

2008



Environmental Surveillance and Monitoring Report For the Environs of New Jersey's Nuclear Power Generating Stations

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New Jersey Department of Environmental Protection
Bureau of Nuclear Engineering
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LIST OF ACRONYMS

ADAMS	Agency-wide Documents Access and Management System
BNE	Bureau of Nuclear Engineering
CFR	Code of Federal Regulations
CREST	Continuous Radiological Environmental Surveillance Telemetry
CV	Coefficient of Variation
DEP	Department of Environmental Protection
ECF	Element Correction Factor
ELCP	Environmental Laboratory Certification Program
EPA	U.S. Environmental Protection Agency
ESMP	Environmental Surveillance and Monitoring Program
GE	General Electric
MWt	Megawatts (thermal)
NAREL	National Air and Radiation Environmental Laboratory
NEES	Nuclear Engineering Environmental Section
NRC	U.S. Nuclear Regulatory Commission
ODCM	Offsite Dose Calculation Manual
OQA	Office of Quality Assurance
PIC	Pressurized Ion Chamber
PPL	Pennsylvania Power and Light
PSEG	Public Service Electric and Gas
RADNET	Environmental Radiation Ambient Monitoring System
REMP	Radiological Environmental Monitoring Program
SOP	Standard Operating Procedure
TLD	Thermoluminescent Dosimeter

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Cover photo: Two NJDEP thermoluminescent dosimeters in a holder located on Oyster Creek plant property (OC-09), approximately ¼ mile west-southwest of the reactor building.

1.0 EXECUTIVE SUMMARY

For 2008, the New Jersey Department of Environmental Protection's Bureau of Nuclear Engineering (BNE) maintained and operated an independent Environmental Surveillance and Monitoring Program (ESMP) for the environs of the Oyster Creek and Salem/Hope Creek Nuclear Generating Stations. This activity was performed in accordance with the legislative authority of the New Jersey Radiation Accident Response Act (N.J.S.A. 26:2D-43.g.). Funding for these activities is provided through annual assessments against each owner of a nuclear facility located in New Jersey. By developing and implementing a comprehensive monitoring strategy, the BNE ensures that New Jersey citizens are aware of and if necessary, protected from harmful exposure to radioactive effluent discharges from New Jersey's nuclear power plants during normal or accident operations.

The specific objectives of the ESMP are to monitor pathways for entry of radioactivity into the environment in order to identify potential exposures to the population from routine and accidental releases of radioactive effluent, and to provide a summary and interpretation of this information to members of the public and government agencies. The ESMP is divided into: (1) the Radiological Environmental Monitoring Program (REMP); (2) the Thermoluminescent Dosimetry Program (TLD)¹; and (3) the Continuous Radiological Environmental Surveillance Telemetry (CREST). The REMP consists of air and potable (drinking) water samples collected by BNE staff. Other media (aquatic sediment, milk, fish/shellfish, surface water and vegetation) are collected by each nuclear power plant owner and split with the BNE for analysis. The BNE's contract laboratories, Eberline Services and Teledyne Brown Engineering analyze all REMP samples. The BNE also operates an independent program to assess direct gamma radiation levels by deploying, collecting and analyzing TLD badges. Results obtained through the REMP and the TLD programs were compared to background readings, historical results, and to U.S. Nuclear Regulatory Commission (NRC) regulatory limits. Any readings above background are investigated by the BNE through historical data comparisons and confirmation of these results with the contract laboratory. Data tables containing results of all REMP and TLD analyses can be found in the appendices of this report. The BNE CREST program is a real-time remote network of radiation detectors that monitors ambient radiation levels in the environment around the nuclear generating stations in New Jersey. They are located from just beyond the fence line of the plant to more than eight miles away.

This report contains information on the environmental sampling conducted during the time period of January 1, 2008 through December 31, 2008. During 2008, the scope of the ESMP included the deployment, collection and analysis of 535 TLD badges and the collection and analysis of 850 REMP samples. Overall, the data collected by the BNE's

¹ A Thermoluminescent Dosimeter is a small device used to measure direct radiation by measuring the amount of visible light emitted from a crystal in the detector when exposed to ionizing radiation.

ESMP throughout 2008 indicate that residents living in the area around Oyster Creek and Salem/Hope Creek nuclear power plants have not received measurable exposures of radiation above normal background.

In 2008, the Bureau initiated a number of improvements to its Environmental Surveillance and Monitoring Program.

For the collection and analysis of TLD's these improvements included:

- Completion of revisions to standard operating procedures in response to comments received from an internal Department Technical Systems Audit of the BNE's TLD Program.
- Generation of element correction factors (ECFs) for over 500 TLD badges during the months of August and December 2008. This represents the entire population of BNE TLD badges available for deployment in the field. The application of ECF's compensates for the slight variations in readings between individual badges, thus normalizing TLD performance.
- Completion of a one week, onsite TLD training course conducted by Mr. Bruce Dicey of Dosimetry Resources, International, Inc.
- Annual calibration of the TLD reader in May of 2008.
- Initiation of a cross training program in January 2008 to train all BNE environmental staff in (1) annealing and analyzing TLD badges; (2) generating reports using the Doctor's Dosimetry software; (3) cleaning the TLD reader; and (4) generating element correction factors.

Throughout 2008, the BNE continued to operate a comparison study whereby TLD badges obtained from an independent laboratory, are co-located with BNE TLD badges at specific locations. A comparison study provides a way for the BNE to compare its own results against those of the independent laboratory for precision and accuracy. The BNE currently uses Global Dosimetry Solutions for the independent laboratory. In 2009, the BNE plans to add more co-located TLD badges to the comparison study at each nuclear plant site.

There were a number of improvements and accomplishments to the REMP in 2008. The deployment and collection of air charcoal samples was initiated for the Finninger Farm air sampling location (OC06) in April of 2008. Historically, the BNE only obtained air particulate filter samples from this location. Finninger Farm air samples are collected weekly by Oyster Creek's contractor, Normandeau Associates (Normandeau), and sent to the BNE for analysis. In addition, a Sample Collection and Processing database was completed in the fall of 2008. The database tracks sample receipt and analysis times and provides historical documentation of any sampling anomalies, such as low air sample volume or insufficient sample size. The database allows staff to generate electronic chain of custody forms that are sent in portable document format (PDF) to the Bureau's contract laboratories for use in sample processing.

Another improvement to the REMP program in 2008 was the initiation of the direct mailing of various split samples (vegetation, surface water, aquatic sediment, fish/shellfish) collected from the environs of the Oyster Creek plant site to the BNE's contract laboratories for analysis. Direct mailing of these samples by Normandeau, from the Oyster Creek site, reduces the laboratory sample receipt time, thereby reducing radioactive sample decay.

Finally, the DEP has contracted with Envitech Ltd to provide a new central computer for the Air Pollution/ Radiation Data Acquisition and Early Warning System, located at the DEP headquarters in Trenton, New Jersey. CREST uses this system to acquire minute by minute radiation data from a network of highly sensitive radiation detectors that surround New Jersey's four nuclear power plants. The contract with Envitech Ltd also includes upgrading data transmission from each of the thirty-two monitoring stations from leased telephone lines to wireless transmission. Presently, two locations, one in the environs of each nuclear plant site, are being tested using this wireless data transmission capability.

The data collected by the BNE's ESMP throughout 2008 does not indicate any discharges to the environment above the NRC regulatory requirements. There also is no upward trend of radioactivity for those radionuclides associated with the commercial nuclear process (such as radionuclides of cobalt, cesium, and iodine) reported during 2008. There are expected and historically noted normal fluctuations in environmental radiation data.

Bi-weekly air particulate samples were analyzed for gross beta activity and gamma emitting radionuclides. The concentrations of radionuclides measured in air were not significantly different than ambient background concentrations. These air samples were analyzed quarterly for strontium-90 (Sr-90). The analyses indicated no measurable Sr-90 concentrations in air within 10 miles of either Oyster Creek or Salem/Hope Creek.

