Dominion Nuclear Connecticut, Inc.
Rope Ferry Rd., Waterford, CT 06385

Mailing Address: P.O. Box 128
Waterford, CT 06385

dom.com

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U.S. Nuclear Regulatory Commission
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Docket Nos.	50-245
	50-336
	50-423
License Nos.	DPR-21
	DPR-65
	NPF-49

DOMINION NUCLEAR CONNECTICUT, INC.
MILLSTONE POWER STATION UNITS 1, 2, AND 3
2015 ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

This letter transmits the Annual Radiological Environmental Operating Report for the Millstone Power Station, for the period January 2015 through December 2015. 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. Thomas G. Cleary at (860) 444-4377.

Sincerely,

Brandford L. Stanley

Director, Nuclear Station Safety and Licensing

IE25
NRR

Attachments: 1

Commitments made in this letter:

1. None.

cc: U. S. Nuclear Regulatory Commission
Region I
2100 Renaissance Blvd, Suite 100
King of Prussia, PA 19406-2713

S. J. Giebel
NRC Project Manager Millstone Unit 1
U.S. Nuclear Regulatory Commission
Two White Flint North, Mail Stop T-8 F5
11545 Rockville Pike
Rockville, MD 20852-2738

L. A. Kauffman
NRC Inspector
U.S. Nuclear Regulatory Commission
Region I
2100 Renaissance Blvd, Suite 100
King of Prussia, PA 19406-2713

H. W Anagnostopoulos
NRC Inspector
U.S. Nuclear Regulatory Commission
Region I
2100 Renaissance Blvd, Suite 100
King of Prussia, PA 19406-2713

R. V. Guzman
NRC Project Manager Millstone Units 2 and 3
U.S. Nuclear Regulatory Commission
One White Flint North, Mail Stop 08 C2
11555 Rockville Pike
Rockville, MD 20852-2738

NRC Senior Resident Inspector
Millstone Power Station

(2copies)
Director
Bureau of Air Management
Monitoring & Radiation Division
Department of Energy and Environmental Protection
79 Elm Street
Hartford, CT 06106-5127

Regional Radiation Representative
(EPA Region 1, Boston)
U. S. Environmental Protection Agency (Region 1)
5 Post Office Square Suite 100
Boston, MA 02109

Regional Representative
Department of Health and Human Services
U. S. Food and Drug Administration
90 Madison St. Room 402
Worcester, MA 01608

R. Stein
Chairman Connecticut Siting Council
10 Franklin Square
New Britain, CT 06051

Chairman
Waterford-East Lyme Shellfish Commission
Waterford Town Hall
Waterford, CT 06385

S. Brietmaier
American Nuclear Insurers
95 Glastonbury Blvd.
Glastonbury, CT 06033

D. Carey
Connecticut Department of Agriculture
Aquaculture Division
P. O. Box 97
Millford, CT 06460

D. Steward
First Selectman Town of Waterford
Waterford Town Hall
Waterford, CT 06385

M. C. Nickerson
First Selectman Town of East Lyme
PO Box 519
Niantic, CT 06357

University Of Connecticut Library
Serials Department
Storrs, CT 06268

Mrs. John Mingo
69 Spithead Road
Waterford, CT 06385

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ATTACHMENT 1

2015 ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

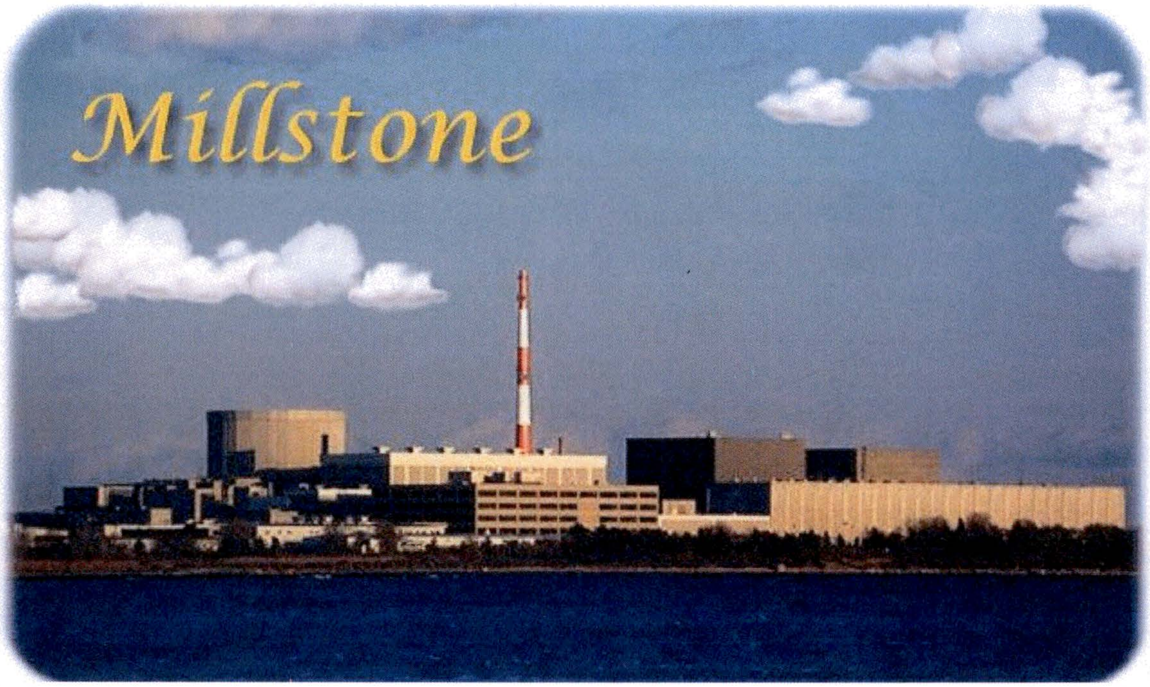
MILLSTONE POWER STATION UNITS 1, 2, AND 3
DOMINION NUCLEAR CONNECTICUT, INC. (DNC)

Millstone Power Station

2015

Radiological Environmental Operating Report

January 1, 2015 – December 31, 2015



Dominion Nuclear Connecticut, Inc.

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

Dominion

ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

MILLSTONE POWER STATION

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

2015

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

~ *TABLE OF CONTENTS* ~

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 (Millstone) during the period from January 1 to December 31, 2015. This document has been prepared in accordance with the requirements of the separate Technical Specifications for Millstone Units 1, 2 and 3.

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

SAMPLING AND ANALYSIS

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

During 2015, there were 721 samples collected from the atmospheric, aquatic, and terrestrial environments. In addition, 176 exposure measurements were obtained using environmental thermoluminescent dosimeters (TLDs). A discussion of all discrepancies from the sample collection requirements in the Millstone 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 Millstone was conducted as required by the Millstone 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. 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 2015 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. Goat locations are more difficult to determine, but best efforts are made by reviewing membership list of the American Dairy Goat Association records, contacting previous owners and, if necessary, performing visual drive-by inspections.

RADIOLOGICAL IMPACT TO THE ENVIRONMENT

The radioactivity detected in some samples was from non-station related sources, such as fallout from past nuclear weapons tests and naturally occurring radionuclides.

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

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 45 and 95 milliRoentgens 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 2015, 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 Millstone operations for 2015 was approximately 0.25 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 2015 REMP for Millstone resulted in the collection and analysis of 897 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. Furthermore, radiation levels and resulting doses from station operation were a small fraction of those attributed to natural 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 Millstone 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 2015 performed by Dominion Nuclear Connecticut (DNC) for Millstone 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 Millstone Unit 1, section 6.9.1.6A for Millstone Unit 2 and Section 6.9.1.3 for Millstone Unit 3), summarizes the results of measurements of radiation and radioactivity in the environment in the vicinity of Millstone and at distant locations during the period January 1 to December 31, 2015.

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 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 Millstone 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 (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

Millstone generates about 2100 megawatts of electricity at full power, which provides approximately one-third of the power consumed in the State of Connecticut. Millstone Unit 2 and Millstone Unit 3 are pressurized water reactors (Millstone Unit 1, 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 Millstone Unit 2 began in December 1975 and Millstone Unit 3 in May 1986.

Millstone was operational during most of 2015, with the exception of a refueling outage at Millstone Unit 2 in October. The annual capacity factor for Millstone Unit 2 was 88.7% and for Millstone Unit 3 was 100.5%.

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 Millstone 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

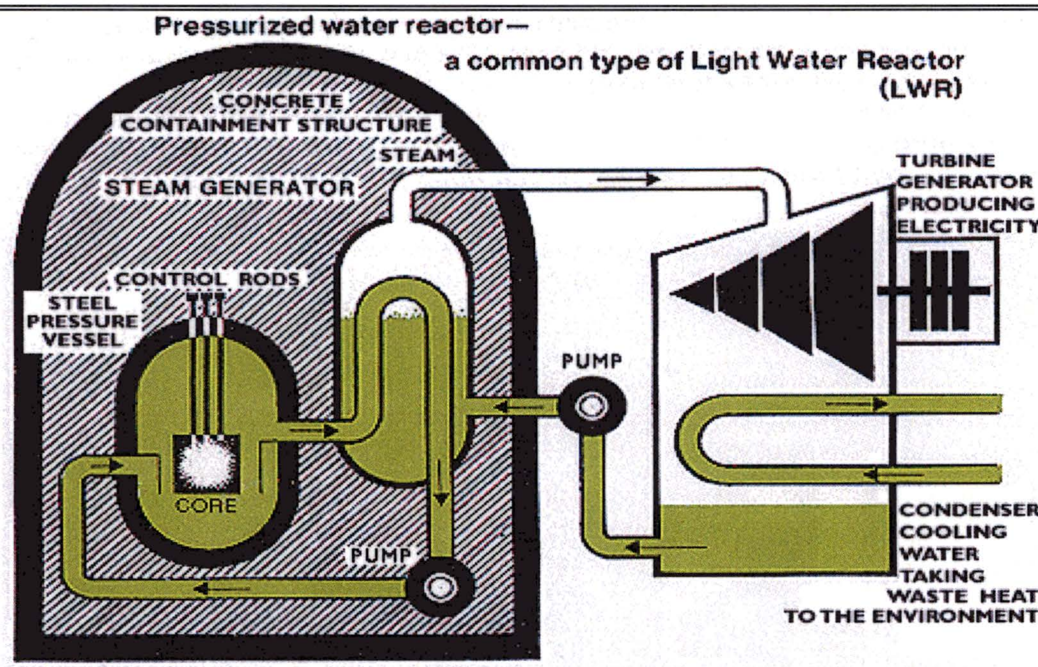


Figure 1.4-1

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).

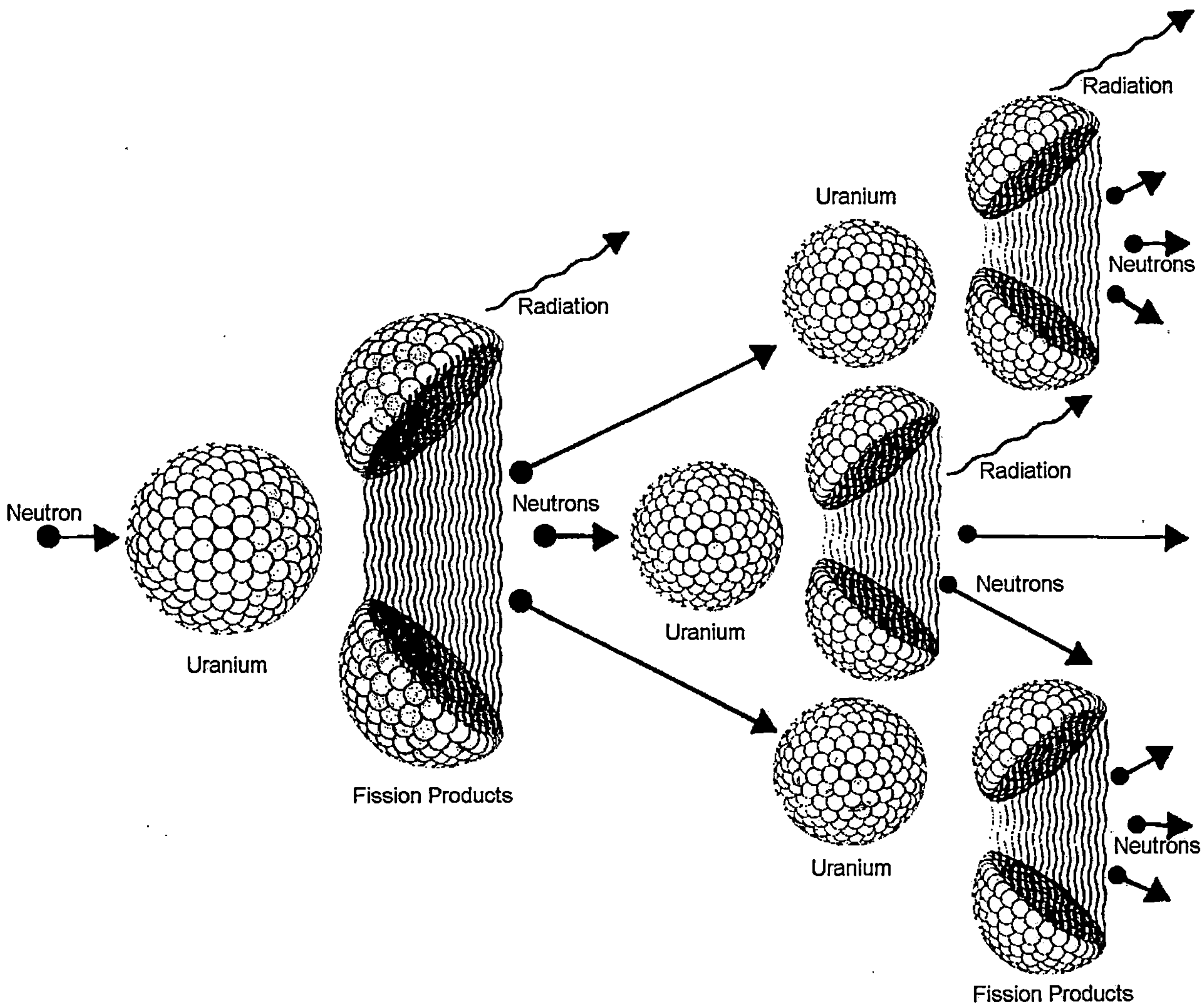


Figure 1.4-2
Radioactive Fission Product Formation

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).

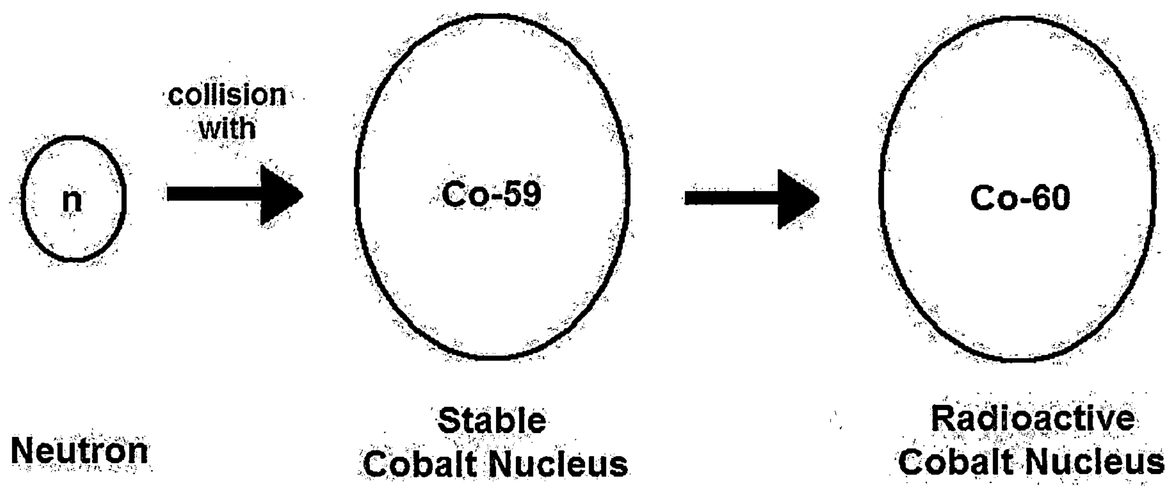


Figure 1.4-3
Radioactive Activation Product Formation

At Millstone 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 Millstone 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 radwaste treatment system;
- sampling and analysis of the liquid radwaste 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 portion 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 radwaste 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 radwaste treatment can be purified and, in some cases, re-used in station systems.

Prior to release, the radioactivity in any liquid radwaste 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. The liquid effluent discharge header has an isolation valve. If an alarm is received, the liquid effluent discharge valve will automatically close, thereby terminating the release to the environment and preventing any liquid radioactivity from being released that may exceed the release 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 Millstone Unit 3) ventilation system;
- Millstone station stack and units' vent effluent radioactivity monitors;
- sampling and analysis of Millstone station 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, Millstone station 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 Millstone Unit 2. Gaseous waste at Millstone Unit 3 is purified through a process gas system, consisting of high-efficiency particulate air filters and charcoal adsorber beds. Gases from periodic venting of the Millstone Unit 2 containment are released through a similar process system (Enclosure Building Filtration System) while gases from the Millstone Unit 3 containment vacuum pumps are released without treatment. If necessary, Millstone Unit 3 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 Millstone Unit 2 are filtered by high-efficiency particulate filters while at Millstone Unit 3 these are not normally filtered. If necessary, particulate and charcoal filters can be used for these purges.

Normally, for Unit 2, the air released from the unit vent is from the ventilation of the auxiliary (which includes the fuel pool), service and enclosure buildings. For Unit 2, fuel pool and enclosure building ventilation can be redirected to the Millstone Site Stack. Normally, for Unit 3, the air released from the unit vent is from the ventilation of the auxiliary, fuel, service, waste disposal and enclosure buildings. For Unit 3, enclosure building ventilation can be redirected to the Millstone 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 Millstone'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 Millstone 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 Millstone 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 Millstone 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 Millstone's RADIATION EXPOSURE PATHWAYS

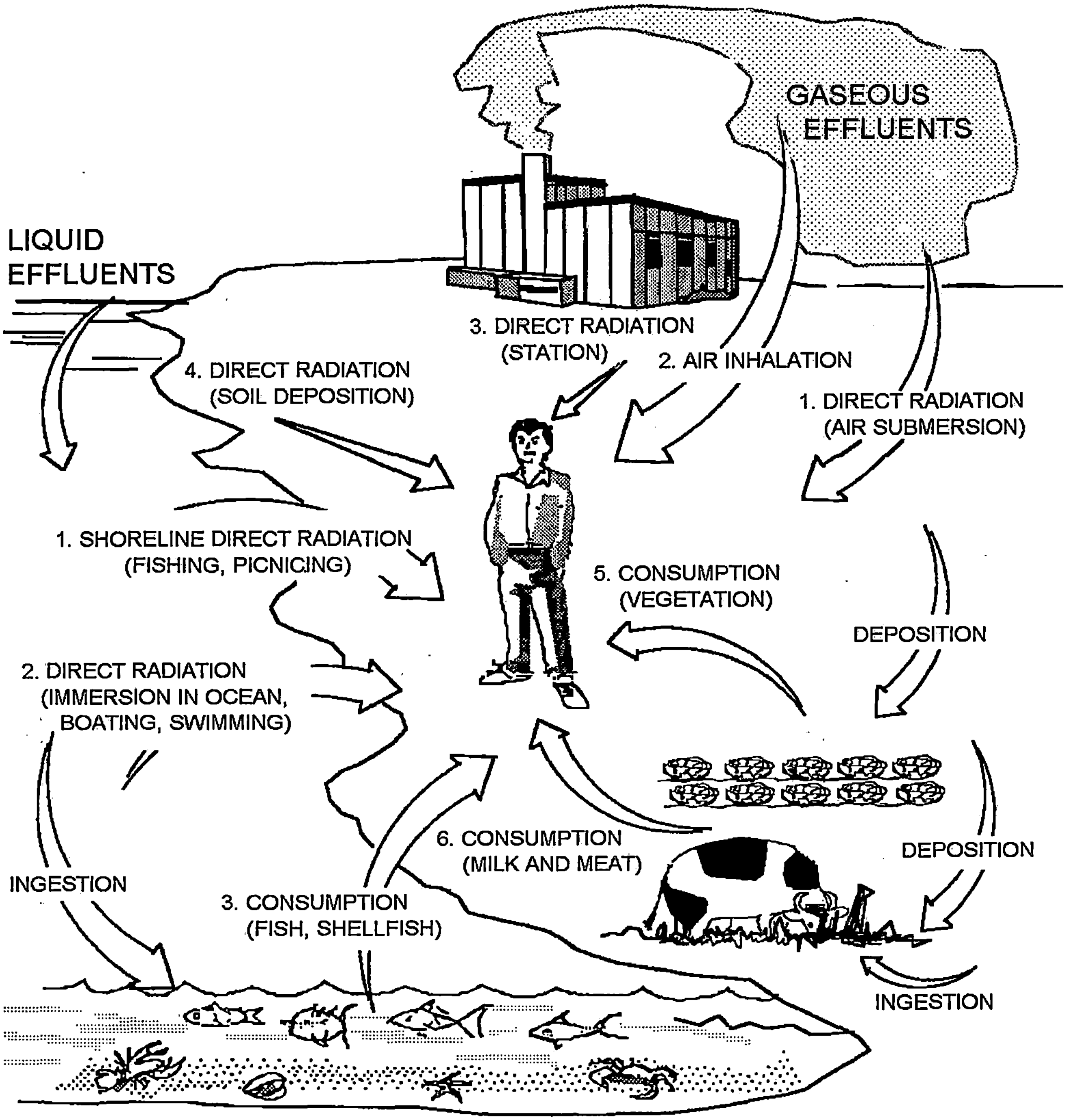


Figure 1.6
Radiation Exposure Pathways

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 five major ways in which gaseous effluents affect humans:

- external radiation from immersion in an 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.

Ambient (direct) radiation emitted from sources of radioactivity at Millstone 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 Millstone 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 because of 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 Millstone (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 Millstone 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[1]	Location Name	Distance, Direction From Release Point[2]	Sample Media
1-I	Onsite - Old Millstone Rd.	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 - MP3 Discharge	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	Pleasure Beach	1.2 Mi, E	TLD, Air Particulate, Iodine, Vegetation
11-I	Great Neck Country Club	1.6 Mi, ENE	TLD, Air Particulate, Iodine
12-X	Fisher's Island, NY	8.0 Mi, ESE	TLD
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	8.8 Mi, W	TLD
17-I	Site Boundary	0.5 Mi, NE	Vegetation
22-X	Cow	10.5 Mi, WNW	Milk
25-I	Within 10 Miles	< 10 Miles	Vegetation
25-X	Within 10 Miles	< 10 Miles	Fruits and/or Vegetables[3]
26-C	Beyond 10 Miles	> 10 Miles	Vegetation
26-X	Beyond 10 Miles	> 10 Miles	Fruits and/or Vegetables[3]
27-I	Niantic	1.7 Mi, WNW	TLD, Air Particulate, Iodine
28-I	Two Tree Island	0.8 Mi, SSE	Fish[4]
29-I	West Jordan Cove	0.4 Mi, ENE-ESE	Clams, Fish[4]
29-X	West Jordan Cove	0.4 Mi, NNE	Fucus
31-I	Niantic Shoals	1.8 Mi, NW	Bottom Sediment, Oysters
32-I	Vicinity of Discharge	< 0.1 Mi	Bottom Sediment, Oysters, Fish[4], Seawater
32-X	Vicinity of Discharge	< 0.1 Mi	Fucus
33-I	Seaside Point	1.8 Mi, ESE	Bottom Sediment
35-I	Niantic Bay	<0.5 Mi, SSW-W	Lobster, Fish[4]
35-X	Niantic Bay	0.3 Mi, WNW	Fucus
36-X	Black Point	3.0 Mi, WSW	Fucus
37-C	Giant's Neck	3.5 Mi, WSW	Bottom Sediment, Oysters, Seawater
38-I	Waterford Shellfish Bed #1	1.0 Mi, NW	Clams
41-I	Myrock Avenue	3.2 Mi, ENE	TLD
42-I	Billow Road	2.4 Mi, WSW	TLD
43-I	Black Point	2.6 Mi, SW	TLD
44-I	Onsite – Schoolhouse	0.1 Mi, NNE	TLD
45-I	Onsite - Access Road	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

No.-Type[1]	Location Name	Distance, Direction From Release Point[2]	Sample Media
48-I	East Lyme - Corey Rd.	3.4 Mi, WNW	TLD
49-I	East Lyme - Society Rd.	3.6 Mi, NW	TLD
50-I	East Lyme - Manwaring Rd.	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 - 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	4.0 Mi, N	TLD
61-I	Waterford - Boston Post Rd.	4.3 Mi, NNW	TLD
62-I	East Lyme - Columbus Ave.	1.9 Mi, WNW	TLD
63-I	Waterford - Jordon Cove Rd.	0.8 Mi, NE	TLD
64-I	Waterford - Shore Rd.	1.1 Mi, ENE	TLD
65-I	Waterford - Bank St.	3.2 Mi, NE	TLD
66-X	NAP Parking Lot - Fit Center	0.4 Mi, NW	TLD
71-I	1-MW-XFMR-03 [5]	Onsite	Well Water
72-I	MW-GPI-1 [5]	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 5	Onsite	Well Water
81-I	S2-MW-1 5	Onsite	Well Water
82-I	MW-6B 5	Onsite	Well Water
83-I	S3-MW-2 5	Onsite	Well Water
88-I	DEEP Dock	0.2 Mi, WNW	Oysters
89-C	Aquatic background	>4 Mi of discharge	Lobster
90-X	Thames River	4 Mi, E	Fucus

Footnotes:
1. Key: I - Indicator C - Control X - Extra - sample not required by the REMODCM
2. Release points are the Millstone station stack for terrestrial locations and the quarry cut for aquatic locations.
3. A fruit or vegetable sample may count as a required vegetation sample.
4. Fish required to be sampled at Location #35 and from one of three other locations (#28, #29 or #32).
5. Any onsite well may be substituted.

