	6.10	1.65	3.98
77	03/08/17	5.50	12.3	15.1	7.42	-5.43	8.66	4.79	5.86	24.5	48.9	-2.78	15.2	-6.74	7.47	-0.23	5.55
	05/15/17	3.80	6.90	3.84	4.54	3.91	6.12	-1.87	3.74	-13.7	33.2	3.78	10.9	-1.03	5.77	2.82	4.13
	08/23/17	28.2	9.88	8.18	4.11	0.50	6.80	-1.09	4.40	25.2	35.8	7.90	10.4	-2.16	10.4	1.53	4.29
	11/07/17	-7.43	10.8	5.81	4.58	-2.80	6.76	-5.44	4.71	6.86	35.6	-1.12	11.4	8.83	8.15	-0.51	4.77
78	03/08/17	-11.7	12.3	4.64	4.75	-0.09	7.79	0.22	4.84	20.1	43.6	5.38	14.2	2.19	7.56	-2.73	5.30
	05/15/17	-11.2	8.33	0.31	3.49	-4.62	5.24	-0.70	3.67	-23.0	28.0	1.83	9.30	-3.99	4.74	0.40	3.67
	08/23/17	7.33	7.07	4.97	3.49	0.13	6.17	2.70	4.20	-65.2	36.4	0.61	10.6	4.63	8.48	0.04	4.01
	11/07/17	-16.5	9.85	6.46	4.32	4.36	7.27	-2.60	4.54	20.9	34.0	4.43	11.6	-0.64	7.31	-0.10	4.82
79	03/20/17	-0.08	6.72	2.46	3.11	-0.31	5.46	0.85	3.66	-14.0	25.4	-6.54	8.65	-2.54	6.19	0.30	3.43
	05/18/17	-2.68	12.0	-0.52	5.11	-6.33	8.05	0.63	5.31	-14.8	46.9	-4.25	11.9	-4.02	8.31	2.43	5.71
	08/24/17	-2.22	8.91	1.92	4.21	1.46	7.77	1.95	4.76	41.6	42.9	-3.70	12.1	-3.31	8.67	-5.03	5.01
	11/08/17	-2.17	9.03	1.39	4.16	0.70	6.52	2.03	4.43	-2.91	37.2	2.46	10.2	-2.73	6.46	0.95	4.11
81	03/13/17	13.5	8.11	-0.44	4.10	-0.44	6.35	1.62	3.62	-2.84	28.9	3.33	9.44	-0.13	6.04	-0.67	3.82
	05/17/17	10.8	10.0	-0.69	4.30	-1.51	7.53	-2.83	4.78	8.49	40.5	-4.97	11.9	4.63	8.18	-2.69	4.51
	08/24/17	1.21	9.53	3.18	4.40	-2.18	6.01	-0.82	4.59	16.1	30.1	1.48	10.7	-0.08	7.86	-0.39	4.05
	11/08/17	5.65	10.2	2.62	5.60	0.64	8.06	-3.61	5.41	13.8	43.0	4.29	14.1	6.72	8.40	1.17	4.67
82	03/13/17	9.92	9.15	13.9	5.04	-4.98	6.10	-2.20	4.41	-20.2	31.3	-0.95	10.9	-3.20	7.26	1.93	3.89
	05/17/17	-2.07	9.33	11.1	4.91	5.06	6.71	-7.35	4.23	-28.2	34.7	5.39	12.6	14.8	8.33	-0.99	4.03
	08/24/17	0.09	9.94	7.77	5.30	-0.72	7.93	-4.49	5.05	-3.15	35.3	0.74	14.3	-1.47	8.80	-0.95	5.03
	11/08/17	-1.92	8.50	1.95	5.56	5.57	8.77	1.69	4.75	-8.38	39.6	13.7	14.8	2.38	8.69	1.55	4.93
83	03/20/17	6.08	7.42	0.93	4.35	-2.40	7.59	1.36	4.66	-14.5	34.8	-2.32	11.6	-2.43	8.18	0.20	4.40
	05/17/17	-0.64	8.82	2.43	4.71	2.21	7.95	-1.35	5.09	-21.4	39.2	3.86	12.3	0.60	8.86	1.47	4.99
	08/24/17	-0.38	10.1	0.46	5.61	-0.70	7.82	2.80	5.46	10.2	38.2	4.16	13.2	0.18	8.78	-1.64	5.29
	11/08/17	4.43	12.7	1.67	5.22	-2.22	10.0	-4.68	5.58	-47.2	44.3	11.4	14.6	-3.61	8.29	-2.38	6.29

TABLE 7
WELL WATER
(pCi/l)

LOCATION	DATE	Cs-137	(+/-)	Ba-140	(+/-)	La-140	(+/-)	Ac-228	(+/-)
71	03/20/17	-0.41	4.28	7.38	20.5	-2.87	9.03	-7.23	17.0
	05/17/17	-3.90	3.24	1.16	14.2	0.22	5.83	-2.09	11.8
	08/23/17	-0.83	4.51	-5.01	24.0	2.28	7.35	10.7	14.7
	11/08/17	-1.83	3.82	8.65	15.6	2.54	4.70	15.0	14.2
72	03/13/17	-2.16	3.23	8.51	17.0	3.93	4.67	7.74	11.8
	05/17/17	3.91	3.77	18.0	17.1	-3.93	5.60	6.70	12.9
	08/23/17	2.75	3.81	-6.14	21.4	0.64	5.80	3.74	13.1
	11/08/17	-0.91	4.36	-30.5	25.7	0.97	5.38	4.49	18.7
76	03/08/17	-4.43	4.09	8.54	17.5	-0.09	6.24	13.4	15.4
	05/15/17	0.31	2.98	5.60	12.0	0.64	3.64	8.72	11.7
	08/23/17	-2.02	4.44	-16.0	24.7	2.99	6.55	-5.01	16.3
	11/07/17	-1.96	3.50	0.09	16.4	3.61	6.32	23.1	19.6
77	03/08/17	0.52	7.00	-0.02	23.7	-0.16	7.87	-18.4	20.1
	05/15/17	-1.24	3.72	3.49	15.8	0.16	5.10	-5.80	14.7
	08/23/17	5.46	3.80	-13.1	19.6	2.86	6.16	13.2	12.4
	11/07/17	-3.45	4.05	-6.49	19.0	6.38	6.61	0.32	16.2
78	03/08/17	-3.53	4.91	-0.59	21.2	-1.60	5.48	5.85	19.7
	05/15/17	-1.23	3.48	7.23	15.0	1.15	4.85	12.1	13.1
	08/23/17	1.16	3.56	2.15	19.5	-1.22	5.46	-1.40	13.3
	11/07/17	0.30	4.13	3.66	21.5	1.48	6.59	-4.86	14.7
79	03/20/17	-0.33	3.15	-8.24	17.6	1.99	6.35	-3.82	13.7
	05/18/17	-3.24	4.90	-2.07	22.2	-5.11	7.68	-3.13	19.7
	08/24/17	1.55	4.40	-8.20	22.6	1.33	6.78	12.3	16.1
	11/08/17	0.63	4.67	0.09	15.5	3.91	6.82	-0.66	14.8
81	03/13/17	-1.06	3.71	11.0	18.2	5.48	6.25	-0.07	12.8
	05/17/17	-4.41	4.73	-3.37	20.4	-0.59	8.10	-13.6	15.8
	08/24/17	-1.70	4.12	13.9	18.8	-5.86	5.48	4.39	15.3
	11/08/17	-4.24	4.80	13.4	24.0	1.70	7.58	-1.89	16.6
82	03/13/17	-2.10	3.93	2.69	18.7	3.95	6.05	7.51	13.5
	05/17/17	-5.13	4.32	3.63	20.8	-3.75	7.43	-4.75	15.0
	08/24/17	0.74	5.10	-8.96	23.0	1.36	6.47	6.49	16.1
	11/08/17	-6.95	5.09	18.8	21.6	-2.84	6.03	0.48	17.5
83	03/20/17	-1.59	4.44	1.94	22.3	-1.55	6.83	-1.99	14.2
	05/17/17	-1.10	4.65	9.90	22.0	5.49	8.01	-0.42	16.7
	08/24/17	-0.37	4.79	-2.35	20.6	4.36	8.07	-8.99	17.3
	11/08/17	-1.72	5.70	0.25	26.0	2.27	7.72	-10.7	18.0

TABLE 8
FRUITS & VEGETABLES
(pCi/g wet wt.)

LOCATION 25 (fruit are extra samples not required by the REMODCM)

COLLECTION DATE	Type	Be-7	(+/-)	K-40	(+/-)	Cr-51	(+/-)	Mn-54	(+/-)	Co-58	(+/-)	Fe-59	(+/-)	Co-60	(+/-)
07/18/17	Tomatoes	0.028	0.061	**1.262**	**0.226**	0.033	0.065	-0.005	0.008	0.004	0.007	0.005	0.015	0.000	0.008
07/18/17	Blueberries	0.028	0.119	**1.172**	**0.328**	-0.071	0.095	0.003	0.014	0.000	0.013	-0.007	0.024	0.009	0.013
10/10/17	Peppers	-0.038	0.145	**1.401**	**0.440**	-0.036	0.140	0.006	0.017	-0.012	0.020	0.014	0.034	-0.002	0.014
10/10/17	Apples	0.012	0.147	**0.483**	**0.287**	0.017	0.139	-0.006	0.017	-0.002	0.018	-0.012	0.033	-0.010	0.019

COLLECTION DATE	Type	Zn-65	(+/-)	Nb-95	(+/-)	Zr-95	(+/-)	Ru-103	(+/-)	Ru-106	(+/-)	Sb-125	(+/-)	I-131	(+/-)
07/18/17	Tomatoes	-0.018	0.019	0.008	0.008	0.005	0.012	-0.004	0.007	-0.037	0.067	-0.006	0.019	0.000	0.009
07/18/17	Blueberries	-0.039	0.034	-0.003	0.013	-0.016	0.022	0.010	0.013	-0.126	0.136	-0.024	0.038	0.006	0.015
10/10/17	Peppers	-0.043	0.052	0.006	0.017	-0.022	0.033	-0.001	0.016	-0.071	0.167	0.019	0.057	-0.010	0.019
10/10/17	Apples	-0.002	0.040	0.006	0.018	0.026	0.029	0.005	0.017	-0.032	0.152	-0.016	0.048	-0.002	0.020

COLLECTION DATE	Type	Cs-134	(+/-)	Cs-137	(+/-)	Ba-140	(+/-)	La-140	(+/-)	Ce-141	(+/-)	Ce-144	(+/-)	Ac-228	(+/-)
07/18/17	Tomatoes	0.005	0.010	-0.005	0.007	0.009	0.029	0.002	0.009	0.003	0.012	-0.008	0.049	0.014	0.029
07/18/17	Blueberries	-0.014	0.012	-0.008	0.013	-0.053	0.046	0.002	0.012	0.000	0.020	0.025	0.087	0.076	0.054
10/10/17	Peppers	0.018	0.020	0.017	0.019	0.043	0.072	0.005	0.019	0.002	0.024	0.040	0.085	-0.033	0.063
10/10/17	Apples	-0.001	0.019	0.009	0.018	0.015	0.067	0.005	0.023	0.001	0.022	0.009	0.090	-0.035	0.065

C= Control location, Background location Results in bold type are positive.

TABLE 8
FRUITS & VEGETABLES
(pCi/g wet wt.)

LOCATION 26C (fruit are extra samples not required by the REMODCM)

COLLECTION DATE	Type	Be-7	(+/-)	K-40	(+/-)	Cr-51	(+/-)	Mn-54	(+/-)	Co-58	(+/-)	Fe-59	(+/-)	Co-60	(+/-)
07/18/17	Tomatoes	0.039	0.077	**1.466**	**0.287**	-0.011	0.086	0.001	0.010	0.001	0.009	0.006	0.020	-0.003	0.008
07/18/17	Blueberries	0.126	0.114	**0.623**	**0.325**	0.009	0.116	-0.004	0.013	0.000	0.015	-0.018	0.027	-0.001	0.013
10/10/17	Peppers	0.089	0.133	**2.036**	**0.425**	-0.003	0.116	0.002	0.015	-0.001	0.014	-0.004	0.033	0.004	0.015
10/10/17	Apples	0.077	0.145	**0.543**	**0.275**	-0.018	0.135	0.000	0.017	0.007	0.015	0.001	0.024	0.007	0.015

COLLECTION DATE	Type	Zn-65	(+/-)	Nb-95	(+/-)	Zr-95	(+/-)	Ru-103	(+/-)	Ru-106	(+/-)	Sb-125	(+/-)	I-131	(+/-)
07/18/17	Tomatoes	-0.039	0.026	0.006	0.010	0.003	0.017	-0.004	0.010	0.079	0.090	0.020	0.027	0.000	0.011
07/18/17	Blueberries	-0.009	0.038	0.004	0.014	-0.008	0.025	0.005	0.013	-0.036	0.125	0.016	0.035	0.005	0.014
10/10/17	Peppers	-0.048	0.040	0.005	0.016	0.003	0.026	0.001	0.016	0.000	0.113	0.002	0.044	-0.008	0.019
10/10/17	Apples	-0.009	0.032	0.002	0.016	0.014	0.028	-0.004	0.015	-0.029	0.144	0.002	0.038	0.012	0.021

COLLECTION DATE	Type	Cs-134	(+/-)	Cs-137	(+/-)	Ba-140	(+/-)	La-140	(+/-)	Ce-141	(+/-)	Ce-144	(+/-)	Ac-228	(+/-)
07/18/17	Tomatoes	-0.005	0.010	-0.009	0.010	0.046	0.037	-0.006	0.011	0.020	0.015	0.015	0.070	0.012	0.037
07/18/17	Blueberries	-0.004	0.016	0.001	0.016	0.006	0.047	-0.013	0.019	0.018	0.018	0.021	0.069	0.067	0.060
10/10/17	Peppers	0.005	0.015	0.013	0.015	-0.019	0.058	0.012	0.016	0.024	0.023	0.041	0.101	-0.031	0.055
10/10/17	Apples	-0.005	0.017	0.016	0.017	0.007	0.065	0.005	0.024	0.010	0.025	-0.057	0.099	-0.034	0.068

C= Control location, Background location Results in bold type are positive.

TABLE 9
BROADLEAF VEGETATION
(pCi/g wet wt.)

LOCATION 1

COLLECTION DATE	Be-7	(+/-)	K-40	(+/-)	Cr-51	(+/-)	Mn-54	(+/-)	Co-58	(+/-)	Fe-59	(+/-)	Co-60	(+/-)
06/13/17	1.633	0.321	**4.850**	**0.736**	-0.100	0.165	0.012	0.019	-0.004	0.018	0.001	0.039	-0.010	0.018
10/03/17	**1.906**	**0.375**	**4.221**	**0.650**	0.026	0.153	-0.012	0.019	-0.014	0.017	0.011	0.035	-0.014	0.018

COLLECTION DATE	Zn-65	(+/-)	Nb-95	(+/-)	Zr-95	(+/-)	Ru-103	(+/-)	Ru-106	(+/-)	Sb-125	(+/-)	I-131	(+/-)
06/13/17	-0.020	0.044	0.010	0.019	-0.006	0.040	-0.008	0.016	-0.081	0.190	0.018	0.050	-0.011	0.021
10/03/17	0.027	0.045	0.008	0.019	0.023	0.036	0.011	0.018	-0.061	0.144	0.011	0.052	0.007	0.035

COLLECTION DATE	Cs-134	(+/-)	Cs-137	(+/-)	Ba-140	(+/-)	La-140	(+/-)	Ce-141	(+/-)	Ce-144	(+/-)	Ac-228	(+/-)
06/13/17	-0.010	0.023	-0.013	0.022	0.067	0.079	-0.011	0.020	0.019	0.023	0.026	0.094	0.087	0.079
10/03/17	-0.002	0.019	0.001	0.020	0.079	0.084	-0.012	0.016	0.016	0.030	-0.061	0.120	0.046	0.073

LOCATION 10

COLLECTION DATE	Be-7	(+/-)	K-40	(+/-)	Cr-51	(+/-)	Mn-54	(+/-)	Co-58	(+/-)	Fe-59	(+/-)	Co-60	(+/-)
06/13/17	**1.157**	**0.280**	**3.428**	**0.544**	0.054	0.140	0.002	0.016	0.004	0.014	-0.004	0.030	0.001	0.015
10/03/17	**1.149**	**0.383**	**3.656**	**0.711**	-0.065	0.202	-0.006	0.022	0.009	0.018	0.019	0.041	0.004	0.018

COLLECTION DATE	Zn-65	(+/-)	Nb-95	(+/-)	Zr-95	(+/-)	Ru-103	(+/-)	Ru-106	(+/-)	Sb-125	(+/-)	I-131	(+/-)
06/13/17	-0.022	0.041	0.002	0.014	0.009	0.027	-0.009	0.015	-0.044	0.144	0.017	0.044	0.018	0.021
10/03/17	-0.028	0.048	0.019	0.021	0.015	0.027	0.006	0.024	-0.047	0.179	0.002	0.057	0.004	0.035

COLLECTION DATE	Cs-134	(+/-)	Cs-137	(+/-)	Ba-140	(+/-)	La-140	(+/-)	Ce-141	(+/-)	Ce-144	(+/-)	Ac-228	(+/-)
06/13/17	-0.003	0.017	-0.007	0.016	-0.017	0.066	0.001	0.018	-0.021	0.027	0.042	0.120	**0.130**	**0.065**
10/03/17	-0.001	0.020	0.007	0.024	0.010	0.112	0.004	0.026	-0.012	0.032	-0.058	0.126	0.119	0.123

Results in bold type are positive.