Surface water samples were taken monthly and potable (drinking) well water samples were taken quarterly. All water samples were analyzed for gamma emitting radionuclides and tritium. No fission or activation products that emit gamma radiation (radionuclides of cobalt, iodine or cesium) were found in any sample analyzed. In addition, no tritium was found in either potable well water or surface water samples in the environs of either nuclear plant.

Fish (striped bass, bluefish, catfish, and flounder) and shellfish (crabs) were sampled at locations surrounding the Salem/Hope Creek facility. Hardshell clams and fish (striped bass, bluefish, tautog and sea trout) were sampled around Oyster Creek. Actual sample collection was done by the nuclear power plant operator. Clams and fish from Oyster Creek, fish from Salem/Hope Creek and hard-shell crabs from Salem/Hope Creek were split and analyzed by the BNE. These samples were collected semi-annually and analyzed for gamma emitting radionuclides and Sr-90. No Sr-90, fission, or activation products were found in any sample.

Routine vegetation samples (cabbages, collards, kale, mustard greens, peppers, tomato and corn) were taken from onsite gardens and local farms in the vicinity of each nuclear plant during the harvest season and analyzed for gamma emitting radionuclides. All vegetation samples were split with the BNE. No fission or activation products were found in these samples.

Monthly milk samples were taken only in the vicinity of Salem/Hope Creek and from the BNE's control location outside of Trenton, New Jersey. Since there are no dairy farms within a 10-mile radius of Oyster Creek, no samples were taken. Samples were analyzed for gamma emitting radionuclides, Sr-89 and Sr-90. Strontium-90, ranging from no activity to 2.23 ± 0.87 pCi/L, was detected at dairy farms in the vicinity of the Salem/Hope Creek nuclear power plant, as well as at the background farm location in Trenton. Activity was consistent with the U.S. Environmental Protection Agency's (EPA) regional average of 2.14 pCi/L and well below both the EPA's national average of 9.3 pCi/L and the EPA's acceptable risk level of 1 in 10,000 or 780 pCi/L. About 99.9% of strontium in the environment comes from fallout from atmospheric nuclear weapons testing conducted in the 1950's-1960's².

Direct gamma radiation measurements were performed quarterly using TLD badges. TLD results ranged from 8.5 to 19.2 milliRoentgens per standard quarter (mR/Std. Qtr.)³ for the surrounding areas of Oyster Creek and Salem/Hope Creek. These results are consistent with those observed in previous years and are considered normal background levels for those areas of New Jersey.

CREST provides monthly average gamma radiation levels based on one- minute average radiation readings. Monthly CREST results in the environment around Oyster Creek and Salem/Hope Creek indicated average ambient radiation levels in the range of normal background (0.005 to 0.009) milliRoentgens per hour (mR/hr).

² NRC Backgrounder: "Radiation Protection and the Tooth Fairy Issue"

³ A Roentgen (R) is a unit of measurement for ionizing radiation (such as X-ray and gamma rays). A milliRoentgen (mR) is one-thousandth of a Roentgen

2.0 UNDERSTANDING SOURCES OF IONIZING RADIATION AND PATHWAYS TO EXPOSURE

2.1 What is ionizing radiation?

People are exposed to radiation every day from naturally occurring background and man-made sources. Radiation is used beneficially to diagnose and treat disease, but it can also produce harmful effects, such as cancer. There are two basic types of radiation – ionizing and non-ionizing. Ionization occurs when a charged portion of a molecule (usually an electron) is given enough energy to break away from the atom. This disruption of the atom can cause biological harm, such as cancer. Types of ionizing radiation include x-rays, gamma rays, alpha and beta particles, neutrons and certain types of cosmic rays. Examples of non-ionizing radiation include electro-magnetic fields, radio frequency, diathermy (physical therapy), power lines and microwaves.

In 2006, according to a report issued in March 2009 by the National Council on Radiation Protection on population exposure (NCRP Report No. 160)⁴ the radiation dose per individual in the U.S. population was 620 millirem (See Figure 1). The report compiled radiation doses to the U.S. population from all sources and indicated that the dose per individual has doubled (from 360 millirem) since the data was compiled previously in the early 1980's. The magnitude and distribution among the various sources of radiation exposure have changed primarily due to the increased use of ionizing radiation in diagnostic and interventional medical procedures.

Medical procedures made up nearly half (48%) of the total radiation exposure of the U.S. population from all sources of radiation. Most of the increase was the result of exposure to the use of radiation in computed tomography, or “CT scans” (24%) and nuclear medicine (12%). The use of CT scans and cardiac nuclear medicine studies in diagnostic procedures has substantially increased. Both of these procedures together contributed close to 36% of the total population dose. Interventional fluoroscopy accounted for another 7% and conventional radiography/fluoroscopy accounted for 5%.

The remaining 50% percent of the total radiation exposure of the U.S. population comes from background sources. The overall contribution of background radiation to the dose per individual remains unchanged since the data was last compiled. The percent increase seen in Figure 1 is due to an increase in population and the increased use of radiation in medical diagnosis. Radon and thoron account for the largest portion of natural radiation exposure (37%). Radon is a gas that occurs from the decay of natural uranium and is found in soil, rock, well water, and building materials. It can enter buildings through the cracks in floors and walls. Other sources of background radiation include space (5%),

⁴ NCRP Report No. 160, Ionizing Radiation Exposure of the Population of the United States, March 2009

internal radiation sources found naturally within our bodies (5%), and terrestrial sources (5%).

Other contributors of exposure included consumer products (2%), and occupational/industrial sources (< 0.1%). Commercial nuclear power accounts for about 8% of the <0.1% of occupational exposure and about 15% of the <0.1% industrial exposure. Industrial sources include research uses and occupational tasks. Examples of consumer products include smoke detectors, lawn fertilizers, and ceramics.