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.	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.
6.	Well Water	6	Semiannual	Gamma Isotopic and Tritium on each sample
7.	Bottom Sediment	5	Semiannual	Gamma Isotopic on each sample
8.	Soil	3	Annually	Gamma Isotopic on each sample
9.	Fin Fish (edible portion)	2	Quarterly	Gamma Isotopic on each sample
10.	Oysters (edible portion)	4	Quarterly	Gamma Isotopic on each sample
11.	Clams (edible portion)	2	Quarterly	Gamma Isotopic on each sample
12.	Lobster (edible portion)	2	Quarterly	Gamma Isotopic on each sample

Footnotes
1. Two or more TLDs or TLD with two or more elements per location.

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

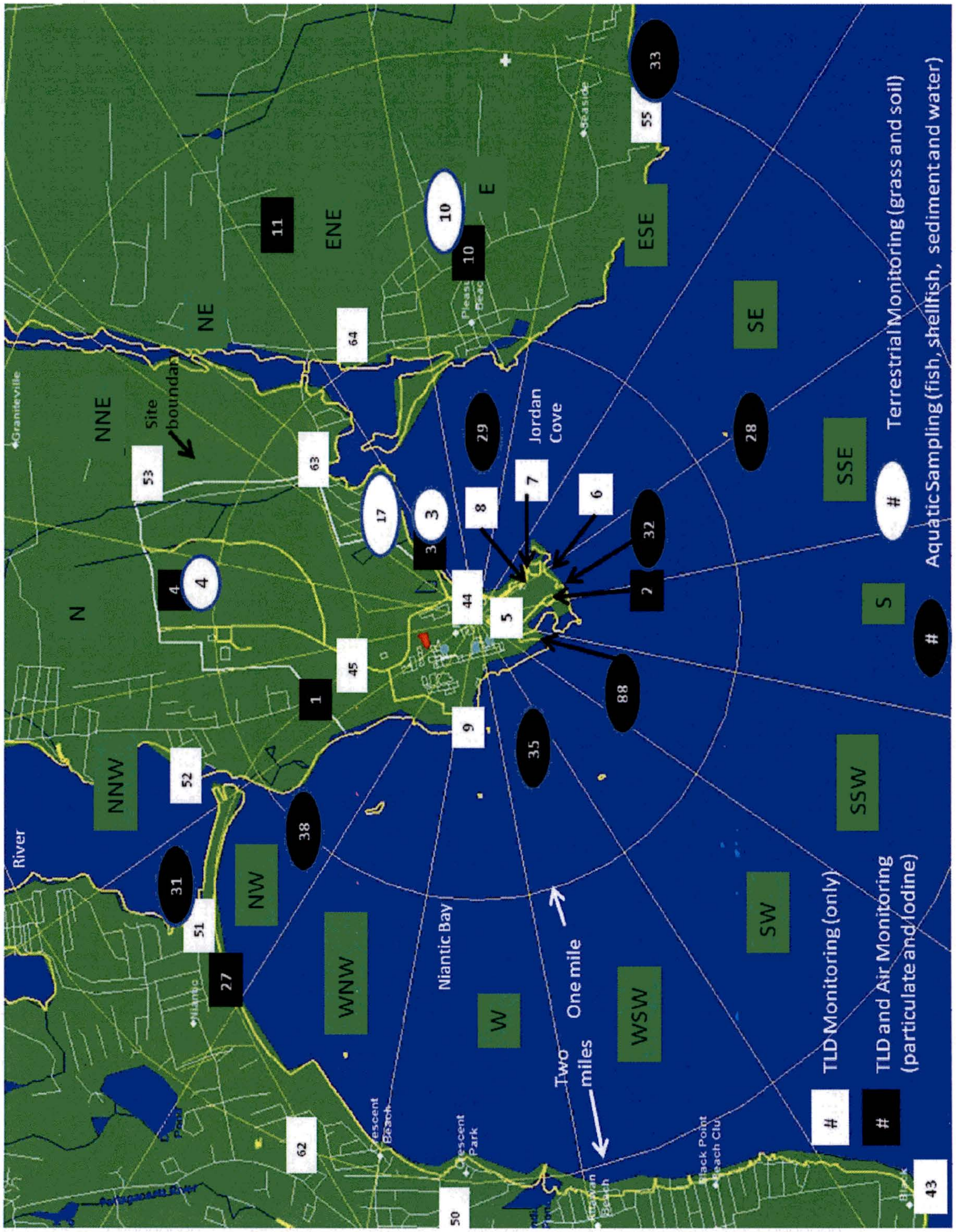
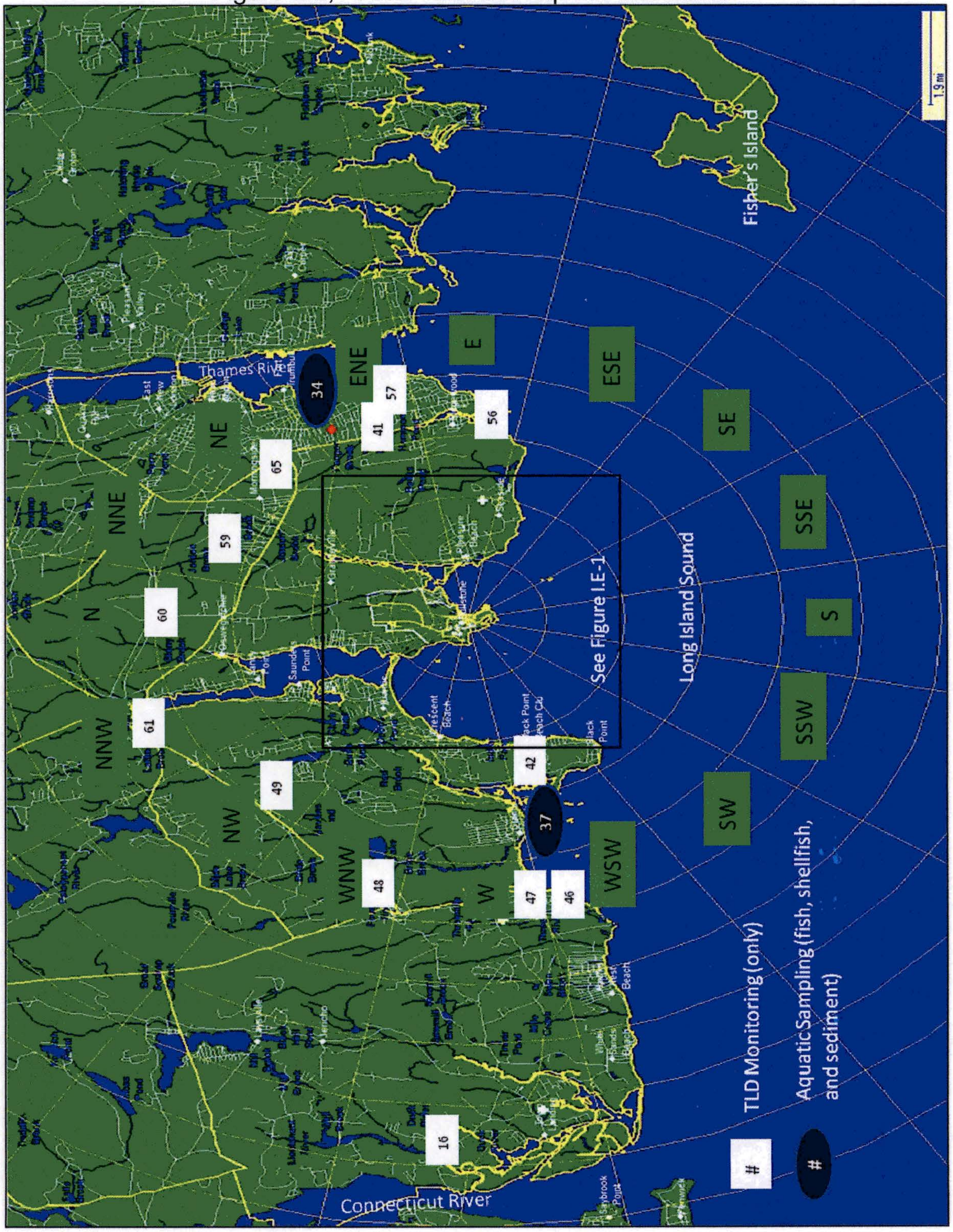


Figure 2.2, "Outer TLD and Aquatic Locations"



2.2 Samples Collected During Report Period

The following table summarizes the number of samples of each type collected and analyzed during 2015:

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	156	20
Air Particulates	208	208	0
Air Iodine	208	208	0
Soil	3	3	0
Cow Milk	0	0	18
Well Water	12	12	15
Fruits & Vegetables	4	4	5
Broadleaf vegetation	8	8	0
Sea Water	16	16	0
Bottom Sediment	10	10	0
Aquatic Flora	0	0	20
Fish	8	7[1]	0
Oysters	16	16	0
Clams	8	7[1]	0
Lobster	8	8	0
Total All Types	**665**	663	78

1 Due to sample unavailability, not all required fish and clam samples could be obtained.

2.3 Required Samples Not Collected During the Report Period

During 2015 there were two required samples not collected - one fish and one clam sample. Also, one oyster sample was collected late with less than a full sample period of collection.

During the first quarter of 2015 repeated attempts to collect fish in Niantic Bay and clams in Waterford Shellfish Bed were unsuccessful.

The fourth quarter oyster sample at Giant's Neck (Location #37), the control location, was collected late on January 15, 2016. Oysters are stocked in trays and the trays are placed at sampling areas for 30 to 50 days before sample collection. At the normal sample date in mid-December it was discovered that the oysters at Giant's Neck had been stolen. The oysters were replaced and they remained in location for the procedurally required minimum of 30 days. Thus, the 4th quarter sample result actually represents a sample period of the end of December and the beginning of January.

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 2015

Medium or Pathway Sampled (Units)	Analysis Type	Total Number	LLD Note 1	Indicator Locations Mean (Range)	Location with Highest Mean Number	Distance Direction	Mean (Range)	Control Locations Mean (Range)
Direct Radiation *TLD (uR/hr)*	**Gamma Dose**	176	NA	7.6 (4.4 - 11.9)	8	0.3 Mi. SE	10.8 (9.6 - 11.6)	7.5 (5.9 - 9.4)
Air Iodine *(pCi/m³)*	**I-131**	208	0.07	<LLD	NA	NA	<LLD	<LLD
Air Particulate *(pCi/m³)*	**GR-B**	208	0.01	0.0137 (0.0042 - 0.023)	1	0.6 Mi. NNW	0.0145 (0.0069 - 0.0226)	0.0139 (0.0067 - 0.021)
	GAMMA	32						
	BE-7		NA	0.0142 (0.084 - 0.820)	2	0.3 Mi. S	0.281 (0.096 - 0.820)	0.117 (0.072 - 0.143)
	Other Gammas		Note 2	<LLD	NA	NA	<LLD	<LLD
Soil *(pCi/g dry)*	**GAMMA**	3						
	K-40		NA	14.0 (13.1 - 15.1)	4	1.0 Mi. N	15.1 One sample	13.8 One sample
	CS-137		0.18	0.34 (0.17 - 0.52)	4	1.0 Mi. N	0.52 One sample	0.34 One sample
	Other Gammas		Note 3	<LLD	NA	NA	<LLD	<LLD
Milk *(pCi/l)*	**SR-89**	4	10	<LLD	NA	NA	<LLD	NA
	SR-90	4	2	<LLD	NA	NA	<LLD	NA
	GAMMA	18						
	K-40		NA	1261 (1102 - 1379)	22	10.3 Mi. WNW	1261 (1102 - 1379)	NA
	Other Gammas		Note 4	<LLD	NA	NA	<LLD	NA

RADIOLOCIAL ENVIRONMENT MONITORING PROGRAM SUMMARY
MILLSTONE POWER STATION
Dockets 50-245, 50-336 & 50-423 2015

Medium or Pathway Sampled (Units)	Analysis Type	Total Number	LLD Note 1	Indicator Locations Mean (Range)	Location with Highest Mean Number	Location with Highest Mean Distance Direction	Location with Highest Mean Mean (Range)	Control Locations Mean (Range)
Well Water *(pCi/l)*	**H-3**	27	2000	<LLD	NA	NA	<LLD	NA
	GAMMA	27						
	K-40		NA	103 - Note 5 (91 - 127)	78	Down-gradient of ISFSI	127 One sample	NA
	Other Gammas		Note 6	<LLD	NA	NA	<LLD	NA
Fruits & Vegetables (pCi/g wet)	**GAMMA**	9						
	K-40		NA	1.629 (0.809 - 2.069)	26	Beyond 10 miles	1.747 (0.803 - 3.199)	1.747 (0.803 - 3.199)
	Other Gammas		Note 7	<LLD	NA	NA	<LLD	<LLD
Broad Leaf Vegetation *(pCi/g wet)*	**GAMMA**	8						
	BE-7		NA	0.719 (0.485 - 0.959)	1	0.6 Mi. NNW	0.884 (0.808 - 0.959)	1.032 - Note 8 (1.021 - 1.42)
	K-40		NA	4.275 (2.840 - 7.607)	10	1.2 Mi. E	5.596 (3.584 - 7.607)	3.533 (3.261 - 3.805)
	Other Gammas		Note 9	<LLD	NA	NA	<LLD	<LLD
Sea Water *(pCi/l)*	**H-3**	16	NA	530 - Note 10 (205 - 1190)	32	Onsite	530 - Note 10 (205 - 1190)	<LLD
	GAMMA	16						
	K-40		NA	317 - Note 11 (238 - 448)	32	Onsite	317 - Note 11 (238 - 448)	282 (203 - 370)
	Other Gammas		Note 6	<LLD	NA	NA	<LLD	<LLD
Bottom Sediment *(pCi/g dry)*	**GAMMA**	10						
	K-40		NA	15.5 (13.06 - 19.94)	34	4.0 Mi. ENE	17.08 14.22 - 19.94	15.25 (12.45 - 18.05)
	Ac-228		NA	1.25 - Note 12 (0.61 - 2.16)	31	1.8 Mi. NW	1.24 (0.31 - 2.16)	<LLD
	Other Gammas		Note 3	<LLD	NA	NA	<LLD	<LLD
Aquatic Flora - Note 13 *(pCi/g wet)*	**GAMMA**	20						
	BE-7		NA	0.203 - Note 14 (0.139 - 0.267)	29	<0.5 Mi. ENE to ESE	0.267 - Note15 (0.197 - 0.267)	<LLD
	K-40		NA	6.98 (6.02 - 9.45)	32	Onsite	7.82 (6.30 - 9.45)	6.60 (6.02 -7.11)
	Ac-228		NA	0.113 - Note 16 (0.072 - 0.142)	29	<0.5 Mi. ENE to ESE	0.123 - Note 17 (0.098 - 0.142)	0.090 - Note 18
	Other Gammas		Note 7	<LLD	NA	NA	<LLD	<LLD

RADIOLOCIAL ENVIRONMENT MONITORING PROGRAM SUMMARY
MILLSTONE POWER STATION
Dockets 50-245, 50-336 & 50-423 2015

Medium or Pathway Sampled (Units)	Analysis Type	Total Number	LLD Note 1	Indicator Locations Mean (Range)	Location with Highest Mean Number	Distance Direction	Mean (Range)	Control Locations Mean (Range)
Fish	**GAMMA**	7						
(pCi/g wet)	K-40		NA	4.41 (3.78 - 5.31)	32	<0.5 Mi.	5.16 (5.00 - 5.31)	NA
	Other Gammas		Note 19	<LLD	NA	NA	<LLD	NA
Oysters	**GAMMA**	16						
(pCi/g wet)	K-40		NA	2.18 (1.54 -2.78)	31	1.8 Mi. NW	2.33 (2.23 - 2.52)	2.34 (2.20 - 2.58)
	Other Gammas		Note 19	<LLD	NA	NA	<LLD	<LLD
Clams	**GAMMA**	7						
(pCi/g wet)	K-40		NA	2.22 (1.77 - 2.78)	29	<0.5 Mi. ENE to ESE	2.30 (1.77 - 2.78)	NA
	Other Gammas		Note 19	<LLD	NA	NA	<LLD	NA
Lobster	**GAMMA**	8						
(pCi/g wet)	K-40		NA	2.83 (2.36 - 3.12)	35	<0.5 Mi. SSW to W	2.83 (2.36 - 3.12)	2.92 (2.54 - 2.69)
	Other Gammas		Note 19	<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 other 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 other gamma is 0.15 pCi/g for Cs-134.
4 - LLDs for milk other 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 - Mean and range for three well sample results with positive K-40. All other sample results were less than LLD.
6 - LLDs for water other 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.
7 - LLDs for fruits & vegetables, broadleaf vegetation and aquatic flora for other 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.
8 - Mean and range for two vegetation sample results with positive Be-7. Other two sample results were less than LLD.
9 – LLDs for other gamma are 0.06 pCi/g for Cs-134 and I-131.
10 - Mean and range for nine seawater sample results with positive H-3. Other seven sample results were less than LLD.
11 - Mean and range for eleven seawater sample results with positive K-40. Other five sample results were less than LLD.

NOTES FOR SUMMARY TABLE (Continued)

12 - Mean and range for four sediment sample results with positive Ac-228. Other six sample results were less than LLD.
13 - All aquatic flora locations are extra, non-required samples with Locations 29, 32 and 35 treated as indicators and Location 36 as a control. Location 90 is a special location which is downstream from the New London water treatment plant. Although it is not influenced by any Millstone releases, at times it will detect radioactivity released from the water treatment plant. Results from Location 90 are in Table 16 but not included here.
14 - Mean and range for six aquatic flora sample results with positive Be-7. Other ten sample results were less than LLD.
15 - Mean and range for two aquatic flora sample results with positive Be-7. Other two sample results were less than LLD.
16 – Mean and range for six aquatic flora sample results with positive Ac-228. Other six sample results were less than LLD.
17 - Mean and range for three aquatic flora sample results with positive Ac-228. One other sample result was less than LLD.
18 – Value for one aquatic flora sample result with positive Ac-228. Other three sample results were less than LLD.
19 - 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)
Δ	is the radioactive decay constant for the particular radionuclide
λt	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.

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 analyes on all samples. 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
(uR/hr)*

LOCATIONS (C = control, background locations; X = extra locations not required by REMODCM)

PERIOD	1	(+/-)	2	(+/-)	3	(+/-)	4	(+/-)	5	(+/-)	6	(+/-)	7	(+/-)	8	(+/-)	9	(+/-)	10	(+/-)	11	(+/-)
1Q	7.2	0.6	9.2	0.8	6.6	0.5	6.9	0.7	8.2	0.8	8.3	0.7	6.1	0.5	9.6	0.8	9.1	1.0	9.4	0.7	6.1	0.8
2Q	7.8	0.5	9.9	0.5	6.8	0.6	7.4	0.5	9.3	0.6	8.7	0.4	4.9	0.3	11.3	0.7	11.3	0.9	9.1	0.5	7.0	0.5
3Q	8.0	0.6	9.4	0.9	7.4	0.6	7.0	0.8	9.4	0.9	8.4	0.6	4.4	0.4	10.9	0.8	11.0	0.8	8.1	0.8	6.4	0.5
4Q	8.1	0.6	9.9	0.7	8.2	0.6	8.0	0.6	9.6	0.9	9.1	0.6	5.1	0.4	11.6	0.9	11.9	0.9	9.2	0.6	7.3	0.6

PERIOD	12X	(+/-)	13C	(+/-)	14C	(+/-)	15C	(+/-)	16C	(+/-)	27	(+/-)	41	(+/-)	42	(+/-)	43	(+/-)	44	(+/-)	45	(+/-)
1Q	6.6	0.7	7.0	0.6	7.3	0.5	6.7	0.7	5.7	0.6	8.6	1.2	6.3	0.5	5.8	0.6	6.5	0.5	7.8	0.6	6.6	0.7
2Q	7.0	0.4	8.5	0.7	9.1	0.5	7.4	0.4	6.1	0.5	7.7	0.5	6.3	0.3	7.1	0.4	7.3	0.8	7.9	0.5	7.1	0.5
3Q	7.2	0.8	8.2	0.7	8.6	0.6	7.4	0.6	5.9	0.4	7.1	0.8	6.2	0.6	7.0	0.7	6.9	0.6	7.4	0.9	7.1	0.7
4Q	7.3	0.6	9.4	0.9	9.2	0.7	8.5	0.5	6.5	0.6	8.0	0.6	6.7	0.8	7.7	0.6	7.4	0.5	8.6	0.7	7.7	0.7

PERIOD	46	(+/-)	47	(+/-)	48	(+/-)	49	(+/-)	50	(+/-)	51	(+/-)	52	(+/-)	53	(+/-)	55	(+/-)	56	(+/-)	57	(+/-)
1Q	6.5	0.8	6.8	0.8	8.2	0.8	6.0	0.6	6.6	0.7	5.6	0.4	6.2	0.7	6.3	0.6	7.2	0.6	6.5	0.5	6.0	0.6
2Q	8.7	0.6	7.5	0.7	9.4	0.6	6.8	0.5	7.3	0.5	6.0	0.6	7.1	0.6	7.1	0.5	7.2	0.6	6.9	1.2	7.2	0.5
3Q	7.7	0.7	7.4	0.7	9.1	0.7	6.6	0.6	7.2	0.5	5.9	0.4	6.8	0.8	6.9	0.5	6.9	0.6	6.6	0.6	7.2	0.7
4Q	8.7	0.8	8.1	0.6	9.8	0.8	6.9	0.5	7.8	0.8	6.4	0.5	7.5	0.6	7.6	0.6	7.4	0.5	7.2	0.6	7.1	0.6

PERIOD	59	(+/-)	60	(+/-)	61	(+/-)	62	(+/-)	63	(+/-)	64	(+/-)	65	(+/-)	66X	(+/-)	73X	(+/-)	74X	(+/-)	75X	(+/-)
1Q	6.7	0.6	5.9	0.6	6.0	0.4	6.6	0.7	7.5	0.8	6.6	0.7	6.8	0.6	7.0	0.6	7.3	1.0	6.6	0.6	6.2	0.5
2Q	7.9	0.5	6.9	0.4	7.0	0.8	7.9	0.5	8.2	0.5	7.3	0.7	8.0	0.8	7.1	0.4	7.6	0.6	7.6	0.5	6.6	0.4
3Q	7.7	0.7	6.7	0.5	7.3	0.8	7.9	0.6	8.4	0.9	7.5	0.6	7.8	0.5	7.2	0.6	7.8	0.7	7.5	0.6	6.7	0.6
4Q	7.9	0.6	6.5	0.5	7.3	0.5	8.0	0.8	8.3	1.2	7.2	0.6	8.0	0.7	7.5	0.6	8.2	0.7	7.7	0.6	6.9	0.5

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

TABLE 2
AIR PARTICULATES
GROSS BETA RADIOACTIVITY
(pCi/m^3)
LOCATIONS (C = control, background location)