TABLE 9
BROADLEAF VEGETATION
(pCi/g wet wt.)

LOCATION 17

COLLECTION DATE	Be-7	(+/-)	K-40	(+/-)	Cr-51	(+/-)	Mn-54	(+/-)	Co-58	(+/-)	Fe-59	(+/-)	Co-60	(+/-)
06/13/17	**0.859**	**0.309**	**3.875**	**0.659**	-0.012	0.151	0.005	0.020	-0.014	0.017	-0.011	0.037	0.006	0.019
10/03/17	**1.613**	**0.313**	**3.418**	**0.457**	-0.057	0.132	-0.012	0.015	0.003	0.012	-0.005	0.035	0.003	0.013

COLLECTION DATE	Zn-65	(+/-)	Nb-95	(+/-)	Zr-95	(+/-)	Ru-103	(+/-)	Ru-106	(+/-)	Sb-125	(+/-)	I-131	(+/-)
06/13/17	-0.009	0.040	0.014	0.019	-0.011	0.031	0.009	0.016	0.046	0.147	0.026	0.053	0.014	0.022
10/03/17	-0.013	0.039	0.008	0.014	0.015	0.027	-0.008	0.014	0.073	0.136	-0.016	0.039	0.008	0.029

COLLECTION DATE	Cs-134	(+/-)	Cs-137	(+/-)	Ba-140	(+/-)	La-140	(+/-)	Ce-141	(+/-)	Ce-144	(+/-)	Ac-228	(+/-)
06/13/17	0.018	0.022	0.025	0.021	0.046	0.074	0.000	0.020	-0.006	0.029	0.037	0.117	0.150	0.103
10/03/17	0.001	0.018	0.017	0.016	0.012	0.077	-0.002	0.020	-0.008	0.025	0.038	0.091	0.205	0.101

LOCATION 26C

COLLECTION DATE	Be-7	(+/-)	K-40	(+/-)	Cr-51	(+/-)	Mn-54	(+/-)	Co-58	(+/-)	Fe-59	(+/-)	Co-60	(+/-)
06/13/17	**0.955**	**0.358**	**4.217**	**0.716**	-0.103	0.157	-0.003	0.016	-0.009	0.020	0.022	0.035	0.000	0.015
10/03/17	**1.454**	**0.263**	**5.570**	**0.608**	-0.016	0.152	0.011	0.016	-0.003	0.017	-0.006	0.035	-0.004	0.014

COLLECTION DATE	Zn-65	(+/-)	Nb-95	(+/-)	Zr-95	(+/-)	Ru-103	(+/-)	Ru-106	(+/-)	Sb-125	(+/-)	I-131	(+/-)
06/13/17	-0.030	0.046	0.003	0.019	-0.007	0.031	-0.007	0.017	0.003	0.166	-0.006	0.055	0.003	0.023
10/03/17	-0.033	0.039	0.011	0.016	0.033	0.029	0.001	0.017	0.043	0.151	0.020	0.044	0.003	0.032

COLLECTION DATE	Cs-134	(+/-)	Cs-137	(+/-)	Ba-140	(+/-)	La-140	(+/-)	Ce-141	(+/-)	Ce-144	(+/-)	Ac-228	(+/-)
06/13/17	0.012	0.017	0.001	0.018	0.031	0.070	-0.030	0.023	-0.004	0.027	-0.007	0.105	0.050	0.079
10/03/17	-0.001	0.018	-0.004	0.020	0.008	0.088	0.013	0.021	-0.021	0.029	0.018	0.110	0.049	0.150

Results in bold type are positive.

TABLE 10
SEA WATER
(pCi/l)

LOCATION 32

DATE	H-3	(+/-)	Be-7	(+/-)	K-40	(+/-)	Cr-51	(+/-)	Mn-54	(+/-)	Co-58	(+/-)	Fe-59	(+/-)
01/31/17	**813**	**156**	27.6	45.4	**315**	**145**	17.1	49.7	-4.25	5.21	-1.07	5.00	9.79	11.2
02/28/17	**559**	**210**	14.9	41.5	130	197	-37.9	37.7	-0.65	5.38	0.67	5.02	9.26	8.53
03/28/17	**851**	**224**	-36.0	38.0	**227**	**118**	12.9	36.3	0.45	4.10	-0.58	4.16	-5.27	8.94
04/25/17	158	172	5.95	28.7	**326**	**91**	-43.9	29.6	1.03	3.76	0.09	3.55	2.74	7.22
05/30/17	268	187	9.86	33.2	**228**	**120**	53.6	36.0	0.02	4.50	0.20	4.09	-6.67	7.66
06/27/17	49	179	-4.18	28.7	**319**	**98**	26.1	29.8	1.68	3.57	-0.45	3.53	1.01	9.03
07/25/17	265	195	2.43	29.1	**403**	**115**	17.1	31.6	-0.02	3.86	-2.14	4.16	-5.59	8.21
08/29/17	**346**	**179**	-19.6	43.0	**252**	**123**	-20.8	42.8	-0.05	4.93	-0.78	4.54	2.74	7.49
09/26/17	**446**	**207**	-4.59	28.8	**309**	**80**	-6.44	30.4	-0.89	2.95	-0.73	3.36	1.46	6.40
10/31/17	**1990**	**300**	2.36	40.1	**286**	**128**	-2.99	40.7	-1.39	5.30	-0.79	5.62	13.3	10.8
11/28/17	**649**	**204**	9.77	27.5	**301**	**88**	1.87	30.1	-0.58	3.59	0.18	3.97	0.72	7.23
12/26/17	11	169	-13.0	32.9	**282**	**97**	1.82	36.0	-1.06	3.58	-2.20	3.52	1.24	7.46

COLLECTION DATE	Co-60	(+/-)	Zn-65	(+/-)	Nb-95	(+/-)	Zr-95	(+/-)	Ru-103	(+/-)	Ru-106	(+/-)	Sb-125	(+/-)
01/31/17	-2.64	5.57	-5.33	14.3	-1.58	5.35	-0.45	10.5	2.26	6.07	-29.7	49.3	-3.62	15.5
02/28/17	-2.15	3.61	-11.2	11.9	-5.16	4.54	2.35	7.72	2.51	4.56	-39.6	51.9	-5.04	12.8
03/28/17	4.74	4.92	-8.38	11.1	-2.28	3.89	2.17	7.39	-1.63	4.26	6.38	30.7	-1.18	11.8
04/25/17	-3.22	4.08	-3.09	8.85	-1.58	4.23	0.94	5.34	-1.18	3.95	-10.1	34.4	-5.46	8.37
05/30/17	2.42	3.28	-2.38	9.88	0.96	3.76	-2.97	7.51	-2.38	4.62	-19.4	35.6	-5.53	11.8
06/27/17	3.16	4.26	-2.11	10.2	2.26	3.27	3.60	6.15	-0.21	3.91	10.9	33.2	-3.29	9.93
07/25/17	-2.21	4.60	-1.59	9.07	1.61	4.03	0.42	7.09	-4.08	3.83	4.64	33.1	1.23	12.1
08/29/17	0.53	4.58	-3.59	9.27	-4.77	4.82	-0.44	9.33	-3.69	5.22	39.8	41.2	-1.10	12.5
09/26/17	1.10	2.87	-2.15	7.43	2.45	3.53	-1.04	5.12	-1.19	3.43	-4.90	26.2	-7.42	8.76
10/31/17	-2.84	4.80	-5.04	12.3	0.30	4.25	-1.09	8.68	-0.77	4.76	-0.94	44.3	-2.76	12.0
11/28/17	-0.73	3.74	-6.27	8.79	4.37	3.57	0.34	5.74	-1.66	3.53	4.27	30.6	6.08	10.5
12/26/17	2.18	3.81	0.08	7.72	0.81	3.92	0.29	5.45	1.37	4.07	-0.23	34.5	0.55	9.83

Results in bold type are positive.

TABLE 10
SEA WATER
(pCi/l)

LOCATION 32 Cont'd

COLLECTION DATE	I-131	(+/-)	Cs-134	(+/-)	Cs-137	(+/-)	Ba-140	(+/-)	La-140	(+/-)	Ac-228	(+/-)
01/31/17	5.60	8.42	3.93	5.57	3.62	5.65	-1.57	24.9	-5.87	8.79	-5.36	22.0
02/28/17	2.01	5.66	1.00	5.53	-3.86	5.39	5.30	19.6	-0.80	6.15	-7.13	20.6
03/28/17	2.25	7.41	1.44	4.23	0.45	4.48	9.49	20.0	-4.04	7.25	-8.10	14.3
04/25/17	-1.46	4.88	-2.56	3.67	0.19	3.46	-3.14	14.5	-6.55	5.30	2.35	14.3
05/30/17	-3.14	6.70	0.37	4.32	-1.31	3.60	-18.1	16.8	2.49	5.66	-2.23	15.4
06/27/17	-3.67	4.67	-1.38	4.29	-0.32	3.80	-4.24	14.9	3.91	5.06	-5.96	14.0
07/25/17	-1.16	3.88	2.17	3.67	1.23	3.80	-4.71	13.5	-0.50	5.04	-0.67	15.2
08/29/17	0.87	6.34	0.08	5.71	-0.95	5.27	11.2	16.5	5.72	5.68	-6.22	20.2
09/26/17	0.91	6.41	2.37	3.64	-3.81	2.98	15.7	16.3	-3.61	5.39	4.55	12.2
10/31/17	0.10	5.69	-0.78	6.27	4.10	5.96	12.1	20.3	-0.98	5.85	-0.02	19.4
11/28/17	-0.73	4.01	-4.00	3.71	0.08	3.88	-21.4	12.7	1.28	3.72	3.82	13.7
12/26/17	-1.45	6.21	-1.91	4.44	1.61	3.49	2.17	18.3	4.63	5.19	0.65	14.2

LOCATION 37C

COLLECTION DATE	H-3	(+/-)	Be-7	(+/-)	K-40	(+/-)	Cr-51	(+/-)	Mn-54	(+/-)	Co-58	(+/-)	Fe-59	(+/-)
03/21/17	17	173	-16.0	28.2	**231**	**96**	-1.57	31.5	-1.22	3.35	1.73	3.21	8.92	6.6
06/06/17	-36	95	29.9	35.1	**217**	**93**	15.5	41.1	1.38	4.54	-1.29	4.48	-4.46	9.9
08/15/17	-5	125	17.7	33.3	**346**	**97**	-16.7	34.8	-3.01	4.26	-2.20	3.59	-2.81	7.8
11/21/17	10	168	8.80	43.6	**262**	**105**	-11.0	42.2	-1.62	3.73	-2.34	4.49	2.76	8.6

COLLECTION DATE	C0-60	(+/-)	Zn-65	(+/-)	Nb-95	(+/-)	Zr-95	(+/-)	Ru-103	(+/-)	Ru-106	(+/-)	Sb-125	(+/-)
03/21/17	-1.34	3.02	-2.97	7.58	1.13	3.20	4.73	5.66	1.78	3.68	3.41	30.3	-3.55	8.32
06/06/17	-0.48	4.83	-15.5	12.8	1.32	3.84	5.12	7.56	1.93	4.57	-16.6	41.6	1.90	12.8
08/15/17	2.79	4.33	-3.53	10.0	-1.49	4.20	-4.57	7.56	1.68	4.82	14.0	31.8	2.01	10.2
11/21/17	-1.98	3.73	-11.8	12.3	0.31	3.86	5.58	8.09	0.01	5.03	-3.09	39.5	-5.72	14.2

COLLECTION DATE	I-131	(+/-)	Cs-134	(+/-)	Cs-137	(+/-)	Ba-140	(+/-)	La-140	(+/-)	Ac-228	(+/-)
03/21/17	-0.88	5.86	-1.71	3.45	2.28	3.72	-0.61	18.8	-2.82	4.94	-2.99	11.4
06/06/17	3.25	5.89	-3.93	4.73	1.48	4.81	11.4	18.2	-0.77	4.08	11.8	15.3
08/15/17	1.80	4.67	2.94	4.35	-3.21	3.77	-9.63	13.0	1.43	4.75	1.65	15.6
11/21/17	-5.85	6.86	-1.22	4.95	-2.99	5.14	-2.32	24.3	-1.56	5.88	-4.02	18.5

C= Control location, Background location Results in bold type are positive.

TABLE 11
BOTTOM SEDIMENT
(pCi/g dry wt.)

LOCATION	COLLECTION	DATE		Be-7 K-40		Cr-51		Mn-54		Co-58		Fe-59	
			(+/-)		(+/-)		(+/-)		(+/-)		(+/-)		(+/-)
31	06/01/17	-0.134	0.352	**16.06**	**1.548**	-0.188	0.389	0.003	0.039	-0.037	0.041	-0.070	0.082
31	07/31/17	0.049	0.292	**16.43**	**1.498**	0.026	0.287	0.007	0.034	0.002	0.034	0.086	0.084
32	05/24/17	-0.144	0.520	**22.76**	**2.325**	-0.196	0.532	0.013	0.073	-0.012	0.058	-0.039	0.126
32	11/08/17	0.182	0.301	**16.27**	**1.570**	-0.141	0.299	-0.012	0.037	0.002	0.031	-0.016	0.079
33	05/04/17	0.184	0.214	**18.28**	**1.386**	-0.011	0.206	-0.008	0.028	-0.018	0.028	-0.021	0.065
33	08/16/17	-0.023	0.247	**19.20**	**1.616**	0.197	0.237	-0.028	0.034	0.006	0.032	-0.001	0.081
34	05/04/17	-0.093	0.173	**18.46**	**1.281**	0.052	0.166	-0.014	0.022	-0.016	0.024	-0.003	0.047
34	08/16/17	-0.013	0.195	**19.66**	**1.483**	0.072	0.204	0.023	0.026	0.002	0.027	0.025	0.070
37C	06/01/17	-0.217	0.288	**15.07**	**1.553**	0.034	0.316	-0.001	0.039	-0.009	0.036	0.003	0.077
37C	10/11/17	0.138	0.187	**14.77**	**1.095**	-0.003	0.184	-0.003	0.021	-0.023	0.022	0.011	0.054

LOCATION	COLLECTION DATE	Co-60		Zn-65		Nb-95		Zr-95		Ru-103		Ru-106	
			(+/-)		(+/-)		(+/-)		(+/-)		(+/-)		(+/-)
31	06/01/17	0.006	0.040	-0.066	0.109	0.044	0.050	0.039	0.072	-0.030	0.040	-0.012	0.352
31	07/31/17	0.005	0.032	-0.079	0.084	0.020	0.038	0.021	0.064	-0.008	0.035	-0.066	0.280
32	05/24/17	0.031	0.065	-0.131	0.168	-0.004	0.073	0.110	0.107	0.014	0.064	-0.155	0.572
32	11/08/17	-0.007	0.043	-0.070	0.102	-0.032	0.035	0.062	0.068	-0.014	0.034	-0.211	0.329
33	05/04/17	0.010	0.032	-0.016	0.080	0.015	0.029	-0.018	0.045	0.007	0.026	-0.027	0.210
33	08/16/17	0.020	0.033	-0.131	0.108	-0.004	0.035	0.021	0.057	0.035	0.029	0.177	0.280
34	05/04/17	-0.028	0.026	0.047	0.064	0.047	0.032	-0.042	0.041	0.005	0.020	-0.037	0.185
34	08/16/17	0.006	0.027	-0.189	0.083	0.006	0.026	-0.024	0.049	0.003	0.025	0.118	0.215
37C	06/01/17	-0.019	0.032	-0.117	0.098	0.001	0.042	0.009	0.062	0.003	0.037	0.097	0.298
37C	10/11/17	-0.010	0.025	-0.047	0.060	0.015	0.021	-0.016	0.037	-0.001	0.022	0.057	0.198

C= Control location, Background location.