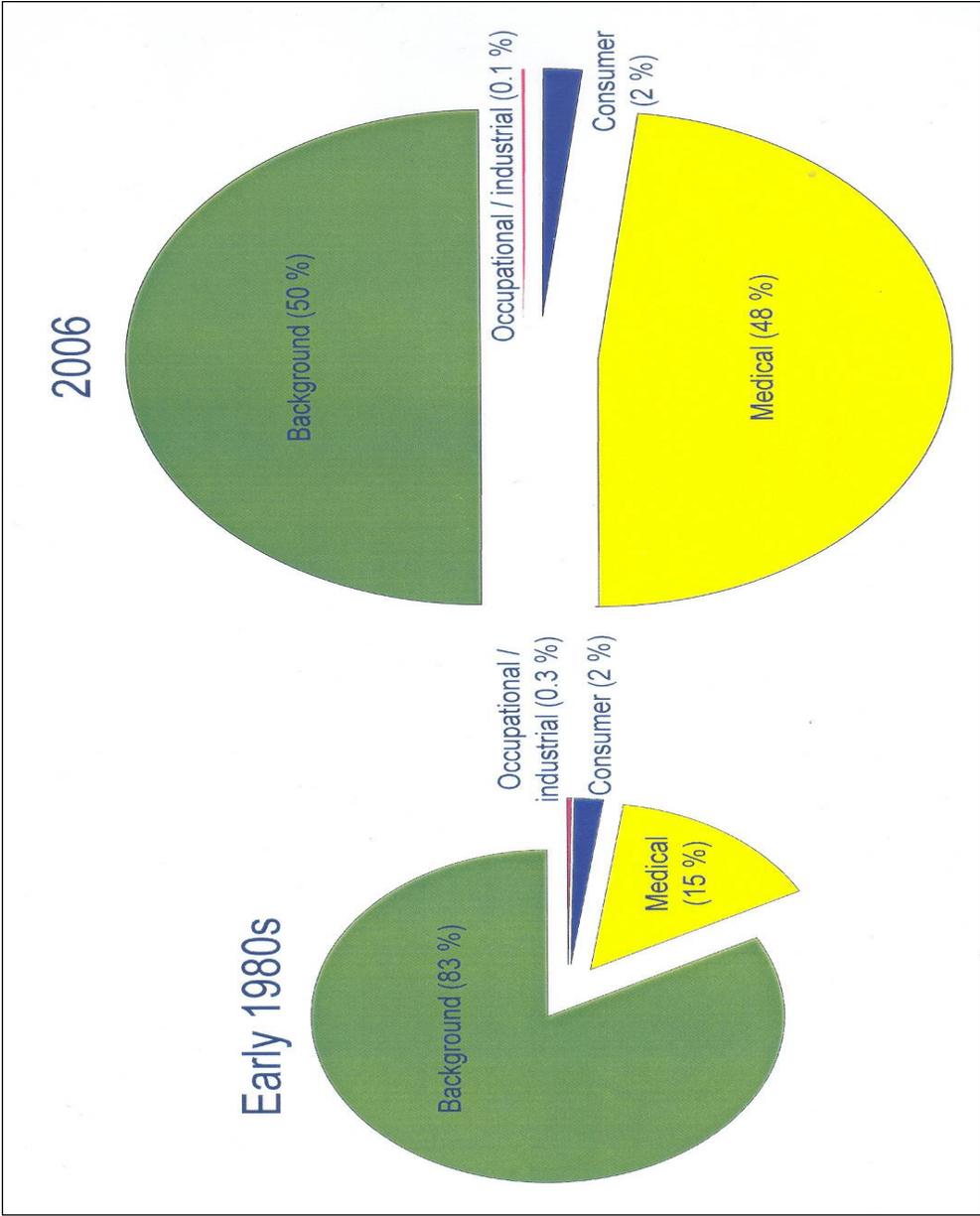


Figure 1 – NCRP Report No. 160, Ionizing Radiation Exposure of the Population of the United States

2.2 Plant Effluents and Release Limits

A nuclear power plant operates on the same principle as a power plant that utilizes fossil fuel (coal, oil and natural gas). In a fossil fuel power plant, the combustion of the fossil fuel provides the heat that generates steam that turns a turbine to produce electricity. A nuclear power plant generates heat through the process of nuclear fission. Through the fission process, the uranium atom absorbs a neutron and splits to produce smaller atoms known as fission products, along with heat and radiation. This process continues producing additional fission products, heat, radiation, and neutrons, creating a continuous reaction. The majority of these fission products are radioactive. Cesium-134, cesium-137, iodine-131 and strontium-90 are examples of fission products. Neutrons, which are not absorbed by uranium fuel, may be absorbed by stable atoms in the materials that make up the components within the reactor. Stable atoms within the reactor become radioactive as a result of neutron activation. These radioactive atoms are referred to as activation products. Cobalt-58, cobalt-60 and tritium are examples of activation products.

As a part of normal operations, a nuclear power plant will release radionuclides. The majority of radioactive effluent released from a commercial power plant to the environment is in the form of gaseous radionuclides. Gaseous iodine-131 is of particular interest because it has an affinity for the thyroid gland, a critical exposure organ. Radionuclides such as cobalt-60, cobalt-58, cesium-134, cesium-137 and strontium-90 are reported by the BNE due to their long half-lives⁵ and the fact that these radionuclides are a direct product of the nuclear fission process.

Noble gas fission products such as krypton, xenon and argon have low solubility in the reactor coolant and remain as a gas, not becoming soluble. Total radioactivity (including noble gases) in liquid and gaseous effluent is measured by the nuclear power plant operator, who own and maintain the monitoring equipment. For gaseous effluent, a continuous sample is drawn and analyzed from all monitored release points. Actual measurements of gross radioactivity can be read directly from an in-line monitor or remotely in the plant's control room and on their in-house computer system. Weekly grab samples of gaseous effluent, gaseous iodine and particulate filters, and liquid effluent are analyzed using gamma spectroscopy. The licensee provides the DEP with results of all liquid and gaseous effluents on a monthly basis. These data are included in the DEP monthly reports, which are available to the public. The BNE staff investigates any elevated readings or fluctuations in data, but the BNE never measures for noble gases.

Routine liquid and gaseous releases of radionuclides to the environment during normal operation of a nuclear power plant will contribute some radiation exposure

⁵ The time in which one half of the atoms of a particular radioactive substance disintegrate into another nuclear form. Measured half-lives vary from millionths of a second to billions of years.

to populations in close proximity to the nuclear power plant site. However, regulatory limits are imposed by the NRC to ensure that the health and safety of the public are protected. The NRC requires all nuclear power plant operators to monitor daily radioactive effluent emissions (airborne and liquid discharges) from the plant and to file reports on an annual basis. The nuclear power plant operator is required to monitor the concentration of radionuclides that are released to the environment in accordance with the NRC's Appendix B to Title 10 of the Code of Federal Regulations, Part 20, "Standards for Protection Against Radiation" and the nuclear power plant's procedures. There is an additional requirement by the NRC, through Regulatory Guidance 1.21⁶, that all nuclear power plants report their radionuclide releases in their Annual Radiological Effluent Release Report. In addition to the total radioactivity measurements, the report includes the limits of release established in the nuclear power plant's procedures⁷.

The assessment of the radiological impact on members of the public is performed by the nuclear power plant operator in their Annual Radiological Environmental Monitoring Report as well as the aforementioned Effluent Release Report. The calculation of potential radiological impact through the use of a hypothetical offsite dose assessment is performed by the power plant for gaseous and liquid effluents and compared to NRC dose limits prescribed in Appendix I to 10CFR50⁸. These assessments and copies of the nuclear power plant's environmental monitoring and effluent release reports are available on the NRC's web-based library system, Agency Document Access and Management System (ADAMS), at <http://www.nrc.gov>.

In assessing the impact of radioactivity on the public or the environment, it is important to consider the amount of radioactivity released to the environment by the nuclear plant; the properties (half-life) of those radionuclides released; the transport method (dispersion in the atmosphere and deposition of particulates in the environment); how the radioactive material enters the body; and the potential biological effect of each radionuclide.

2.3 Pathways of Exposure to Humans

Human exposure to radionuclides can occur through three different pathways: inhalation, ingestion, and direct exposure which includes skin absorption (Figure 2).

Airborne releases to the environment are diluted as they are carried away from the site by the wind, which continuously acts to disperse radioactivity. Airborne

⁶ Regulatory Guide 1.21; Measuring, Evaluating, and Reporting Radioactivity in Solid Wastes and Releases of Radioactive Materials in Liquid and Gaseous Effluents from Light-Water-Cooled Nuclear Power

⁷ Effluent release limits are set forth in the nuclear plant's procedure entitled, "Offsite Dose Calculation Manual"

⁸ 10CFR50, Appendix I, Numerical Guides for Design Objectives and Limiting Conditions for Operation to Meet the Criterion "As Low As Reasonably Achievable" for Radioactive Material in Light-Water Cooled Nuclear Power Reactor Effluents

3.0 OVERVIEW OF THE ENVIRONMENTAL SURVEILLANCE AND MONITORING PROGRAM

The purpose of the ESMP is to monitor the various pathways by which people and the environment could be exposed to radiation. Most ESMP data are collected at and beyond the site boundaries of New Jersey's nuclear power plants. Environmental samples are obtained for the determination of radioactivity in air, drinking water, surface water, milk, aquatic biota (fish/shellfish), vegetation, aquatic sediment, and occasionally soil. Direct gamma radiation measurements are taken using TLD badges.

The specific objectives of the ESMP are to monitor pathways for entry of radioactivity into the environment in order to identify potential exposures to the population from routine and accidental releases of radioactive effluent by the nuclear reactors; and to provide this information to members of the public and government agencies.