PERIOD ENDING	01	(+/-)	02	(+/-)	03	(+/-)	04	(+/-)	10	(+/-)	11	(+/-)	27	(+/-)	15C	(+/-)
01/13/15	0.016	0.002	0.015	0.002	0.014	0.002	0.014	0.002	0.015	0.002	0.015	0.002	0.014	0.002	0.014	0.002
01/26/15	0.014	0.002	0.013	0.002	0.012	0.002	0.012	0.002	0.013	0.002	0.014	0.002	0.015	0.002	0.013	0.002
02/10/15	0.016	0.002	0.015	0.002	0.014	0.002	0.015	0.002	0.015	0.002	0.015	0.002	0.016	0.002	0.013	0.002
02/24/15	0.018	0.002	0.018	0.002	0.021	0.002	0.019	0.002	0.020	0.002	0.018	0.002	0.017	0.002	0.020	0.002
03/10/15	0.018	0.002	0.018	0.002	0.018	0.002	0.021	0.003	0.020	0.002	0.021	0.002	0.020	0.002	0.019	0.002
03/24/15	0.010	0.002	0.011	0.002	0.012	0.002	0.011	0.002	0.012	0.002	0.011	0.002	0.012	0.002	0.013	0.002
04/07/15	0.013	0.002	0.012	0.002	0.014	0.002	0.016	0.002	0.014	0.002	0.015	0.002	0.015	0.002	0.014	0.002
04/21/15	0.019	0.002	0.011	0.002	0.010	0.002	0.010	0.002	0.009	0.002	0.010	0.002	0.011	0.002	0.009	0.002
05/05/15	0.007	0.002	0.006	0.002	0.005	0.002	0.005	0.001	0.008	0.002	0.007	0.002	0.004	0.001	0.007	0.002
05/19/15	0.021	0.002	0.015	0.002	0.016	0.002	0.017	0.002	0.015	0.002	0.018	0.002	0.018	0.002	0.019	0.002
06/02/15	0.012	0.002	0.010	0.002	0.011	0.002	0.010	0.002	0.011	0.002	0.014	0.002	0.014	0.002	0.011	0.002
06/16/15	0.010	0.002	0.006	0.001	0.006	0.002	0.008	0.002	0.009	0.002	0.008	0.002	0.007	0.001	0.008	0.002
06/30/15	0.010	0.002	0.006	0.001	0.007	0.002	0.007	0.002	0.007	0.002	0.008	0.002	0.008	0.002	0.011	0.002
07/14/15	0.010	0.002	0.010	0.002	0.013	0.002	0.014	0.002	0.012	0.002	0.012	0.002	0.012	0.002	0.012	0.002
07/28/15	0.013	0.002	0.010	0.002	0.012	0.002	0.011	0.002	0.011	0.002	0.013	0.002	0.011	0.002	0.013	0.002
08/11/15	0.013	0.002	0.014	0.002	0.014	0.002	0.015	0.002	0.015	0.002	0.013	0.002	0.012	0.002	0.014	0.002
08/25/15	0.016	0.002	0.013	0.002	0.012	0.002	0.015	0.002	0.012	0.002	0.016	0.002	0.015	0.002	0.014	0.002
09/08/15	0.022	0.002	0.020	0.002	0.021	0.003	0.023	0.003	0.019	0.002	0.020	0.002	0.021	0.002	0.021	0.003
09/22/15	0.019	0.002	0.017	0.002	0.018	0.002	0.019	0.002	0.017	0.002	0.019	0.002	0.017	0.002	0.017	0.002
10/06/15	0.010	0.002	0.010	0.002	0.009	0.002	0.010	0.002	0.008	0.002	0.010	0.002	0.009	0.002	0.012	0.002
10/20/15	0.012	0.002	0.012	0.002	0.013	0.002	0.012	0.002	0.011	0.002	0.011	0.002	0.011	0.002	0.012	0.002
11/03/15	0.015	0.002	0.012	0.002	0.016	0.002	0.013	0.002	0.012	0.002	0.013	0.002	0.014	0.002	0.015	0.002
11/17/15	0.018	0.002	0.017	0.002	0.018	0.002	0.019	0.002	0.017	0.002	0.017	0.002	0.019	0.002	0.017	0.002
12/01/15	0.012	0.002	0.015	0.002	0.011	0.002	0.012	0.002	0.013	0.002	0.012	0.002	0.012	0.002	0.014	0.002
12/15/15	0.023	0.002	0.021	0.002	0.021	0.002	0.021	0.002	0.021	0.002	0.023	0.002	0.023	0.002	0.020	0.002
12/29/15	0.011	0.002	0.010	0.002	0.008	0.002	0.010	0.002	0.010	0.002	0.010	0.002	0.013	0.002	0.011	0.002

TABLE 3
AIRBORNE IODINE (I-131)
(pCi/m^3)
LOCATIONS (C = control, background location)

PERIOD ENDING	01	(+/-)	02	(+/-)	03	(+/-)	04	(+/-)	10	(+/-)	11	(+/-)	27	(+/-)	15C	(+/-)
01/13/15	0.006	0.007	0.007	0.008	0.006	0.007	0.007	0.008	-0.004	0.008	-0.003	0.008	-0.004	0.009	-0.004	0.008
01/26/15	0.000	0.015	0.000	0.018	0.000	0.015	0.000	0.018	0.010	0.016	0.009	0.015	0.011	0.018	0.010	0.016
02/10/15	-0.011	0.028	-0.014	0.036	-0.012	0.030	-0.015	0.036	0.003	0.033	0.003	0.030	0.004	0.040	0.003	0.034
02/24/15	-0.001	0.006	-0.001	0.007	-0.001	0.006	-0.001	0.007	0.003	0.006	0.003	0.005	0.003	0.006	0.003	0.006
03/10/15	-0.006	0.030	-0.006	0.035	-0.006	0.030	-0.007	0.036	0.003	0.033	0.002	0.029	0.003	0.037	0.003	0.035
03/24/15	-0.022	0.020	-0.025	0.022	-0.022	0.020	-0.026	0.024	-0.002	0.018	-0.002	0.016	-0.003	0.020	-0.003	0.020
04/07/15	0.006	0.017	0.007	0.019	0.006	0.017	0.007	0.020	0.007	0.010	0.006	0.009	0.008	0.011	0.007	0.011
04/21/15	0.004	0.011	0.011	0.032	0.009	0.028	0.010	0.030	0.010	0.028	0.004	0.025	0.005	0.033	0.004	0.028
05/05/15	-0.005	0.014	-0.006	0.016	-0.005	0.015	-0.005	0.014	0.007	0.015	0.006	0.014	0.006	0.015	0.006	0.014
05/19/15	0.000	0.017	0.000	0.017	-0.001	0.019	-0.001	0.018	-0.011	0.018	-0.010	0.017	-0.010	0.018	-0.010	0.017
06/02/15	-0.003	0.010	-0.003	0.010	-0.003	0.012	-0.003	0.011	0.014	0.019	0.013	0.017	0.015	0.020	0.013	0.017
06/16/15	0.021	0.029	0.021	0.029	0.023	0.032	0.022	0.031	0.002	0.034	0.002	0.030	0.002	0.027	0.002	0.029
06/30/15	0.002	0.011	0.002	0.011	0.002	0.013	0.002	0.012	0.001	0.005	-0.002	0.010	-0.002	0.010	-0.002	0.011
07/14/15	0.003	0.007	0.003	0.008	0.004	0.009	0.004	0.008	0.010	0.008	0.009	0.008	0.009	0.008	0.009	0.008
07/28/15	-0.004	0.006	-0.004	0.006	-0.005	0.007	-0.005	0.006	0.002	0.007	0.002	0.006	0.002	0.006	0.002	0.006
08/11/15	0.005	0.023	0.005	0.023	0.006	0.027	0.006	0.026	-0.019	0.039	-0.017	0.033	-0.017	0.034	-0.018	0.035
08/25/15	0.008	0.025	0.008	0.026	0.009	0.030	0.009	0.028	0.016	0.028	0.018	0.031	-0.018	0.032	0.018	0.033
09/08/15	-0.001	0.010	-0.001	0.009	-0.001	0.011	-0.001	0.010	0.000	0.003	-0.002	0.011	-0.002	0.011	-0.002	0.012
09/22/15	-0.003	0.019	-0.003	0.019	-0.004	0.022	-0.003	0.021	-0.010	0.019	-0.011	0.021	-0.011	0.021	-0.012	0.022
10/06/15	-0.002	0.011	-0.002	0.011	-0.002	0.012	-0.002	0.012	0.001	0.010	0.001	0.011	0.001	0.011	0.001	0.011
10/20/15	0.002	0.024	0.002	0.024	0.002	0.029	0.002	0.027	-0.018	0.029	-0.020	0.032	-0.021	0.033	-0.021	0.033
11/03/15	-0.007	0.034	-0.007	0.035	-0.009	0.041	-0.008	0.038	-0.012	0.034	-0.013	0.038	-0.013	0.038	-0.014	0.040
11/17/15	-0.014	0.028	-0.015	0.028	-0.016	0.031	-0.016	0.031	-0.001	0.027	-0.002	0.029	-0.002	0.029	-0.002	0.030
12/01/15	0.011	0.022	0.011	0.022	0.011	0.023	0.012	0.024	0.001	0.032	0.001	0.035	0.001	0.036	0.001	0.036
12/15/15	-0.010	0.023	-0.010	0.024	-0.011	0.025	-0.011	0.026	-0.018	0.036	-0.020	0.039	-0.019	0.038	-0.020	0.040
12/29/15	0.007	0.030	0.007	0.030	0.007	0.032	-0.010	0.031	-0.009	0.027	-0.009	0.029	-0.005	0.016	-0.010	0.031

TABLE 4
AIR PARTICULATES
(pCi/m^3) (15C = control, background location)

GAMMA SPECTRA - QTR 1 (12/30/14 - 04/07/15)

LOCATION	Be-7	(+/-)	Mn-54	(+/-)	Co-58	(+/-)	Co-60	(+/-)	Zn-65	(+/-)	Nb-95	(+/-)	Zr-95	(+/-)
01	**0.0966**	0.0297	0.0005	0.0011	0.0010	0.0019	0.0008	0.0008	0.0028	0.0029	-0.0001	0.0023	0.0031	0.0040
02	**0.1600**	0.0575	0.0019	0.0104	-0.0077	0.0267	-0.0019	0.0098	0.0141	0.0240	0.0175	0.0274	-0.0384	0.0464
03	**0.1307**	0.0433	0.0000	0.0017	0.0014	0.0036	0.0010	0.0012	-0.0010	0.0036	0.0030	0.0037	-0.0035	0.0063
04	0.0875	0.0735	-0.0014	0.0028	-0.0002	0.0039	-0.0016	0.0019	0.0058	0.0066	0.0032	0.0054	-0.0018	0.0091
10	**0.1176**	0.0531	0.0007	0.0017	0.0020	0.0024	0.0013	0.0018	-0.0005	0.0041	0.0014	0.0035	-0.0014	0.0060
11	**0.1253**	0.0420	-0.0002	0.0014	-0.0008	0.0022	-0.0005	0.0012	0.0000	0.0029	-0.0021	0.0029	0.0005	0.0049
27	**0.1907**	0.0667	-0.0014	0.0023	-0.0035	0.0053	0.0002	0.0031	0.0009	0.0046	-0.0024	0.0060	-0.0030	0.0114
15C	**0.1265**	0.0409	0.0003	0.0014	-0.0022	0.0022	0.0000	0.0009	0.0005	0.0031	0.0007	0.0027	0.0026	0.0042

LOCATION	Ru-103	(+/-)	Ru-106	(+/-)	Cs-134	(+/-)	Cs-137	(+/-)	Ba-140	(+/-)	Ce-141	(+/-)	Ce-144	(+/-)
01	0.0007	0.0041	-0.0139	0.0131	-0.0001	0.0012	0.0003	0.0010	-0.0020	0.4906	0.0023	0.0078	-0.0003	0.0057
02	0.0407	0.0531	0.0571	0.1124	0.0050	0.0103	-0.0058	0.0106	-0.9744	5.8260	-0.0245	0.0802	0.0383	0.0535
03	-0.0034	0.0057	0.0042	0.0133	0.0002	0.0013	0.0003	0.0015	-0.2647	0.7735	0.0013	0.0098	-0.0017	0.0066
04	0.0002	0.0093	-0.0115	0.0213	0.0028	0.0021	0.0016	0.0019	-0.1101	1.0220	-0.0053	0.0174	-0.0012	0.0127
10	0.0004	0.0061	0.0031	0.0145	-0.0001	0.0018	-0.0004	0.0015	0.1637	0.7549	0.0025	0.0090	-0.0071	0.0069
11	-0.0059	0.0059	-0.0085	0.0110	-0.0003	0.0011	-0.0003	0.0010	-0.2590	0.5423	0.0033	0.0087	-0.0035	0.0064
27	-0.0048	0.0088	0.0057	0.0250	0.0026	0.0024	0.0007	0.0022	-0.2331	1.1510	0.0009	0.0124	0.0015	0.0086
15C	-0.0017	0.0040	-0.0065	0.0100	0.0004	0.0011	-0.0011	0.0010	-0.0005	0.5666	0.0038	0.0082	0.0015	0.0060

GAMMA SPECTRA - QTR 2 (04/07/15 - 06/30/15)

LOCATION	Be-7	(+/-)	Mn-54	(+/-)	Co-58	(+/-)	Co-60	(+/-)	Zn-65	(+/-)	Nb-95	(+/-)	Zr-95	(+/-)
01	**0.1016**	0.0428	0.0002	0.0011	-0.0018	0.0023	-0.0002	0.0013	-0.0001	0.0028	-0.0004	0.0023	-0.0011	0.0037
02	**0.1069**	0.0277	0.0001	0.0010	-0.0010	0.0026	0.0007	0.0012	0.0011	0.0036	0.0018	0.0028	-0.0073	0.0050
03	**0.1275**	0.0537	0.0001	0.0023	0.0005	0.0050	0.0007	0.0024	0.0038	0.0065	0.0035	0.0049	-0.0032	0.0082
04	**0.1406**	0.0476	0.0003	0.0017	0.0009	0.0032	-0.0012	0.0014	0.0015	0.0037	0.0006	0.0035	0.0015	0.0056
10	**0.1192**	0.0507	0.0007	0.0021	0.0011	0.0034	0.0004	0.0019	0.0036	0.0041	-0.0004	0.0036	-0.0010	0.0068
11	**0.1099**	0.0413	0.0001	0.0012	0.0006	0.0015	0.0007	0.0009	0.0003	0.0023	-0.0018	0.0025	0.0036	0.0039
27	**0.1061**	0.0382	-0.0011	0.0015	0.0002	0.0024	0.0005	0.0011	0.0002	0.0035	0.0019	0.0028	0.0017	0.0049
15C	**0.1433**	0.0394	0.0002	0.0016	0.0000	0.0026	0.0005	0.0016	0.0009	0.0039	-0.0012	0.0031	0.0013	0.0054

LOCATION	Ru-103	(+/-)	Ru-106	(+/-)	Cs-134	(+/-)	Cs-137	(+/-)	Ba-140	(+/-)	Ce-141	(+/-)	Ce-144	(+/-)
01	0.0022	0.0037	0.0033	0.0090	0.0007	0.0011	0.0006	0.0013	0.0007	0.3877	0.0083	0.0071	0.0026	0.0054
02	-0.0013	0.0049	-0.0058	0.0113	0.0008	0.0013	0.0012	0.0009	-0.1350	0.4362	-0.0010	0.0070	0.0023	0.0057
03	0.0065	0.0074	-0.0100	0.0225	0.0020	0.0020	-0.0007	0.0020	0.0380	0.8127	0.0083	0.0097	-0.0028	0.0061
04	-0.0023	0.0055	0.0089	0.0105	-0.0006	0.0013	-0.0003	0.0014	-0.1254	0.5343	0.0004	0.0088	0.0023	0.0073
10	0.0042	0.0080	0.0110	0.0145	0.0009	0.0017	0.0002	0.0017	0.2946	0.6238	-0.0023	0.0109	0.0003	0.0090
11	-0.0006	0.0035	0.0012	0.0088	0.0003	0.0011	-0.0003	0.0009	0.2200	0.3246	-0.0009	0.0066	-0.0032	0.0054
27	-0.0012	0.0041	-0.0017	0.0104	0.0019	0.0013	-0.0004	0.0010	-0.1183	0.4492	0.0025	0.0072	0.0029	0.0065
15C	-0.0057	0.0055	0.0163	0.0143	0.0015	0.0015	-0.0003	0.0012	0.4738	0.4849	0.0018	0.0096	0.0042	0.0077

TABLE 4
AIR PARTICULATES
(pCi/m^3)

GAMMA SPECTRA - QTR 3 (06/30/15 - 10/06/15)

LOCATION	Be-7	(+/-)	Mn-54	(+/-)	Co-58	(+/-)	Co-60	(+/-)	Zn-65	(+/-)	Nb-95	(+/-)	Zr-95	(+/-)
01	**0.1339**	0.0457	-0.0006	0.0018	-0.0013	0.0035	-0.0004	0.0014	0.0027	0.0037	-0.0011	0.0036	-0.0036	0.0063
02	**0.0960**	0.0348	0.0004	0.0011	-0.0010	0.0022	0.0002	0.0009	0.0029	0.0030	0.0018	0.0021	0.0009	0.0040
03	**0.1214**	0.0318	-0.0002	0.0010	0.0015	0.0024	0.0007	0.0010	0.0019	0.0040	0.0017	0.0026	-0.0021	0.0046
04	**0.1185**	0.0426	-0.0011	0.0009	-0.0004	0.0022	-0.0010	0.0010	-0.0017	0.0030	0.0012	0.0028	-0.0010	0.0044
10	**0.1136**	0.0321	-0.0007	0.0010	-0.0004	0.0026	0.0011	0.0012	0.0017	0.0033	0.0020	0.0028	-0.0017	0.0052
11	**0.0862**	0.0288	-0.0005	0.0012	-0.0013	0.0025	-0.0001	0.0013	0.0038	0.0032	0.0002	0.0029	0.0003	0.0051
27	**0.1839**	0.0422	-0.0002	0.0011	0.0002	0.0025	-0.0006	0.0008	-0.0012	0.0027	-0.0006	0.0026	-0.0028	0.0051
15C	**0.1264**	0.0549	-0.0008	0.0019	-0.0020	0.0031	0.0014	0.0016	0.0015	0.0045	0.0022	0.0045	-0.0024	0.0077

LOCATION	Ru-103	(+/-)	Ru-106	(+/-)	Cs-134	(+/-)	Cs-137	(+/-)	Ba-140	(+/-)	Ce-141	(+/-)	Ce-144	(+/-)
01	-0.0027	0.0069	0.0040	0.0140	0.0025	0.0020	-0.0003	0.0015	-0.0247	0.8042	-0.0034	0.0098	0.0013	0.0074
02	0.0012	0.0041	0.0081	0.0094	0.0008	0.0012	-0.0001	0.0010	-0.0282	0.3596	-0.0006	0.0071	-0.0011	0.0047
03	0.0009	0.0042	0.0035	0.0101	0.0035	0.0014	0.0010	0.0010	-0.1019	0.5216	-0.0050	0.0082	0.0010	0.0059
04	-0.0005	0.0041	-0.0010	0.0105	-0.0010	0.0012	0.0010	0.0011	-0.0016	0.4223	-0.0040	0.0082	-0.0049	0.0054
10	0.0043	0.0042	-0.0062	0.0114	0.0013	0.0012	-0.0004	0.0010	0.0965	0.5611	-0.0002	0.0080	0.0017	0.0055
11	0.0000	0.0051	-0.0017	0.0107	0.0008	0.0011	0.0000	0.0008	0.0875	0.6066	0.0007	0.0086	0.0000	0.0062
27	-0.0069	0.0039	-0.0028	0.0115	-0.0003	0.0011	0.0008	0.0012	-0.1457	0.5858	-0.0028	0.0077	-0.0031	0.0056
15C	0.0004	0.0077	-0.0051	0.0147	0.0005	0.0018	-0.0010	0.0018	0.0188	0.8558	-0.0035	0.0105	0.0038	0.0076

GAMMA SPECTRA - QTR 4 (10/06/15 - 12/29/15)

LOCATION	Be-7	(+/-)	Mn-54	(+/-)	Co-58	(+/-)	Co-60	(+/-)	Zn-65	(+/-)	Nb-95	(+/-)	Zr-95	(+/-)
01	**0.0940**	0.0301	0.0004	0.0014	0.0017	0.0019	0.0005	0.0011	0.0022	0.0030	-0.0010	0.0021	0.0015	0.0036
02	**0.1001**	0.0361	-0.0004	0.0020	0.0006	0.0033	-0.0008	0.0023	0.0062	0.0057	-0.0009	0.0035	-0.0002	0.0067
03	**0.0843**	0.0381	0.0003	0.0011	-0.0028	0.0027	0.0022	0.0016	-0.0033	0.0036	-0.0015	0.0031	0.0039	0.0042
04	**0.0961**	0.0422	0.0000	0.0014	-0.0014	0.0029	-0.0012	0.0013	0.0017	0.0033	0.0006	0.0026	0.0004	0.0048
10	**0.1010**	0.0352	0.0004	0.0018	0.0010	0.0031	0.0004	0.0013	0.0021	0.0045	-0.0004	0.0032	-0.0019	0.0057
11	**0.1020**	0.0298	-0.0001	0.0012	-0.0006	0.0026	-0.0002	0.0013	-0.0007	0.0030	-0.0001	0.0023	0.0044	0.0044
27	**0.1090**	0.0338	0.0005	0.0012	-0.0008	0.0014	0.0004	0.0005	-0.0004	0.0026	-0.0007	0.0018	-0.0006	0.0029
15C	**0.0717**	0.0312	0.0001	0.0011	-0.0016	0.0020	-0.0002	0.0009	0.0034	0.0029	0.0005	0.0021	-0.0010	0.0040

LOCATION	Ru-103	(+/-)	Ru-106	(+/-)	Cs-134	(+/-)	Cs-137	(+/-)	Ba-140	(+/-)	Ce-141	(+/-)	Ce-144	(+/-)
01	-0.0002	0.0037	0.0032	0.0119	0.0014	0.0012	0.0002	0.0010	0.0238	0.2170	0.0031	0.0065	-0.0031	0.0068
02	-0.0032	0.0070	0.0035	0.0201	0.0015	0.0019	0.0007	0.0020	-0.2509	0.3692	0.0104	0.0081	-0.0075	0.0085
03	0.0019	0.0043	0.0052	0.0115	-0.0001	0.0014	-0.0005	0.0013	-0.0790	0.2377	-0.0076	0.0075	0.0051	0.0074
04	0.0003	0.0042	-0.0101	0.0128	0.0013	0.0013	0.0002	0.0012	0.1546	0.2243	-0.0018	0.0063	-0.0029	0.0059
10	-0.0019	0.0048	-0.0045	0.0145	0.0006	0.0019	0.0006	0.0014	-0.1319	0.3111	-0.0020	0.0077	-0.0008	0.0081
11	-0.0014	0.0039	-0.0110	0.0116	0.0005	0.0011	0.0009	0.0011	-0.0540	0.2216	-0.0025	0.0064	-0.0032	0.0071
27	-0.0013	0.0034	0.0009	0.0087	-0.0005	0.0010	0.0002	0.0008	0.0260	0.2191	0.0010	0.0053	-0.0013	0.0054
15C	0.0004	0.0032	0.0084	0.0086	-0.0005	0.0009	0.0007	0.0009	0.1427	0.1942	0.0028	0.0055	0.0011	0.0052

TABLE 5
SOIL
(pCi/g dry wt.)

LOCATION	COLLECTION DATE	Be-7	(+/-)	K-40	(+/-)	Cr-51	(+/-)	Mn-54	(+/-)	Co-58	(+/-)	Fe-59	(+/-)
03	11/03/15	0.120	0.534	**13.100**	1.587	-0.122	0.599	0.008	0.054	-0.016	0.051	-0.040	0.124
04	11/03/15	0.084	0.777	**15.110**	3.027	-1.040	0.932	0.031	0.098	-0.036	0.099	0.037	0.208
14C	11/03/15	0.323	0.820	**13.750**	2.354	0.038	0.999	0.009	0.080	0.046	0.087	0.077	0.183

(14C = control, background location)

LOCATION	COLLECTION DATE	Co-60	(+/-)	Zn-65	(+/-)	Nb-95	(+/-)	Zr-95	(+/-)	Ru-103	(+/-)	Ru-106	(+/-)
03	11/03/15	-0.027	0.051	0.022	0.130	0.030	0.058	0.144	0.099	0.019	0.061	0.028	0.442
04	11/03/15	-0.042	0.084	-0.325	0.195	0.048	0.107	-0.074	0.211	0.030	0.112	-0.112	0.711
14C	11/03/15	-0.061	0.076	-0.096	0.215	0.111	0.096	-0.030	0.164	-0.024	0.096	-0.042	0.708

LOCATION	COLLECTION DATE	Sb-125	(+/-)	Cs-134	(+/-)	Cs-137	(+/-)	Ce-141	(+/-)	Ce-144	(+/-)	Ac-228	(+/-)	
03	11/03/15	0.030	0.130	-0.023	0.057	**0.167**	0.080	0.001	0.116	-0.551	0.388	1.076	0.370	Note
04	11/03/15	0.127	0.172	-0.029	0.092	**0.517**	0.155	0.072	0.167	-0.464	0.544	0.720	0.832	
14C	11/03/15	0.140	0.248	-0.073	0.096	**0.338**	0.185	-0.121	0.178	0.187	0.608	0.347	0.642	

Note: Extra counts detected in the Ac-228 peak area but there was no peak for positive identification of Ac-228.