TABLE 11
BOTTOM SEDIMENT
(pCi/g dry wt.)

LOCATION	DATE	Ag-110m		Sb-125		I-131		Cs-134		Cs-137		Ac-228	
			(+/-)		(+/-)		(+/-)		(+/-)		(+/-)		(+/-)
31	06/01/17	0.008	0.040	-0.047	0.116	-0.039	0.076	0.048	0.048	0.005	0.044	0.077	0.337
31	07/31/17	0.003	0.030	0.033	0.093	0.065	0.063	0.106	0.056	0.008	0.034	0.709	0.229
32	05/24/17	-0.048	0.065	0.012	0.163	-0.061	0.111	0.128	0.109	0.033	0.071	0.361	0.647
32	11/08/17	-0.008	0.030	0.040	0.088	0.025	0.053	0.013	0.040	-0.030	0.032	0.253	0.333
33	05/04/17	0.010	0.025	-0.028	0.076	0.007	0.037	0.006	0.033	0.025	0.029	0.142	0.226
33	08/16/17	-0.017	0.030	0.047	0.079	0.005	0.043	-0.003	0.034	-0.006	0.035	0.310	0.148
34	05/04/17	-0.011	0.022	-0.013	0.059	-0.010	0.032	0.028	0.028	0.030	0.024	0.034	0.201
34	08/16/17	0.007	0.023	0.000	0.066	-0.048	0.040	0.029	0.033	0.025	0.026	0.084	0.208
37C	06/01/17	0.012	0.038	-0.015	0.095	-0.021	0.064	0.009	0.038	0.008	0.040	0.073	0.161
37C	10/11/17	-0.009	0.018	-0.004	0.062	-0.002	0.035	-0.017	0.026	0.024	0.021	0.050	0.163

C= Control location, Background location.

TABLE 12
AQUATIC FLORA - FUCUS
(pCi/g wet wt.)

LOCATION	COLLECTION DATE	Be-7	(+/-)	K-40	(+/-)	Cr-51	(+/-)	Mn-54	(+/-)	Co-58	(+/-)	Fe-59	(+/-)
29	03/08/17	0.1123	0.2312	**4.5670**	**0.8212**	0.0251	0.1970	0.0131	0.0283	0.0060	0.0212	-0.0281	0.0560
29	05/23/17	0.3012	0.2040	**6.8670**	**0.6176**	-0.1210	0.1282	0.0114	0.0151	0.0071	0.0139	-0.0040	0.0303
29	08/15/17	0.0504	0.0960	**6.8130**	**0.5452**	0.0209	0.0890	-0.0071	0.0105	-0.0074	0.0100	-0.0028	0.0235
29	11/15/17	0.2945	0.2130	**7.5120**	**0.6763**	0.0431	0.1116	-0.0010	0.0146	-0.0039	0.0152	-0.0209	0.0318
32	03/08/17	0.1142	0.1018	**6.7320**	**0.4969**	-0.0039	0.0965	-0.0056	0.0112	0.0013	0.0114	0.0112	0.0284
32	05/23/17	0.1267	0.1898	**9.1250**	**0.9998**	-0.0347	0.1587	-0.0010	0.0243	-0.0124	0.0195	0.0266	0.0563
32	08/15/17	0.1018	0.1416	**8.0110**	**0.6689**	-0.1416	0.1485	-0.0039	0.0163	-0.0094	0.0163	-0.0040	0.0348
32	11/15/17	0.0847	0.1584	**6.8210**	**0.7806**	0.0375	0.1452	0.0026	0.0156	-0.0099	0.0169	-0.0032	0.0367
35	03/08/17	0.1716	0.1892	**4.7250**	**0.6575**	-0.1699	0.1719	0.0053	0.0191	-0.0123	0.0179	0.0096	0.0397
35	05/24/17	**0.3347**	**0.1457**	**6.4350**	**0.6112**	0.1058	0.1113	0.0060	0.0109	-0.0043	0.0107	-0.0181	0.0284
35	07/31/17	0.1012	0.1307	**6.7890**	**0.6934**	-0.0195	0.1264	0.0176	0.0143	-0.0001	0.0134	0.0064	0.0347
35	11/09/17	0.1448	0.1889	**6.1990**	**0.6413**	0.2243	0.1901	0.0141	0.0202	-0.0100	0.0206	-0.0066	0.0389
36	03/28/17	0.2104	0.1759	**5.8670**	**0.7263**	0.0873	0.1266	0.0044	0.0144	0.0147	0.0160	0.0031	0.0390
36	06/01/17	**0.2062**	**0.1224**	**6.6810**	**0.4693**	-0.0239	0.0812	0.0018	0.0101	-0.0052	0.0099	-0.0040	0.0234
36	08/01/17	0.0797	0.0983	**6.7760**	**0.5066**	0.0377	0.1043	0.0028	0.0108	-0.0006	0.0112	0.0141	0.0233
36	10/11/17	0.0047	0.0980	**6.7210**	**0.5690**	0.0163	0.0879	-0.0064	0.0105	-0.0117	0.0103	-0.0064	0.0266
90	03/31/17	**0.5125**	**0.1707**	**5.7620**	**0.5417**	-0.0429	0.1131	0.0005	0.0114	-0.0122	0.0111	0.0066	0.0293
90	05/04/17	0.1594	0.1738	**6.2820**	**0.5505**	0.0008	0.0853	-0.0014	0.0118	-0.0040	0.0114	-0.0013	0.0265
90	08/16/17	0.0570	0.1023	**6.3100**	**0.5940**	0.0077	0.0983	0.0059	0.0123	-0.0018	0.0119	0.0087	0.0267
90	11/27/17	0.3494	0.2467	**8.5580**	**0.6394**	-0.0140	0.1126	0.0081	0.0133	0.0016	0.0122	-0.0038	0.0288

Results in bold type are positive.

TABLE 12
AQUATIC FLORA - FUCUS
(pCi/g wet wt.)

Location	Collection Date	Co-60		Zn-65		Nb-95		Zr-95		Ru-103		Ru-106	
			(+/-)		(+/-)		(+/-)		(+/-)		(+/-)		(+/-)
29	03/08/17	0.0125	0.0223	-0.0326	0.0628	-0.0117	0.0257	-0.0306	0.0421	0.0067	0.0239	0.0398	0.2378
29	05/23/17	-0.0062	0.0127	0.0078	0.0321	0.0062	0.0148	0.0111	0.0245	0.0007	0.0145	-0.0340	0.1212
29	08/15/17	-0.0017	0.0118	-0.0393	0.0325	-0.0033	0.0111	-0.0038	0.0217	0.0003	0.0120	0.0186	0.0968
29	11/15/17	0.0112	0.0140	-0.0401	0.0393	-0.0004	0.0145	0.0028	0.0271	-0.0090	0.0154	-0.0432	0.1196
32	03/08/17	0.0064	0.0116	-0.0317	0.0283	-0.0006	0.0118	0.0206	0.0208	-0.0029	0.0119	0.0134	0.1030
32	05/23/17	-0.0015	0.0290	0.0298	0.0547	-0.0165	0.0210	0.0181	0.0375	0.0049	0.0210	-0.0018	0.1648
32	08/15/17	0.0039	0.0185	-0.0145	0.0417	0.0082	0.0159	-0.0066	0.0292	0.0026	0.0169	0.1157	0.1560
32	11/15/17	0.0062	0.0155	-0.0254	0.0445	0.0102	0.0175	0.0069	0.0315	0.0090	0.0168	0.0040	0.1482
35	03/08/17	0.0124	0.0185	0.0132	0.0438	-0.0023	0.0188	0.0088	0.0320	0.0050	0.0218	-0.0042	0.1706
35	05/24/17	0.0114	0.0124	-0.0022	0.0336	-0.0004	0.0129	-0.0206	0.0207	0.0102	0.0102	0.0052	0.1020
35	07/31/17	0.0114	0.0169	-0.0052	0.0381	-0.0005	0.0136	0.0184	0.0251	-0.0141	0.0157	0.0260	0.1116
35	11/09/17	0.0126	0.0196	0.0218	0.0482	0.0027	0.0189	-0.0298	0.0354	0.0012	0.0197	0.0649	0.1781
36	03/28/17	0.0039	0.0149	-0.0446	0.0454	-0.0010	0.0175	0.0036	0.0277	0.0052	0.0162	0.0620	0.1617
36	06/01/17	-0.0012	0.0096	0.0065	0.0267	0.0092	0.0094	0.0010	0.0157	-0.0014	0.0104	-0.0370	0.0874
36	08/01/17	0.0045	0.0130	0.0070	0.0296	0.0067	0.0120	0.0102	0.0213	-0.0064	0.0114	0.0139	0.0964
36	10/11/17	-0.0027	0.0135	0.0124	0.0318	0.0112	0.0113	-0.0121	0.0186	-0.0108	0.0112	-0.0148	0.1132
90	03/31/17	-0.0052	0.0125	-0.0160	0.0293	0.0009	0.0121	0.0015	0.0201	-0.0142	0.0132	-0.0487	0.0980
90	05/04/17	-0.0149	0.0127	-0.0205	0.0298	0.0004	0.0116	0.0132	0.0201	0.0025	0.0119	-0.0256	0.0926
90	08/16/17	-0.0016	0.0123	-0.0032	0.0375	0.0107	0.0126	-0.0015	0.0217	-0.0006	0.0117	-0.0357	0.1118
90	11/27/17	-0.0038	0.0157	-0.0003	0.0282	-0.0092	0.0130	-0.0020	0.0211	0.0024	0.0125	-0.0579	0.1130

Results in bold type are positive.

TABLE 12
AQUATIC FLORA - FUCUS
(pCi/g wet wt.)

Location	Collection Date	Ag-110m	(+/-)	Sb-125	(+/-)	I-131	(+/-)	Cs-134	(+/-)	Cs-137	(+/-)	Ac-228	(+/-)
29	03/08/17	-0.0285	0.0207	-0.0556	0.0669	0.0139	0.0332	0.0195	0.0264	0.0282	0.0236	0.0254	0.1858
29	05/23/17	-0.0063	0.0119	-0.0233	0.0365	0.0020	0.0253	0.0126	0.0173	0.0029	0.0147	**0.1920**	**0.0721**
29	08/15/17	-0.0017	0.0108	-0.0032	0.0286	0.0039	0.0167	0.0050	0.0125	0.0044	0.0109	0.0426	0.0967
29	11/15/17	0.0017	0.0129	-0.0250	0.0407	0.0066	0.0203	0.0001	0.0162	0.0032	0.0138	0.0744	0.1077
32	03/08/17	0.0138	0.0109	-0.0057	0.0320	-0.0026	0.0171	0.0074	0.0128	0.0010	0.0120	0.0309	0.0446
32	05/23/17	-0.0089	0.0198	0.0433	0.0505	0.0226	0.0328	0.0077	0.0205	-0.0183	0.0213	0.1076	0.0929
32	08/15/17	-0.0003	0.0156	-0.0327	0.0445	-0.0230	0.0253	-0.0134	0.0185	-0.0028	0.0174	0.1051	0.0689
32	11/15/17	-0.0033	0.0146	0.0252	0.0455	0.0177	0.0248	-0.0134	0.0194	0.0073	0.0157	0.1044	0.1173
35	03/08/17	-0.0119	0.0177	0.0119	0.0559	-0.0176	0.0302	-0.0097	0.0236	0.0137	0.0195	0.0556	0.0888
35	05/24/17	0.0010	0.0087	-0.0227	0.0277	0.0039	0.0202	0.0133	0.0114	0.0025	0.0107	**0.0905**	**0.0467**
35	07/31/17	0.0070	0.0138	-0.0034	0.0404	-0.0131	0.0252	-0.0016	0.0161	0.0086	0.0157	0.0158	0.0618
35	11/09/17	-0.0025	0.0188	0.0368	0.0515	-0.0082	0.0298	0.0110	0.0226	0.0151	0.0201	-0.0184	0.0745
36	03/28/17	0.0187	0.0149	-0.0072	0.0396	0.0024	0.0256	-0.0138	0.0177	-0.0150	0.0174	0.0754	0.0722
36	06/01/17	-0.0071	0.0086	0.0220	0.0261	0.0095	0.0193	-0.0010	0.0102	0.0023	0.0094	0.0685	0.0466
36	08/01/17	-0.0011	0.0101	-0.0115	0.0315	0.0008	0.0193	0.0097	0.0116	0.0020	0.0115	0.0630	0.0462
36	10/11/17	-0.0095	0.0123	0.0094	0.0308	-0.0008	0.0176	0.0036	0.0125	-0.0066	0.0134	0.0796	0.0546
90	03/31/17	-0.0010	0.0096	0.0014	0.0297	0.0051	0.0249	0.0015	0.0109	-0.0054	0.0114	0.0509	0.0675
90	05/04/17	-0.0172	0.0111	-0.0297	0.0280	**0.0441**	**0.0257**	-0.0026	0.0132	-0.0039	0.0123	0.1195	0.0870
90	08/16/17	0.0012	0.0114	-0.0005	0.0325	0.0148	0.0164	0.0097	0.0155	-0.0044	0.0125	0.0075	0.0627
90	11/27/17	-0.0116	0.0120	-0.0037	0.0338	0.0161	0.0164	0.0151	0.0145	0.0024	0.0138	**0.1318**	**0.0791**

Results in bold type are positive.

TABLE 13
FISH
(pCi/g wet wt.)

LOCATION	COLLECTION DATE	Be-7	(+/-)	K-40	(+/-)	Cr-51	(+/-)	Mn-54	(+/-)	Co-58	(+/-)	Fe-59	(+/-)
32	04/19/17	-0.105	0.247	**3.196**	**0.739**	0.253	0.259	0.012	0.026	0.025	0.028	0.002	0.053
32	10/17/17	0.064	0.236	**3.189**	**0.656**	0.074	0.262	0.031	0.030	-0.018	0.029	0.014	0.056
35	05/04/17	-0.082	0.273	**3.037**	**0.825**	0.028	0.290	0.001	0.028	-0.020	0.030	0.017	0.056
35	07/12/17	0.132	0.275	**3.177**	**0.988**	0.037	0.273	-0.006	0.031	0.007	0.024	0.020	0.082

LOCATION	COLLECTION DATE	Co-60	(+/-)	Zn-65	(+/-)	Nb-95	(+/-)	Zr-95	(+/-)	Ru-103	(+/-)	Ru-106	(+/-)
32	04/19/17	0.008	0.031	-0.079	0.059	-0.018	0.027	-0.033	0.047	-0.014	0.028	-0.158	0.218
32	10/17/17	0.062	0.037	-0.002	0.068	0.002	0.029	0.029	0.053	0.005	0.029	-0.088	0.294
35	05/04/17	-0.013	0.026	0.011	0.079	0.038	0.032	0.001	0.043	-0.016	0.038	0.090	0.299
35	07/12/17	0.022	0.038	0.044	0.087	0.013	0.028	0.001	0.062	0.027	0.036	0.243	0.287

LOCATION	COLLECTION DATE	Ag-110M	(+/-)	Sb-125	(+/-)	I-131	(+/-)	Cs-134	(+/-)	Cs-137	(+/-)	Ac-228	(+/-)
32	04/19/17	0.005	0.025	0.001	0.071	-0.038	0.057	-0.014	0.034	0.016	0.027	0.058	0.103
32	10/17/17	0.019	0.026	-0.055	0.079	-0.024	0.033	-0.011	0.034	0.008	0.029	-0.050	0.111
35	05/04/17	-0.004	0.030	0.041	0.088	0.016	0.055	-0.004	0.032	0.004	0.033	0.063	0.120
35	07/12/17	-0.019	0.036	-0.074	0.085	-0.020	0.050	-0.033	0.035	0.004	0.040	0.001	0.137

Results in bold are positive.