To carry out these objectives, the BNE:

- Deploys TLD badges on a quarterly basis at 30 offsite locations plus 2 background locations. The TLD provides direct gamma radiation measurements in the environs of the Oyster Creek and Salem/Hope Creek nuclear power plants, as well as background locations over 20 miles from either nuclear plant. There are 20 locations around the Oyster Creek nuclear power plant (Table A-4), 10 in the environs of the Salem/Hope Creek nuclear power plant (Table A-6), and 2 background locations (Table A-2).
- Monitors the nearby environment surrounding the nuclear power plants in New Jersey through remote gamma radiation monitoring systems called the Continuous Radiological Environmental Surveillance Telemetry (CREST) system.
- Collects and analyzes approximately 700 samples annually around the Oyster Creek and Salem/Hope Creek nuclear power plants as part of the Radiological Environmental Monitoring Program (REMP). An additional 108 samples are collected annually to provide comparative background radiation data for air and milk media.

3.1 Thermoluminescent Dosimetry Program

The BNE maintains a Thermoluminescent Dosimetry Program (TLD) program, independent from that of each nuclear power plant operator, in order to determine the ambient gross gamma radiation levels in the vicinity of the Oyster Creek and Salem/Hope Creek nuclear plants. A TLD is a passive radiation detector that requires no power source and is designed to have the same sensitivity to radiation as human tissue. The BNE utilizes Panasonic TLD badges¹⁰. TLD badges are placed at specified locations and exchanged on a quarterly basis by BNE staff. TLD badges collect data from the environment continuously 24 hours a day, 7 days a week, 365 days a year. Once collected, BNE staff use a Panasonic TLD

¹⁰ Model UD-814

reader¹¹ to obtain data from the TLD badges. Control and transit TLD badges are read along with each set of field TLD badges to estimate storage and transit exposures.

Site selection follows NRC's criteria described in NUREG-0837, "NRC TLD Direction Radiation Monitoring Network", and is summarized as follows:

- Within five miles of each nuclear plant site, TLD badges are located offsite in each standard wind compass sector (such as North, South, North Northeast, and South-Southwest). TLD badges are not placed in sectors that consist entirely of open water or are unoccupied or inaccessible.
- Additional TLD stations are selected relative to major population centers and areas of interest such as government buildings, schools and/or hospitals. The population center closest to the Oyster Creek is in Forked River, approximately 2 miles from the nuclear plant. There are several TLD badges located in Forked River. The closest population center to Salem/Hope Creek is approximately 9.5 miles from the site, in Salem, New Jersey.

The locations, site descriptions, and distances from the plant of the BNE's TLD monitoring locations are provided in Appendix A. Figure 3 shows a BNE field TLD located in the area of the Oyster Creek nuclear generating station.

During 2008, the BNE made improvements to the TLD program that included:

- Completion of revisions to standard operating procedures on: "Cleaning the Panasonic Thermoluminescent Dosimeter Reader" and "Generating Thermoluminescent Element Correction Factors (ECFs)", in response to comments received from an internal Department Technical Systems Audit of the BNE's TLD Program. The audit, completed in 2007, included a review of the program's standard operating procedures and field/laboratory visits to evaluate the program's ability to collect, process, analyze and report TLD data.
- Generation of ECFs for over 500 TLD badges during the months of August and December 2008. This represents the entire population of BNE TLD badges available for deployment in the field. Prior to generating ECFs, all TLD badges are irradiated to 100 milliRem. This value was chosen because it is low enough to minimize the impact of accumulated exposure on the TLD phosphors, due to background sources, but high enough to produce a good statistical response. The application of ECF's compensates for the slight variations in readings between individual badges, thus normalizing TLD performance. The BNE is able to generate ECFs for its TLD badge population using an irradiation service provided by Pennsylvania Power and Light's (PPL) TLD laboratory located in

¹¹ Panasonic Model UD-716

Allentown, Pennsylvania. PPL has been providing this service to the BNE since 2006. PPL also provides the quality assurance/quality control irradiations for each of the Bureau's quarterly deployments.

- Completion of a one week, onsite training course conducted by Mr. Bruce Dicey of Dosimetry Resources, International, Inc. This course provided formal training in the components of TLD detectors, the operation and troubleshooting of TLD readers, applicable TLD standards, and establishing a high quality TLD program. It included an informal review of the BNE's standard operating procedures and provided recommendations for improvement.
- Annual calibration of the TLD reader in May of 2008. To maintain the quality of TLD data, BNE staff performs annual calibrations of its Panasonic Model 716 TLD reader's photon counter. Calibration of the photon counter includes downloading all of the internal parameters from the TLD reader; acquiring the data from TLDs that have been irradiated to 100 milliRem by PPL's TLD laboratory; generating a Quality Control (QC) report to determine whether or not the photon counter calibration process has met predetermined acceptance criteria; and in cases when acceptance criteria are not met, making necessary adjustments to the TLD reader internal parameters to bring the counter within calibration.
- Initiation of a cross training program in January 2008 to train all BNE environmental staff in (1) annealing and analyzing TLDs; (2) generating reports using the Doctor's Dosimetry software; (3) cleaning the TLD reader; and (4) generating element correction factors.



Figure 3 – TLD Used in the Environment

3.2 Continuous Radiological Environmental Surveillance Telemetry

The Continuous Radiological Environmental Surveillance Telemetry System (CREST) is a near real-time remote network of highly sensitive radiation detectors surrounding New Jersey's four nuclear power plants. It serves to monitor the environment for any unexpected releases of radiation from the Salem/Hope Creek Generating Station and the Oyster Creek Generating Station. Ten CREST stations are located around the Salem/Hope Creek Generating Stations, and sixteen station locations around the Oyster Creek Generating Station. The stations are positioned to maximize coverage across every available wind compass sector, from just outside the fence-line up to eight miles from the Salem/Hope Creek Generating Stations, and up to 2.7 miles away from the Oyster Creek Generating Station.

Each CREST site includes a GE Reuter Stokes RSS-131 pressurized ion chamber (PIC) filled with argon gas. The PIC is able to accurately detect changes in ambient gamma radiation levels, from naturally occurring background radiation to what might be encountered during an emergency event at one of the nuclear power plants. In addition to measuring radiation, the CREST sites are equipped with Climatronics meteorological sensors that measure wind speed and wind direction at every station. These data would be used in conjunction with measured radiation levels during a nuclear event to determine what areas might be impacted and how quickly.



Figure 4 - Servicing a CREST Monitoring Station

The CREST system is part of the DEP's Air Pollution/Radiation Data Acquisition and Early Warning System. It is supported by BNE staff utilizing a bucket truck dedicated to its operation and maintenance. The CREST radiation and meteorological data are transmitted on a minute-by-minute basis to a central computer in Trenton. If radiation levels exceed a predetermined threshold, an alarm is triggered and the BNE staff is notified to investigate. The threshold is set above normal background levels, but well below what would pose a health risk. In addition to providing continuous monitoring of ambient radiation levels, CREST also serves as an emergency response system should a radioactive release occur at any of the nuclear plant sites.

Over the past several years, BNE staff has been working towards upgrading the entire CREST system, starting with the radiation monitors, then the central computer system and finally the means of data transmission. Field monitoring sites were upgraded first, using the latest generation of radiation detectors, Reuter-Stokes RS-131s. The next major undertaking was a replacement of the central computing system. A contract was awarded to Envitech, Ltd. to provide a new data acquisition system to support both the BNE's radiation monitoring sites, as well as the Bureau of Air Monitoring's air quality monitoring stations. The new central computer system is largely in place, with the contract scheduled for completion by December 31, 2009. The contract with Envitech also includes exploration of potential upgrades to data transmission from the sites. Wireless transmission has been successfully piloted at one CREST station in the environs of the Oyster Creek nuclear plant during 2008. Additional sites will be upgraded to wireless technology based on availability of equipment and service coverage.

Since last year, the BNE added two employees on a six-month voluntary reassignment to support all aspects of the CREST program. The employees will assist in the transition to wireless data transmission, as well as learning the operation and maintenance of the CREST system.

Locations and descriptions of the BNE CREST stations can be found in Appendix A, Table A-4 (Oyster Creek) and Table A-6 (Salem/Hope Creek).