TABLE 6
COW MILK
(pCi/l)

LOCATION	COLLECTION DATE	I-131	(+/-)	Sr-89	(+/-)	Sr-90	(+/-)	K-40	(+/-)	Cs-134	(+/-)	Cs-137	(+/-)	Ba-140	(+/-)	La-140	(+/-)
22	01/21/15	-0.132	0.083					**1226**	120	0.711	3.973	2.946	3.538	-10.800	15.650	1.426	5.418
	02/18/15	-0.211	0.148					**1295**	205	-6.748	6.098	4.754	6.112	21.580	29.690	-2.854	9.028
	03/11/15	0.133	0.223	4.9	2.7	0.7	1.3	**1352**	178	2.921	4.703	-2.471	4.336	-3.004	24.780	2.192	5.964
	04/15/15	-0.526	0.347					**1203**	112	0.668	2.987	1.238	2.898	-1.231	14.630	2.791	5.011
	05/13/15	-0.208	0.322					**1249**	186	5.351	7.164	2.682	6.240	28.800	28.500	6.665	9.012
	05/27/15	-0.441	0.206					**1224**	170	-0.256	4.364	3.123	4.349	3.913	22.070	-0.041	4.513
	06/10/15	-0.171	0.345					**1254**	192	0.177	4.933	1.279	5.281	-7.014	24.410	4.429	6.763
	06/22/15	-0.303	0.199	3.1	4.0	0.0	0.9	**1186**	185	-5.860	5.091	0.312	5.231	-5.341	21.110	-0.136	6.032
	07/08/15	0.006	0.211					**1360**	148	-1.967	3.710	-0.162	3.364	11.170	15.530	-0.486	3.898
	07/23/15	-0.179	0.139					**1212**	153	-2.154	5.144	2.243	4.211	1.566	20.320	1.918	6.529
	08/12/15	-0.119	0.190					**1217**	188	-3.266	6.888	-0.891	7.155	-10.020	29.930	-2.299	7.536
	08/26/15	-0.571	0.499					**1373**	237	-1.491	6.586	-0.996	5.847	-8.877	28.100	4.742	9.184
	09/16/15	-0.298	0.349					**1379**	250	-10.330	6.599	0.381	6.839	-1.172	31.820	0.275	7.201
	09/28/15	-0.157	0.458	7.4	5.9	0.5	0.4	**1102**	174	-3.461	4.465	0.011	4.768	-2.659	23.600	5.516	8.152
	10/13/15	-0.069	0.196					**1314**	214	4.950	5.419	-1.614	5.318	8.551	22.390	-1.510	6.276
	10/27/15	-0.638	0.224					**1251**	201	-3.238	4.829	0.986	5.200	-3.325	23.210	3.736	5.861
	11/18/15	0.092	0.415					**1211**	213	-3.238	7.696	0.168	7.672	20.710	24.980	4.292	7.229
	12/08/15	-0.220	0.248	4.7	3.2	0.7	0.7	**1284**	127	-0.693	2.780	-0.967	3.165	11.850	12.990	-2.151	4.244

TABLE 7
WELL WATER
(pCi/l)

LOCATION	COLLECTION DATE	H-3	(+/-)	Be-7	(+/-)	K-40	(+/-)	Cr-51	(+/-)	Mn-54	(+/-)	Co-58	(+/-)	Fe-59	(+/-)	Co-60	(+/-)
71	06/23/15	246	513	-31.2	32.7	-44.3	53.8	-39.3	32.5	3.9	3.3	-0.5	4.3	0.5	8.2	-1.1	3.3
	09/22/15	-184	502	22.9	33.1	37.8	41.3	-9.7	35.3	-2.2	4.0	-3.4	3.4	1.3	6.5	-0.8	3.7
	12/10/15	-83	556	13.0	28.6	54.7	47.1	-36.7	31.3	0.2	2.7	0.3	3.3	0.0	6.2	0.9	2.5
72	06/22/15	534	523	-7.9	29.4	6.4	38.7	-14.8	33.1	-1.8	3.4	-1.1	3.4	-4.7	7.8	2.5	4.1
	09/21/15	13	518	23.8	42.0	-7.3	67.5	6.0	52.3	-1.6	5.0	-0.1	4.7	3.0	9.9	1.4	4.2
	12/09/15	476	595	19.1	23.9	11.6	49.9	-2.8	28.2	-2.6	2.7	0.9	2.6	-2.3	6.8	2.2	2.7
76	06/18/15	83	491	12.8	31.4	-8.25	49.48	-49.3	36.5	-0.8	3.48	-0.46	3.68	1.12	6.33	-0.57	3.47
	09/15/15	368	593	-30.9	48.6	48.2	104.6	39.6	49.5	-3.3	6.2	0.0	6.0	-5.3	12.8	-4.5	6.2
	12/07/15	-586	590	-20.6	44.3	-5.1	80.9	2.1	53.8	-5.0	6.9	-0.8	5.4	12.2	9.6	1.1	5.8
77	06/18/15	573	530	-17.2	33.2	-5.7	53.8	5.3	37.3	1.1	4.4	0.9	4.0	-3.9	6.8	0.8	4.1
	09/15/15	165	579	-46.0	41.1	29.2	71.4	0.3	53.8	4.0	4.9	-0.2	5.0	0.9	9.9	3.0	4.3
	12/07/15	45	565	16.6	48.8	56.9	92.3	29.9	50.2	-6.4	6.0	-6.5	6.8	1.2	11.1	-4.6	5.8
78	06/18/15	438	514	1.38	27.2	**127**	61.56	-10.5	32.1	-0.23	2.94	2.23	3.31	4.05	5.11	-0.02	2.79
	09/15/15	-32	563	7.0	34.8	48.6	82.0	-10.5	36.6	-0.1	4.6	-3.6	4.1	-0.1	9.2	-4.7	5.4
	12/07/15	488	740	-33.2	54.3	-10.0	78.7	-40.5	53.4	-6.2	6.6	2.0	5.8	-2.3	12.0	3.7	5.3
79	06/22/15	523	529	-2.2	34.4	34.9	70.2	-2.2	33.9	-0.6	3.4	-0.4	3.7	1.4	7.4	3.0	4.1
	09/21/15	438	551	-15.2	35.1	-29.7	60.0	-31.7	42.5	-1.8	3.5	-1.0	4.2	5.6	8.0	2.6	3.6
	12/09/15	548	602	-11.6	24.9	12.6	35.8	11.5	32.7	-1.0	2.2	-2.3	2.4	-0.2	3.8	-0.7	1.5
81	06/22/15	749	546	4.4	34.8	-33.9	65.2	-11.4	40.0	-1.2	3.2	-0.4	4.3	2.9	7.3	-1.0	4.5
	09/21/15	89	524	10.2	46.9	64.6	82.4	23.8	55.1	0.2	4.7	0.6	5.3	4.4	9.0	2.4	4.0
	12/10/15	388	591	-6.5	23.7	18.9	52.5	-29.0	29.9	0.7	2.7	-1.3	2.6	-2.6	5.1	-0.2	2.8
82	06/22/15	677	540	-33.7	38.9	4.6	75.8	25.1	44.5	-4.5	4.3	-3.2	4.3	2.7	7.8	0.3	3.6
	09/22/15	-419	481	-54.7	47.5	21.1	72.1	28.4	52.0	-3.3	6.2	1.6	6.9	-2.7	11.3	-0.2	6.7
	12/10/15	216	577	20.4	25.1	**93.2**	41.7	3.6	30.1	-1.3	2.5	-2.5	3.0	-1.1	6.0	2.7	2.8
83	06/22/15	544	528	17.0	35.2	-9.0	65.3	2.9	44.2	-1.3	3.7	-0.3	3.4	2.2	6.9	-2.7	4.3
	09/21/15	-362	486	46.1	44.0	-78.0	65.8	-20.8	40.2	-5.4	4.8	0.4	4.7	3.0	9.8	3.9	4.9
	12/10/15	13	561	-0.5	25.0	**90.6**	55.8	-0.1	29.7	0.0	2.7	-3.5	2.6	4.8	5.3	1.2	2.3

TABLE 7
WELL WATER
(pCi/l)

LOCATION	COLLECTION DATE	Zn-65	(+/-)		Nb-95	(+/-)		Zr-95	(+/-)	Ru-103	(+/-)	Ru-106	(+/-)	Sb-125	(+/-)	I-131	(+/-)	Cs-134	(+/-)
71	06/23/15	1.9	4.9		-4.5	4.1		0.4	6.7	-4.5	4.5	14.6	41.4	-4.3	11.0	2.9	6.5	-3.3	4.7
	09/22/15	5.6	8.7		4.2	4.4		3.7	6.4	-3.8	4.2	-0.5	34.7	-0.7	10.7	-5.0	5.4	0.3	3.9
	12/10/15	2.4	6.1		3.7	3.1		-2.7	4.8	-3.3	3.7	2.8	27.9	-4.7	8.3	6.2	8.6	-1.2	3.2
72	06/22/15	-0.4	8.6		-3.0	3.7		-3.6	5.2	1.3	3.4	2.0	34.0	-7.1	10.1	-0.2	5.9	1.9	3.0
	09/21/15	-1.8	11.5		1.0	4.9		-3.9	8.1	-4.2	5.8	-26.2	49.3	0.5	13.4	6.4	7.6	-4.7	5.8
	12/09/15	-2.1	4.8		0.5	2.9		1.5	4.3	-4.5	3.0	-1.4	20.5	-4.4	7.0	3.9	8.0	0.1	3.5
76	06/18/15	-1.5	7.9		-0.7	4.0		-1.4	6.7	1.3	4.2	15.5	34.5	6.0	10.6	-1.3	6.3	-1.2	3.7
	09/15/15	4.5	13.1		1.6	6.0		2.5	10.2	0.0	5.4	-7.1	43.0	-9.3	13.9	-0.9	8.1	2.3	5.0
	12/07/15	9.2	15.2		4.1	5.8		1.0	8.3	-3.3	6.6	-24.2	56.7	-9.5	17.6	0.2	7.4	-0.8	7.0
77	06/18/15	-0.6	8.9		-1.8	5.0		-0.5	6.4	-0.1	4.1	-10.1	35.9	-11.8	10.3	-1.3	7.1	-1.3	4.3
	09/15/15	5.1	10.4		4.9	5.8		5.8	8.6	-4.3	6.2	-3.3	45.0	-5.8	13.9	-3.5	8.6	-1.0	5.8
	12/07/15	25.2	15.4	Note 1	9.1	8.7		-7.8	10.4	-1.0	6.1	39.6	53.7	-10.8	18.2	-5.3	7.3	-1.6	6.4
		Note 1: Zn-65 was not identified in sample. Counts in Zn-65 peak area were from naturally occuring Bi-214.																	
78	06/18/15	12.1	6.5	Note 2	4.1	3.7		1.6	5.8	-1.7	3.6	10.9	29.2	-12.4	9.3	2.9	5.9	2.5	5.4
	09/15/15	-16.2	12.8		3.5	4.6		1.2	8.7	3.1	4.4	-28.8	41.0	4.5	11.6	0.2	7.1	-1.2	4.8
	12/07/15	-9.5	18.1		4.6	5.8		-0.9	9.7	2.3	6.6	8.5	55.9	0.7	15.4	-5.9	7.8	4.7	5.9
		Note 2: Result for Zn-65 was less thant the minimum detectable activity (MDA).																	
79	06/22/15	1.9	8.4		2.7	3.6		6.2	6.4	-4.3	3.7	-24.8	34.1	4.1	9.9	3.2	6.7	2.3	3.6
	09/21/15	-17.1	11.7		4.0	4.9		-0.8	7.4	1.0	4.5	-10.1	44.2	-8.5	13.9	1.4	6.3	3.9	5.0
	12/09/15	-6.4	4.5		0.5	2.3		-2.5	4.3	4.2	3.2	-6.9	22.1	-1.8	7.4	2.0	9.7	-0.6	3.0
81	06/22/15	2.6	8.5		0.8	4.0		-3.8	6.4	-0.1	4.6	4.4	35.4	0.1	11.3	0.6	6.6	-0.1	4.1
	09/21/15	8.5	10.9		6.4	5.8		-4.3	8.3	-1.8	6.2	-11.6	42.3	2.9	14.5	-3.5	8.2	3.1	5.7
	12/10/15	2.7	5.6		2.7	2.7		-0.9	4.7	0.7	3.1	-12.5	23.9	2.5	7.4	3.6	7.5	0.3	2.9
82	06/22/15	-4.9	9.2		10.5	4.9	Note 3	6.9	7.3	1.1	4.5	19.8	34.6	-1.5	12.7	3.0	7.8	1.6	4.5
	09/22/15	-0.1	15.9		7.7	7.2		-3.8	10.2	-2.3	5.9	-1.9	50.5	-3.4	17.2	7.2	7.9	1.0	6.5
	12/10/15	0.0	6.3		6.9	3.7	Note 3	-2.2	5.2	-3.7	3.2	3.2	22.1	-0.4	7.3	2.8	7.9	0.3	2.7
83	06/22/15	-6.3	8.7		4.3	4.5		-1.1	7.3	-2.0	4.6	15.1	35.4	-5.6	11.6	-3.9	7.9	2.4	4.7
	09/21/15	2.7	12.4		6.7	6.3		0.5	8.3	-0.8	5.1	-23.7	42.0	-2.0	13.8	0.3	6.6	0.1	5.6
	12/10/15	-4.0	5.4		1.5	2.7		-1.5	5.0	-1.4	3.2	16.6	22.4	4.1	6.9	4.3	7.9	0.9	2.8

Note 3: Extra counts detected in the Nb-95 peak area but there was no peak for positive identification of Nb-95.

TABLE 7
WELL WATER
(pCi/l)

LOCATION	COLLECTION DATE	Cs-137	(+/-)	Ba-140	(+/-)	La-140	(+/-)	Ac-228	(+/-)
71	06/23/15	-0.5	4.1	4.6	16.5	-3.7	7.0	1.9	14.6
	09/22/15	-0.9	4.2	6.1	15.8	-0.2	4.8	8.2	14.7
	12/10/15	2.8	2.9	16.1	20.1	5.3	6.4	6.0	11.2
72	06/22/15	-1.5	3.6	-18.2	16.3	3.1	5.7	0.0	14.8
	09/21/15	-4.8	5.4	-1.3	23.3	3.2	8.1	13.6	19.2
	12/09/15	0.4	2.9	-0.5	16.8	-0.5	6.0	13.2	10.2
76	06/18/15	-0.4	3.7	-4.5	17.0	-1.1	5.5	-9.2	14.2
	09/15/15	-6.0	6.4	-25.5	26.0	0.6	8.4	11.7	21.5
	12/07/15	-0.3	6.9	8.4	26.0	-1.1	4.4	-7.1	21.2
77	06/18/15	-1.4	4.1	-7.8	18.2	1.7	5.9	11.1	13.5
	09/15/15	-3.0	5.6	0.2	26.5	-4.0	7.0	12.2	19.2
	12/07/15	2.3	7.3	0.0	24.9	1.6	8.6	22.0	23.8
78	06/18/15	0.2	3.2	-4.9	16.0	-2.6	4.4	10.9	11.2
	09/15/15	3.1	5.1	-3.7	19.5	-6.0	7.5	1.8	15.3
	12/07/15	0.8	6.3	1.3	26.1	2.9	7.7	-11.4	19.7
79	06/22/15	3.0	3.9	4.5	18.9	2.2	6.5	7.8	14.2
	09/21/15	-2.5	4.3	0.4	19.6	3.2	5.1	5.6	16.7
	12/09/15	1.3	2.4	-1.0	17.5	0.6	3.4	-10.8	8.5
81	06/22/15	0.9	4.2	7.1	18.7	-1.7	6.9	-2.1	14.3
	09/21/15	-4.2	6.3	25.7	23.6	9.3	6.3	1.0	19.3
	12/10/15	-0.7	2.6	0.3	17.4	4.3	5.1	-1.8	9.5
82	06/22/15	0.3	4.7	-17.5	20.2	-0.8	6.2	4.2	15.4
	09/22/15	-1.5	5.9	3.1	22.1	-0.8	8.1	-15.4	24.2
	12/10/15	-2.8	2.9	1.1	18.3	4.7	6.6	-2.6	10.0
83	06/22/15	-4.6	4.7	11.5	21.1	5.6	7.4	-4.4	15.2
	09/21/15	-1.0	4.7	-15.9	19.5	-1.3	6.6	2.9	18.4
	12/10/15	0.1	2.6	0.2	19.1	-2.7	4.6	3.3	9.9

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	(+/-)
07/27/15	Greens	0.025	0.097	**1.954**	0.355	0.021	0.109	0.009	0.011	-0.009	0.012	-0.008	0.027	-0.007	0.010
07/27/15	Blueberries	0.046	0.092	**0.809**	0.251	0.040	0.107	-0.003	0.009	-0.004	0.010	0.010	0.022	0.003	0.009
08/10/15	Tomatoes	0.009	0.072	**2.069**	0.280	-0.037	0.082	0.006	0.008	0.002	0.009	0.018	0.020	-0.002	0.009
10/20/15	Eggplant	0.024	0.063	**2.048**	0.256	0.034	0.069	0.002	0.007	-0.003	0.009	-0.014	0.019	-0.006	0.009
10/20/15	Apples	-0.005	0.062	**1.265**	0.226	0.035	0.069	0.004	0.007	-0.006	0.007	-0.005	0.014	0.006	0.008

COLLECTION DATE	Type	Zn-65	(+/-)	Nb-95	(+/-)	Zr-95	(+/-)	Ru-103	(+/-)	Ru-106	(+/-)	Sb-125	(+/-)	I-131	(+/-)
07/27/15	Greens	-0.029	0.029	0.004	0.012	-0.006	0.019	-0.007	0.013	0.086	0.090	0.003	0.029	0.011	0.034
07/27/15	Blueberries	-0.013	0.022	-0.007	0.011	-0.001	0.019	-0.003	0.011	-0.047	0.084	-0.024	0.027	0.009	0.034
08/10/15	Tomatoes	-0.021	0.022	0.008	0.010	0.003	0.016	-0.003	0.009	-0.053	0.080	0.013	0.023	0.011	0.018
10/20/15	Eggplant	0.002	0.018	0.006	0.008	0.006	0.013	-0.004	0.007	-0.036	0.075	-0.007	0.022	0.015	0.012
10/20/15	Apples	-0.004	0.016	0.003	0.007	0.008	0.012	-0.003	0.007	-0.007	0.059	-0.007	0.019	-0.001	0.012

COLLECTION DATE	Type	Cs-134	(+/-)	Cs-137	(+/-)	Ba-140	(+/-)	La-140	(+/-)	Ce-141	(+/-)	Ce-144	(+/-)	Ac-228	(+/-)
07/27/15	Greens	-0.002	0.013	-0.004	0.011	-0.014	0.075	0.031	0.025	0.017	0.020	-0.010	0.066	0.012	0.036
07/27/15	Blueberries	-0.019	0.011	-0.003	0.009	-0.035	0.066	-0.011	0.023	-0.023	0.018	0.002	0.058	0.007	0.041
08/10/15	Tomatoes	-0.009	0.009	0.003	0.008	0.002	0.047	-0.003	0.015	0.002	0.014	-0.043	0.058	0.009	0.034
10/20/15	Eggplant	-0.014	0.008	0.002	0.007	0.003	0.035	-0.011	0.009	-0.002	0.012	0.002	0.049	-0.004	0.030
10/20/15	Apples	-0.017	0.008	0.003	0.008	0.030	0.032	0.002	0.010	0.001	0.012	0.008	0.046	-0.007	0.027

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

LOCATION 26 (control, background location; 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	(+/-)
07/27/15	Greens	0.009	0.100	**2.168**	0.314	-0.036	0.113	0.003	0.011	-0.006	0.011	-0.022	0.027	-0.002	0.009
07/27/15	Blueberries	0.043	0.056	**0.803**	0.174	0.021	0.078	0.001	0.006	0.006	0.006	-0.005	0.015	-0.001	0.007
10/20/15	Eggplant	0.020	0.071	**3.199**	0.370	0.001	0.073	0.006	0.008	0.001	0.008	0.000	0.016	-0.005	0.008
10/20/15	Apples	0.051	0.088	**0.820**	0.243	-0.061	0.081	0.001	0.010	-0.003	0.009	-0.003	0.021	0.002	0.007

COLLECTION DATE	Type	Zn-65	(+/-)	Nb-95	(+/-)	Zr-95	(+/-)	Ru-103	(+/-)	Ru-106	(+/-)	Sb-125	(+/-)	I-131	(+/-)
07/27/15	Greens	-0.007	0.025	-0.003	0.013	0.022	0.021	-0.004	0.014	-0.011	0.094	0.012	0.028	-0.003	0.034
07/27/15	Blueberries	-0.018	0.017	0.005	0.007	0.010	0.014	-0.002	0.008	0.027	0.060	-0.014	0.020	0.000	0.023
10/20/15	Eggplant	-0.002	0.020	0.003	0.008	0.000	0.015	0.002	0.008	-0.032	0.073	0.004	0.021	-0.007	0.015
10/20/15	Apples	-0.006	0.023	0.003	0.010	0.005	0.017	-0.006	0.011	0.014	0.088	0.006	0.027	-0.012	0.018

COLLECTION DATE	Type	Cs-134	(+/-)	Cs-137	(+/-)	Ba-140	(+/-)	La-140	(+/-)	Ce-141	(+/-)	Ce-144	(+/-)	Ac-228	(+/-)
07/27/15	Greens	-0.001	0.012	-0.002	0.011	-0.021	0.071	0.022	0.022	0.015	0.021	-0.039	0.076	-0.001	0.037
07/27/15	Blueberries	-0.009	0.007	-0.002	0.006	0.013	0.049	-0.014	0.016	-0.005	0.011	-0.031	0.039	0.015	0.028
10/20/15	Eggplant	-0.005	0.008	-0.002	0.009	0.020	0.036	0.007	0.012	0.001	0.015	0.023	0.056	-0.005	0.032
10/20/15	Apples	-0.002	0.011	0.004	0.010	0.047	0.044	0.000	0.013	0.016	0.015	0.067	0.062	0.027	0.042

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	(+/-)
07/16/15	**0.808**	0.207	**4.064**	0.410	-0.019	0.126	-0.004	0.012	-0.003	0.011	0.019	0.026	0.010	0.012
10/06/15	**0.959**	0.311	**4.127**	0.698	-0.153	0.211	0.021	0.020	-0.005	0.024	-0.004	0.047	0.000	0.022

COLLECTION DATE	Zn-65	(+/-)	Nb-95	(+/-)	Zr-95	(+/-)	Ru-103	(+/-)	Ru-106	(+/-)	Sb-125	(+/-)	I-131	(+/-)
07/16/15	-0.026	0.031	-0.003	0.013	-0.021	0.022	0.000	0.014	0.004	0.108	0.006	0.033	0.027	0.032
10/06/15	0.001	0.059	0.019	0.025	0.015	0.036	-0.008	0.023	-0.005	0.217	0.063	0.069	-0.031	0.039

COLLECTION DATE	Cs-134	(+/-)	Cs-137	(+/-)	Ba-140	(+/-)	La-140	(+/-)	Ce-141	(+/-)	Ce-144	(+/-)	Ac-228	(+/-)
07/16/15	0.002	0.011	0.010	0.013	-0.031	0.077	0.003	0.019	0.025	0.022	-0.055	0.072	0.057	0.050
10/06/15	0.014	0.026	0.010	0.024	0.056	0.115	-0.019	0.028	-0.018	0.039	-0.018	0.174	0.145	0.134

LOCATION 10

COLLECTION DATE	Be-7	(+/-)	K-40	(+/-)	Cr-51	(+/-)	Mn-54	(+/-)	Co-58	(+/-)	Fe-59	(+/-)	Co-60	(+/-)
07/16/15	**0.485**	0.183	**3.584**	0.374	-0.009	0.115	0.015	0.011	-0.008	0.011	-0.006	0.024	-0.004	0.009
10/06/15	0.634	0.449	**7.607**	1.042	-0.165	0.194	0.002	0.018	-0.011	0.017	0.011	0.045	0.001	0.016

COLLECTION DATE	Zn-65	(+/-)	Nb-95	(+/-)	Zr-95	(+/-)	Ru-103	(+/-)	Ru-106	(+/-)	Sb-125	(+/-)	I-131	(+/-)
07/16/15	-0.045	0.027	-0.005	0.012	-0.005	0.020	0.001	0.013	-0.016	0.101	0.006	0.031	0.016	0.032
10/06/15	0.011	0.047	-0.007	0.020	-0.011	0.039	0.007	0.020	0.005	0.181	-0.044	0.057	-0.003	0.035

COLLECTION DATE	Cs-134	(+/-)	Cs-137	(+/-)	Ba-140	(+/-)	La-140	(+/-)	Ce-141	(+/-)	Ce-144	(+/-)	Ac-228	(+/-)
07/16/15	0.000	0.012	0.008	0.012	0.043	0.077	0.007	0.016	-0.015	0.022	0.028	0.082	0.107	0.051
10/06/15	-0.001	0.022	0.004	0.019	-0.046	0.080	-0.002	0.021	0.022	0.038	-0.010	0.146	-0.020	0.080

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	(+/-)
07/16/15	**0.604**	0.258	**2.840**	0.398	-0.055	0.140	-0.002	0.013	-0.009	0.014	0.000	0.029	0.009	0.012
10/06/15	**0.826**	0.288	**3.430**	0.699	-0.068	0.196	-0.011	0.017	-0.005	0.015	0.034	0.048	-0.006	0.024

COLLECTION DATE	Zn-65	(+/-)	Nb-95	(+/-)	Zr-95	(+/-)	Ru-103	(+/-)	Ru-106	(+/-)	Sb-125	(+/-)	I-131	(+/-)
07/16/15	-0.048	0.031	0.006	0.013	-0.002	0.023	-0.007	0.013	-0.027	0.111	0.008	0.037	-0.017	0.038
10/06/15	0.022	0.040	0.000	0.021	0.000	0.033	0.010	0.020	0.026	0.143	-0.059	0.052	0.008	0.034

COLLECTION DATE	Cs-134	(+/-)	Cs-137	(+/-)	Ba-140	(+/-)	La-140	(+/-)	Ce-141	(+/-)	Ce-144	(+/-)	Ac-228	(+/-)
07/16/15	-0.008	0.016	0.013	0.013	-0.042	0.083	-0.008	0.023	0.010	0.023	-0.047	0.086	0.026	0.049
10/06/15	-0.007	0.022	0.003	0.020	-0.052	0.096	0.009	0.033	-0.013	0.033	-0.074	0.130	0.063	0.076

LOCATION 26 (control, background location)

COLLECTION DATE	Be-7	(+/-)	K-40	(+/-)	Cr-51	(+/-)	Mn-54	(+/-)	Co-58	(+/-)	Fe-59	(+/-)	Co-60	(+/-)
07/16/15	**1.021**	0.193	**3.805**	0.372	-0.004	0.100	-0.009	0.010	0.007	0.010	0.011	0.023	0.004	0.011
10/06/15	**1.042**	0.290	**3.261**	0.598	0.061	0.177	-0.001	0.018	-0.008	0.016	-0.020	0.040	0.010	0.019

COLLECTION DATE	Zn-65	(+/-)	Nb-95	(+/-)	Zr-95	(+/-)	Ru-103	(+/-)	Ru-106	(+/-)	Sb-125	(+/-)	I-131	(+/-)
07/16/15	-0.025	0.026	-0.007	0.010	-0.003	0.017	0.008	0.011	-0.033	0.087	0.013	0.027	0.001	0.028
10/06/15	-0.040	0.038	0.006	0.019	0.002	0.035	0.000	0.019	-0.053	0.157	0.023	0.046	-0.025	0.033