TABLE 14
OYSTERS
(pCi/g wet wt.)

LOCATION	COLLECTION DATE	Be-7	(+/-)	K-40	(+/-)	Cr-51	(+/-)	Mn-54	(+/-)	Co-58	(+/-)	Fe-59	(+/-)
31	04/11/17	0.010	0.129	**2.002**	**0.430**	-0.006	0.130	0.002	0.018	-0.007	0.015	0.005	0.035
31	11/14/17	0.021	0.379	**1.617**	**0.907**	0.085	0.403	-0.014	0.049	-0.016	0.040	-0.016	0.077
89	03/08/17	0.026	0.393	**2.305**	**0.694**	-0.127	0.378	-0.014	0.039	-0.016	0.047	-0.013	0.066
89	10/11/17	-0.009	0.343	**3.098**	**0.939**	0.026	0.363	-0.008	0.043	-0.051	0.043	-0.008	0.079

LOCATION	COLLECTION DATE	Co-60	(+/-)	Zn-65	(+/-)	Nb-95	(+/-)	Zr-95	(+/-)	Ru-103	(+/-)	Ru-106	(+/-)
31	04/11/17	0.001	0.015	0.014	0.032	0.012	0.013	0.011	0.025	-0.010	0.014	-0.093	0.137
31	11/14/17	0.027	0.042	-0.089	0.091	-0.004	0.036	-0.016	0.071	0.034	0.044	-0.170	0.344
89	03/08/17	0.020	0.040	0.009	0.065	0.032	0.047	0.065	0.077	-0.046	0.052	-0.086	0.435
89	10/11/17	0.000	0.039	-0.080	0.096	0.029	0.043	-0.043	0.061	-0.014	0.041	-0.185	0.393

LOCATION	COLLECTION DATE	Ag-110M	(+/-)	Sb-125	(+/-)	I-131	(+/-)	Cs-134	(+/-)	Cs-137	(+/-)	Ac-228	(+/-)
31	04/11/17	-0.003	0.014	0.003	0.040	0.002	0.018	0.006	0.017	-0.003	0.016	-0.011	0.065
31	11/14/17	-0.019	0.041	-0.036	0.117	-0.027	0.064	0.024	0.045	-0.006	0.040	-0.099	0.160
89	03/08/17	0.003	0.040	-0.034	0.132	-0.088	0.065	0.017	0.050	-0.009	0.047	0.011	0.130
89	10/11/17	-0.003	0.038	-0.142	0.098	0.018	0.070	0.024	0.039	-0.014	0.037	-0.064	0.142

Results in bold type are positive.

TABLE 15
CLAMS
(pCi/g wet wt.)

LOCATION	COLLECTION DATE	Be-7	(+/-)	K-40	(+/-)	Cr-51	(+/-)	Mn-54	(+/-)	Co-58	(+/-)	Fe-59	(+/-)
29	04/24/17	-0.013	0.182	**2.068**	**0.585**	0.104	0.181	-0.013	0.023	-0.006	0.019	-0.017	0.054
29	09/13/17	-0.103	0.330	**2.643**	**0.939**	-0.139	0.345	-0.009	0.034	0.002	0.033	-0.014	0.067
31	06/23/17	0.135	0.220	**1.964**	**0.849**	0.034	0.282	0.022	0.031	-0.032	0.029	0.021	0.073
31	10/24/17	-0.274	0.266	**1.558**	**0.927**	-0.180	0.267	0.014	0.027	0.030	0.033	0.038	0.071

LOCATION	COLLECTION DATE	Co-60	(+/-)	Zn-65	(+/-)	Nb-95	(+/-)	Zr-95	(+/-)	Ru-103	(+/-)	Ru-106	(+/-)
29	04/24/17	-0.017	0.020	-0.049	0.051	-0.010	0.025	0.031	0.045	0.006	0.022	-0.071	0.199
29	09/13/17	0.012	0.038	0.000	0.081	0.011	0.032	-0.023	0.063	-0.011	0.037	-0.116	0.353
31	06/23/17	0.021	0.027	0.047	0.075	-0.011	0.030	0.045	0.051	0.015	0.033	0.149	0.293
31	10/24/17	0.017	0.040	-0.029	0.077	-0.014	0.032	-0.071	0.058	-0.001	0.033	-0.248	0.322

LOCATION	COLLECTION DATE	Ag-110M	(+/-)	Sb-125	(+/-)	I-131	(+/-)	Cs-134	(+/-)	Cs-137	(+/-)	Ac-228	(+/-)
29	04/24/17	0.007	0.019	-0.045	0.053	0.010	0.035	0.003	0.023	0.009	0.024	0.047	0.079
29	09/13/17	0.013	0.036	-0.010	0.092	-0.019	0.071	-0.012	0.039	-0.010	0.038	0.007	0.140
31	06/23/17	0.011	0.031	0.101	0.086	0.005	0.041	0.020	0.032	-0.036	0.037	-0.001	0.148
31	10/24/17	0.021	0.036	0.018	0.093	-0.042	0.042	0.024	0.041	-0.003	0.040	-0.077	0.120

Results in bold are positive.

TABLE 16
LOBSTERS
(pCi/g wet wt.)

LOCATION	COLLECTION DATE	Be-7	(+/-)	K-40	(+/-)	Cr-51	(+/-)	Mn-54	(+/-)	Co-58	(+/-)	Fe-59	(+/-)
35	05/04/17	0.137	0.355	**2.027**	**0.964**	-0.125	0.347	0.035	0.043	-0.011	0.038	-0.052	0.086
35	07/13/17	-0.024	0.303	**3.987**	**0.907**	-0.166	0.300	0.026	0.036	-0.011	0.037	0.015	0.068
89C	06/13/17	-0.066	0.215	**2.306**	**0.786**	-0.048	0.207	-0.036	0.033	0.008	0.029	-0.029	0.057
89C	08/16/17	-0.138	0.298	**2.496**	**0.660**	0.014	0.285	0.013	0.033	0.020	0.034	-0.027	0.062

LOCATION	COLLECTION DATE	Co-60	(+/-)	Zn-65	(+/-)	Nb-95	(+/-)	Zr-95	(+/-)	Ru-103	(+/-)	Ru-106	(+/-)
35	05/04/17	-0.011	0.038	-0.085	0.093	0.002	0.040	0.011	0.073	0.009	0.042	0.140	0.363
35	07/13/17	0.001	0.037	-0.031	0.075	0.007	0.035	0.030	0.063	-0.031	0.037	-0.045	0.368
89C	06/13/17	-0.017	0.024	0.001	0.072	-0.005	0.032	0.005	0.053	-0.025	0.028	0.065	0.292
89C	08/16/17	0.011	0.031	0.021	0.083	0.032	0.033	-0.005	0.057	-0.014	0.035	-0.406	0.308

LOCATION	COLLECTION DATE	Ag-110M	(+/-)	Sb-125	(+/-)	I-131	(+/-)	Cs-134	(+/-)	Cs-137	(+/-)	Ac-228	(+/-)
35	05/04/17	0.011	0.039	-0.094	0.112	-0.024	0.069	-0.031	0.045	0.014	0.043	0.122	0.164
35	07/13/17	-0.014	0.032	0.089	0.096	-0.008	0.053	-0.019	0.041	0.014	0.036	0.001	0.150
89C	06/13/17	-0.002	0.029	0.037	0.092	-0.011	0.032	0.010	0.031	-0.003	0.030	-0.044	0.117
89C	08/16/17	-0.013	0.031	-0.061	0.097	-0.052	0.050	-0.007	0.035	0.000	0.035	0.029	0.127

C=Control Location, Background Location Results in bold are positive.

4. DISCUSSION OF RESULTS

This section summarizes the results of the analyses on the REMP samples. The only case where station related radioactivity was detected was tritium (H-3) in seawater collected at the quarry discharge point. This was within the station boundary. The naturally occurring nuclides of Be-7, K-40, and Ac-228 were detected in some samples. Be-7 is from cosmic radiation. It was observed in air and broadleaf vegetation and in some fucus samples. K-40 and Ac-228 are two common terrestrial isotopes. K-40 was not seen in air or well water samples but was observed in almost every other type of sample. Ac-228 was observed in one sediment and two soil samples. Cs-137 and Sr-90 from atmospheric nuclear weapons testing in the 1960's have been observed in the past. A study by the Connecticut Department of Energy and Environmental Protection in 2006 affirmed that radioactivity from nuclear weapons testing has decreased to almost non-detectable levels (Reference 19). Since 2006 detection of Cs-137 and Sr-90 in environmental samples has been rare. During 2017, Cs-137 was detected in two soil samples and Sr-90 was not detected. The values detected were above the LLD of 0.18 pCi/g and it is common to find these levels of Cs-137 in undisturbed soil[22]. No other REMP samples show an increase in the Cs-137 and the overall trend is decreasing with time.

4.1 Gamma Exposure Rate (Table 1)

Gamma exposure rate is determined from the integrated exposure measured over a calendar quarter using TLDs. Prior to 1990, Victoreen CaF_2(Mn) glass bulb dosimeters were used for these measurements. In 1990, these were replaced by Harshaw CaF_2(Mn) chips. In 2000, the CaF_2(Mn) TLDs, were replaced with the $CaSO_4$(Tm) Panasonic model UD-804 ASx TLDs. Readings are recorded as uR/hr. The unit uR stands for 'micro-roentgen' with a 'micro' being one-millionth of a roentgen. A roentgen is the quantity of radiation equal to 87.6 ergs of energy per gram of air. For gamma exposure a micro-roentgen is equivalent to a micro-rem, a measure of dose to man.

The dosimeters are strategically placed at a number of onsite locations, as well as at inner and outer offsite locations. Starting in 2001, the collection of TLDs was changed from monthly to quarterly and additional measurement locations were incorporated into the REMP requirements listed in the REMODCM (Reference 8). Three more locations (73-75) were added in mid-2003 to prepare for monitoring the potential effect from the ISFSI. Two Dry Cask Containers were loaded in the first quarter 2005. Three containers were loaded in 2006, three in 2007, three in 2009, three in 2010 and seven in 2015. None were loaded in 2008, from 2011 to 2014. The exposure rate measurements at two of the three additional TLD locations remain basically unchanged from the background measurements performed prior to any cask loading (six quarter background average mid 2003 – 2004: 9.5 uR/hour at Location 73, 7.5 uR/hour at Location 74 and 6.9 uR/hour at Location 75). At Location 73 the readings have increased 0.2 uR/hour with an average of 7.9 uR/hour for 2017. In 2016, six ISFSIs were loaded into the Horizontal Storage Modules and the station offsite dose from ISFSI has increased from 0.038 mrem/year to 0.041 mrem/year and is below the 25 mrem/year 40.190 CFR limit.

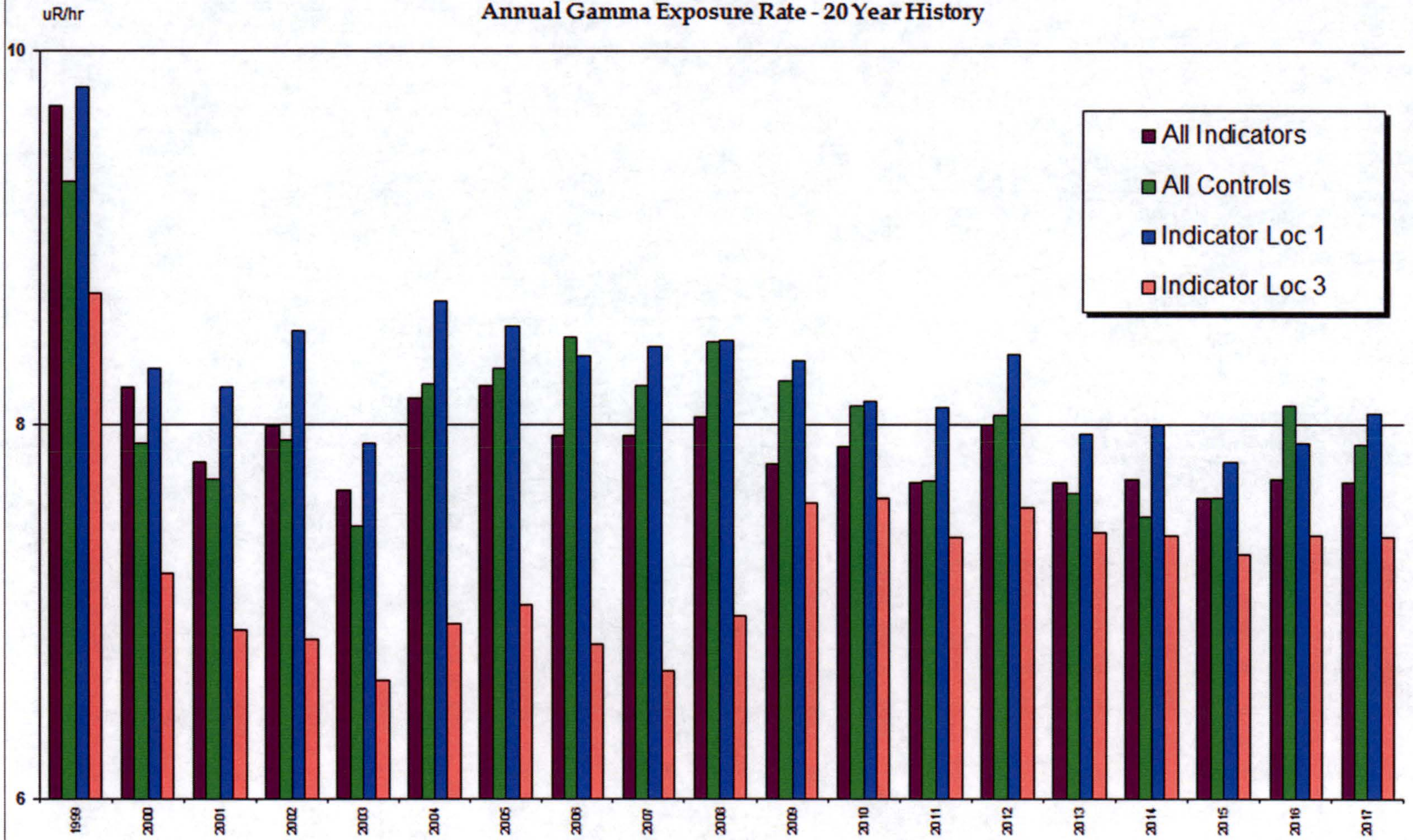
Table 1 in Section 3.2 lists the exposure rate measurements for all 43 monitored locations. These measurements demonstrate the general variations in background radiation between the various onsite and offsite locations and include gamma exposure from all sources of radioactivity. For example, the Weather Shack (Location 2), Quarry East (Location 5), Environmental Laboratory (Location 8), Bay Point Beach (Location 9), Goshen Fire Dept (Location 10), Corey Road (Location 48), and Site Switchyard Fence (Location 73) experience higher exposure rates due to their proximity to granite beds and stonewalls. In addition, the Mystic (Location 13C) and Ledyard (Location 14C) control locations experience relatively higher background exposure rate than the other control locations at Norwich and Old Lyme (Locations 15C and 16C).

Figure 4.1-1 shows a historical trend of TLD exposure rate measurements, comparing an annual average of all indicator TLDs, an annual average of all control TLDs, and the annual average of the two most critical indicator locations which are used to represent the two closest site boundary residences in the North-northwest and Northeast directions. The average indicator and control readings were both 7.9 uR/hour. This is equivalent to an annual dose of about 69 mrem.