3.3 Radiological Environmental Monitoring Program

Through its Radiological Environmental Monitoring Program (REMP), the BNE independently monitors environmental radiation in areas surrounding New Jersey's nuclear generating stations. During 2008, the BNE's REMP program included the collection and analysis of 353 air particulate samples (gross beta and quarterly composite), 295 air iodine samples, 76 water samples (surface and drinking well water), 40 milk samples, 17 aquatic sediment samples, 23 fish/shellfish samples, and 46 vegetable samples from both nuclear generating stations (Oyster Creek and Salem/Hope Creek) combined. Of the 850 total samples collected, 116 were background air (Appendix B, Tables B-1, B-4, and

B-7) and/or milk samples (Appendix B, Table B-16) collected from areas distant from the nuclear power plants. See Appendix A, Table A-1 for a description of the sampling media, frequency and type of analysis and Appendix A, Table A-2 for a description of the background stations.

All REMP samples were analyzed for the BNE by independent contract laboratories, Eberline Services for water sample analyses and Teledyne Brown Engineering for all other sampling media.

The BNE's Radiological Environmental Laboratory Monitoring contract specifies minimum detection limits for the analysis of radionuclides in the various media (air, water, soil, milk, fish/shellfish, vegetables) collected through the BNE's radiological environmental monitoring program (Appendix C, Table C-1). The Bureau's contract labs must achieve detection limits that are equal to or lower than the limits cited in Table C-1. The detection limits are determined in accordance with the procedures specified in Appendix B of the EPA's Code of Federal Regulations (CFR) 40 CFR 136 (Guidelines Establishing Test Procedures for the Analysis of Pollutants) and are based on the regulatory requirements in 40 CFR 141 (National Primary Drinking Water Regulations) and the NRC Branch Technical Position, Revision 1, November 1979. The EPA Safe Drinking Water Standards for radionuclides are the same as New Jersey's Groundwater Quality Standards, which are the same as the New Jersey Surface Water Quality Standards.

Furthermore, for the analysis of water samples throughout the duration of the laboratory contract, the contractor must be in compliance with the New Jersey Administrative Code (N.J.A.C.) 7:18 (Regulations Governing the Certification of Laboratories and Environmental Measurements). This program is administered by the DEP's Office of Quality Assurance through its Environmental Laboratory Certification Program (ELCP). Additional information on the ELCP can be found at <http://www.nj.gov/dep/oqa/>

Both of the BNE's laboratory contracts expire the end of March 2009. As a result, in the fall of 2008, the BNE began the process of rebidding its Radiological Environmental Lab Services Contract with the intent of awarding a new contract in the spring of 2009. The term of the contract will be two years, with an option to extend it an additional two years.

For the REMP, several improvements were accomplished throughout 2008. The collection of air charcoal samples was initiated for the Finninger Farm air sampling location (OC06) in April of 2008. The Finninger Farm property, which is owned by the Exelon Corporation, is located across US Route 9 and east of the Oyster Creek nuclear power plant. The property boundaries are defined by the South Branch of the Forked River (intake canal) on the north side, Oyster Creek (discharge canal) to the south, Barnegat Bay to the east and US Route 9 to the west. Finninger Farm air samples are collected weekly by Oyster Creek's

contractor, Normandeau Associates, and sent to the BNE for analysis of Iodine-131. Historically, the BNE only obtained air particulate filter samples from this location.

In addition, a Sample Collection and Processing database was completed in the Fall of 2008. This database allows all collected sample data to be inventoried and archived for invoicing and historic purposes. The database tracks sample receipt and analysis times, along with along with historical documentation of any sampling issues, such as low air sample volume or insufficient sample size. It also allows staff to generate electronic chain of custody forms that are then sent in portable document format (PDF) to the Bureau's contract laboratories for use in sample processing. Sample receipt verifications are then archived in the BNE's sample collection database. Development of a sample analysis database will continue throughout next year.

Another improvement to the REMP program in 2008 was the initiation of the direct mailing of various split samples collected from the environs of the Oyster Creek plant site to the BNE's contract laboratories for analysis. Prior to this, split samples collected by the licensee were first sent to the BNE where they were repackaged and then sent to the Bureau's contract laboratories. Direct mailing from the Oyster Creek site reduces the laboratory sample receipt time, thereby reducing radioactive sample decay. Direct mailing of Oyster Creek split samples is being performed by Normandeau Associates. Split samples that are shipped in this manner are: aquatic sediment, aquatic biota (fish/shellfish), vegetation and surface water. No split samples are mailed directly to the BNE's contract laboratories from the Salem/Hope Creek nuclear plant site. Instead, PSEG Nuclear's contract lab, Maplewood Testing Service, delivers split samples of milk, aquatic sediment, aquatic biota (fish/shellfish), vegetation, and surface water to the BNE for shipment to the Bureau's contract laboratories.

3.3.1 Air Sampling

BNE staff maintains a network of air sampling locations around Oyster Creek and Salem/Hope Creek Nuclear Generating Stations. Air samples are collected bi-weekly¹² (once every two weeks) using low-volume continuous air samplers¹³. Each air sample is comprised of two media.

The first is an air filter that captures radioactive particulates, and is counted every two weeks for gross beta radioactivity. Gross beta is a measurement of all beta activity, regardless of the specific radionuclide source. It is used as a method to screen samples for relative levels of beta emitters which include cobalt-60, iodine-131, cesium-137, and strontium-

¹² With the exception of air samples from the Finninger Farm site which are collected weekly by the licensee and sent directly to the BNE contract lab

¹³ Hi-Q Model VS23-0523CV

90. After being analyzed for gross beta radioactivity, the air filters from each biweekly sampling collection are stored until the end of each calendar quarter. This is called an air particulate quarterly composite. Storage of biweekly air filters for quarterly composite sampling is possible due to the long half lives of the radionuclides being measured. Each quarterly composite sample is subsequently analyzed for gamma emitting radionuclides and for strontium-89/90.

The second air sample media collected is a charcoal canister which is analyzed for gaseous iodine-131 at the end of each bi-weekly period.

Air sampling locations have been chosen with respect to (1) atmospheric stability data; (2) the prevailing wind direction; and (3) the height of the airborne release point from each nuclear plant site. A complete list of air sampling locations can be found in Appendix A, Table A-3 for Oyster Creek and Table A-5 for Salem/Hope Creek. Background locations are found in Appendix A, Table A-2.

3.3.2 Water Sampling

Drinking water samples are taken quarterly by BNE staff from around each nuclear facility as a way to evaluate potential human exposure to radionuclides that may accumulate in drinking water. Drinking water samples are taken from commercial well water systems. Samples are obtained directly from tap water at each location (such as a school, administration building or state park). Sample locations are chosen in aquifers downstream and upstream of each commercial nuclear facility. Each sample obtained is analyzed for gamma emitters, such as cesium-134/137 and cobalt-58/60, as well as for tritium.

Surface water samples are taken monthly by the nuclear power plant operator and split with the BNE as a way to evaluate potential exposure to radionuclides from ingestion of surface water or through direct contact with surface water, such as when participating in boating, fishing, or swimming activities. Samples are collected in locations in the direct liquid effluent pathway of release from each commercial nuclear facility (such as the discharge canal at Oyster Creek) and in locations that are outside the influence of the discharge point or any effects of re-circulation of liquid plant effluent (for example, effects of recirculation in the river or bay). Analyses for gamma emitters and tritium are performed on all surface water samples.

3.3.3 Aquatic Biota (Fish/Shellfish)

Fish and shellfish samples are collected and analyzed quarterly as an indicator of any radionuclides that may have entered the food chain and

consumed by humans. Edible portions and body fluids are analyzed to evaluate radionuclide concentrations in fish/shellfish. Fish sampling is divided into two types. First, bottom feeders (such as species of flounder, catfish or eel) ingest radioactive materials that settle to the bottom of the bays and canals. Second, predator fish (such as bluefish, bass, and white perch) that feed upon other species of fish are collected. Biological samples of clams and hardshell crabs are taken to monitor radionuclide concentrations in shellfish. Shellfish (clams and crabs) are also considered bottom feeders.