COLLECTION DATE	Cs-134	(+/-)	Cs-137	(+/-)	Ba-140	(+/-)	La-140	(+/-)	Ce-141	(+/-)	Ce-144	(+/-)	Ac-228	(+/-)
07/16/15	-0.010	0.011	0.009	0.010	0.020	0.061	0.005	0.017	-0.016	0.019	0.015	0.063	0.022	0.040
10/06/15	-0.032	0.022	0.021	0.020	-0.019	0.085	-0.007	0.026	0.008	0.032	0.009	0.127	0.007	0.093

TABLE 10
SEA WATER
(pCi/l)

LOCATION 32

COLLECTION DATE	H-3	(+/-)	Be-7	(+/-)	K-40	(+/-)	Cr-51	(+/-)	Mn-54	(+/-)	Co-58	(+/-)	Fe-59	(+/-)
01/26/15	**375**	135	-7.2	22.1	**245**	67	-18.0	23.7	0.4	2.3	0.4	2.7	2.5	5.4
02/24/15	92	117	8.5	32.3	**329**	92	-5.1	31.9	-0.9	4.4	-3.1	3.9	5.8	9.5
03/31/15	**319**	134	5.0	15.1	**277**	46	8.0	21.1	0.1	1.7	-1.0	1.8	-0.8	4.0
04/28/15	176	121	0.5	29.3	**448**	225	28.1	32.5	0.2	3.3	-1.4	3.5	0.6	6.8
05/26/15	**645**	154	23.8	36.8	181	123	-18.6	42.6	1.5	4.4	-2.9	4.2	-1.4	8.5
06/30/15	**622**	156	17.3	29.8	**273**	79	4.4	31.0	-0.5	3.2	-0.5	3.2	-3.6	6.3
07/28/15	**437**	188	-0.9	26.8	**311**	77	18.2	27.9	-1.5	3.0	-3.0	3.5	-1.7	6.4
08/25/15	**546**	136	-7.1	32.2	**273**	93	5.7	33.6	-0.1	3.2	1.6	3.9	-0.9	9.2
09/29/15	**433**	243	0.6	39.6	**308**	110	-7.6	41.4	1.5	4.8	-2.5	5.1	-2.6	11.0
10/27/15	**1190**	323	-28.5	42.0	**238**	115	-10.6	46.5	-0.2	4.8	1.2	4.9	3.0	9.1
11/24/15	**205**	123	-1.1	26.1	**371**	102	-30.1	31.0	1.7	2.8	-3.8	3.7	-4.9	6.8
12/29/15	157	125	11.4	39.8	**411**	110	-1.1	45.5	-5.2	4.1	-1.2	4.4	-1.3	10.3

COLLECTION DATE	Co-60	(+/-)	Zn-65	(+/-)	Nb-95	(+/-)		Zr-95	(+/-)	Ru-103	(+/-)	Ru-106	(+/-)	Sb-125	(+/-)
01/26/15	-1.4	3.2	-5.8	5.6	0.9	2.5		2.4	4.7	-1.0	2.8	0.0	23.8	-1.8	6.8
02/24/15	1.4	4.2	-3.7	10.4	-0.1	4.6		-2.6	7.3	1.8	4.3	-12.7	38.6	-3.3	9.6
03/31/15	-0.5	1.6	-5.1	3.5	-0.3	1.7		3.0	3.4	-0.9	2.4	-7.1	14.2	0.3	4.7
04/28/15	-1.1	3.7	2.6	7.0	5.7	3.7	Note	-4.5	6.2	1.9	3.6	19.0	31.5	4.0	9.3
05/26/15	0.6	3.9	0.9	8.2	-1.0	4.7		-4.6	7.2	-2.2	5.1	-2.9	38.3	-3.9	11.8
06/30/15	1.7	3.2	0.1	7.7	0.5	3.4		-0.8	6.0	3.8	3.8	10.7	28.4	4.2	8.6
07/28/15	-2.3	3.3	8.0	8.3	17.2	4.2	Note	1.5	5.2	1.1	3.2	-0.3	25.3	5.0	8.7
08/25/15	-0.1	4.2	-11.3	9.8	-0.6	3.8		3.8	7.6	-0.3	3.7	-7.6	33.9	-1.6	11.4
09/29/15	0.1	4.1	-9.4	10.9	1.9	3.5		0.3	7.5	-0.2	5.2	-20.6	44.2	-11.5	13.5
10/27/15	4.0	4.9	-10.5	12.5	-3.8	4.8		-2.1	8.1	1.4	4.8	10.2	40.7	4.8	13.3
11/24/15	3.5	3.3	4.6	8.4	-1.3	3.4		-2.1	5.1	-0.9	3.8	-0.2	35.9	11.0	10.1
12/29/15	3.2	3.9	-0.8	9.9	3.1	4.5		1.6	8.3	-0.6	4.8	9.6	43.4	8.6	10.5

Note: Extra counts detected in the Nb-95 peak area but there was no peak for positive identification of Nb-95.

COLLECTION DATE	I-131	(+/-)	Cs-134	(+/-)	Cs-137	(+/-)	Ba-140	(+/-)	La-140	(+/-)	Ac-228	(+/-)
01/26/15	-2.8	4.6	-1.1	2.6	-0.9	2.8	-7.1	12.0	3.1	3.9	-4.3	9.7
02/24/15	5.8	6.6	-4.8	3.7	-0.6	3.8	3.0	20.1	2.3	7.6	-5.0	15.9
03/31/15	4.7	8.3	-0.1	1.7	0.1	1.6	-8.5	14.3	-1.9	4.3	-2.8	6.5
04/28/15	4.5	6.9	0.0	3.4	0.7	3.9	13.2	19.9	-2.3	4.8	-79.5	30.5
05/26/15	-0.6	8.3	-5.4	4.4	0.9	4.7	3.6	23.0	2.0	5.2	2.9	15.7
06/30/15	2.5	7.1	1.4	3.5	0.5	3.5	-20.1	19.5	1.6	5.9	4.0	12.2
07/28/15	0.2	5.7	3.7	3.4	0.1	3.6	-0.9	16.0	4.8	5.2	1.6	12.4
08/25/15	-1.3	6.1	-1.3	4.3	3.0	3.8	2.5	14.7	0.1	5.1	-13.5	14.4
09/29/15	0.9	7.9	-4.4	5.2	0.7	4.6	3.0	22.1	2.5	6.4	0.1	14.9
10/27/15	-2.7	7.2	0.3	4.7	-0.1	4.7	-4.3	19.5	3.2	7.4	10.3	17.4
11/24/15	-0.9	5.4	-2.0	3.7	-3.0	3.6	5.7	16.6	2.0	5.7	10.7	12.3
12/29/15	-0.1	7.9	-4.6	4.6	-2.8	5.0	20.6	22.6	1.6	7.3	-2.2	16.3

TABLE 10
SEA WATER
(pCi/l)

LOCATION 37 (control, background location)

COLLECTION DATE	H-3	(+/-)	Be-7	(+/-)	K-40	(+/-)	Cr-51	(+/-)	Mn-54	(+/-)	Co-58	(+/-)	Fe-59	(+/-)
03/16/15	-62	107	4.7	30.1	**203**	98	30.95	35.23	0.5	3.5	-2.6	3.3	2.3	8.4
06/09/15	45	118	1.8	27.5	**314**	80	-3.13	31.22	-0.8	2.9	1.1	3.0	0.2	6.1
09/15/15	54	159	-2.6	40.5	**242**	120	27.20	46.87	0.0	4.5	0.9	4.7	6.0	8.2
12/08/15	91	118	11.3	46.2	**370**	118	38.93	47.98	1.1	5.6	-2.5	5.2	-5.9	9.4

COLLECTION DATE	Co-60	(+/-)	Zn-65	(+/-)	Nb-95	(+/-)	Zr-95	(+/-)	Ru-103	(+/-)	Ru-106	(+/-)	Sb-125	(+/-)
03/16/15	1.3	3.6	-8.5	7.6	-1.4	3.8	2.9	6.7	-4.3	4.5	17.2	32.5	-5.9	10.2
06/09/15	2.7	3.1	0.1	6.8	-0.6	3.2	-3.5	5.6	-2.4	3.6	-20.0	27.0	-1.3	7.6
09/15/15	1.1	4.9	-12.6	10.3	1.3	5.0	1.0	8.5	-1.8	5.1	-6.3	39.6	-7.3	13.4
12/08/15	3.9	4.2	1.7	11.2	2.6	4.5	-2.8	7.7	-0.1	5.0	-25.1	42.1	-6.5	12.7

COLLECTION DATE	I-131	(+/-)	Cs-134	(+/-)	Cs-137	(+/-)	Ba-140	(+/-)	La-140	(+/-)	Ac-228	(+/-)
03/16/15	7.3	7.8	-1.0	3.3	2.4	3.6	-2.2	17.9	1.6	6.8	5.8	14.4
06/09/15	-3.3	7.2	-2.6	2.9	-1.1	3.0	3.5	18.3	1.3	5.0	-4.1	11.2
09/15/15	-5.6	8.6	-7.5	5.8	-0.9	5.3	-28.8	20.9	-4.4	6.6	-20.2	19.5
12/08/15	0.1	8.4	-0.7	5.4	0.7	5.5	8.4	22.0	-5.4	10.2	-12.1	19.4

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

LOCATION	COLLECTION DATE	Be-7	(+/-)	K-40	(+/-)	Cr-51	(+/-)	Mn-54	(+/-)	Co-58	(+/-)	Fe-59	(+/-)
31	01/16/15	0.095	0.235	**14.16**	0.98	0.087	0.283	0.011	0.027	0.010	0.025	0.001	0.048
31	11/20/15	-0.231	0.308	**14.17**	1.34	-0.102	0.329	0.007	0.038	-0.013	0.034	-0.113	0.073
32	06/24/15	0.090	0.327	**15.79**	1.42	-0.177	0.360	0.025	0.040	0.030	0.039	-0.117	0.093
32	12/10/15	-0.131	0.340	**13.06**	1.84	0.113	0.369	0.003	0.033	0.007	0.029	-0.027	0.053
33	05/13/15	0.248	0.364	**16.55**	1.34	0.115	0.456	0.011	0.042	-0.013	0.043	0.075	0.083
33	07/23/15	0.320	0.324	**16.14**	1.15	-0.031	0.394	0.010	0.030	0.012	0.035	0.037	0.084
34	03/12/15	-0.115	0.144	**14.22**	0.71	0.019	0.146	-0.002	0.016	0.000	0.016	-0.029	0.041
34	07/23/15	-0.105	0.214	**19.94**	1.24	-0.179	0.246	-0.010	0.024	0.011	0.026	-0.019	0.069
37	01/16/15	0.009	0.141	**12.45**	0.92	-0.213	0.165	-0.004	0.016	-0.001	0.018	0.002	0.049
37	11/20/15	0.021	0.217	**18.05**	1.25	-0.054	0.216	0.018	0.025	-0.008	0.025	0.016	0.067

(37 is control, background location)

LOCATION	COLLECTION DATE	Co-60	(+/-)	Zn-65	(+/-)	Nb-95	(+/-)	Zr-95	(+/-)	Ru-103	(+/-)	Ru-106	(+/-)
31	01/16/15	-0.001	0.022	-0.067	0.053	0.011	0.028	0.007	0.052	-0.004	0.030	0.210	0.236
31	11/20/15	0.028	0.036	0.026	0.084	-0.032	0.042	0.034	0.076	0.034	0.041	-0.037	0.336
32	06/24/15	0.001	0.034	-0.062	0.117	0.068	0.046	-0.028	0.074	0.015	0.043	0.077	0.306
32	12/10/15	-0.007	0.034	-0.004	0.070	-0.013	0.034	0.019	0.068	0.015	0.036	0.010	0.256
33	05/13/15	-0.007	0.038	-0.130	0.108	0.035	0.043	0.043	0.075	-0.021	0.046	-0.346	0.369
33	07/23/15	0.022	0.031	-0.085	0.080	-0.009	0.041	0.010	0.065	0.032	0.041	0.022	0.278
34	03/12/15	-0.001	0.016	-0.049	0.046	0.018	0.017	0.008	0.029	0.006	0.018	-0.026	0.143
34	07/23/15	-0.014	0.025	-0.062	0.075	-0.011	0.026	-0.028	0.045	0.017	0.025	0.121	0.205
37	01/16/15	0.004	0.019	-0.010	0.052	-0.006	0.020	0.004	0.036	0.002	0.020	-0.073	0.152
37	11/20/15	-0.002	0.029	-0.036	0.071	0.013	0.029	0.007	0.049	-0.019	0.027	-0.209	0.231

LOCATION	COLLECTION DATE	Ag-110M	(+/-)	Sb-125	(+/-)	I-131	(+/-)	Cs-134	(+/-)	Cs-137	(+/-)	Ac-228	(+/-)	
31	01/16/15	0.000	0.026	-0.020	0.071	-0.016	0.077	0.028	0.027	0.017	0.027	0.311	0.392	
31	11/20/15	0.009	0.038	-0.024	0.092	0.062	0.096	-0.003	0.040	-0.026	0.042	2.164	0.381	Note
32	06/24/15	-0.054	0.036	-0.004	0.090	0.057	0.104	0.002	0.039	0.010	0.041	1.211	0.300	Note
32	12/10/15	0.016	0.025	-0.016	0.086	0.009	0.100	-0.018	0.031	0.025	0.040	1.010	0.379	Note
33	05/13/15	-0.045	0.039	-0.003	0.112	-0.042	0.118	0.011	0.042	-0.018	0.044	0.130	0.366	
33	07/23/15	0.002	0.030	0.022	0.087	-0.013	0.165	0.045	0.035	-0.042	0.033	0.605	0.215	Note
34	03/12/15	0.000	0.016	-0.003	0.041	-0.009	0.047	-0.008	0.017	0.002	0.018	0.181	0.126	
34	07/23/15	-0.005	0.022	-0.024	0.051	-0.057	0.101	-0.008	0.022	-0.020	0.025	0.012	0.162	
37	01/16/15	-0.019	0.015	-0.041	0.038	0.038	0.042	-0.003	0.019	0.016	0.017	0.027	0.127	
37	11/20/15	0.000	0.021	0.007	0.064	-0.036	0.055	0.015	0.023	0.006	0.022	0.146	0.134	

Note: Extra counts detected in the Ac-228 peak area but there was no peak for positive identification of Ac-228.

TABLE 12
AQUATIC FLORA - FUCUS
(pCi/g wet wt.) (all samples are extra, not required by the REMODCM)

LOCATION	COLLECTION DATE	Be-7	(+/-)		K-40	(+/-)	Cr-51	(+/-)	Mn-54	(+/-)	Co-58	(+/-)	Fe-59	(+/-)
29	01/15/15	**0.2670**	0.1124		**6.0720**	0.4164	-0.0073	0.0936	-0.0048	0.0098	-0.0088	0.0103	0.0042	0.0250
29	05/12/15	**0.1966**	0.0612		**6.0290**	0.2142	0.0115	0.0494	-0.0003	0.0044	0.0006	0.0047	-0.0024	0.0115
29	07/22/15	0.0643	0.0905		**6.8460**	0.4335	-0.0694	0.1072	-0.0046	0.0093	0.0003	0.0102	0.0038	0.0258
29	10/05/15	0.0667	0.0875		**6.0680**	0.6264	0.0064	0.1127	0.0010	0.0122	0.0014	0.0123	0.0000	0.0351
32	01/15/15	**0.1980**	0.1178		**8.3540**	0.3809	-0.0712	0.0793	0.0010	0.0078	-0.0029	0.0079	-0.0020	0.0202
32	05/12/15	0.0234	0.0858		**7.1700**	0.4172	-0.0224	0.0892	-0.0039	0.0093	0.0056	0.0095	0.0084	0.0215
32	07/22/15	0.0881	0.0621		**6.3020**	0.3398	-0.0053	0.0705	-0.0033	0.0069	0.0023	0.0075	0.0017	0.0183
32	11/20/15	0.0319	0.1159		**9.4520**	0.6652	0.0407	0.1118	0.0052	0.0124	0.0024	0.0124	-0.0053	0.0332
35	01/15/15	**0.2375**	0.1582		**7.7990**	0.5258	-0.0154	0.0387	0.0005	0.0038	-0.0002	0.0036	-0.0025	0.0112
35	05/12/15	0.1387	0.0832	Note 1	**6.5640**	0.3650	-0.0562	0.0915	0.0002	0.0087	-0.0082	0.0089	0.0033	0.0215
35	07/22/15	0.0942	0.0954		**6.8390**	0.3896	-0.0368	0.0912	0.0087	0.0091	-0.0040	0.0101	0.0129	0.0228
35	10/05/15	0.0709	0.1506		**7.8080**	0.8566	0.0654	0.1500	0.0062	0.0147	-0.0089	0.0178	-0.0002	0.0399
		Note 1: Result is less than minimum detectable activity (MDA) of 0.149 pCi/g.												
36	01/16/15	0.1634	0.1287		**6.1650**	0.5130	0.0931	0.1153	-0.0057	0.0129	0.0069	0.0136	-0.0111	0.0338
36	06/12/15	0.0651	0.0896		**6.0150**	0.4647	-0.0282	0.0964	0.0033	0.0100	-0.0042	0.0108	-0.0257	0.0262
36	09/10/15	0.0623	0.0851		**7.1020**	0.4150	0.0014	0.0939	0.0014	0.0086	-0.0011	0.0089	0.0126	0.0230
36	11/20/15	0.1802	0.1193	Note 2	**7.1070**	0.6037	-0.0017	0.1067	0.0020	0.0131	-0.0002	0.0135	0.0086	0.0340
		Note 2: Result is less than minimum detectable activity (MDA) of 0.224 pCi/g.												
90	03/12/15	**0.2663**	0.1021		**6.1880**	0.2976	-0.0020	0.0665	0.0021	0.0058	-0.0035	0.0061	0.0174	0.0155
90	05/13/15	0.1291	0.0993		**6.6930**	0.3477	0.0049	0.0830	0.0079	0.0081	0.0016	0.0092	-0.0016	0.0199
90	07/23/15	-0.0139	0.0526		**7.0070**	0.3016	-0.0286	0.0583	-0.0006	0.0060	0.0032	0.0065	-0.0029	0.0167
90	12/04/15	0.0713	0.1144		**8.6210**	0.5996	0.0834	0.1103	-0.0009	0.0115	0.0149	0.0126	-0.0197	0.0288

TABLE 12
AQUATIC FLORA - FUCUS
(pCi/g wet wt.) (all samples are extra, not required by the REMODCM)

LOCATION	COLLECTION DATE	Co-60		Zn-65		Nb-95		Zr-95		Ru-103		Ru-106	
			(+/-)		(+/-)		(+/-)		(+/-)		(+/-)		(+/-)
29	01/15/15	0.0064	0.0083	-0.0107	0.0251	0.0007	0.0102	-0.0161	0.0186	-0.0021	0.0104	-0.0836	0.0847
29	05/12/15	0.0017	0.0049	-0.0162	0.0120	0.0037	0.0050	0.0090	0.0089	0.0025	0.0051	-0.0059	0.0410
29	07/22/15	0.0085	0.0103	-0.0294	0.0259	0.0065	0.0105	0.0229	0.0195	0.0044	0.0107	-0.0424	0.0891
29	10/05/15	0.0051	0.0141	-0.0206	0.0348	-0.0027	0.0127	-0.0018	0.0231	0.0014	0.0133	-0.0307	0.1233
32	01/15/15	0.0010	0.0094	-0.0137	0.0183	0.0047	0.0084	0.0144	0.0144	-0.0090	0.0083	-0.0340	0.0702
32	05/12/15	-0.0014	0.0090	-0.0032	0.0234	-0.0002	0.0096	0.0030	0.0165	-0.0004	0.0096	0.0250	0.0756
32	07/22/15	0.0026	0.0076	-0.0145	0.0186	0.0035	0.0067	-0.0123	0.0112	-0.0019	0.0079	0.0387	0.0565
32	11/20/15	-0.0025	0.0143	-0.0249	0.0299	0.0132	0.0120	0.0153	0.0191	0.0007	0.0128	0.0693	0.1101
35	01/15/15	-0.0078	0.0054	0.0107	0.0100	0.0018	0.0046	0.0025	0.0092	0.0020	0.0044	0.0051	0.0326
35	05/12/15	0.0039	0.0082	-0.0114	0.0207	0.0034	0.0098	0.0011	0.0165	0.0030	0.0099	0.0029	0.0782
35	07/22/15	0.0071	0.0098	-0.0260	0.0206	0.0090	0.0098	0.0024	0.0166	0.0038	0.0096	0.0289	0.0764
35	10/05/15	0.0107	0.0191	-0.0275	0.0482	0.0084	0.0172	0.0190	0.0328	0.0079	0.0166	0.0488	0.1298
36	01/16/15	-0.0024	0.0118	-0.0463	0.0316	-0.0008	0.0136	0.0051	0.0238	-0.0013	0.0130	-0.0150	0.1086
36	06/12/15	0.0018	0.0104	-0.0285	0.0240	0.0051	0.0108	-0.0013	0.0193	0.0061	0.0112	0.0024	0.0824
36	09/10/15	-0.0014	0.0088	-0.0004	0.0272	0.0024	0.0106	-0.0175	0.0169	0.0028	0.0095	-0.0184	0.0732
36	11/20/15	0.0104	0.0140	-0.0316	0.0285	0.0037	0.0149	-0.0316	0.0266	-0.0056	0.0140	-0.0437	0.1158
90	03/12/15	0.0054	0.0057	-0.0215	0.0160	-0.0014	0.0068	-0.0011	0.0118	-0.0017	0.0067	0.0431	0.0564
90	05/13/15	-0.0030	0.0084	0.0066	0.0209	0.0004	0.0087	0.0131	0.0151	-0.0031	0.0085	0.0314	0.0708
90	07/23/15	0.0031	0.0061	-0.0264	0.0162	-0.0062	0.0066	-0.0023	0.0115	0.0027	0.0066	0.0494	0.0526
90	12/04/15	0.0079	0.0137	-0.0276	0.0289	-0.0044	0.0130	0.0104	0.0249	-0.0089	0.0131	-0.0258	0.0986

TABLE 12
AQUATIC FLORA - FUCUS
(pCi/g wet wt.) (all samples are extra, not required by the REMODCM)

LOCATION	COLLECTION DATE	Ag-110M		Sb-125		I-131		Cs-134		Cs-137		Ac-228		
			(+/-)		(+/-)		(+/-)		(+/-)		(+/-)		(+/-)	
29	01/15/15	-0.0030	0.0085	0.0015	0.0215	0.0237	0.0283	-0.0036	0.0099	0.0015	0.0093	0.0387	0.0683	
29	05/12/15	0.0013	0.0045	0.0004	0.0120	0.0047	0.0134	-0.0113	0.0047	0.0026	0.0048	**0.0978**	0.0242	
29	07/22/15	-0.0038	0.0095	0.0342	0.0236	0.0032	0.0332	-0.0193	0.0105	0.0043	0.0099	**0.1282**	0.0574	
29	10/05/15	0.0025	0.0135	-0.0030	0.0322	-0.0214	0.0229	0.0016	0.0160	-0.0126	0.0151	**0.1416**	0.0633	
32	01/15/15	0.0115	0.0080	-0.0054	0.0215	0.0257	0.0228	-0.0092	0.0075	-0.0154	0.0085	0.0751	0.0549	
32	05/12/15	-0.0034	0.0077	0.0010	0.0233	0.0070	0.0279	-0.0007	0.0093	0.0016	0.0084	0.0719	0.0391	Note 1
32	07/22/15	-0.0075	0.0063	0.0017	0.0167	-0.0089	0.0218	-0.0065	0.0069	0.0025	0.0065	0.0326	0.0424	
32	11/20/15	0.0004	0.0113	-0.0209	0.0344	0.0196	0.0343	-0.0100	0.0122	0.0004	0.0129	0.0797	0.0800	
35	01/15/15	-0.0028	0.0042	0.0051	0.0110	-0.0001	0.0119	-0.0003	0.0031	0.0003	0.0044	0.1261	0.0750	Note 2
35	05/12/15	-0.0026	0.0090	-0.0076	0.0232	0.0014	0.0271	0.0028	0.0089	0.0035	0.0094	0.0078	0.0816	
35	07/22/15	-0.0015	0.0082	0.0026	0.0233	-0.0034	0.0281	-0.0188	0.0088	0.0094	0.0087	**0.1151**	0.0623	
35	10/05/15	-0.0100	0.0160	0.0034	0.0432	-0.0096	0.0260	-0.0186	0.0194	0.0052	0.0160	-0.0186	0.0695	
36	01/16/15	0.0001	0.0109	-0.0028	0.0301	0.0173	0.0308	-0.0058	0.0133	-0.0054	0.0125	0.0802	0.0665	
36	06/12/15	-0.0006	0.0095	0.0044	0.0208	0.0189	0.0341	-0.0104	0.0107	-0.0016	0.0100	**0.0989**	0.0483	
36	09/10/15	-0.0046	0.0082	-0.0023	0.0252	-0.0043	0.0205	0.0071	0.0084	0.0075	0.0092	0.0185	0.0383	
36	11/20/15	-0.0007	0.0138	-0.0041	0.0324	0.0273	0.0275	0.0017	0.0107	-0.0030	0.0140	0.0898	0.0573	Note 1
90	03/12/15	-0.0077	0.0057	0.0071	0.0165	0.0109	0.0195	-0.0025	0.0063	0.0048	0.0060	0.0552	0.0379	
90	05/13/15	-0.0017	0.0078	-0.0193	0.0202	0.0044	0.0212	-0.0034	0.0090	0.0020	0.0083	0.0615	0.0472	
90	07/23/15	0.0024	0.0054	0.0027	0.0148	0.0222	0.0186	0.0011	0.0063	0.0007	0.0059	**0.0902**	0.0479	
90	12/04/15	-0.0082	0.0107	-0.0158	0.0269	0.0055	0.0286	0.0049	0.0137	0.0096	0.0118	0.0840	0.0768	

Note 1: Result for Ac-228 was less than Minimum Detectable Activity (MDA)

Note 2: Extra counts detected in the Ac-228 peak area but there was no peak for positive identification of Ac-228.