The averages of all indicator locations for the period when Millstone MPS1 was still in operation (1996 to 1999) exhibit the effects of N-16 BWR turbine building skyshine to immediate areas onsite. Skyshine increased exposure rates as high as 6 uR/hr at onsite monitoring stations. The elevated exposure rates from skyshine decreased rapidly with distance to levels indistinguishable from normal background measurements at the nearest offsite monitoring stations. Also apparent in Figure 4.1-1 is a change of the type of TLD dosimeter in the year 2000. The difference in response between the two types of TLD dosimeters is apparent, with the new type reading 15% to 20% lower. This lower response is consistent for all locations, including both indicator and control locations.

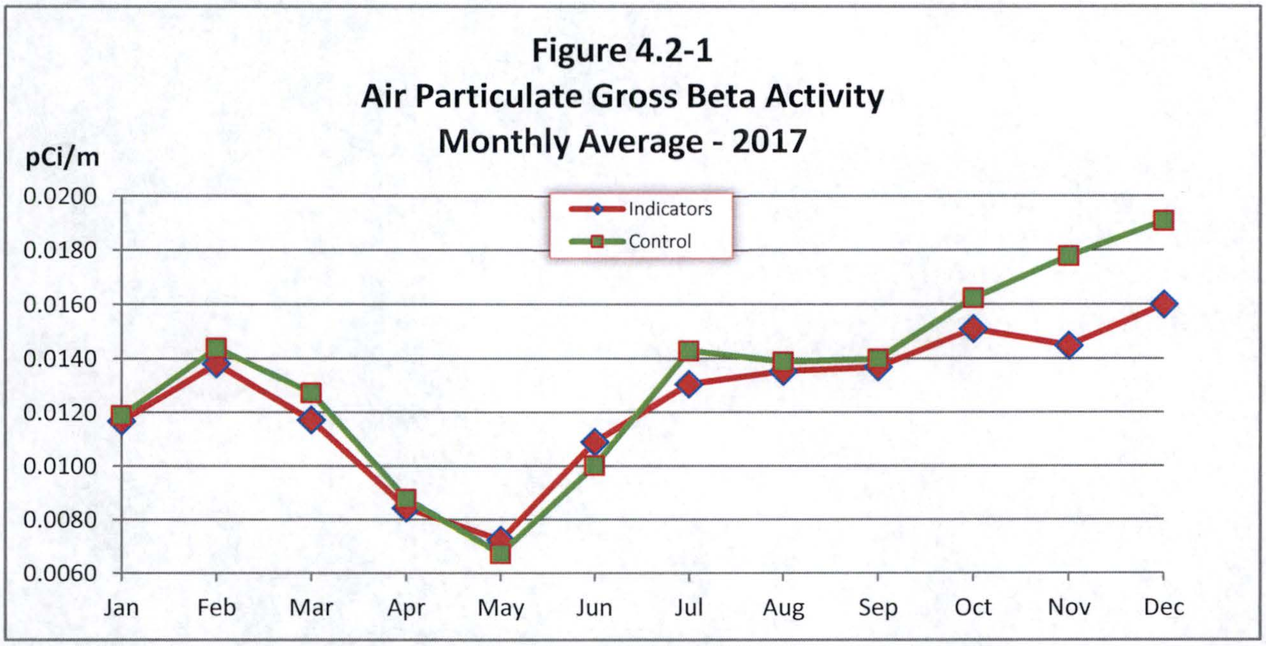
Figure 4.1-1 also relates the difference in indicator locations 1 and 3 and the annual average of all indicator TLDs to the annual average of the control TLDs collected and measured during coincident periods throughout the year. Locations 1 and 3 are important because they are onsite and located between the plant and nearby populated areas. As discussed earlier, the exposure measurements of many indicator locations onsite (and two of the control locations) are influenced by natural background exposure differences caused by the many granite out-croppings typical of the local area. Figure 4.1-1 shows that the annual average at indicator Location 3 was lower in gamma exposure rate than the average control gamma exposure rate. These differences are the result of the differences in granite at these locations. Location 3 was moved in the second quarter 2009 to minimize the effect of tree covering for the air sampler also located at this location. The 2009 to 2017 data for Location 3 shows an increase likely attributable to 2-3 μR/hr gradients observed from the granite bedrock of the MPS Site[21].

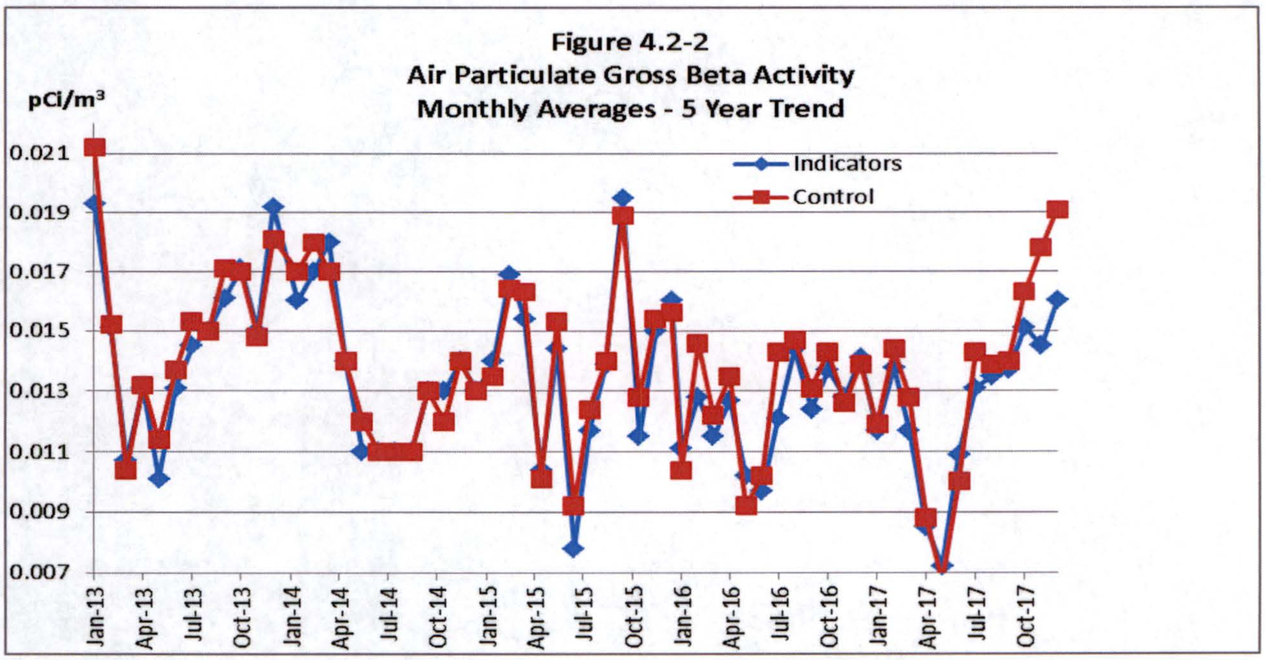
Figure 4.1-1
Annual Gamma Exposure Rate - 20 Year History



4.2 Air Particulate Gross Beta Radioactivity (Table 2)

Air is continuously sampled at seven inner ring (0 to 2 miles) locations and one control location (14 miles N) by passing it through glass fiber particulate filters. These samples are collected every two weeks and analyzed for gross beta radioactivity. Results are shown on Figure 4.2-1 and Table 2. Gross beta activity remained at levels similar to that seen over the last decade. Inner and control monitoring locations continue to show no significant variation in measured activities (see Figure 4.2-2). This indicates that any station contribution is not measurable. An increase in the deviation between the indicators and the control (figure 4.2-1) has been noted. This is currently under evaluation.





4.3 Airborne Iodine (Table 3)

Charcoal cartridges are included at all of the air particulate monitoring stations for the collection of atmospheric iodine. These cartridges were analyzed for I-131 every two weeks. No detectable levels of I-131 were seen in the 2017 charcoal samples.

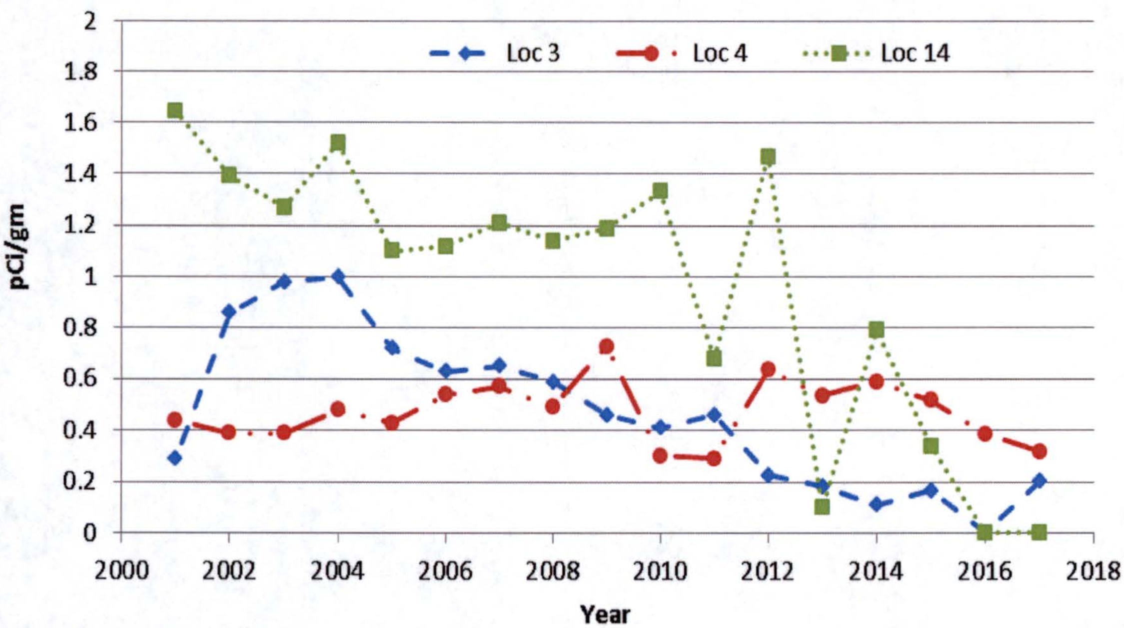
4.4 Air Particulate Gamma (Table 4)

The air particulate samples that are utilized for the gross beta analyses are composited quarterly and analyzed for gamma emitting isotopes. The results, as shown in Table 4, indicate the presence of naturally occurring Be-7, which is produced by cosmic radiation. No other positive results are seen. These analyses indicate the lack of any station radioactivity.

4.5 Soil (Table 5)

This media is collected annually from one control and two indicator locations. MPS has collected and analyzed soil since 2001. Prior to 2001, soil had not been sampled for over fifteen years because station related detectable activity had not been detected. Since 2001 no station detectable activity has been seen in these samples. Naturally occurring K-40 and Ac-228 is detected in soil. Cs-137 from nuclear weapons testing was detected in two soil samples. The results of these samples, allows for the determination of baseline activity levels in soil. This is particularly important for Cs-137, since significant levels from past weapons testing fallout remain in the soil. Figure 4.5-1 shows the trend of Cs-137 in soil samples. Except for Location 3, the trend appears to be declining with time. Baseline levels should be useful in the future, when site characterization and decommissioning of the station become the focus during preparations for license termination.

Figure 4.5-1
Cs-137 in Soil



4.6 Milk (Table 6)

Typically, the most sensitive indicator of fission product existence in the terrestrial environment is the radiological analysis of milk samples. Milk is a widely consumed food; therefore it is usually one of the most critical exposure pathways. Since 1996 all dairy (cow) farms close enough to MPS to be considered an indicator location (i.e. within 10 miles) have ceased operation. One cow milk location and one goat location, both between ten and twelve miles from the station, were sampled as extra, non-required samples and results are shown in Table 6. Naturally occurring K-40 is the only positive result seen in both cow milk and goat milk.

Each year the Land Use Census is used to identify locations of milk animals that should be included in the monitoring program. It is performed annually and is maintained by observations, door-to-door surveys and consulting with local agriculture authorities. The 2017 census is listed in Appendix A. If a new dairy farm is identified close enough to MPS to be considered an indicator location, the collection of cow milk at that location would be added.

4.7 Well Water (Table 7)

All REMP well samples including ISFSI well samples were less than the Minimum Detectable Concentration (MDC). Additional samples from other wells were obtained as part of the Groundwater Protection Program (GWPP). Results from the GWPP are reported in the MPS annual "Radioactive Effluent Release Report" for 2017. ISFSI well results have been documented in Table 7 as required by the Connecticut Sitting Council.

4.8 Fruits and Vegetables (Table 8)

Consistent with past years, this media did not show any station effects. Naturally occurring K-40 was detected in all samples.

4.9 Broad Leaf Vegetation (Table 9)

Consistent with past years, this media did not show any station effects. Most samples had detectable levels of cosmic produced Be-7 and naturally occurring K-40 at levels consistent with previous years. Occasionally these samples have indicated positive levels of Cs-137 in the past. This can be attributed to fallout from weapons testing which has been widespread in terrestrial samples for many years.

4.10 Seawater (Table 10)

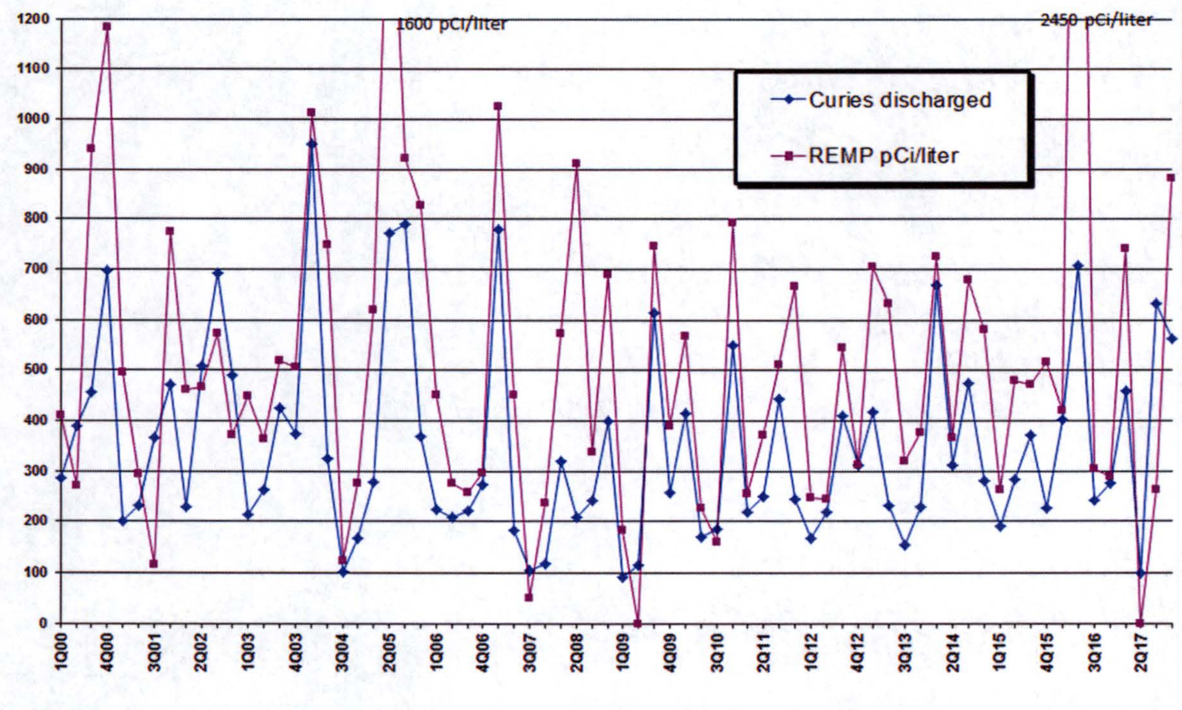
The guidance in Reference 15 specifies one sample upstream (control – beyond significant influence of the discharge) and one sample downstream (indicator – beyond but near the mixing zone) for surface water samples. Historically the downstream sample for MPS has been located in the vicinity of discharge (Location 32) which is prior to the mixing zone. This location was chosen since it was readily accessible and not affected by cold weather conditions. Operation of an automatic sampler at the indicator location is necessary for providing a representative sample. Any dose consequences can be assessed by use of the appropriate dilution factors. It's not necessary to have a continuous sampler at the control location due to the historical relative consistency noted in seawater background activity near the Millstone.