All fish/shellfish samples are split with the nuclear power plant operator and analyzed for gamma emitting isotopes such as cobalt-60 and cesium-137 and for beta-emitting strontium-89/90.

3.3.4 Vegetation

The nuclear power plant operators collect samples of locally grown vegetables from a combination of farms during the growing season (April through October) and split these samples with the BNE for analysis. Edible portions of vegetables such as cabbage, collards, kale, mustard greens, corn and tomato are analyzed for gamma emitting radionuclides in order to evaluate possible radionuclide uptake by crops and deposition of radionuclides on leafy vegetables.

The Salem/Hope Creek nuclear plant environmental group cultivated a garden onsite and planted cabbage. The garden is located approximately one half mile from the Salem Units 1 & 2 reactors and provides an in-close vegetation sampling location. Prior to the garden located onsite, the nearest offsite farm for sample collection was over 6 miles away. The BNE requested and received split vegetation samples from this location during the year.

3.3.5 Aquatic Sediment

Aquatic sediment samples are collected quarterly from the bottom of water passages that carry effluents from the nuclear generating stations to evaluate the concentrations of radionuclides. Sediments are fine solid materials that have settled out of a liquid stream or standing body of water. Accumulation of radionuclides in sediment can lead to exposure to humans through the ingestion of aquatic biota or through direct shoreline exposure.

Around Oyster Creek, sediment samples are taken from Barnegat Bay, and Great Bay/Little Egg Harbor as well as the plant's discharge canal. Locations range from 0.4 to 20 miles from Oyster Creek. Around Salem/Hope Creek, sediment samples are taken from five locations along

the Delaware River. Locations range from approximately 0.2 to 0.7 miles downstream and one location approximately 2.5 miles upstream of the release point from Salem Units 1 and 2. Hope Creek nuclear power plant does not directly discharge to the Delaware River because of the closed loop cooling tower.

All aquatic sediment samples are collected by the nuclear power plant operator, and split with the BNE. Samples are analyzed for gamma emitting isotopes such as cesium-134/137 and cobalt-58/60.

3.3.6 Milk

Milk is sampled because it is a readily available food source consumed by a large portion of the population and is a good indicator of radionuclides present in the environment. If released, the radionuclides can settle on pastures, and ultimately be consumed by milk-producing dairy animals (cows or goats). Milk samples are collected monthly from a combination of four farms located within 20 miles of Salem/Hope Creek. All samples are split with the nuclear power plant operator and analyzed for gamma emitting radionuclides and for strontium-89/90. A background sampling location in the Trenton area for milk was established in 2004 and is sampled quarterly. There are no dairy farms within a 5-mile radius of Oyster Creek¹⁴. Therefore no milk samples are collected from the environs of Oyster Creek for analysis.

3.4 Bureau of Nuclear Engineering Background REMP Locations

In order to assess the contribution of radioactivity in the environment from the commercial nuclear plants in New Jersey, the BNE has established background stations for air and milk media. A background sample location is one that is considered beyond the influence of either the Oyster Creek or Salem/Hope Creek nuclear power plants and is used to evaluate normal levels of radionuclides in the environment from natural sources and fallout from previous years' weapons testing (weapons tests conducted in the 1950's, 1960's and Chinese weapons tests during the late 1970's through October of 1980). Background data are used to track and trend radioactivity over time and are compared to the BNE's samples taken near each nuclear plant site.

For air sampling, the BNE maintains a background monitor at Brendan T. Byrne State Forest in New Lisbon, New Jersey and at the BNE Offices in Ewing, New Jersey. The air sampler at Brendan T. Byrne State Forest is approximately 20 miles from Oyster Creek and approximately 60 miles from Salem/Hope Creek. The air sampler at the BNE Offices is approximately 50 miles from Oyster Creek

¹⁴ Exelon Corporation, Annual Radiological Environmental Operating Report 2007

and 80 miles from Salem/Hope Creek. The BNE collects background air samples bi-weekly (once every two weeks).

A background location for milk was established in August of 2004 at a dairy farm located in suburban Trenton, New Jersey. This dairy farm is approximately 50 miles from Oyster Creek and 80 miles from Salem/Hope Creek, well beyond the influence of either of New Jersey's nuclear generating stations. The nearest nuclear power plant in Pennsylvania (Limerick Nuclear Power Plant) is located approximately 50 miles west of the background dairy farm¹⁵. The BNE staff collects background milk samples once each quarter.

Locations and descriptions of the BNE's background sampling sites can be found in Appendix A, Table A-2.

4.0 DESCRIPTION OF NEW JERSEY NUCLEAR POWER PLANT SITES

4.1 Oyster Creek Nuclear Generating Station

The Oyster Creek Nuclear Generating Station is a boiling water reactor rated at 650-megawatts electric (see Figure 5). The facility is located in Lacey Township, Ocean County, New Jersey, near Barnegat Bay. It has been in commercial operation since December of 1969. Oyster Creek is owned and operated by Exelon Nuclear, a business unit of Exelon Corporation headquartered in Warrenville, Illinois.

The Oyster Creek site is comprised of 1,316 acres located in the coastal pine barrens of New Jersey and is traversed by U.S. Highway Route 9. Geographically, the plant is situated in the Outer Coastal Plain near the Pinelands National Reserve. The area contains extensive freshwater and saltwater marshes. Barnegat Bay Inlet and the Atlantic Ocean are within 10 miles of the plant. Land use near the plant consists of commercial, residential, and recreational properties. Island Beach State Park and adjacent shore areas contribute to a large seasonal increase to the local population.

The largest concentrations of residents are to the north and the northeast. The closest residents are 0.5 miles northeast of the plant. The nearest population center is Ocean Township, which lies less than two miles south-southeast of the site. Other population centers within the 10-mile radius of the plant include Lacey Township and Toms River (Dover Township). There are a number of retirement communities in the area, including Lacey, Whiting (northwest) and Ocean Township.

¹⁵ Limerick Nuclear Power Plant is a two-unit nuclear power plant owned and operated by the Exelon Corporation.



Figure 5: Oyster Creek Nuclear Generating Station, Forked River, New Jersey

Oyster Creek uses a man-made intake and discharge canal to provide cooling water for the plant. Water enters the intake canal, located north and east of the site, from the Barnegat Bay, and is pumped through the station as a source of cooling water. Water returns from the plant into the discharge canal, along with existing water that is diverted from the intake canal through pumps, directly into the discharge canal, in order to maintain an acceptable temperature limit for aquatic biota. The water is then discharged from the canal south and east of the plant, and is returned to the Barnegat Bay. The Oyster Creek flows from the west and south of the plant into the discharge canal south of the plant. The branches of the Forked River flow into the intake canal, mixing with waters entering the canal from Barnegat Bay.

4.2 Artificial Island – Salem/Hope Creek Generating Stations

Artificial Island (see Figure 6) is the site of the Salem and Hope Creek Nuclear Generating Stations (Salem/Hope Creek). The Salem Generating Station consists of two pressurized water reactors. Salem Unit 1, rated at 1090 megawatts electric has been in commercial operation since June of 1977. Salem Unit 2, rated at 1115 megawatts electric has been in commercial operation since October of 1981. The Hope Creek Nuclear Generating Station (Hope Creek) is a boiling water reactor rated at 1067 megawatts electric. It has been in commercial operation since February of 1987. All three plants are owned and operated by Public Service Electric and Gas (PSEG). Salem Units 1 and 2 also are partly owned by Exelon Corporation.



**Figure 6 – Salem and Hope Creek Nuclear Generating Stations
Lower Alloways Creek Township, NJ**

Artificial Island is a 700-acre man-made site created by the deposition of fill from dredging operations. Land use in the areas adjacent to the site consists of commercial, government, agricultural, and residential properties. To the north and east are extensive tidal marshlands and low-lying areas. Mad Horse Creek Wildlife Management Area, located to the north and east of the site supports trapping and fishing. This wildlife area also is important for migratory birds. Within 10 miles of the site is some of South Jersey's prime agricultural land. The nearest New Jersey resident to the site is approximately four miles away.