TABLE 13
FISH
(pCi/g wet wt.)

LOCATION	COLLECTION DATE	Be-7	(+/-)	K-40	(+/-)	Cr-51	(+/-)	Mn-54	(+/-)	Co-58	(+/-)	Fe-59	(+/-)
29	07/28/15	-0.057	0.106	**4.512**	0.378	-0.042	0.133	0.003	0.011	-0.010	0.012	-0.020	0.028
29	10/06/15	-0.093	0.276	**3.792**	0.946	0.046	0.239	0.002	0.029	0.000	0.032	0.021	0.070
32	03/23/15	-0.064	0.075	**5.314**	0.325	-0.108	0.095	0.002	0.008	0.001	0.009	0.005	0.021
32	04/07/15	-0.011	0.108	**5.002**	0.406	-0.026	0.114	-0.004	0.011	-0.011	0.012	-0.018	0.025
35	05/20/15	-0.155	0.171	**4.466**	0.573	0.006	0.187	-0.002	0.021	-0.014	0.021	-0.011	0.042
35	07/14/15	0.000	0.027	**4.020**	0.151	-0.014	0.039	0.000	0.002	-0.001	0.003	0.001	0.007
35	10/06/15	0.022	0.281	**3.775**	0.759	-0.082	0.312	-0.009	0.034	0.006	0.030	-0.006	0.067

LOCATION	COLLECTION DATE	Co-60	(+/-)	Zn-65	(+/-)	Nb-95	(+/-)	Zr-95	(+/-)	Ru-103	(+/-)	Ru-106	(+/-)
29	07/28/15	-0.005	0.012	-0.042	0.028	0.001	0.013	-0.015	0.022	-0.004	0.014	-0.099	0.104
29	10/06/15	0.000	0.025	-0.018	0.069	-0.001	0.033	-0.019	0.059	-0.012	0.032	-0.154	0.256
32	03/23/15	0.004	0.009	-0.027	0.018	0.002	0.009	0.010	0.016	-0.002	0.010	-0.004	0.070
32	04/07/15	0.000	0.012	-0.057	0.028	0.017	0.012	0.007	0.021	0.003	0.012	0.007	0.106
35	05/20/15	-0.009	0.020	0.020	0.044	0.010	0.020	0.001	0.035	0.008	0.022	0.028	0.192
35	07/14/15	0.002	0.002	0.001	0.006	0.002	0.003	-0.001	0.005	0.001	0.004	-0.017	0.022
35	10/06/15	-0.013	0.030	-0.001	0.082	0.043	0.033	-0.023	0.057	-0.030	0.035	0.186	0.289

LOCATION	COLLECTION DATE	Ag-110M	(+/-)	Sb-125	(+/-)	I-131	(+/-)	Cs-134	(+/-)	Cs-137	(+/-)	Ac-228	(+/-)
29	07/28/15	-0.002	0.011	0.020	0.031	0.010	0.045	0.000	0.014	0.007	0.012	-0.050	0.047
29	10/06/15	-0.021	0.032	0.012	0.079	0.021	0.045	-0.004	0.036	0.001	0.033	-0.116	0.130
32	03/23/15	0.005	0.008	0.012	0.019	0.013	0.052	-0.004	0.008	0.000	0.008	-0.033	0.047
32	04/07/15	-0.001	0.011	-0.012	0.033	0.007	0.025	-0.043	0.012	0.002	0.012	0.008	0.061
35	05/20/15	0.009	0.018	-0.017	0.054	0.004	0.039	0.007	0.024	-0.007	0.021	0.035	0.080
35	07/14/15	0.001	0.002	0.003	0.006	-0.047	0.034	-0.001	0.002	0.002	0.003	-0.035	0.020
35	10/06/15	-0.039	0.030	0.053	0.100	-0.009	0.053	0.013	0.038	0.028	0.034	-0.014	0.115

TABLE 14
OYSTERS
(pCi/g wet wt.)

LOCATION	COLLECTION DATE	Be-7	(+/-)	K-40	(+/-)	Cr-51	(+/-)	Mn-54	(+/-)	Co-58	(+/-)	Fe-59	(+/-)
31	03/12/15	-0.087	0.199	**2.310**	0.607	0.000	0.224	0.006	0.027	-0.006	0.021	0.011	0.049
31	05/21/15	-0.090	0.114	**2.515**	0.493	-0.045	0.122	-0.002	0.015	0.008	0.016	0.018	0.033
31	08/10/15	0.167	0.480	**2.269**	0.983	-0.126	0.478	-0.027	0.051	0.010	0.053	0.049	0.112
31	12/07/15	0.045	0.190	**2.226**	0.841	0.001	0.186	-0.001	0.039	0.006	0.027	-0.036	0.060
32	03/04/15	-0.062	0.244	**2.149**	0.620	0.150	0.291	-0.012	0.027	0.031	0.027	-0.054	0.066
32	05/19/15	-0.385	0.431	**2.034**	0.840	-0.294	0.451	0.031	0.041	-0.015	0.044	-0.020	0.079
32	07/10/15	-0.090	0.142	**2.406**	0.441	-0.088	0.148	-0.003	0.017	-0.008	0.019	-0.029	0.032
32	12/09/15	-0.030	0.219	**2.112**	0.839	0.198	0.318	-0.060	0.046	-0.010	0.037	0.027	0.081
88	03/05/15	0.069	0.261	**1.539**	0.793	0.021	0.343	-0.002	0.029	-0.019	0.028	0.003	0.066
88	05/20/15	-0.048	0.154	**1.891**	0.470	-0.057	0.174	0.003	0.019	0.002	0.018	0.027	0.038
88	08/19/15	0.081	0.396	**2.784**	1.209	-0.277	0.320	-0.006	0.039	0.005	0.047	0.046	0.099
88	12/07/15	0.138	0.357	**1.822**	1.105	0.236	0.346	0.049	0.048	-0.030	0.042	0.008	0.081
37	03/10/15	0.029	0.194	**2.583**	0.612	0.166	0.242	-0.012	0.022	0.020	0.027	-0.015	0.055
37	05/29/15	0.023	0.292	**2.247**	0.917	0.030	0.378	-0.019	0.036	-0.011	0.041	-0.016	0.079
37	08/31/15	0.162	0.302	**2.195**	1.031	-0.326	0.311	0.033	0.043	-0.016	0.032	-0.063	0.072
37	01/15/16	0.095	0.215	**1.025**	0.656	-0.020	0.222	0.025	0.026	-0.017	0.026	-0.020	0.053

37 is control, background location. Sample on 1/15/16, a 4th quarter 2015 sample was collected late. See discussion.

TABLE 14
OYSTERS
(pCi/g wet wt.)

LOCATION	COLLECTION DATE	Co-60		Zn-65		Nb-95		Zr-95		Ru-103		Ru-106	
			(+/-)		(+/-)		(+/-)		(+/-)		(+/-)		(+/-)
31	03/12/15	0.018	0.025	-0.033	0.054	0.008	0.028	0.001	0.046	0.012	0.027	0.073	0.201
31	05/21/15	0.017	0.018	-0.039	0.037	-0.010	0.016	-0.011	0.026	0.000	0.015	0.008	0.124
31	08/10/15	-0.016	0.056	-0.125	0.112	-0.007	0.050	-0.028	0.096	0.007	0.065	0.075	0.484
31	12/07/15	0.020	0.046	-0.061	0.065	0.012	0.036	-0.017	0.055	-0.024	0.034	0.022	0.287
32	03/04/15	0.020	0.029	-0.030	0.054	0.020	0.035	0.036	0.055	-0.009	0.035	0.024	0.248
32	05/19/15	0.004	0.042	-0.048	0.099	-0.003	0.044	-0.030	0.074	-0.019	0.049	0.149	0.467
32	07/10/15	0.002	0.016	-0.031	0.042	0.015	0.019	-0.017	0.033	-0.004	0.020	-0.216	0.158
32	12/09/15	-0.006	0.029	-0.027	0.071	0.022	0.047	-0.030	0.063	-0.016	0.039	0.051	0.347
88	03/05/15	0.003	0.028	-0.061	0.062	-0.024	0.030	0.000	0.054	0.025	0.037	-0.153	0.287
88	05/20/15	0.000	0.017	-0.073	0.043	0.004	0.019	0.019	0.034	0.008	0.020	-0.082	0.173
88	08/19/15	0.019	0.047	-0.043	0.106	-0.031	0.039	-0.054	0.092	0.030	0.045	-0.370	0.321
88	12/07/15	-0.002	0.043	-0.026	0.097	-0.012	0.053	-0.003	0.098	-0.028	0.047	-0.290	0.410
37	03/10/15	-0.008	0.020	-0.060	0.061	-0.008	0.023	0.043	0.050	-0.023	0.027	0.166	0.186
37	05/29/15	0.009	0.038	-0.103	0.082	0.023	0.034	0.013	0.065	0.004	0.041	-0.144	0.294
37	08/31/15	0.026	0.036	-0.133	0.094	0.005	0.036	-0.032	0.066	0.016	0.041	-0.172	0.337
37	01/15/16	-0.006	0.024	-0.062	0.059	0.035	0.024	0.007	0.045	0.004	0.027	0.195	0.231

37 is control, background location. Sample on 1/15/16, a 4th quarter 2015 sample was collected late. See discussion.

TABLE 14
OYSTERS
(pCi/g wet wt.)

LOCATION	COLLECTION DATE	Ag-110M	(+/-)	Sb-125	(+/-)	I-131	(+/-)	Cs-134	(+/-)	Cs-137	(+/-)	Ac-228	(+/-)	
31	03/12/15	0.011	0.023	-0.016	0.053	0.023	0.080	-0.015	0.025	0.010	0.028	0.010	0.090	
31	05/21/15	0.000	0.015	-0.009	0.038	-0.007	0.026	0.001	0.017	-0.002	0.017	0.023	0.067	
31	08/10/15	-0.001	0.048	0.005	0.135	0.106	0.119	-0.002	0.069	0.038	0.055	0.149	0.178	
31	12/07/15	0.014	0.031	0.000	0.079	-0.020	0.041	0.001	0.032	-0.030	0.033	-0.185	0.162	
32	03/04/15	-0.013	0.026	-0.028	0.073	-0.143	0.111	0.017	0.029	0.011	0.027	0.101	0.103	
32	05/19/15	-0.005	0.048	-0.071	0.121	-0.030	0.098	-0.073	0.050	-0.014	0.051	-0.067	0.187	
32	07/10/15	0.017	0.017	0.011	0.044	0.004	0.042	0.014	0.019	-0.009	0.018	0.016	0.071	
32	12/09/15	-0.019	0.041	-0.012	0.104	-0.002	0.068	0.027	0.042	0.013	0.043	-0.043	0.148	
88	03/05/15	0.000	0.029	0.048	0.077	0.063	0.120	0.004	0.032	-0.017	0.033	0.055	0.134	
88	05/20/15	0.009	0.016	0.039	0.050	0.000	0.034	0.005	0.021	-0.005	0.019	0.097	0.091	
88	08/19/15	0.026	0.038	0.025	0.134	0.021	0.070	-0.029	0.052	-0.005	0.046	0.254	0.169	Note
88	12/07/15	-0.016	0.042	0.080	0.124	-0.096	0.085	-0.058	0.049	0.005	0.045	0.036	0.153	
37	03/10/15	-0.001	0.021	0.021	0.063	0.002	0.066	-0.031	0.026	-0.014	0.024	-0.041	0.094	
37	05/29/15	-0.023	0.029	0.003	0.088	-0.054	0.103	-0.003	0.036	0.000	0.032	-0.092	0.139	
37	08/31/15	0.012	0.037	0.040	0.101	0.027	0.074	-0.002	0.041	-0.008	0.040	0.031	0.139	
37	01/15/16	-0.028	0.025	0.055	0.064	0.007	0.053	0.008	0.028	0.015	0.025	-0.026	0.108	

Note: Ac-228 was not identified in sample. Counts in Ac-228 peak area were from naturally occuring Pb-214.

37 is control, background location. Sample on 1/15/16, a 4th quarter 2015 sample was collected late. See discussion.

TABLE 15
CLAMS
(pCi/g wet wt.)

LOCATION	COLLECTION DATE	Be-7	(+/-)	K-40	(+/-)	Cr-51	(+/-)	Mn-54	(+/-)	Co-58	(+/-)	Fe-59	(+/-)
29	03/12/15	0.077	0.350	**1.769**	0.717	-0.455	0.425	0.015	0.041	0.025	0.035	0.016	0.065
29	06/09/15	0.032	0.204	**2.379**	0.726	-0.033	0.229	0.000	0.021	-0.019	0.026	0.005	0.054
29	07/24/15	0.265	0.348	**2.275**	0.772	0.021	0.380	0.003	0.035	-0.023	0.034	0.012	0.070
29	10/07/15	0.314	0.243	**2.775**	0.819	0.173	0.245	0.012	0.024	-0.005	0.026	-0.008	0.042
38	06/11/15	0.126	0.268	**2.144**	0.604	0.058	0.297	0.005	0.028	-0.001	0.033	0.007	0.062
38	08/04/15	0.055	0.358	**2.205**	0.951	-0.343	0.431	-0.002	0.037	0.015	0.051	-0.045	0.090
38	10/27/15	0.096	0.406	1.992	1.251 Note	-0.088	0.544	-0.009	0.056	0.001	0.059	-0.087	0.085

Note: Results is less than minimum detectable activity (MDA) of 2.67 pCi/g.

LOCATION	COLLECTION DATE	Co-60	(+/-)	Zn-65	(+/-)	Nb-95	(+/-)	Zr-95	(+/-)	Ru-103	(+/-)	Ru-106	(+/-)
29	03/12/15	-0.010	0.036	-0.034	0.066	0.041	0.039	-0.001	0.063	0.001	0.045	0.025	0.351
29	06/09/15	0.009	0.027	0.000	0.056	0.021	0.025	-0.009	0.046	-0.017	0.025	0.064	0.189
29	07/24/15	0.005	0.031	-0.022	0.091	0.028	0.042	-0.049	0.066	0.004	0.045	-0.070	0.344
29	10/07/15	-0.010	0.027	0.021	0.061	0.015	0.031	0.016	0.052	-0.009	0.029	-0.126	0.222
38	06/11/15	-0.002	0.027	-0.052	0.059	0.001	0.029	0.007	0.050	0.031	0.033	-0.085	0.261
38	08/04/15	0.011	0.043	0.072	0.099	-0.028	0.044	-0.016	0.067	0.008	0.051	-0.123	0.415
38	10/27/15	0.009	0.055	-0.048	0.151	-0.013	0.053	0.085	0.096	-0.010	0.055	0.091	0.460

LOCATION	COLLECTION DATE	Ag-110M	(+/-)	Sb-125	(+/-)	I-131	(+/-)	Cs-134	(+/-)	Cs-137	(+/-)	Ac-228	(+/-)
29	03/12/15	0.003	0.037	0.063	0.100	-0.048	0.121	-0.044	0.040	-0.028	0.042	0.128	0.141
29	06/09/15	0.027	0.023	-0.013	0.063	-0.023	0.042	0.007	0.032	-0.010	0.026	0.028	0.111
29	07/24/15	0.010	0.034	-0.050	0.084	0.037	0.143	0.007	0.037	0.036	0.036	0.084	0.155
29	10/07/15	-0.008	0.027	-0.016	0.087	-0.083	0.050	0.006	0.031	-0.016	0.032	-0.046	0.117
38	06/11/15	-0.001	0.028	0.024	0.073	0.144	0.120	-0.023	0.030	0.029	0.028	0.079	0.109
38	08/04/15	-0.009	0.043	-0.038	0.107	0.042	0.152	-0.035	0.043	0.007	0.039	-0.018	0.159
38	10/27/15	-0.010	0.054	-0.051	0.171	0.015	0.100	-0.043	0.065	-0.001	0.056	0.144	0.220

TABLE 16
LOBSTERS
(pCi/g wet wt.)

LOCATION	COLLECTION DATE	Be-7	(+/-)	K-40	(+/-)	Cr-51	(+/-)	Mn-54	(+/-)	Co-58	(+/-)	Fe-59	(+/-)
35	03/24/15	0.228	0.320	**2.355**	0.738	-0.151	0.387	-0.004	0.032	-0.011	0.033	-0.009	0.075
35	05/26/15	-0.150	0.201	**3.004**	0.691	-0.087	0.196	0.018	0.021	-0.015	0.029	-0.015	0.054
35	07/30/15	0.203	0.412	**3.122**	1.043	-0.235	0.527	-0.013	0.038	-0.022	0.051	0.089	0.100
35	10/22/15	-0.046	0.384	**3.083**	1.586	0.089	0.401	-0.026	0.044	-0.057	0.051	0.013	0.080
89	03/20/15	-0.023	0.528	**2.549**	0.968	0.149	0.725	0.000	0.038	0.008	0.044	0.090	0.106
89	06/19/15	-0.341	0.321	**2.687**	0.964	0.005	0.282	0.009	0.033	-0.022	0.037	-0.038	0.088
89	08/18/15	-0.167	0.258	**2.544**	0.731	-0.007	0.260	0.003	0.030	-0.004	0.029	-0.004	0.055
89	12/08/15	0.064	0.486	**3.880**	1.618	0.258	0.491	0.013	0.073	-0.007	0.059	0.023	0.149

(89 is control, background location)

LOCATION	COLLECTION DATE	Co-60	(+/-)	Zn-65	(+/-)	Nb-95	(+/-)	Zr-95	(+/-)	Ru-103	(+/-)	Ru-106	(+/-)
35	03/24/15	0.008	0.032	-0.032	0.070	0.008	0.037	0.024	0.068	-0.003	0.042	0.152	0.290
35	05/26/15	0.012	0.025	-0.050	0.058	0.002	0.025	-0.028	0.048	0.012	0.023	-0.035	0.215
35	07/30/15	0.002	0.039	-0.083	0.098	0.010	0.045	-0.022	0.091	0.027	0.056	-0.030	0.380
35	10/22/15	0.010	0.056	-0.067	0.131	0.026	0.052	0.073	0.073	0.027	0.049	0.068	0.415
89	03/20/15	0.023	0.049	-0.038	0.100	-0.041	0.046	-0.012	0.079	-0.051	0.065	-0.058	0.433
89	06/19/15	-0.010	0.033	0.002	0.084	0.003	0.042	-0.002	0.068	-0.001	0.036	0.088	0.316
89	08/18/15	-0.010	0.028	-0.056	0.073	0.004	0.029	0.007	0.050	0.011	0.027	-0.141	0.255
89	12/08/15	0.028	0.040	-0.090	0.152	0.044	0.061	0.099	0.130	-0.034	0.060	-0.339	0.571

LOCATION	COLLECTION DATE	Ag-110M	(+/-)	Sb-125	(+/-)	I-131	(+/-)	Cs-134	(+/-)	Cs-137	(+/-)	Ac-228	(+/-)
35	03/24/15	-0.008	0.028	-0.010	0.075	0.254	0.203	-0.058	0.036	0.010	0.028	-0.015	0.112
35	05/26/15	0.009	0.020	-0.014	0.061	0.027	0.052	-0.009	0.030	0.009	0.024	-0.003	0.096
35	07/30/15	0.029	0.041	0.044	0.150	-0.016	0.160	-0.068	0.056	-0.039	0.042	-0.162	0.211
35	10/22/15	-0.035	0.044	0.001	0.131	-0.020	0.067	0.018	0.049	-0.014	0.049	0.042	0.251
89	03/20/15	-0.021	0.042	-0.096	0.121	-0.238	0.481	-0.032	0.045	0.030	0.043	-0.005	0.142
89	06/19/15	0.000	0.033	0.001	0.085	-0.025	0.083	0.007	0.032	0.027	0.039	0.037	0.124
89	08/18/15	-0.003	0.027	0.013	0.074	0.014	0.049	-0.003	0.035	0.000	0.029	-0.159	0.094
89	12/08/15	0.016	0.060	0.109	0.166	0.039	0.091	-0.006	0.070	0.009	0.064	0.019	0.233

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 numerous samples. Be-7 is from cosmic radiation. It was observed in air and broadleaf vegetation and in some fruits, vegetable and fucus samples. K-40 and Ac-228 are two common terrestrial isotopes. K-40 was observed in almost every type of sample. Ac-228 results were variable; it was observed in some sediment and fucus samples. Cs-137 and Sr-90 from atmospheric nuclear weapons testing in the 1960's have been observed in the past. During 2015, Cs-137 was detected in soil samples. Sr-90 was not detected in 2015.

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 or 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: 9.1 uR/hour at Location 73, 7.4 uR/hour at Location 74 and 6.7 uR/hour at Location 75). At Location 73 the readings have been lower since the fourth quarter of 2012, averaging 7.6 uR/hour.

Table 1 in Section 3.2 lists the exposure rate measurements for all 44 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), Millstone Unit 3 Discharge (Location 5), Environmental Laboratory (Location 8), Bay Point Beach (Location 9), Pleasure Beach (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 7.6 uR/hour. This is equivalent to an annual dose of about 67 mrem. Given the error in measurement results this is in agreement with the estimated dose from Millstone of about 0.25 mrem for 2015.

The averages of all indicator locations for the period when Millstone Unit 1 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 1 is slightly higher in gamma exposure rate than the average control gamma exposure rate. An opposite trend is shown for Location 3. 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 2015 data for Location 3 shows an increase likely attributable to the being closer to granite at the new location.