A technician collects an aliquot from the automatic sampler at Location 32 on a weekly frequency. These samples are composited for monthly analyses. For the Control Location, Giant's Neck (Location 37C), six weekly grab samples are obtained for quarterly compositing.

Naturally occurring K-40 was the only detectable gamma activity seen in these samples. Measured station related levels of H-3 in seawater from the vicinity of discharge (Location 32) were observed in most samples. Tritium releases are typically higher near outages due to the need for increased liquid processing during these times. As mentioned above, these samples are taken directly from liquid effluent flow prior to dilution into the Long Island Sound.

Tritium builds up in the reactor coolant during each fuel cycle. It is generated during station operation from fission and neutron reactions. Figure 4.10-1 shows an eighteen-year trend of H-3 releases in the MPS liquid effluents versus the measured environmental concentrations from the vicinity of discharge location. In 2017 MPS had two refueling outages requiring the processing and subsequent discharge of refueling water, which explains the slightly elevated activity values in the first and fourth quarter of 2017. The highest value in 2017 for seawater was 1900 pCi/l, which is below regulatory LLD for tritium specified in NUREG 1301 of 3000 pCi/l. The total annual exposure from the liquid discharge pathway for 2017 was 0.001 mrem/yr.

Figure 4.10-1
H-3 Curies Released versus Seawater Concentration
18 Year Trend



4.11 Bottom Sediment (Table 11)

There was no station related radioactivity detected in bottom sediment samples in 2017. Naturally occurring K-40 is seen in all samples and naturally occurring Ac-228 in some samples. Bottom sediment is not a significant dose pathway to man, especially at areas not typically used by the public.

4.12 Aquatic Flora (Table 12)

Aquatic flora is a sensitive indicator of low levels of man-made radioactivity (e.g., Mn-54, Co-58, Co-60, Zn-65, I-131 and Ag-110m) in the environment so it was added as a required sample at four locations in revision 28 of the REMODCM. Naturally occurring Be-7 and Ac-228 appear in some samples and K-40 in all samples. One sample on the Thames River identified 4.41E-4 pCi/g of I-131. No other samples taken in the identified I-131. MPS had a gaseous release of 1 µCi I-131 during the second quarter, but this was not identified in any other samples taken in the second and third quarter. The positive I-131 sample could also be attributed to any one of the many contributing sources in the Thames River. The potential contributing I-131 sources to the Thames River include the Submarine Base, Electric Boat, Pfizer, and medical wastes from I-131 treatment.

4.13 Fish (Table 13)

The activity in fish is the same as that seen in the past. No activity was observed except for the naturally occurring K-40.

4.14 Oysters (Table 14)

All locations utilize oysters stocked in trays. The stocked trays are kept at sampling areas and represent conditions in those areas. Due to safety concerns Location #32 was moved over eight years ago to a more accessible area in the middle of the quarry. Although it is labeled as vicinity of the discharge, it was previously located at the end of the quarry. The near-field dilution factor for liquid discharges from the MPS Quarry discharge is a factor of 3. Obtaining oyster sampling has presented challenges in obtaining the sample size required for analysis. In 2017 there were no challenges in obtaining oyster samples and four extra samples were obtained.

Naturally occurring K-40 is seen in all samples. MPS related Ag-110m and Zn-65 in oysters collected at Location #32 have been seen in the past. Oysters have a high capacity for accumulating silver and zinc. Studies have shown that oysters can accumulate as much as 50 times or more the amount of zinc compared to most other seafood. However, in 2017 no plant related radioactivity was detected in oysters.

4.15 Clams (Table 15)

Occasionally this media indicates the presence of station related radioactivity. In 2017 no activity was observed except for the naturally occurring K-40.

4.16 Lobsters (Table 16)

In 2017 no activity was observed except for the naturally occurring K-40.

5. REFERENCES

1) United States of America, Code of Federal Regulations, Title 10, Part 50, Appendix A Criteria 64.

2) Donald T. Oakley, "Natural Radiation Exposure in the United States," U. S. Environmental Protection Agency, ORP/SID 72-1, June 1972.

3) National Council on Radiation Protection and Measurements, Report No. 160, "Ionizing Radiation Exposures of the Population of the United States," March 2009.

4) National Council on Radiation Protection and Measurements, Report No. 94, "Exposure of the Population of the United States and Canada from Natural Background Radiation," December 1987.

5) United States Nuclear Regulatory Commission, Regulatory Guide 8.29, "Instructions Concerning Risks from Occupational Radiation Exposure," Revision 0, July 1981.

6) United States of America, Code of Federal Regulations, Title 10, Part 20.1302.

7) United States Nuclear Regulatory Commission, Regulatory Guide 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I," Revision 1, October 1977.

8) Millstone Power Station Radiological Effluent Monitoring and Offsite Dose Calculation Manual, Revision 027-00, March 13, 2017 and Revision 28, October 1, 2017.

9) Millstone Nuclear Power Station Unit 1 Defueled Technical Specifications.

10) Millstone Nuclear Power Station Unit 2 Technical Specifications, License No. DPR-65.

11) Millstone Nuclear Power Station Unit 3 Technical Specifications, License No. NPF-49.

12) United States Nuclear Regulatory Commission, Regulatory Guide 4.1, "Program for Monitoring Radioactivity in the Environs of Nuclear Power Plants," Rev. 1, April 1975.

13) ICN/TracerLab, "Millstone Nuclear Power Station Pre-operational Environmental Radiation Survey Program, Quarterly Reports," April 1967 to June 1970.

14) International Commission of Radiological Protection, Publication No. 43, "Principles of Monitoring for the Radiation Protection of the Population," May 1984.

15) United States Nuclear Regulatory Commission, NUREG-1301, "Offsite Dose Calculation Manual Guidance: Standard Radiological Effluent Controls for Pressurized Water Reactors," April 1991.

16) United States Nuclear Regulatory Commission, Branch Technical Position, "An Acceptable Radiological Environmental Monitoring Program," Rev. 1, November 1979.

17) Reassessment of Millstone Power Station's Environmental Monitoring Data, Connecticut Department of Environmental Protection, Division of Radiation, March 2006.

18) Nuclear Regulatory Commission Regulatory Guide 4.1, Radiological Environmental Monitoring for Nuclear Power Plants, Revision 2, June 2009.

19) Division of Radiation, CT Dept. of Energy and Environmental Protection, "Reassessment of Millstone Power Station's Environmental Monitoring Data," January, 2006.

20) Connecticut Sitting Council Decision and Order for ISFSI, Docket No. 265, May 27, 2004.

21) RP-16-08, "Take-Home Thermoluminescent Dosimeter Variance," June 17, 2016.

22) MP-HPO-98137, "Determination Of Cs-137 In Undisturbed Soil At Location s Greater Than 10 Miles From Millstone Site," July 28, 1998.

APPENDIX A

LAND USE CENSUS FOR 2017

The annual land use census in the vicinity of MPS was conducted as required by the MPS REMODCM. Typically the cow milk locations are identified by a review of the annual registration information obtained from the State of Connecticut Department of Agriculture licensing website at https://www.elicense.ct.gov/Lookup/GenerateRoster.aspx. Gardens are located by a drive-by during the harvest season. Although broadleaf sampling was performed and may be used in lieu of a garden census, gardens were included in the 2017 census. Only vegetable gardens having an area of more than 500 square feet need to be identified. The Land Use Census conservatively assumes that the nearest resident within each directional sector has a garden to minimize measuring gardens at individual's residence. If a garden is closer than the nearest resident in a sector, then the garden is listed as the closest garden in that sector. The search for new goat farms included consulting goat association records, which includes the American Goat Owners Association (http://adga.org/), contacting previous owners. A search of food sources other than milk and local gardens was conducted using the search route on "Local Food Guide to Connecticut" at http://www.farmfresh.org/. Results of the land use census are given in Tables A-1 through A-2. No new dairy animals within 10 miles of the MPS were located during the census.

The 2017 Land Use Census also evaluated aquatic sampling exposure pathways from the fish and shell fish located around MPS. Attachment 1 shows shellfish beds around MPS from the Bureau of Aquaculture of the Department of Agriculture. The salt water fishing areas are identified Attachment 2. There were no changes in restricted areas, receptor locations, new exposure pathways or modifications to existing exposure pathways as a result of this assessment.

The dose modeling incorporates the distances listed in Tables A-1, A-2.

TABLE A-1
2017 Survey

Downwind Direction	Resident/Garden	
	Miles	Meters
N	0.95	1521
NNE	0.53	854
NE	0.47	763
ENE	0.97	1554
E	0.92	1475
ESE	1.06	1701
SE	N/A	N/A
SSE	N/A	N/A
S	N/A	N/A
SSW	N/A	N/A
SW	2.28	3670
WSW	1.95	3130
W	1.78	2858
WNW	1.51	2423
NW	1.35	2179
NNW	0.51	816

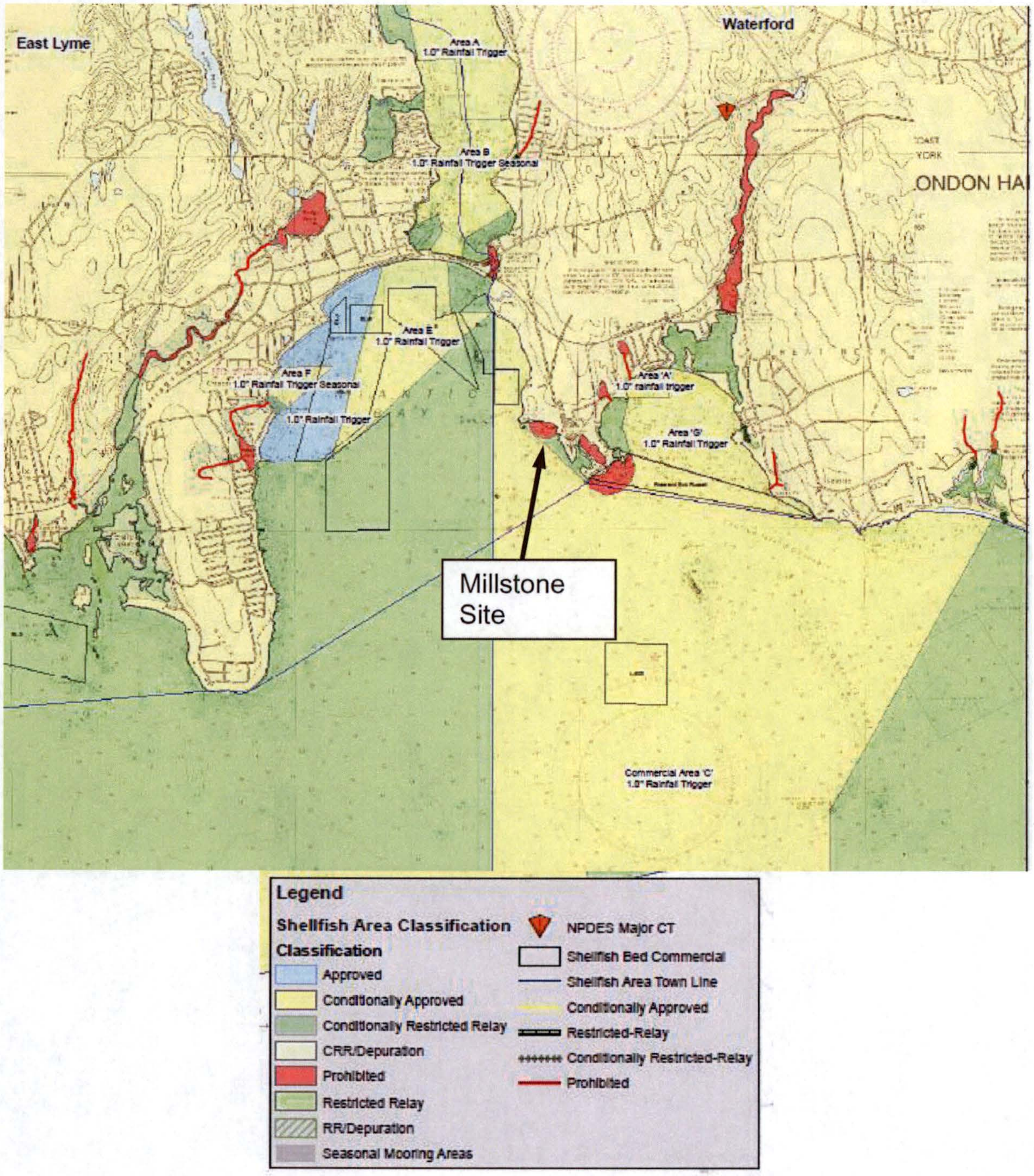
Notes:

1. No gardens located closer than resident.
2. Sectors SE thru SSW are N/A because they are over water.

Table A-2
Milk and other foods within five miles of MPS - 2017

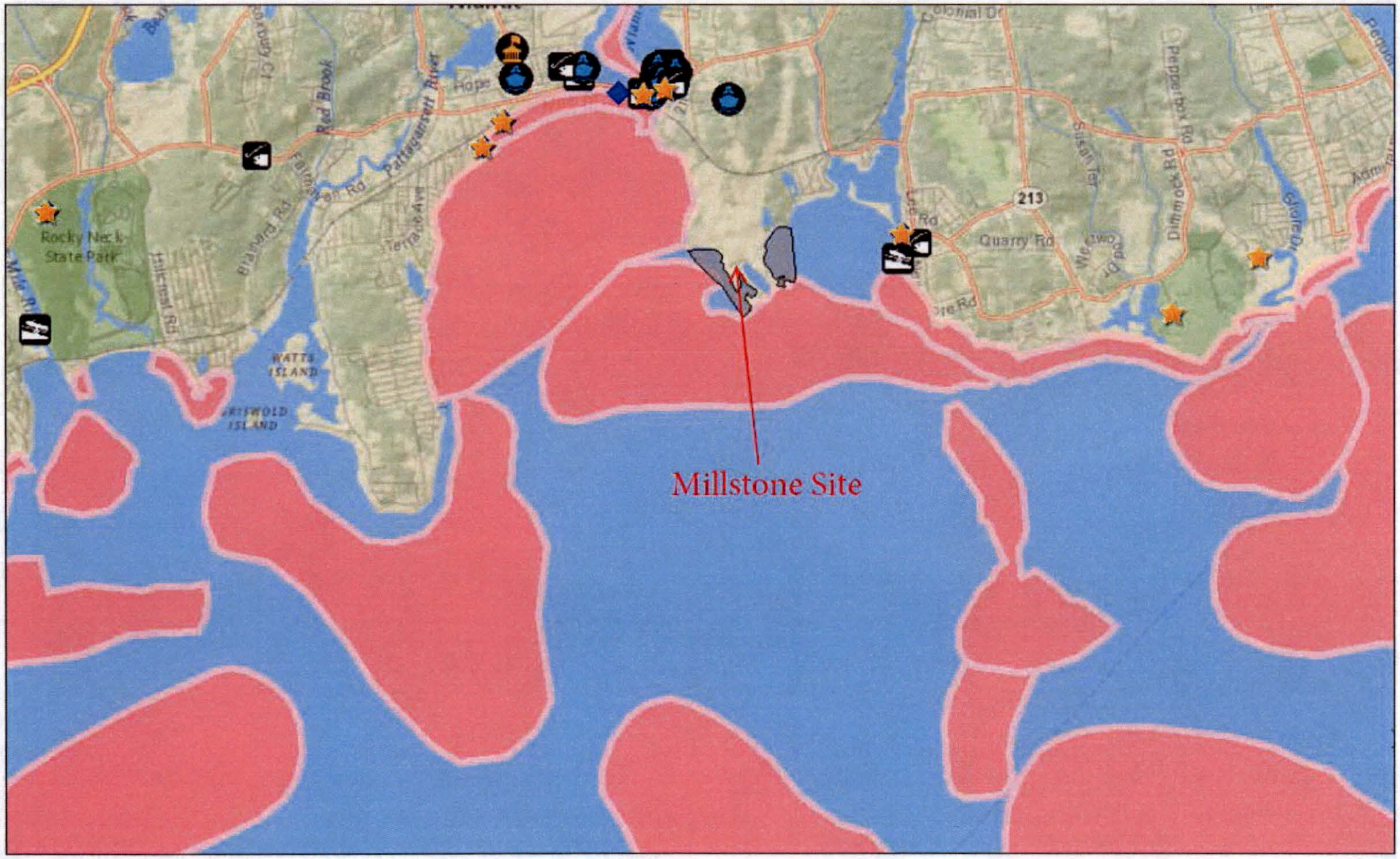
Sector	Miles	Business	Location	Comments
NE	2.1	Private residence	Waterford	Goats - not milking
ENE	3.0	Secchiaroli Farms	Waterford	Has pigs but feed sources not local
NW	4.3	Smith's Acres	Niantic	Fruits and vegetables
WNW	5.0	Four Mile River Farm	Old Lyme	Eggs, beef, pork
NW	5.2	Scott's Yankee Farmer	East Lyme	Fruits and vegetables, cider

MP-CHEM-17-13
Attachment One
Shellfish Beds in Vicinity of Millstone



MP-CHEM-17-13
Attachment Two

Saltwater Fishing Resource Map



APPENDIX B

SUMMARY OF INTERLABORATORY COMPARISONS

Summary of Results – Inter-laboratory Comparison Program (ICP)

This appendix summarizes the Intercomparison Program of the Teledyne Brown Engineering (TBE) Laboratory as required by technical specifications for each MPS unit. The TBE Laboratory analyzed Performance Evaluation (PE) samples of air particulate, air iodine, milk, soil, vegetation, and water matrices for various analytes. The PE samples supplied by Analytics Inc., Environmental Resource Associates (ERA) and Department of Energy (DOE) Mixed Analyte Performance Evaluation Program (MAPEP), were evaluated against the following pre-set acceptance criteria:

A. Analytics Evaluation Criteria

Analytics' evaluation report provides a ratio of TBE's result and Analytics' known value. Since flag values are not assigned by Analytics, TBE evaluates the reported ratios based on internal QC requirements based on the DOE MAPEP criteria.