5.0 ENVIRONMENTAL SURVEILLANCE AND MONITORING PROGRAM – SAMPLING RESULTS

5.1 Background Monitoring Results

Results for background air particulate samples were consistent in magnitude with results found at sample locations in close proximity to each commercial nuclear power plant. The highest gross beta concentration was 0.106 pCi/m^3 , well below the EPA's RadNet screening criteria of 1.0 pCi/m^3 but greater than the minimum detectable concentration requirement (Appendix C, Table C-1) of 0.0100 pCi/m^3 . There were no fission or activation products in air particulate samples at either background location. Beryllium-7, found naturally in the environment, was present at both background stations.

Trace amounts of strontium-90 ($0.95 \pm .36$ pCi/L and 1.06 ± 0.51 pCi/L) were detected in milk samples collected from the background farm located in the Trenton area. About 99.9% of strontium in the environment comes from fallout from atmospheric nuclear weapons testing conducted in the 1950's-1960's¹⁶. No other fission or activation products in milk were found.

All TLD results for both background locations were less than 20 milliroentgens per standard quarter (mR/Std. Qtr) with a range of 8.74 to 15.48 mR/Std. Qtr. These results are consistent with those observed in the environs around both nuclear power plants.

A complete summary of sample results from the background locations can be found in Appendix B, Table B-1 for air iodine, and Table B-4 for air particulate gross beta, Table B-16 for milk and Table B-22 for TLD.

5.2 Oyster Creek Monitoring Results

5.2.1 Oyster Creek Thermoluminescent Dosimetry Results

The BNE maintains twenty (20) TLD sites in the offsite surrounding area of Oyster Creek. Each location has two TLD badges that are exchanged at the end of each calendar quarter. Appendix A, Table A-4 provides details on TLD locations, site descriptions, and distances from Oyster Creek. Figure 7 depicts the locations of TLD sites near Oyster Creek. A complete summary of Oyster Creek's TLD results can be found in Appendix B, Table B-23.

All TLD badges are deployed, exchanged and analyzed by BNE staff. The overall collection efficiency for the offsite Oyster Creek TLD network¹⁷ in 2008 was 99%. Two TLD badges and badge holders were missing from a sample location (OC 15), due to vandalism, during the fourth quarter of 2008.

All TLD results for the environs of Oyster Creek were less than 20 milliroentgens (mR) per standard quarter (Std. Qtr) with a range of 8.5 to 13.7 mR/Std. Qtr. These results are consistent with those observed in previous years.

¹⁶ NRC Backgrounder: "Radiation Protection and the Tooth Fairy Issue"

¹⁷ For Figure 7, CREST monitoring locations are co-located with TLD badges for Stations OC-1 through OC-16. Stations OC-20 through OC-23 contains TLD badges ONLY.



**Figure 7 – CREST and Thermoluminescent Dosimeter Locations
Oyster Creek Nuclear Generating Station**

5.2.2 Oyster Creek CREST Data Monitoring

Figure 7 (above) identifies the locations of CREST stations around the Oyster Creek Nuclear Generating Station. Appendix B, Table B-26, provides graphical summaries of ambient radiation results for each CREST site. The monthly average ambient radiation level recorded at each station is graphed in milliroentgens per hour (mR/hr). Three sites (OC8, OC9 and OC13) were not operational in 2008 due to failed telephone lines and therefore do not have associated data graphs.

Normal background radiation levels range from 0.005 to 0.009 mR/hr, in the vicinity of the Oyster Creek nuclear power plant. The monthly average ambient radiation levels at all CREST stations located in the

environment around the nuclear power plant site fell within this range during 2008.

5.2.3 Oyster Creek Air Sample Results

Air samples were collected around Oyster Creek from six locations. Figure 8 displays and Appendix A, Table A-3 describes a detailed list of air sampling sites.



Figure 8 – Air Sampling Locations, Oyster Creek Nuclear Generating Station

Air samples are collected bi-weekly in the environs of the Oyster Creek nuclear plant with the exception of Finninger Farm¹⁸. Air samples are collected on a weekly basis from the Finninger Farm location in accordance with the licensee’s Offsite Dose Calculation Manual (ODCM). The ODCM requires the licensee to sample in the highest predominant wind direction sectors. Up through the first quarter of 2008, the BNE received only the air filter portion of the sample for analysis of gross beta radioactivity at this location. The BNE requested and has been receiving the air charcoal canister portion for the analysis of gaseous iodine-131 since the second quarter of 2008.

As the result of the discovery of higher than normal cesium-137 in vegetation samples on the owner controlled Finninger Farm property in

¹⁸ Finninger Farm, located east of U.S. Route 9, is owned by Exelon Corporation. This land (approximately 650 acres) was formerly privately-owned farmland prior to the operation of the Oyster Creek nuclear plant.

2006¹⁹, and subsequent meteorological analysis of the prevailing wind directions in the area, AmerGen added an air sampling location in the east-northeast sector. This wind compass sector is considered a high deposition area in the event of a release of radioactivity from Oyster Creek. The air sampler is located approximately ¼ mile from the plant. During 2009, the BNE will install an air sampler in the same location.

5.2.3a Air Particulate Gross Beta Results

Gross beta activity is a measurement of all beta activity present, regardless of specific radionuclide source. Gross measurements are used as a method to screen samples for relative levels of radioactivity. Specific analyses of beta-emitting isotopes are done at the end of each calendar quarter, when samples are composited by location.

Figure 9 graphically represents the average gross beta concentration in air for each of the BNE's sampling locations around Oyster Creek, as well as the background locations at Brendan T. Byrne State Forest in New Lisbon, New Jersey and Trenton, New Jersey. All air sites measured were not significantly different than the ambient background concentrations at Brendan T. Byrne State Forest and Trenton.

The highest gross beta concentration was 0.083 pCi/m³, well below the EPA's RadNet screening criteria of 1.0 pCi/m³ but greater than the minimum detectable concentration requirement (Appendix C, Table C-1) of 0.0100 pCi/m³. RadNet is a national network of monitoring stations that regularly collect air, precipitation, drinking water, and milk samples for analysis of radioactivity. RadNet, which has stations in each state, has been used to track environmental releases of radioactivity from nuclear weapons tests and nuclear accidents. Sample results are compared against EPA screening levels for the various media. A screening level is a guideline used by the EPA to decide whether or not to determine the identity and activity of radionuclides in the sample, and does not correspond to any regulatory dose limit. RadNet documents background levels of radioactivity and publishes this information in "Environmental Radiation Data" reports that are available on the EPA's internet website at, <http://www.epa.gov/enviro/html/erams/>.

¹⁹ See 2006 NJBNE Environmental Surveillance and Monitoring Report, <http://www.nj.gov/dep/rpp/bne/index.htm>