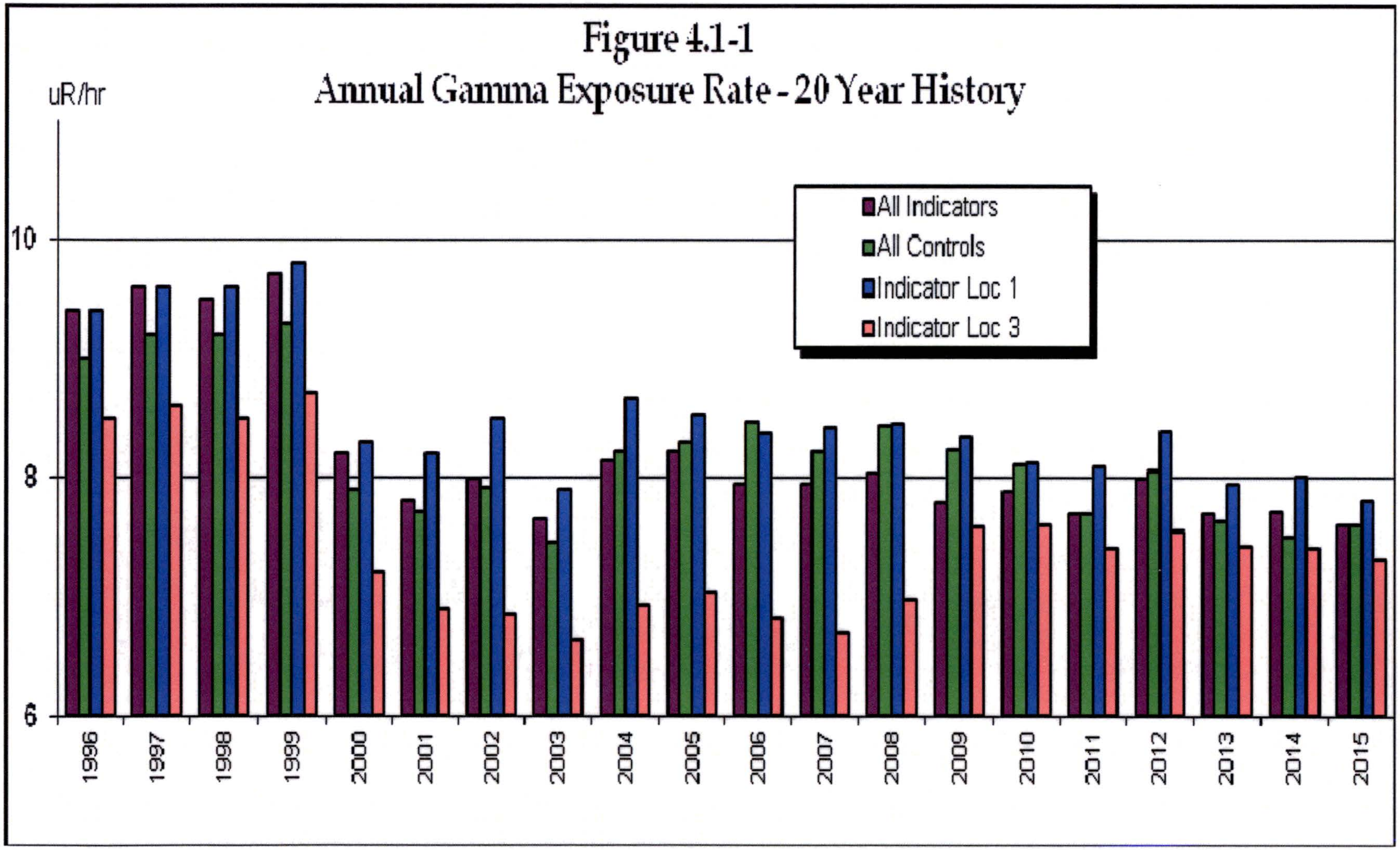
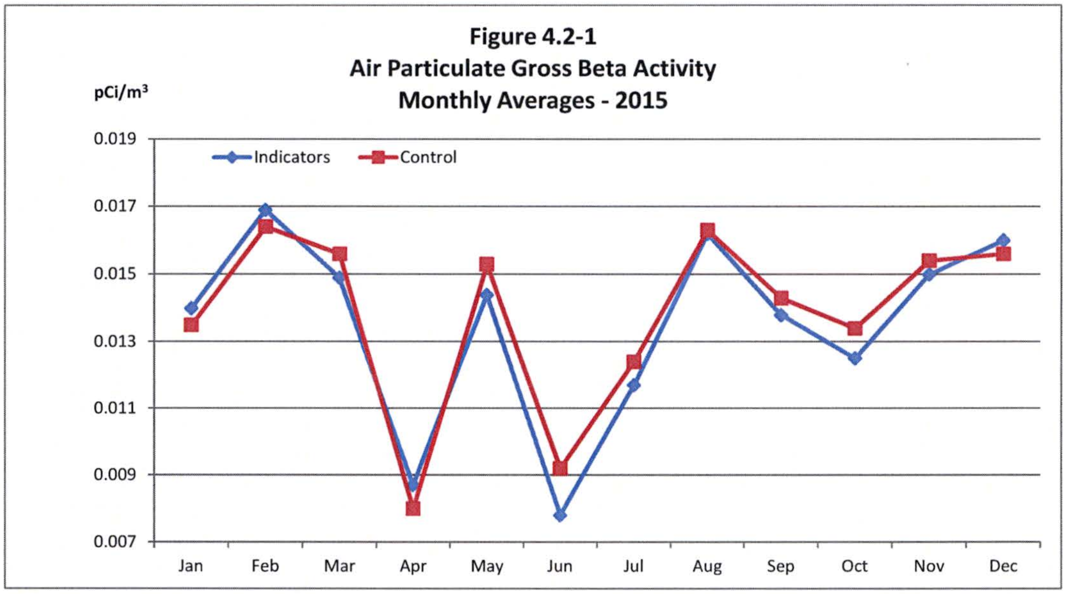
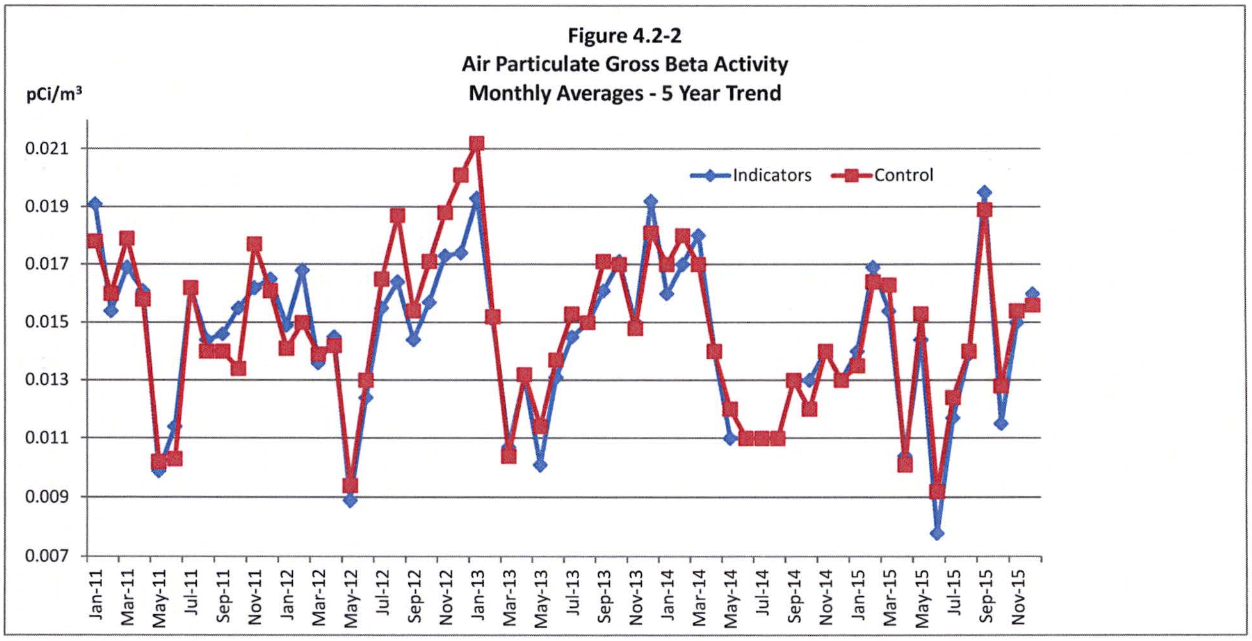


Figure 4.1-1
Annual Gamma Exposure Rate - 20 Year History
uR/hr
10
8
6
All Indicators
All Controls
Indicator Loc 1
Indicator Loc 3
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015

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.





4.4 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 2015 charcoal samples.

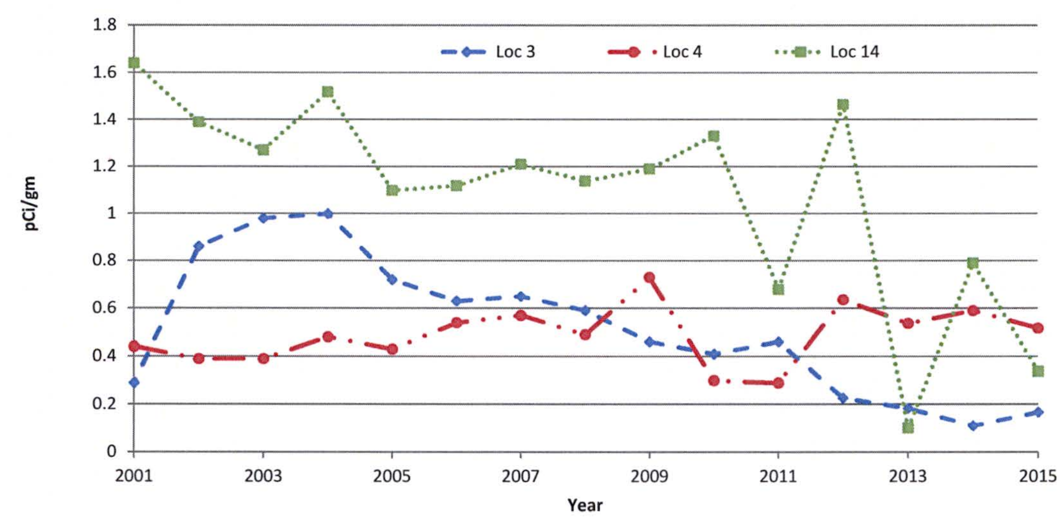
4.4 Air Particulate Gamma (Table 4)

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. Millstone 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 is detected in soil. In the Location 3 sample extra counts were detected in the Ac-228 peak area but there was no peak for positive identification of Ac-228. Cs-137 from nuclear weapons testing was detected in all three 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 4.6-1 shows the trend of Cs-137 in soil samples. Except for Location 4, 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 4.6-1
Cs-137 in Soil



4.6 Cow 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 Millstone to be considered an indicator location (i.e. within 10 miles) have ceased operation. One cow milk location, about ten and half miles from the station, was sampled as an extra, not required sample and results are shown in Table 6. Naturally occurring K-40 is the only positive result seen in cow milk. The Sr-89 sample result for the first quarter was larger than the sample error but was less than the minimum detectable concentration (MDC) of 4.87 pCi/l.

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 2015 census is listed in Appendix A. If a new dairy farm is identified close enough to Millstone to be considered an indicator location, the collection of cow milk at that location would be added.

4.7 Well Water (Table 7)

There were no station related radioactivity detected in the samples collected as part of the REMP. Zn-65 in Well #77 sample of December 7 has a reported value which is greater than 1.5 times the 2σ error. This value is a result of counts from the natural nuclide Bi-214 in the 1121 Kev peak spilling into the Zn-65 peak at 1116 Kev. Nb-95 in Well #82 samples of June 22 and December 10 had a reported value which are greater than 1.5 times the 2σ error. Extra counts detected in the Nb-95 peak area but there was no peak for positive identification of Nb-95. Additional samples from this well, and other wells, were obtained as part of the Groundwater Protection Program (GWPP). Results from the GWPP are reported in the Millstone annual "Radioactive Effluent Release Report" for 2015.

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 indicate 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)

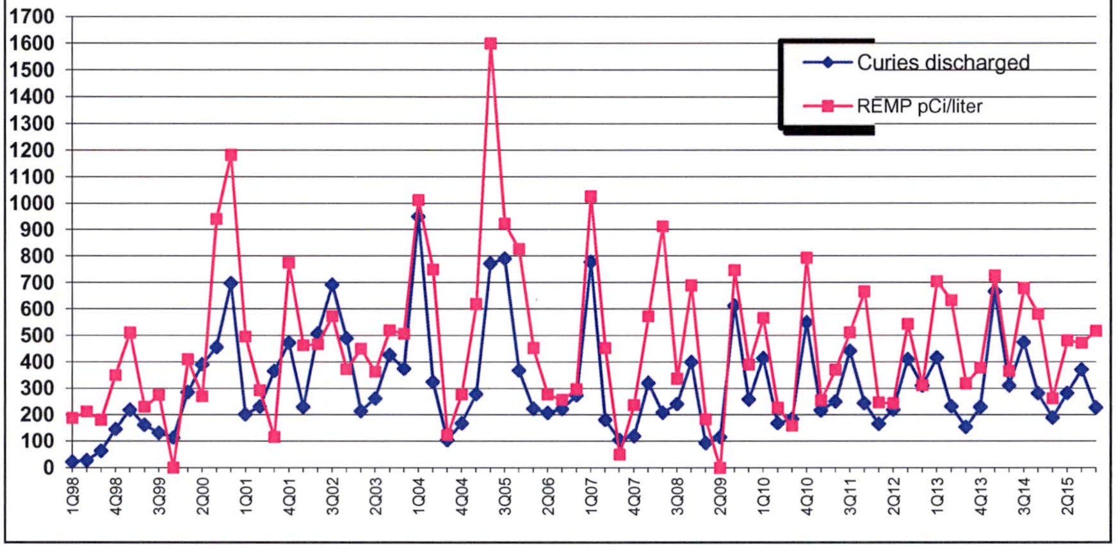
The guidance in Reference 15 specifies one sample upstream (control – beyond significant influence of the discharge) and one sample downstream (indicator – beyond but near the mixing zone) for surface water samples. Historically the downstream sample for Millstone has been located in the vicinity of 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. Nb-95 in the samples of April 28 and July 28 at Location 32 have a reported value which are greater than 1.5 times the 2σ error. In both cases, extra counts were detected in the Nb-95 peak area but there was no peak for positive identification of Nb-95. 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 4.14-1 shows an eighteen-year trend of H-3 releases in the Millstone liquid effluents versus the measured environmental concentrations from the vicinity of discharge location.

Figure 4.14-1
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 2015. 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)

Although sampling of this media is not required, it provides useful information since it a very sensitive indicator of radioactivity in the environment. Naturally occurring Be-7 and Ac-228 appear in some samples and K-40 in all samples. Low levels of man-made radioactivity (e.g., Mn-54, Co-58, Co-60, Zn-65, I-131 and Ag-110m) have been detected in the past but not in 2015.

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. The 4th quarter sample for Location #37, the control location, was collected late on January 15, 2016. At the normal sample date in mid-December it was discovered that the oysters in the stocked tray had been stolen. The oysters were replaced and they remained in location for the procedurally required minimum of 30 days. Thus, the 4th quarter sample result actually represents a sample period of the end of December and the beginning of January. 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. For 2015, no Millstone activity was observed in oysters both in the quarry and beyond the Millstone discharge area. The near-field dilution factor for liquid discharges from the Millstone Quarry discharge is a factor of 3.

Naturally occurring K-40 is seen in all samples. Ac-228 was reported at Location 88 has a value greater than 1.5 times the 2σ error. Counts in the Ac-228 peak area were from naturally occurring Pb-214; there was no positive identification for Ac-228. Millstone related Ag-110m and Zn-65 in oysters collected at Location #32 have been seen historically. 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 2015 no plant related radioactivity was detected in oysters.

4.15 Clams (Table 15)

Occasionally this media indicates the presence of station related radioactivity. In 2015 no activity was observed except for the naturally occurring K-40.

4.16 Lobsters (Table 16)

In 2015 no activity was observed except for the naturally occurring K-40.

5. REFERENCES

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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, 2015.

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.

APPENDIX A

LAND USE CENSUS FOR 2015

The annual land use census in the vicinity of Millstone was conducted as required by the Millstone 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 2015 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 resident within each directional sector identified by a drive-by survey is assumed to have a garden. If a garden closer than the nearest resident in a sector is identified, that garden is listed as the closest garden in that sector. Goat locations are more difficult to determine, but best efforts are made to consult goat association records including the American Goat Owners Association (http://adga.org/), contact previous owners or perform drive-bys, if necessary. 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-5. No new dairy animals within 10 miles of the Millstone were located during the census.

The dose modeling incorporates the distances listed in Tables A-1, A-2 and A-3.

TABLE A-1

Active Dairy Cows Within 20 Miles of Millstone Point - 2015

Direction	Distance		
	Miles	Meters	Location
WNW	10.3	16573	Lyme
NW	10.5	16895	Old Lyme
NE	15.0	24135	Preston
NNE	15.3	24618	Preston
NNE	16.3	26227	Preston
NNE	17.7	28479	Preston
NNE	17.8	28640	Preston
ENE	17.9	28801	North Stonington
N	18.0	28962	Bozrah
N	18.5	29767	North Franklin
N	18.9	30410	Lebanon
NE	19.3	31054	North Stonington
N	19.4	31215	North Franklin
NNW	19.5	31376	Lebanon
N	19.5	31376	North Franklin

TABLE A-2

Dairy Goats Within 20 Miles of Millstone Point - 2015

Direction	Distance		Location
	Miles	Meters	
WNW	7.3	11746	Old Lyme
N	11.2	18021	Oakdale
NNW	11.9	19147	Salem
ENE	12.0	19308	Mystic
ENE	13.2	21239	Mystic
NNW	13.2	21239	Salem
NW	14.6	23491	East Haddam
WNW	14.6	23550	Hadlyme
N	15.9	25583	Salem
NNE	17.1	27514	Preston
N	17.3	27846	Lebanon
ENE	17.7	28479	North Stonington
NW	17.9	28801	East Haddam
NE	17.9	28801	North Stonington
WNW	18.4	29606	Haddam
ENE	18.5	29767	Westerly, RI
N	19.2	30893	Lebanon

TABLE A-3

2015 Resident and Garden Survey

Closest Distance For:

Downwind Direction	Resident		Garden	
	miles	meters	miles	meters
N	0.96	1552	0.96	1552
NNE	0.54	861	0.54	861
NE	0.48	771	0.48	771
ENE	0.97	1562	0.97	1562
E	0.92	1480	0.92	1480
ESE	1.07	1725	1.07	1725
SE	N/A	N/A	N/A	N/A
SSE	N/A	N/A	N/A	N/A
S	N/A	N/A	N/A	N/A
SSW	N/A	N/A	N/A	N/A
SW	2.29	3685	2.29	3685
WSW	1.99	3199	1.99	3199
W	1.73	2788	1.73	2788
WNW	1.51	2423	1.48	2381
NW	1.36	2193	1.36	2193
NNW	0.49	787	0.49	787

N/A - not applicable (over water sectors)

Table A-4

Poultry and Livestock Breeders or Dealers - 2015

Miles	BUSINESS	CITY	
11.3	TRACTOR SUPPLY COMPANY # 1769	OLD SAYBROOK	Poultry
14.7	FLEMINGS FEED AND HARDWARE	STONINGTON	Poultry
14.9	YANKEE CHICKS	NORWICH	Poultry
14.9	WYCHWOOD FARM	STONINGTON	Poultry
16.9	NORWICH AGWAY	NORWICH	Poultry
17.7	TRACTOR SUPPLY COMPANY #1485	PAWCATUCK	Poultry
17.7	SELIGMAN DAIRY CATTLE	PRESTON	Livestock
17.8	SHAGBARK LUMBER & FARM SUPPLIES	EAST HADDAM	Poultry
17.9	FLEMINGS FEED	PRESTON	Poultry
17.9	BERIAH LEWIS FARM	NORTH STONINGTON	Livestock
18.4	CHARLES RIVER	NORTH FRANKLIN	Poultry
18.9	TRACTOR SUPPLY COMPANY #1731	COLCHESTER	Poultry

Table A-5

Other Foods within 20 miles of Millstone - 2015

Sector	Miles	Business	Location	Comments
NNW	1.0	Smith's Acres	Niantic	Fruits and vegetables
ENE	3.0	Secchiaroli Farms	Waterford	Has pigs but feed sources not local
WNW	4.9	Four Mile River Farm	Old Lyme	Eggs, beef, pork
NW	5.2	Scott's Yankee Farmer	East Lyme	Fruits and vegetables, cider
NNW	5.4	White Gate Farm	East Lyme	Vegetables, eggs, chicken, turkey
ENE	5.5	Groton Family Farm	Groton	Vegetables, maple syrup, eggs
NNE	6.3	Milaras Piggery	Quaker Hill	Pork; may get goats later
N	7.3	F.R.E.S.H. Farm	Waterford	Watermelon, vegetables
NNW	7.5	Hunts Brook Farm	Quaker Hill	Garlic, honey
NE	8.5	Red Fence Farm	Groton	Fruits, eggs, chicken, fowl, turkey
NNW	8.5	Cranbery Meadow Farm	East Lyme	Beef
N	9.3	Valchris Farm	Oakdale	Fruit
	9.4	Noank Aquaculture Cooperative	Noank	Clams, oysters
ENE	10.2	Willow Spring Farm	Mystic	Apples, pumpkins
NW	10.5	Beaver Brook Farm	Old Lyme	Cheese (cow&sheep), ice cream, milk (cow&sheep), yougurt (cow&sheep), lamb
NNE	10.9	Holmberg Orchards and Winery	Gales Ferry	Fruits and vegetables, cider, wine
	11.5	Bomster Scallops	Stonington	Scallops, shrimp
NE	11.7	Hidden Brook Gardens	Ledyard	Fruits and vegetables, apple butter and sauce
NNW	11.9	Soeltl Farm	Salem	Eggs, beef, chicken, fowl, pork, turkey, veal
NE	12.1	Allyn's Red Barn	Ledyard	Apples, cidar
W	12.1	Hay House	Old Saybrook	Fruits and vegetables, honey, eggs, feed
WNW	12.3	Three Sisters Farm	Essex	Grapes, honey
ENE	12.5	The Funny Farm	Ledyard	Fruits and vegetables
NE	12.5	Cedar Meadows Farm	Ledyard	Eggs, chicken, lamb, pork, turkey
NW	12.6	Provider Farm	Salem	Vegetables, beef, veal
ENE	12.6	Starry Night Farm	Stonington	Vegetables, eggs
NE	12.7	Maugle Sierra Vineyards	Ledyard	Wine
ENE	12.9	Footsteps Farm	Stonington	Eggs, chicken, pork, turkey
NE	13.1	Town Farm LLC	Ledyard	Vegetables
NE	13.6	Aiki Farm	Ledyard	Vegetables
ENE	13.9	JW Beef, LLC	Stonington	Beef
ENE	14.3	Stonington Beef	Stonington	Beef
ENE	14.4	Terra Firma Farm	Stonington	Vegetables, eggs, beef, chicken, lamb, pork, turkey
ENE	14.5	Saltwater Farm Vineyard	Stonington	Grapes, wine
NE	14.8	Wychwood Turkey Farm	Stonington	Turkey
ENE	15.2	Stonington Vineyards	Stonington	Wine
NE	15.5	Roseledge Country Inn and Farm Shoppe	Preston	Honey, maple syrup
ENE	15.8	Tar Barrel Hill Farm	Stonington	Eggs, chicken
ENE	16.8	Davis Farm	Pawcatuck, RI	Vegetables, corn meal, feed
NE	16.9	LoPresti Farm	Preston	Vegetables
NNW	17.0	Common Ground GSA	Colchester	Fruits and vegetables, eggs, feed
NW	17.0	Staehly Farms	East Haddam	Fruits and vegetables, eggs
ENE	17.1	Hubbard's Honey	North Stonington	Honey
NW	17.3	Smith Farm/AVP	Haddam	Vegetables
ENE	17.3	GYOCT	Pawcatuck,CT	Vegetables, strawberries, herbs
E	17.8	Watch Hill Farms	Watch Hill, RI	Vegetables, honey, eggs
N	17.9	Kofkoff Egg Farm	Bozrah	Eggs
N	18.0	Brush Hill Dairy	Bozrah	Eggs
	18.0	Watch Hill Oysters	Watch Hill, RI	Oysters, quahogs, scallops
NE	18.2	Jonathan Edwards Winery	North Stonington	Wine
ENE	18.5	Keena Farm	Westerly, RI	Vegetables, herbs, eggs, ducks, goats
N	18.7	Full Bloom Apiary	North Franklin	Honey
N	18.9	M&K Dairy Ladies of Lebanon	Lebanon	Cheese
N	19.3	Blue Slope Farm	Franklin	Meat (chevon), maple syrup
NE	19.3	Maple Lane Farms	Preston	Fruits and vegetables
NE	19.4	Morning Star Meadows Farm	North Stonington	Vegetables, eggs, lamb, mutton
NNW	19.5	Beltane Farm	Lebanon	Cheese (cow&goat), milk (cow), yougurt (goat)
NNW	19.6	Four Winds Farm	Lebanon	Beef
	19.8	Beltane Farm	Lebanon	Cheese
N	19.9	Red and White Orchard	Franklin	Apples, turkey

APPENDIX B

SUMMARY OF INTERLABORATORY COMPARISONS

INTRODUCTION

This appendix summarizes the Intercomparison Program of the Teledyne Brown Engineering (TBE) Laboratory as required by technical specifications for each Millstone unit. Teledyne uses QA/QC samples provided by Eckert & Ziegler Analytics, by the Environmental Resource Associates (ERA) Proficiency Test (PT) Program and by the Department of Energy (DOE) Mixed Analyte Performance Evaluation Program (MAPEP) to monitor the quality of analytical processing associated with the REMP. The suite of samples are comparable with the pre-1996 US EPA Interlaboratory Cross-Check Program in terms of sample number, matrices, and nuclides. It includes:

- milk for gamma (9 nuclides) analyses once per quarter
- milk for low level Iodine-131 analyses once per quarter
- milk for Sr-89 and Sr-90 analyses once per quarter
- water for gamma (6 to 8 nuclides) once per quarter
- water for tritium analyses once per quarter
- water for Sr-90 analyses three of four quarters
- water for gamma Sr-89 analyses twice per year
- air filter for gamma (9 nuclides) analyses once per quarter
- air filter for gross beta analysis twice per year
- charcoal filter for I-131 once per quarter
- air filter for Sr-90 analyses twice per year
- soil for gamma (7 or 9 nuclides) analyses twice per year
- vegetation for gamma (6 nuclides) analyses twice per year
- vegetation for Sr-90 analyses twice per year

Intercomparison program results are evaluated using the laboratory's internal bias acceptance criterion. Teledyne Brown's acceptance criterion is defined as within 20% of the known value. Sample results which are less or greater than 20% of the known value but within 30% is acceptable with warning. Samples results outside 30% of the known value are not acceptable. All sample analyses which are not acceptable are investigated.