B. ERA Evaluation Criteria

ERA's evaluation report provides an acceptance range for control and warning limits with associated flag values. ERA's acceptance limits are established per the USEPA, National Environmental Laboratory Accreditation Conference (NELAC), state-specific Performance Testing (PT) program requirements or ERA's SOP for the Generation of Performance Acceptance Limits, as applicable. The acceptance limits are either determined by a regression equation specific to each analyte or a fixed percentage limit promulgated under the appropriate regulatory document.

C. DOE Evaluation Criteria

MAPEP's evaluation report provides an acceptance range with associated flag values. MAPEP defines three levels of performance:

- Acceptable (flag = "A") - result within ± 20% of the reference value
- Acceptable with Warning (flag = "W") - result falls in the ± 20% to ± 30% of the reference value
- Not Acceptable (flag = "N") – bias is greater than 30% of the reference value

Note: The Department of Energy (DOE) Mixed Analyte Performance Evaluation Program (MAPEP) samples are created to mimic conditions found at DOE sites which do not resemble typical environmental samples obtained at commercial nuclear power facilities.

For the TBE laboratory, 168 out of 173 analyses performed met the specified acceptance criteria. Five analyses did not meet the specified acceptance criteria for the following reasons and were addressed through the TBE Corrective Action Program.

1. The ERA April 2017 two nuclides in water were evaluated as *Not Acceptable*. (NCR 17-09)
   a. The Zn-65 result of 39.3 pCi/L, exceeded the lower acceptance limit of 47.2. The known value was unusually low for this study. The sample was run in duplicate on two different detectors. The results of each were 39.3 ± 18.2 pCi/L (46% error and lower efficiency) and 59.3 ± 8.23 pCi/L (13.9% error and higher efficiency). The result from the 2nd detector would have been well within the acceptable range (47.2 – 65.9) and 110.2% of the known value of 53.8 pCi/L.

b. The Sr-89 result of 40.7 pCi/L exceeded the lower acceptance limit of 53.8. All associated QC and recoveries were reviewed and no apparent cause could be determined for the failure. The prior three cross-check results were from 99 – 115% of the known values and the one that followed this sample (November, 2017) was 114% of the known value.

2. The DOE MAPEP August 2017 air particulate U-238 result of 0.115 ± 0.025 Bq/sample was higher than the known value of 0.087 ± 0.002 with a ratio of 1.32, therefore the upper ratio of 1.30 (acceptable with warning) was exceeded. TBE's result with error easily overlaps with the acceptable range. MAPEP does not evaluate results with any associated error. Also, the spike level for this sample was very low (2.35 pCi) compared to TBE's normal LCS of 6 pCi. TBE considers this result as passing. (NCR 17-15)

3. The Analytics September 2017 soil Cr-51 result was evaluated as *Not Acceptable* (Ratio of TBE to known result at 0.65). The reported value was 0.230 ± 0.144 pCi/g and the known value was 0.355 ± 0.00592 pCi/g. The sample was counted overnight for 14 hours; however the Cr-51 was spiked at a very low level and had a counting error of 65%. Cr-51 has a 27-day half-life, making low-level quantification even more difficult. The error does not appear to have been taken into consideration for this result. If it had been evaluated with the error, the highest result would have been 105% of the reference value, which is acceptable. Also, the known value is significantly lower than TBE's typical MDC for this nuclide in a soil matrix and would typically not be reported to clients (unless specified). The results of all of the previous cross-checks have been in the acceptable (80 – 120%) range. TBE will evaluate further upon completion of the next ICP sample. (NCR 17-16)

4. The ERA November 2017 water Sr-90 sample was evaluated as *Not Acceptable*. TBE's result of 27.1 pCi/L exceeded the lower acceptance range (30.8 – 48.0 pCi/L). After reviewing the associated QC data for this sample, it was determined that although the spike recovery for Sr-90 was within our laboratory guidelines (70% -130%), both the spike result and our ERA result were biased low. The original cross-check sample was completely consumed and we were unable to reanalyze before submitting the result. We have modified our preparation process to avoid this situation for future cross-check samples. We also have enhanced LIMS programming to force a LCSD when a workgroup includes cross-check samples (as opposed to running a DUP).
(NCR 17-19)

The Inter-Laboratory Comparison Program provides evidence of "in control" counting systems and methods, and that the laboratories are producing accurate and reliable data.

Analytics Environmental Radioactivity Cross Check Program
Teledyne Brown Engineering Environmental Services

Month/Year	Identification Number	Matrix	Nuclide	Units	TBE Reported Value	Known Value[(a)]	Ratio of TBE to Analytics Result	Evaluation [(b)]
March 2017	E11811	Milk	Sr-89	pCi/L	87	97.7	0.89	A
			Sr-90	pCi/L	12.4	16.2	0.77	A
	E11812	Milk	Ce-141	pCi/L	135	145	0.93	A
			Co-58	pCi/L	153	150	1.02	A
			Co-60	pCi/L	182	183	1.00	A
			Cr-51	pCi/L	258	290	0.89	A
			Cs-134	pCi/L	104	120	0.87	A
			Cs-137	pCi/L	142	140	1.02	A
			Fe-59	pCi/L	135	129	1.05	A
			I-131	pCi/L	92.6	97.9	0.95	A
			Mn-54	pCi/L	173	164	1.05	A
			Zn-65	pCi/L	208	199	1.04	A
	E11813	Charcoal	I-131	pCi	92	93.9	0.98	A
	E11814	AP	Ce-141	pCi	99.9	101	0.99	A
			Co-58	pCi	95.4	104	0.92	A
			Co-60	pCi	140	127	1.10	A
			Cr-51	pCi	211	201	1.05	A
			Cs-134	pCi	82.1	83.2	0.99	A
			Cs-137	pCi	92.8	97.0	0.96	A
			Fe-59	pCi	107	89.3	1.20	A
			Mn-54	pCi	106	114	0.93	A
			Zn-65	pCi	137	138	0.99	A
	E11816	Soil	Ce-141	pCi/g	0.258	0.250	1.03	A
			Co-58	pCi/g	0.241	0.258	0.93	A
			Co-60	pCi/g	0.312	0.315	0.99	A
			Cr-51	pCi/g	0.439	0.500	0.88	A
			Cs-134	pCi/g	0.176	0.207	0.85	A
			Cs-137	pCi/g	0.304	0.317	0.96	A
			Fe-59	pCi/g	0.210	0.222	0.95	A
			Mn-54	pCi/g	0.292	0.283	1.03	A
			Zn-65	pCi/g	0.353	0.344	1.03	A
	E11815	Water	Fe-55	pCi/L	1600	1890	0.85	A

(a) The Analytics known value is equal to 100% of the parameter present in the standard as determined by gravimetric and/or volumetric measurements made during standard preparation.

(b) Analytics evaluation based on TBE internal QC limits:
A = Acceptable - reported result falls within ratio limits of 0.80-1.20
W = Acceptable with warning - reported result falls within 0.70-0.80 or 1.20-1.30
N = Not Acceptable - reported result falls outside the ratio limits of < 0.70 and > 1.30

Analytics Environmental Radioactivity Cross Check Program
Teledyne Brown Engineering Environmental Services

Month/Year	Identification Number	Matrix	Nuclide	Units	TBE Reported Value	Known Value [(a)]	Ratio of TBE to Analytics Result	Evaluation [(b)]
June 2017	E11844	Milk	Sr-89	pCi/L	81.3	92.6	0.88	A
			Sr-90	pCi/L	12.1	13.5	0.90	A
	E11846	Milk	Ce-141	pCi/L	142	151	0.94	A
			Co-58	pCi/L	147	155	0.95	A
			Co-60	pCi/L	185	191	0.97	A
			Cr-51	pCi/L	321	315	1.02	A
			Cs-134	pCi/L	168	188	0.89	A
			Cs-137	pCi/L	148	150	0.99	A
			Fe-59	pCi/L	116	115	1.01	A
			I-131	pCi/L	102	93.6	1.09	A
			Mn-54	pCi/L	168	172	0.98	A
			Zn-65	pCi/L	195	204	0.96	A
	E11847	Charcoal	I-131	pCi	87.9	84.8	1.04	A
	E11845	AP	Sr-89	pCi	70.8	79.1	0.90	A
			Sr-90	pCi	9.10	11.5	0.79	W
	E11848	AP	Ce-141	pCi	112	116	0.96	A
			Co-58	pCi	119	119	1.00	A
			Co-60	pCi	171	146	1.17	A
			Cr-51	pCi	270	241	1.12	A
			Cs-134	pCi	152	144	1.05	A
			Cs-137	pCi	114	115	0.99	A
			Fe-59	pCi	94.1	88.3	1.07	A
			Mn-54	pCi	139	132	1.06	A
			Zn-65	pCi	141	156	0.90	A
	E11849	Water	Fe-55	pCi/L	1840	1890	0.97	A
July 2017	E11901	AP	GR-A	pCi	50.1	44.2	1.13	A
			GR-B	pCi	218	233	0.93	A

(a) The Analytics known value is equal to 100% of the parameter present in the standard as determined by gravimetric and/or volumetric measurements made during standard preparation.

(b) Analytics evaluation based on TBE internal QC limits:
A = Acceptable - reported result falls within ratio limits of 0.80-1.20
W = Acceptable with warning - reported result falls within 0.70-0.80 or 1.20-1.30
N = Not Acceptable - reported result falls outside the ratio limits of < 0.70 and > 1.30

Analytics Environmental Radioactivity Cross Check Program
Teledyne Brown Engineering Environmental Services

Month/Year	Identification Number	Matrix	Nuclide	Units	TBE Reported Value	Known Value (a)	Ratio of TBE to Analytics Result	Evaluation (b)
September 2017	E11914	Milk	Sr-89	pCi/L	84.3	82.7	1.02	A
			Sr-90	pCi/L	12.6	12.1	1.04	A
	E11915	Milk	Ce-141	pCi/L	93.9	87.0	1.08	A
			Co-58	pCi/L	115	117	0.98	A
			Co-60	pCi/L	265	262	1.01	A
			Cr-51	pCi/L	273	217	1.26	W
			Cs-134	pCi/L	186	201	0.93	A
			Cs-137	pCi/L	175	172	1.02	A
			Fe-59	pCi/L	137	125	1.09	A
			I-131	pCi/L	78.0	71.0	1.10	A
			Mn-54	pCi/L	128	123	1.04	A
			Zn-65	pCi/L	206	184	1.12	A
	E11916	Charcoal	I-131	pCi	71.9	64.4	1.12	A
	E11917	AP	Ce-141	pCi	80.1	86.3	0.93	A
			Co-58	pCi	110	116	0.95	A
			Co-60	pCi	277	260	1.07	A
			Cr-51	pCi	275	215	1.28	W
			Cs-134	pCi	192	199	0.96	A
			Cs-137	pCi	165	170	0.97	A
			Fe-59	pCi	122	124	0.98	A
			Mn-54	pCi	120	122	0.99	A
			Zn-65	pCi	175	183	0.96	A
	E11918	Water	Fe-55	pCi/L	1630	1630	1.00	A
	E11919	Soil	Ce-141	pCi/g	0.136	0.142	0.96	A
			Co-58	pCi/g	0.179	0.191	0.94	A
			Co-60	pCi/g	0.405	0.429	0.94	A
			Cr-51	pCi/g	0.230	0.355	0.65	N (1)
			Cs-134	pCi/g	0.272	0.328	0.83	A
			Cs-137	pCi/g	0.336	0.356	0.94	A
			Fe-59	pCi/g	0.210	0.205	1.02	A
			Mn-54	pCi/g	0.210	0.201	1.05	A
			Zn-65	pCi/g	0.301	0.301	1.00	A

(a) The Analytics known value is equal to 100% of the parameter present in the standard as determined by gravimetric and/or volumetric measurements made during standard preparation.