RESULTS

For the TBE laboratory, 131 out of 139 analyses performed met the specified acceptance criteria. Eight analyses (AP - Cr-51, U-234/233, Gr A, Sr-90; Soil Sr-90; Water - Ni-3 and U natural; Vegetation Sr-90 samples) did not meet the specified acceptance criteria for the following reasons:

1. Teledyne Brown Engineering's Analytics' June 2015 air particulate Cr-51 result of 323 ± 45.5 pCi was higher than the known value of 233 pCi with a ratio of 1.39. The upper ratio of 1.20 was exceeded. The air particulate sample is counted on a shelf (above the detector), which is the ideal geometry for this sample. But due to the fact that Cr-51 has the shortest half-life and the weakest gamma energy of the mixed nuclide sample, this geometry produces a larger error for the Cr-51. Taking into consideration the uncertainty, the activity of Cr-51 overlaps with the known value at a ratio of 1.19, which would be considered acceptable. NCR 15-18
2. Teledyne Brown Engineering's MAPEP March 2015 soil Sr-90 result of 286 Total Bq.kg was lower than the known value of 653 Bq/kg, exceeding the lower acceptance range of 487 Bq/kg. The failure was due to incomplete digestion of the sample. NCR 15-13
3. Teledyne Brown Engineering's MAPEP March 2015 air particulate U-234/233 result of 0.0211 Bq/sample was higher than the known value of 0.0155 Bq/sample, exceeding the upper acceptance range of 0.0202 Bq/sample. Due to the extremely low activity, it was difficult to quantify the U-234/233. Taking into consideration the uncertainty, the activity of U-234/233 overlaps with the known value, which is statistically considered the same value. NCR 15-13

4. Teledyne Brown Engineering's MAPEP March 2015 air particulate gross alpha result of 0.448 Bq/sample was lower than the known value of 1.77 Bq/sample, exceeding the lower acceptance range of 0.53 Bq/sample. The efficiency used for gross alpha is made from a non-attenuated alpha standard. The MAPEP filter has the alphas embedded in the filter, requiring an attenuated efficiency. In order to correct the low bias, TBE will create an attenuated efficiency for MAPEP air particulate filters. NCR 15-13
5. Teledyne Brown Engineering's MAPEP September water Ni-63 result of 11.8 ± 10.8 Bq/L was higher than the known value of 8.55 Bq/L, exceeding the upper acceptance range of 11.12 Bq/L. The original sample was run with a 10 mL aliquot which was not sufficient for the low level of Ni-63 in the sample. The rerun aliquot of 30 mL produced an acceptable result of 8.81 Bq/L. NCR 15-21
6. Teledyne Brown Engineering's MAPEP September air particulate Sr-90 result of 1.48 Bq/sample was lower than the known value of 2.18 Bq/sample, exceeding the lower acceptance range of 1.53 Bq/sample. In the past, MAPEP has added substances (unusual compounds found in DOE complexes) to various matrices that have resulted in incomplete removal of the isotope of interest for the laboratories analyzing the cross checks. We feel that this is possibly the case with this sample. NCR 15-21
7. Teledyne Brown Engineering's MAPEP September vegetation Sr-90 result of 0.386 Bq/sample was lower than the known value of 1.30 Bq/sample, exceeding the lower acceptance range of 0.91 Bq/sample. In the past, MAPEP has added substances (unusual compounds found in DOE complexes) to various matrices that have resulted in incomplete removal of the isotope of interest for the laboratories analyzing the cross checks. We feel that this is possibly the case with this sample. NCR 15-21
8. Teledyne Brown Engineering's ERA November water Uranium natural result of 146.9 pCi/L was higher than the known value of 56.2 pCi/L, exceeding the upper acceptance limit of 62.4 pCi/L. The technician failed to dilute the original sample, but used the entire 12 mL sample. When recalculated using the 12 mL aliquot, the result of 57.16 agreed with the assigned value of 56.2. NCR 15-19

DATA

ANALYTICS ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM
TELEDYNE BROWN ENGINEERING ENVIRONMENTAL SERVICES

Month/Year	Identification Number	Matrix	Nuclide	Units	Reported Value (a)	Known Value (b)	Ratio (c) TBE/Analytics	Evaluation (d)
March 2015	E11181	Milk	Sr-89	pCi/L	88.9	97.2	0.91	A
			Sr-90	pCi/L	12.2	17.4	0.70	W
	E11182	Milk	I-131	pCi/L	61.3	65.1	0.94	A
			Ce-141	pCi/L	104	113	0.92	A
			Cr-51	pCi/L	265	276	0.96	A
			Cs-134	pCi/L	138	154	0.90	A
			Cs-137	pCi/L	205	207	0.99	A
			Co-58	pCi/L	178	183	0.97	A
			Mn-54	pCi/L	187	188	0.99	A
			Fe-59	pCi/L	182	177	1.03	A
			Zn-65	pCi/L	345	351	0.98	A
			Co-60	pCi/L	379	405	0.94	A
	E11184	AP	Ce-141	pCi	107	85.0	1.26	W
			Cr-51	pCi	261	224	1.17	A
			Cs-134	pCi	74.6	77.0	0.97	A
			Cs-137	pCi	99.6	102	0.98	A
			Co-58	pCi	99.8	110	0.91	A
			Mn-54	pCi	99.2	96.9	1.02	A
			Fe-59	pCi	109	119	0.92	A
			Zn-65	pCi	188	183	1.03	A
			Co-60	pCi	200	201	1.00	A
	E11183	Charcoal	I-131	pCi	82.9	85.4	0.97	A
	E11185	Water	Fe-55	pCi/L	1950	1900	1.03	A

ANALYTICS ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM
TELEDYNE BROWN ENGINEERING ENVIRONMENTAL SERVICES

Month/Year	Identification Number	Matrix	Nuclide	Units	Reported Value (a)	Known Value (b)	Ratio (c) TBE/Analytics	Evaluation (d)
June 2015	E11234	Milk	Sr-89	pCi/L	94.9	92.6	1.02	A
			Sr-90	pCi/L	14.3	12.7	1.13	A
	E11238	Milk	I-131	pCi/L	93.2	95.9	0.97	A
			Ce-141	pCi/L	Not provided for this study			
			Cr-51	pCi/L	349	276	1.26	W
			Cs-134	pCi/L	165	163	1.01	A
			Cs-137	pCi/L	143.0	125	1.14	A
			Co-58	pCi/L	82.0	68.4	1.20	A
			Mn-54	pCi/L	113	101	1.12	A
			Fe-59	pCi/L	184	151	1.22	W
			Zn-65	pCi/L	269	248	1.08	A
			Co-60	pCi/L	208	193	1.08	A
	E11237	AP	Ce-141	pCi	Not provided for this study			
			Cr-51	pCi	323	233	1.39	N (1)
			Cs-134	pCi	139	138	1.01	A
			Cs-137	pCi	111	106	1.05	A
			Co-58	pCi	54.0	57.8	0.93	A
			Mn-54	pCi	96.8	84.9	1.14	A
			Fe-59	pCi	162	128	1.27	W
			Zn-65	pCi	198	210	0.94	A
			Co-60	pCi	178	163	1.09	A
	E11236	Charcoal	I-131	pCi	93.9	80	1.17	A
June 2015	E11238	Water	Fe-55	pCi/L	1890	1790	1.06	A
December 2015	E11354	Milk	Sr-89	pCi/L	96.2	86.8	1.11	A
			Sr-90	pCi/L	14.8	12.5	1.18	A
	E11355	Milk	I-131	pCi/L	95.1	91.2	1.04	A
			Ce-141	pCi/L	117	129	0.91	A
			Cr-51	pCi/L	265	281	0.94	A
			Cs-134	pCi/L	153	160	0.96	A
			Cs-137	pCi/L	119	115	1.03	A
			Co-58	pCi/L	107	110	0.97	A
			Mn-54	pCi/L	153	145	1.06	A
			Fe-59	pCi/L	117	108	1.08	A
			Zn-65	pCi/L	261	248	1.05	A
			Co-60	pCi/L	212	213	1.00	A
	E11357	AP	Ce-141	pCi	89.9	84.0	1.07	A
			Cr-51	pCi	215	184	1.17	A
			Cs-134	pCi	103	105	0.98	A
			Cs-137	pCi	76.6	74.8	1.02	A
			Co-58	pCi	76.2	71.9	1.06	A
			Mn-54	pCi	91.4	94.4	0.97	A
			Fe-59	pCi	78.6	70.3	1.12	A
			Zn-65	pCi	173	162	1.07	A
			Co-60	pCi	138	139	0.99	A
	E11422	AP	Sr-89	pCi	98.0	96.9	1.01	A
			Sr-90	pCi	10.0	14.0	0.71	W
	E11356	Charcoal	I-131	pCi	74.9	75.2	1.00	A
	E11358	Water	Fe-55	pCi/L	2160	1710	1.26	W
	E11353	Soil	Ce-141	pCi/kg	252	222	1.14	A
			Cr-51	pCi/kg	485	485	1.00	A
			Cs-134	pCi/kg	319	277	1.15	A
			Cs-137	pCi/kg	292	276	1.06	A
			Co-58	pCi/kg	193	190	1.02	A
			Mn-54	pCi/kg	258	250	1.03	A
			Fe-59	pCi/kg	218	186	1.17	A
			Zn-65	pCi/kg	457	429	1.07	A
			Co-60	pCi/kg	381	368	1.04	A
March 2015	15-MaW32	Water	Am-241	Bq/L	0.632	0.654	0.458 - 0.850	A
			Ni-63	Bq/L	2.5		(1)	A
			Pu-238	Bq/L	0.0204	0.0089	(2)	A
			Pu-239/240	Bq/L	0.9	0.8	0.582 - 1.082	A

ANALYTICS ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM
TELEDYNE BROWN ENGINEERING ENVIRONMENTAL SERVICES

Month/Year	Identification Number	Matrix	Nuclide	Units	Reported Value (a)	Known Value (b)	Ratio (c) TBE/Analytics	Evaluation (d)
	15-MaS32	Soil	Ni-63	Bq/kg	392	448.0	314 - 582	A
			Sr-90	Bq/kg	286	653	487 - 849	N (3)
	15-RdF32	AP	Sr-90	Bq/sample	-0.0991		(1)	A
			U-234/233	Bq/sample	0.0211	0.0155	0.0109 - 0.0202	N (3)
			U-238	Bq/sample	0.095	0.099	0.069 - 0.129	A
	15-GrF32	AP	Gr-A	Bq/sample	0.448	1.77	0.53 - 3.01	N (3)
			Gr-B	Bq/sample	0.7580	0.75	0.38 - 1.13	A
	15-RdV32	Vegetation	Cs-134	Bq/sample	8.08	7.32	5.12 - 9.52	A
			Cs-137	Bq/sample	11.6	9.18	6.43 - 11.93	W
			Co-57	Bq/sample	-0.0096		(1)	A
			Co-60	Bq/sample	6.53	5.55	3.89 - 7.22	A
			Mn-54	Bq/sample	0.0058		(1)	A
			Sr-90	Bq/sample	0.999	1.08	0.76 - 1.40	A
			Zn-65	Bq/sample	-0.108		(1)	A
September 2015	15-MaW33	Water	Am-241	Bq/L	1.012	1.055	0.739 - 1.372	A
			Ni-63	Bq/L	11.8	8.55	5.99 - 11.12	N (4)
			Pu-238	Bq/L	0.727	0.681	0.477 - 0.885	A
			Pu-239/240	Bq/L	0.830	0.900	0.630 - 1.170	A
	15-MaS33	Soil	Ni-63	Bq/kg	635	682	477 - 887	A
			Sr-90	Bq/kg	429	425	298 - 553	A
	15-RdF33	AP	Sr-90	Bq/sample	1.48	2.18	1.53 - 2.83	N (4)
			U-234/233	Bq/sample	0.143	0.143	0.100 - 0.186	A
			U-238	Bq/sample	0.149	0.148	0.104 - 0.192	A
	15-GrF33	AP	Gr-A	Bq/sample	0.497	0.90	0.27 - 1.53	A
			Gr-B	Bq/sample	1.34	1.56	0.78 - 2.34	A
	15-RdV33	Vegetation	Cs-134	Bq/sample	6.10	5.80	4.06 - 7.54	A
			Cs-137	Bq/sample	0.0002		(1)	A
			Co-57	Bq/sample	8.01	6.62	4.63 - 8.61	W
			Co-60	Bq/sample	4.97	4.56	3.19 - 5.93	A
			Mn-54	Bq/sample	8.33	7.68	5.38 - 9.98	A
			Sr-90	Bq/sample	0.386	1.30	0.91 - 1.69	N (4)
(1) False positive test.			Zn-65	Bq/sample	6.07	5.46	3.82 - 7.10	A
May 2015	RAD-101	Water	Sr-89	pCi/L	45.2	63.2	51.1 - 71.2	N (1)
			Sr-90	pCi/L	28.0	41.9	30.8 - 48.1	N (1)
			Ba-133	pCi/L	80.6	82.5	63.9 - 90.8	A
			Cs-134	pCi/L	71.7	75.7	61.8 - 83.3	A
			Cs-137	pCi/L	187	189	170 - 210	A
			Co-60	pCi/L	85.7	84.5	76.0 - 95.3	A
			Zn-65	pCi/L	197	203	183 - 238	A
			Gr-A	pCi/L	26.1	42.6	22.1 - 54.0	A
			Gr-B	pCi/L	28.8	32.9	21.3 - 40.6	A
			I-131	pCi/L	23.5	23.8	19.7 - 28.3	A
			U-Nat	pCi/L	6.19	6.59	4.99 - 7.83	A
			H-3	pCi/L	3145	3280	2770 - 3620	A
	MRAD-22	Filter	Gr-A	pCi/filter	28.3	62.2	20.8 - 96.6	A
011/01/2015	RAD-103	Water	Sr-89	pCi/L	40.9	35.7	26.7 - 42.5	A
			Sr-90	pCi/L	29.3	31.1	22.7 - 36.1	A
			Ba-133	pCi/L	31.5	32.5	25.9 - 36.7	A
			Cs-134	pCi/L	59.65	62.3	50.6 - 68.5	A
			Cs-137	pCi/L	156	157	141 - 175	A
			Co-60	pCi/L	70.6	71.1	64.0 - 80.7	A
			Zn-65	pCi/L	145	126	113 - 149	A
			Gr-A	pCi/L	38.2	51.6	26.9 - 64.7	A
			Gr-B	pCi/L	42.0	36.6	24.1 - 44.2	A
			I-131	pCi/L	24.8	26.3	21.9 - 31.0	A
			U-Nat	pCi/L	146.90	56.2	45.7 - 62.4	N (2)
			H-3	pCi/L	21100	21300	18700 - 23400	A

ANALYTICS ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM
TELEDYNE BROWN ENGINEERING ENVIRONMENTAL SERVICES

Month/Year	Identification Number	Matrix	Nuclide	Units	Reported Value (a)	Known Value (b)	Ratio (c) TBE/Analytics	Evaluation (d)
March 2015	E11181	Milk	Sr-89	pCi/L	88.9	97.2	0.91	A
			Sr-90	pCi/L	12.2	17.4	0.70	W
	E11182	Milk	I-131	pCi/L	61.3	65.1	0.94	A
			Ce-141	pCi/L	104	113	0.92	A
			Cr-51	pCi/L	265	276	0.96	A
			Cs-134	pCi/L	138	154	0.90	A
			Cs-137	pCi/L	205	207	0.99	A
			Co-58	pCi/L	178	183	0.97	A
			Mn-54	pCi/L	187	188	0.99	A
			Fe-59	pCi/L	182	177	1.03	A
			Zn-65	pCi/L	345	351	0.98	A
			Co-60	pCi/L	379	405	0.94	A
	E11184	AP	Ce-141	pCi	107	85.0	1.26	W
			Cr-51	pCi	261	224	1.17	A
			Cs-134	pCi	74.6	77.0	0.97	A
			Cs-137	pCi	99.6	102	0.98	A
			Co-58	pCi	99.8	110	0.91	A
			Mn-54	pCi	99.2	96.9	1.02	A
			Fe-59	pCi	109	119	0.92	A
			Zn-65	pCi	188	183	1.03	A
			Co-60	pCi	200	201	1.00	A
	E11183	Charcoal	I-131	pCi	82.9	85.4	0.97	A
	E11185	Water	Fe-55	pCi/L	1950	1900	1.03	A
June 2015	E11234	Milk	Sr-89	pCi/L	94.9	92.6	1.02	A
			Sr-90	pCi/L	14.3	12.7	1.13	A
	E11238	Milk	I-131	pCi/L	93.2	95.9	0.97	A
			Ce-141	pCi/L	Not provided for this study			
			Cr-51	pCi/L	349	276	1.26	W
			Cs-134	pCi/L	165	163	1.01	A
			Cs-137	pCi/L	143.0	125	1.14	A
			Co-58	pCi/L	82.0	68.4	1.20	A
			Mn-54	pCi/L	113	101	1.12	A
			Fe-59	pCi/L	184	151	1.22	W
			Zn-65	pCi/L	269	248	1.08	A
			Co-60	pCi/L	208	193	1.08	A
	E11237	AP	Ce-141	pCi	Not provided for this study			
			Cr-51	pCi	323	233	1.39	N (1)
			Cs-134	pCi	139	138	1.01	A
			Cs-137	pCi	111	106	1.05	A
			Co-58	pCi	54.0	57.8	0.93	A
			Mn-54	pCi	96.8	84.9	1.14	A
			Fe-59	pCi	162	128	1.27	W
			Zn-65	pCi	198	210	0.94	A
			Co-60	pCi	178	163	1.09	A
	E11236	Charcoal	I-131	pCi	93.9	80	1.17	A

ANALYTICS ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM
TELEDYNE BROWN ENGINEERING ENVIRONMENTAL SERVICES

Month/Year	Identification Number	Matrix	Nuclide	Units	Reported Value (a)	Known Value (b)	Ratio (c) TBE/Analytics	Evaluation (d)
June 2015	E11238	Water	Fe-55	pCi/L	1890	1790	1.06	A
December 2015	E11354	Milk	Sr-89	pCi/L	96.2	86.8	1.11	A
			Sr-90	pCi/L	14.8	12.5	1.18	A
	E11355	Milk	I-131	pCi/L	95.1	91.2	1.04	A
			Ce-141	pCi/L	117	129	0.91	A
			Cr-51	pCi/L	265	281	0.94	A
			Cs-134	pCi/L	153	160	0.96	A
			Cs-137	pCi/L	119	115	1.03	A
			Co-58	pCi/L	107	110	0.97	A
			Mn-54	pCi/L	153	145	1.06	A
			Fe-59	pCi/L	117	108	1.08	A
			Zn-65	pCi/L	261	248	1.05	A
			Co-60	pCi/L	212	213	1.00	A
	E11357	AP	Ce-141	pCi	89.9	84.0	1.07	A
			Cr-51	pCi	215	184	1.17	A
			Cs-134	pCi	103	105	0.98	A
			Cs-137	pCi	76.6	74.8	1.02	A
			Co-58	pCi	76.2	71.9	1.06	A
			Mn-54	pCi	91.4	94.4	0.97	A
			Fe-59	pCi	78.6	70.3	1.12	A
			Zn-65	pCi	173	162	1.07	A
			Co-60	pCi	138	139	0.99	A
	E11422	AP	Sr-89	pCi	98.0	96.9	1.01	A
			Sr-90	pCi	10.0	14.0	0.71	W
	E11356	Charcoal	I-131	pCi	74.9	75.2	1.00	A
	E11358	Water	Fe-55	pCi/L	2160	1710	1.26	W
	E11353	Soil	Ce-141	pCi/kg	252	222	1.14	A
			Cr-51	pCi/kg	485	485	1.00	A
			Cs-134	pCi/kg	319	277	1.15	A
			Cs-137	pCi/kg	292	276	1.06	A
			Co-58	pCi/kg	193	190	1.02	A
			Mn-54	pCi/kg	258	250	1.03	A
			Fe-59	pCi/kg	218	186	1.17	A
			Zn-65	pCi/kg	457	429	1.07	A
			Co-60	pCi/kg	381	368	1.04	A

(1) AP Cr-51 - Cr-51 has the shortest half-life and the weakest gamma energy of the mixed nuclide sample, which produces a large error. Taking into account the error, the lowest value would be 119% of the reference value, which would be considered acceptable. NCR 15-18

(a) Teledyne Brown Engineering reported result.

(b) 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.

(c) Ratio of Teledyne Brown Engineering to Analytics results.

(d) 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	Media	Nuclide*	Units	Reported Value (a)	Known Value (b)	Acceptance Range	Evaluation (c)
March 2015	15-MaW32	Water	Am-241	Bq/L	0.632	0.654	0.458 - 0.850	A
			Ni-63	Bq/L	2.5		(1)	A
			Pu-238	Bq/L	0.0204	0.0089	(2)	A
			Pu-239/240	Bq/L	0.9	0.8	0.582 - 1.082	A
	15-MaS32	Soil	Ni-63	Bq/kg	392	448.0	314 - 582	A
			Sr-90	Bq/kg	286	653	487 - 849	N (3)
	15-RdF32	AP	Sr-90	Bq/sample	-0.0991		(1)	A
			U-234/233	Bq/sample	0.0211	0.0155	0.0109 - 0.0202	N (3)
			U-238	Bq/sample	0.095	0.099	0.069 - 0.129	A
	15-GrF32	AP	Gr-A	Bq/sample	0.448	1.77	0.53 - 3.01	N (3)
			Gr-B	Bq/sample	0.7580	0.75	0.38 - 1.13	A
	15-RdV32	Vegetation	Cs-134	Bq/sample	8.08	7.32	5.12 - 9.52	A
			Cs-137	Bq/sample	11.6	9.18	6.43 - 11.93	W
			Co-57	Bq/sample	-0.0096		(1)	A
			Co-60	Bq/sample	6.53	5.55	3.89 - 7.22	A
			Mn-54	Bq/sample	0.0058		(1)	A
			Sr-90	Bq/sample	0.999	1.08	0.76 - 1.40	A
			Zn-65	Bq/sample	-0.108		(1)	A
September 2015	15-MaW33	Water	Am-241	Bq/L	1.012	1.055	0.739 - 1.372	A
			Ni-63	Bq/L	11.8	8.55	5.99 - 11.12	N (4)
			Pu-238	Bq/L	0.727	0.681	0.477 - 0.885	A
			Pu-239/240	Bq/L	0.830	0.900	0.630 - 1.170	A
	15-MaS33	Soil	Ni-63	Bq/kg	635	682	477 - 887	A
			Sr-90	Bq/kg	429	425	298 - 553	A
	15-RdF33	AP	Sr-90	Bq/sample	1.48	2.18	1.53 - 2.83	N (4)
			U-234/233	Bq/sample	0.143	0.143	0.100 - 0.186	A
			U-238	Bq/sample	0.149	0.148	0.104 - 0.192	A
	15-GrF33	AP	Gr-A	Bq/sample	0.497	0.90	0.27 - 1.53	A
			Gr-B	Bq/sample	1.34	1.56	0.78 - 2.34	A
	15-RdV33	Vegetation	Cs-134	Bq/sample	6.10	5.80	4.06 - 7.54	A
			Cs-137	Bq/sample	0.0002		(1)	A
			Co-57	Bq/sample	8.01	6.62	4.63 - 8.61	W
			Co-60	Bq/sample	4.97	4.56	3.19 - 5.93	A
			Mn-54	Bq/sample	8.33	7.68	5.38 - 9.98	A
			Sr-90	Bq/sample	0.386	1.30	0.91 - 1.69	N (4)
			Zn-65	Bq/sample	6.07	5.46	3.82 - 7.10	A

(1) False positive test.

(2) Sensitivity evaluation.

(3) Soil Sr-90 - incomplete digestion of the sample resulted in low results; AP U-234/233 - extremely low activity was difficult to quantify AP Gr-A - the MAPEP filter has the activity embedded in the filter. To corrected the low bias, TBE will create an attenuated efficiency for MAPEP samples. NCR 15-13

(4) Water Ni-63 extremely low activity was difficult to quantify; AP & Vegetation Sr-90 was lost during separation, possible from substance added by MAPEP NCR 15-21.

(a) Teledyne Brown Engineering reported result.

(b) 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.

(c) DOE/MAPEP evaluation: A=acceptable, W=acceptable with warning, N=not acceptable.

ERA ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM
TELEDYNE BROWN ENGINEERING ENVIRONMENTAL SERVICES

Month/Year	Identification Number	Media	Nuclide	Units	Reported Value (a)	Known Value (b)	Acceptance Limits	Evaluation (c)
May 2015	RAD-101	Water	Sr-89	pCi/L	45.2	63.2	51.1 - 71.2	N (1)
			Sr-90	pCi/L	28.0	41.9	30.8 - 48.1	N (1)
			Ba-133	pCi/L	80.6	82.5	63.9 - 90.8	A
			Cs-134	pCi/L	71.7	75.7	61.8 - 83.3	A
			Cs-137	pCi/L	187	189	170 - 210	A
			Co-60	pCi/L	85.7	84.5	76.0 - 95.3	A
			Zn-65	pCi/L	197	203	183 - 238	A
			Gr-A	pCi/L	26.1	42.6	22.1 - 54.0	A
			Gr-B	pCi/L	28.8	32.9	21.3 - 40.6	A
			I-131	pCi/L	23.5	23.8	19.7 - 28.3	A
			U-Nat	pCi/L	6.19	6.59	4.99 - 7.83	A
			H-3	pCi/L	3145	3280	2770 - 3620	A
	MRAD-22	Filter	Gr-A	pCi/filter	28.3	62.2	20.8 - 96.6	A
011/01/2015	RAD-103	Water	Sr-89	pCi/L	40.9	35.7	26.7 - 42.5	A
			Sr-90	pCi/L	29.3	31.1	22.7 - 36.1	A
			Ba-133	pCi/L	31.5	32.5	25.9 - 36.7	A
			Cs-134	pCi/L	59.65	62.3	50.6 - 68.5	A
			Cs-137	pCi/L	156	157	141 - 175	A
			Co-60	pCi/L	70.6	71.1	64.0 - 80.7	A
			Zn-65	pCi/L	145	126	113 - 149	A
			Gr-A	pCi/L	38.2	51.6	26.9 - 64.7	A
			Gr-B	pCi/L	42.0	36.6	24.1 - 44.2	A
			I-131	pCi/L	24.8	26.3	21.9 - 31.0	A
			U-Nat	pCi/L	146.90	56.2	45.7 - 62.4	N (2)
			H-3	pCi/L	21100	21300	18700 - 23400	A
				(2) NCR 15-19 has been initiated to address the failure.				
	MRAD-23	Filter	Gr-A	pCi/filter	Lost during processing			

(1) Yield on the high side of our acceptance range indicates possibility of calcium interference. NCR 15-09

(2) Technician failed to dilute original sample. If diluted, the result would have been 57.1, which fell within the acceptance limits. NCR 15-19

(a) Teledyne Brown Engineering reported result.

(b) 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.

(c) ERA evaluation: A=acceptable. Reported result falls within the Warning Limits. NA=not acceptable. Reported result falls outside of the Control Limits. CE=check for Error. Reported result falls within the Control Limits and outside of the Warning Limit.