(b) Analytics evaluation based on TBE internal QC limits:
A = Acceptable - reported result falls within ratio limits of 0.80-1.20
W = Acceptable with warning - reported result falls within 0.70-0.80 or 1.20-1.30
N = Not Acceptable - reported result falls outside the ratio limits of < 0.70 and > 1.30

(1) See NCR 17-16 (page B-3)

Analytics Environmental Radioactivity Cross Check Program
Teledyne Brown Engineering Environmental Services

Month/Year	Identification Number	Matrix	Nuclide	Units	TBE Reported Value	Known Value (a)	Ratio of TBE to Analytics Result	Evaluation (b)
December 2017	E12054	Milk	Sr-89	pCi/L	92.1	92.3	1.00	A
			Sr-90	**pCi/L**	**18.3**	**16.9**	**1.09**	**A**
	E12055	Milk	Ce-141	pCi/L	97.8	98.3	0.99	A
			Co-58	pCi/L	92.3	89.9	1.03	A
			Co-60	pCi/L	176	173	1.02	A
			Cr-51	pCi/L	226	242	0.93	A
			Cs-134	pCi/L	118	125	0.95	A
			Cs-137	pCi/L	148	141	1.05	A
			Fe-59	pCi/L	123	113	1.08	A
			I-131	pCi/L	66.0	57.8	1.14	A
			Mn-54	pCi/L	173	161	1.08	A
			Zn-65	pCi/L	233	211	1.10	A
	E12056	Charcoal	I-131	pCi	48.1	47.5	1.01	
	E12057A	AP	Ce-141	pCi	108	111	0.97	A
			Co-58	pCi	89.5	102	0.88	A
			Co-60	pCi	223	196	1.14	A
			Cr-51	pCi	311	274	1.13	A
			Cs-134	pCi	141	142	1.00	A
			Cs-137	pCi	162	160	1.01	A
			Fe-59	pCi	121	129	0.94	A
			Mn-54	pCi	177	182	0.97	A
			Zn-65	pCi	203	239	0.85	A
	E12058	Water	Fe-55	pCi/L	1970	1740	1.13	A
	E12059	AP	Sr-89	pCi	71.2	87.4	0.81	A
			Sr-90	pCi	12.9	16.0	0.81	A

(a) *The Analytics known value is equal to 100% of the parameter present in the standard as determined by gravimetric and/or volumetric measurements made during standard preparation*

(b) *Analytics evaluation based on TBE internal QC limits:*
A = Acceptable - reported result falls within ratio limits of 0.80-1.20
W = Acceptable with warning - reported result falls within 0.70-0.80 or 1.20-1.30
N = Not Acceptable - reported result falls outside the ratio limits of < 0.70 and > 1.30

DOE's Mixed Analyte Performance Evaluation Program (MAPEP)
Teledyne Brown Engineering Environmental Services

Month/Year	Identification Number	Matrix	Nuclide	Units	TBE Reported Value	Known Value [a]	Acceptance Range	Evaluation [b]
February 2017	17-MaS36	Soil	Ni-63	Bq/kg	-5.512		*(1)*	A
			Sr-90	Bq/kg	571	624	437 - 811	A
	17-MaW36	Water	Am-241	Bq/L	0.693	0.846	0.592 - 1.100	A
			Ni-63	Bq/L	13.4	12.2	8.5 - 15.9	A
			Pu-238	Bq/L	0.7217	0.703	0.492 - 0.914	A
			Pu-239/240	Bq/L	0.9277	0.934	0.654 - 1.214	A
	17-RdF36	AP	U-234/233	Bq/sample	0.0911	0.104	0.073 - 0.135	A
			U-238	Bq/sample	0.0967	0.107	0.075 - 0.139	A
	17-RdV36	Vegetation	Cs-134	Bq/sample	6.44	6.95	4.87 - 9.04	A
			Cs-137	Bq/sample	4.61	4.60	3.22 - 5.98	A
			Co-57	Bq/sample	-0.0229		*(1)*	A
			Co-60	Bq/sample	8.52	8.75	6.13 - 11.38	A
			Mn-54	Bq/sample	3.30	3.28	2.30 - 4.26	A
			Sr-90	Bq/sample	1.30	1.75	1.23 - 2.28	W
			Zn-65	Bq/sample	5.45	5.39	3.77 - 7.01	A
August 2017	17-MaS37	Soil	Ni-63	Bq/kg	1130	1220	854 - 1586	A
			Sr-90	Bq/kg	296	289	202 - 376	A
	17-MaW37	Water	Am-241	Bq/L	0.838	0.892	0.624 - 1.160	A
			Ni-63	Bq/L	-0.096		*(1)*	A
			Pu-238	Bq/L	0.572	0.603	0.422 - 0.784	A
			Pu-239/240	Bq/L	0.863	0.781	0.547 - 1.015	A
	17-RdF37	AP	U-234/233	Bq/sample	0.103	0.084	0.059 - 0.109	W
			U-238	Bq/sample	0.115	0.087	0.061 - 0.113	N (2)
	17-RdV37	Vegetation	Cs-134	Bq/sample	2.34	2.32	1.62 - 3.02	A
			Cs-137	Bq/sample	0.05		*(1)*	A
			Co-57	Bq/sample	3.32	2.8	2.0 - 3.6	A
			Co-60	Bq/sample	2.09	2.07	1.45 - 2.69	A
			Mn-54	Bq/sample	2.90	2.62	1.83 - 3.41	A
			Sr-90	Bq/sample	1.17	1.23	0.86 - 1.60	A
			Zn-65	Bq/sample	6.07	5.37	3.76 - 6.98	A

(a) The MAPEP known value is equal to 100% of the parameter present in the standard as determined by gravimetric and/or volumetric measurements made during standard preparation.

(b) DOE/MAPEP evaluation:
A = Acceptable - reported result falls within ratio limits of 0.80-1.20
W = Acceptable with warning - reported result falls within 0.70-0.80 or 1.20-1.30
N = Not Acceptable - reported result falls outside the ratio limits of < 0.70 and > 1.30

(1) False positive test
(2) See NCR 17-15 (page B-3)

ERA Environmental Radioactivity Cross Check Program
Teledyne Brown Engineering Environmental Services

Month/Year	Identification Number	Matrix	Nuclide	Units	TBE Reported Value	Known Value [(a)]	Acceptance Limits	Evaluation [(b)]
March 2017	MRAD-26	AP	GR-A	pCi/sample	76.3	85.5	28.6 - 133	A
April 2017	RAD-109	Water	Ba-133	pCi/L	49.2	49.7	40.8 - 55.1	A
			Cs-134	pCi/L	83.2	90.1	74.0 - 99.1	A
			Cs-137	pCi/L	202	206	185 - 228	A
			Co-60	pCi/L	51.2	54.7	49.2 - 62.7	A
			Zn-65	pCi/L	39.3	53.8	47.2 - 65.9	N (1)
			GR-A	pCi/L	53.6	75.0	39.5 - 92.3	A
			GR-B	pCi/L	42.7	38.5	25.5 - 46.0	A
			U-Nat	pCi/L	50.1	55.6	45.2 - 61.7	A
			H-3	pCi/L	7080	6850	5920 - 7540	A
			Sr-89	pCi/L	40.7	66.2	53.8 - 74.3	N (1)
			Sr-90	pCi/L	26.9	26.7	19.3 - 31.1	A
			I-131	pCi/L	26.7	29.9	24.9 - 34.9	A
September 2017	MRAD-27	AP	GR-A	pCi/sample	40.9	50.1	16.8 - 77.8	A
		AP	GR-B	pCi/sample	58.0	61.8	39.1 - 90.1	A
October 2017	RAD-111	Water	Ba-133	pCi/L	71.3	73.7	61.7 - 81.1	A
			Cs-134	pCi/L	43.0	53.0	42.8 - 58.3	A
			Cs-137	pCi/L	48.2	52.9	47.6 - 61.1	A
			Co-60	pCi/L	69.0	69.5	62.6 - 78.9	A
			Zn-65	pCi/L	335	348	313 - 406	A
			GR-A	pCi/L	32.5	35.6	18.3 - 45.8	A
			GR-B	pCi/L	24.3	25.6	16.0 - 33.6	A
			U-Nat	pCi/L	36.6	37.0	30.0 - 40.9	A
			H-3	pCi/L	6270	6250	5390 - 6880	A
			I-131	pCi/L	26.4	24.2	20.1 - 28.7	A
November 2017	111317O	Water	Sr-89	pCi/L	57.1	50.0	39.4 - 57.5	A
			Sr-90	pCi/L	27.1	41.8	30.8 - 48.0	N (2)

(a) The ERA known value is equal to 100% of the parameter present in the standard as determined by gravimetric and/or volumetric measurements made during standard preparation.

(b) ERA evaluation:
A = Acceptable - Reported value falls within the Acceptance Limits
N = Not Acceptable - Reported value falls outside of the Acceptance Limits

(1) See NCR 17-09 (page B-2)
(2) See NCR 17-19 (page B-3)

APPENDIX C

ERRATUM

Erratum- Correction to the 2016 Annual Radiological Environmental Operating Report

Replace entire Section 4.10 of the 2016 report with the following:

4.10 Seawater (Table 10)

The guidance in Reference 15 specifies one sample upstream (control – beyond significant influence of the discharge) and one sample downstream (indicator – beyond but near the mixing zone) for surface water samples. Historically the downstream sample for MPS has been located in the vicinity of discharge (Location 32) which is prior to the mixing zone. This location was chosen since it was readily accessible and not affected by cold weather conditions. Operation of an automatic sampler at the indicator location is necessary for providing a representative sample. Any dose consequences can be assessed by use of the appropriate dilution factors. It's not necessary to have a continuous sampler at the control location due to the historical relative consistency noted in seawater background activity near the Millstone.

A technician collects an aliquot from the automatic sampler at Location 32 on a weekly frequency. These samples are composited for monthly analyses. For the Control Location, Giant's Neck (Location 37C), six weekly grab samples are obtained for quarterly compositing.

Naturally occurring K-40 was the only detectable gamma activity seen in these samples. Measured station related levels of H-3 in seawater from the vicinity of discharge (Location 32) were observed in most samples. Tritium releases are typically higher near outages due to the need for increased liquid processing during these times. As mentioned above, these samples are taken directly from liquid effluent flow prior to dilution into the Long Island Sound.

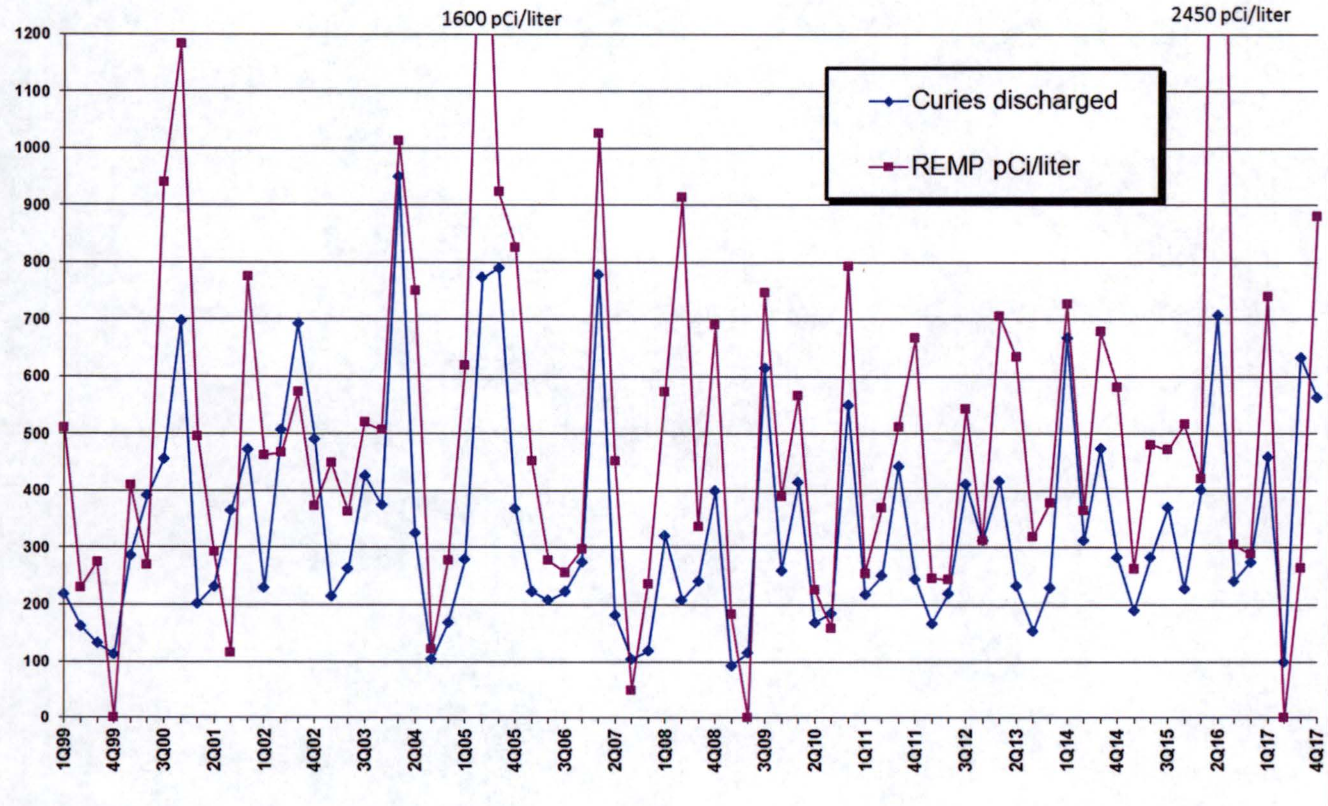
Tritium builds up in the reactor coolant during each fuel cycle. It is generated during station operation from fission and neutron reactions. Between 1992 and 2002, H-3 was not typically detected. However, due to the enhanced detection sensitivity, H-3 levels are now often detected at the indicator location. Figure 4.10-1 shows an eighteen-year trend of H-3 releases in the MPS liquid effluents versus the measured environmental concentrations from the vicinity of discharge location. The high REMP sample results during the second quarter of 2016 occurred during the MPS3 outage when circulating water pumps were turned off. Tritium concentrations in the MPS Quarry were elevated because of less dilution flow during that period. Increase in dose during the time of higher tritium concentrations was not significant. The table below shows quarterly doses from release of radioactivity in liquid effluents from MPS3 during 2016.

MPS3	*1st Quarter*	*2nd Quarter*	*3rd Quarter*	*4th Quarter*	*Annual Total*
Max Individual	(mrem)	(mrem)	(mrem)	(mrem)	(mrem)
Whole Body	2.65E-04	5.26E-04	3.17E-04	2.46E-04	1.35E-03
Thyroid	2.12E-04	4.77E-04	6.40E-05	2.46E-04	9.99E-04
Max Organ[1]	4.73E-04	6.11E-04	1.68E-03	2.46E-04	2.37E-03

Whole body and thyroid doses were higher in the second quarter than the other three quarters by factors of about two to eight. Max organ dose in the second quarter was lower than the third quarter dose by a factor of about three and higher than the doses in the other two quarters by factors of 1.3 and 2.5. Despite an increase in dose for eight of nine doses in other quarters the second quarter increase was still a small fraction of the quarterly dose limits.

The quarterly dose limits are 1.5 mrem for whole body and 5 mrem for any organ, including the thyroid. Whole body dose in the second quarter was less than 0.04% of the limit, thyroid dose in the second quarter was less than 0.01% of the limit and max organ dose in the second quarter was less than 0.02% of the limit

Figure 4.10-1
H-3 Curies Released versus Seawater Concentration
18 Year Trend



4. DISCUSSION OF RESULTS

This section summarizes the results of the analyses on the REMP samples. The only case where station related radioactivity was detected was tritium (H-3) in seawater collected at the quarry discharge point. This was within the station boundary. The naturally occurring nuclides of Be-7, K-40, and Ac-228 were detected in some samples. Be-7 is from cosmic radiation. It was observed in air and broadleaf vegetation and in some fucus samples. K-40 and Ac-228 are two common terrestrial isotopes. K-40 was not seen in air or well water samples but was observed in almost every other type of sample. Ac-228 was observed in one sediment and two soil samples. Cs-137 and Sr-90 from atmospheric nuclear weapons testing in the 1960's have been observed in the past. A study by the Connecticut Department of Energy and Environmental Protection in 2006 affirmed that radioactivity from nuclear weapons testing has decreased to almost non-detectable levels (Reference 19). Since 2006 detection of Cs-137 and Sr-90 in environmental samples has been rare. During 2016, Cs-137 was detected in one soil sample and Sr-90 was not detected.

4.1 Gamma Exposure Rate (Table 1)

Gamma exposure rate is determined from the integrated exposure measured over a calendar quarter using TLDs. Prior to 1990, Victoreen CaF2(Mn) glass bulb dosimeters were used for these measurements. In 1990, these were replaced by Harshaw CaF2(Mn) chips. In 2000, the CaF2(Mn) TLDs, were replaced with the CaSO4(Tm) Panasonic model UD-804 ASx TLDs. Readings are recorded as uR/hr. The unit uR stands for 'micro-roentgen' with a 'micro' being one-millionth of a roentgen. A roentgen is the quantity of radiation equal to 87.6 ergs of energy per gram of air. For gamma exposure a micro-roentgen is equivalent to a micro-rem, a measure of dose to man.

The dosimeters are strategically placed at a number of onsite locations, as well as at inner and outer offsite locations. Starting in 2001, the collection of TLDs was changed from monthly to quarterly and additional measurement locations were incorporated into the REMP requirements listed in the REMODCM (Reference 8). Three more locations (73-75) were added in mid-2003 to prepare for monitoring the potential effect from the ISFSI. Two Dry Cask Containers were loaded in the first quarter 2005. Three containers were loaded in 2006, three in 2007, three in 2009, three in 2010, seven in 2015, and six in 2016. None were loaded in 2008, from 2011, and 2014. The exposure rate measurements at two of the three additional TLD locations remain basically unchanged from the background measurements performed prior to any cask loading (six quarter background average mid 2003 – 2004: 9.5 uR/hour at Location 73, 7.5 uR/hour at Location 74 and 6.9 uR/hour at Location 75). At Location 73 the readings have been lower since the fourth quarter of 2012, averaging 7.7 μR/hr.