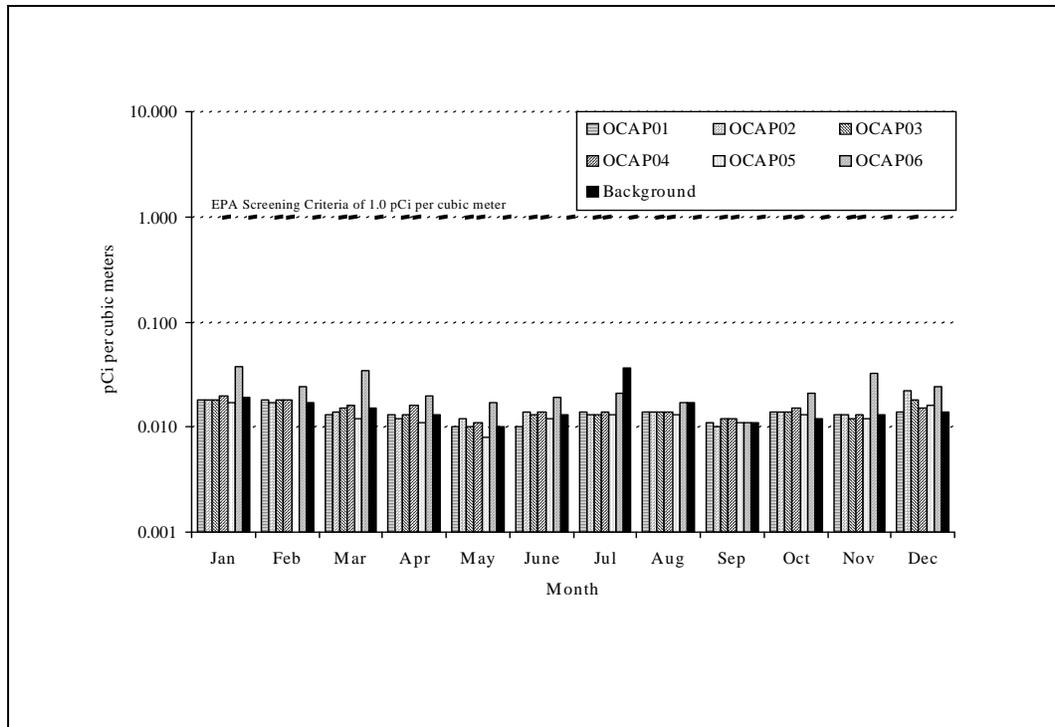


Figure 9 – Average Gross Beta Concentrations in Airborne Particulates – 2008, Oyster Creek Nuclear Generating Station

5.2.3b Air Particulate Quarterly Composites (Sr-90)

Sr-90 is a beta emitting fission product present in radioactive fallout²⁰ and commercial nuclear power plants. It remains in the environment for an extended period of time due to its 28.1 year half-life. Sr-90 is known to increase the risk of bone cancer and leukemia in animals and is presumed to do so in humans.²¹

Due to concerns expressed by the public, the DEP instituted quarterly analysis of Sr-90 in air samples in 1999. The predominance of environmental data shows no increase of Sr-90 in the environment since that time.²²

Quarterly analysis of samples collected and analyzed indicates no measurable Sr-90 concentrations in air. This was consistent to what was found at both background locations.

²⁰ See section 3.4, page 19, for sources of fallout.

²¹ EPA, Radiation Information, Strontium, <http://www.epa.gov/radiation/radionuclides/strontium.htm>

²² A Review of Understanding Patterns and Trends of Radioactive Strontium-90 in Baby Teeth of New Jersey Children and Cancer: A Report To the NJ State Department of Health and Senior Services, January 2006, <http://www.nj.gov/dep/rpp/index.htm>.

5.2.3c Air Particulate Quarterly Composites (Gamma Emitters)

Gamma isotopic analysis of the air particulate portion of the bi-weekly air samples did not detect any radionuclides of interest (cobalt or cesium). Beryllium-7, which is produced naturally by cosmic ray interactions with atmospheric constituents, was detected²³. This was consistent to what was found at both background locations (Trenton and Brendan T. Byrne State Forest).

5.2.3d Air Iodine Results

Iodine-131 was not detected (all results below the minimum detectable concentration requirement of 0.07 pCi/m³, per Appendix C, Table C-1) in any of the air charcoal samples collected bi-weekly from the six continuous air monitoring locations around Oyster Creek. The collection of weekly air charcoal samples at the Finninger Farm site was initiated during the Spring of 2008. These samples are collected weekly by the nuclear power plant operator and sent to the BNE's contract laboratory for analysis. Historically, the BNE only obtained air particulate filter samples from this location.

A complete summary of all air sample results can be found in Appendix B, Table B-2 for air iodine; Table B-5 for air particulate gross beta; and Table B-8 for air particulate quarterly composites.

5.2.4 Oyster Creek Water Sample Results

Oyster Creek utilizes an intake/discharge canal, along with the Barnegat Bay for the discharge of cooling water and potential effluent discharges. The Oyster Creek nuclear plant does not routinely release activity in liquids to the environment. In the event of an unplanned release, the resulting activity will be included in the licensee's Annual Effluent Release Report, available through the NRC website at, <http://www.nrc.gov> or the Ocean County public library system.

Surface water samples are collected from four locations. These locations range from 0.4 miles in the plant's discharge canal to 20 miles away in the Great Bay/Little Egg Harbor. Surface water samples also are collected in the Barnegat Bay, located east of the discharge canal (2.1 miles from the plant) and in Stouts Creek, a tributary of the Barnegat Bay, located approximately 3.6 miles north of the plant discharge canal.

Well water samples were collected from two sources. Samples are taken from the Oyster Creek Administration Building and offsite from the New

²³ Parker, R.P., Beryllium-7 and Fission Products in Surface Air, *Nature* 193, 967 - 968 (10 March 1962)

Jersey State Forked River Marina. The latter site is located approximately 1.7 miles north-northeast of the facility and considered upstream of the plant with regard to the aquifer that supplies water to the community.

Surface water and well water samples were analyzed for gamma emitting isotopes (such as radionuclides of cobalt, cesium, and iodine) and for tritium (Appendix B, Table B-18 and Table B-20). For the analysis of iodine-131 in both routine surface water and well water samples, the BNE requires its contract laboratory to achieve the EPA drinking water detection limit of 1.0 pCi/L. No gamma emitting isotopes or tritium were found in any routine surface water and well water samples collected during the year.

A complete summary of surface water and well water results can be found in Appendix B, Table B-18 and Table B-20.

In recent years environmental monitoring programs at several nuclear power plants have detected measurable levels of tritium contamination in groundwater. The unplanned release of tritium that contaminated the groundwater is the result of equipment degradation at the sites. As part of a fleet wide initiative, Exelon Corporation, the owners of Oyster Creek, began collecting and analyzing groundwater samples from 36 onsite wells. Onsite well samples were split between Exelon and the BNE and analyzed for tritium and gamma emitting radionuclides. All of the initial sampling results from these wells were less than the minimum detectable concentration of 300 pCi/L. Results of the BNE's split samples are available on the BNE website at <http://www.state.nj.us/dep/rpp/welltab.htm>. Additional information regarding tritium can be found on the NRC's website at <http://www.nrc.gov/>

5.2.5 Oyster Creek Aquatic Biota Sample Results

Oyster Creek collected and split both fish and shellfish samples with the BNE. Samples of fish (striped bass, bluefish, tautog, sea trout, and drum) were collected in April and October from three sample locations, Great Bay/Little Egg Harbor, some 20 miles south and east of the Discharge Canal, along with two separate locations in the Discharge Canal (0.1 and 0.4 miles from the plant). Hardshell clams were collected from three locations, the Barnegat Bay, approximately 2.1 miles east of the discharge canal, Stouts Creek, located 3.6 miles north and east of the discharge canal, and Great Bay/Little Egg Harbor.

No fission or activation products were detected in any fish or shellfish samples collected and analyzed (results were less than the minimum detectable concentration for cobalt and cesium, Appendix C, Table C-1).

In addition, no strontium was found in any sample. Potassium-40, a naturally occurring radionuclide, was found in all samples.

A summary of sample results can be found in Appendix B, Table B-10.

5.2.6 Oyster Creek Vegetation Sample Results

Edible vegetation samples are routinely collected from three sampling locations each year and split with the BNE for analysis. These locations include two onsite vegetable gardens and one background garden located over 20-miles upwind of the nuclear plant (see Appendix A, Table A-3 for the location of each garden).

During 2008, naturally occurring potassium-40 was found in all edible vegetables. Sample analysis results from the vegetable samples were below minimum detectable levels (Appendix C, Table C-1) for fission and activation products for all locations.

A complete summary of edible vegetable sample results can be found Appendix B, Table B-14.

5.2.7 Oyster Creek Aquatic Sediment Sample Results

Aquatic sediment samples were collected from four locations. Sample locations include the plant Discharge Canal, Barnegat Bay (East of the site), Stouts Creek and Great Bay/Little Egg Harbor.

Sample analysis results from aquatic sediment samples were below minimum detectable levels (Appendix C, Table C-1) for fission and activation products for all locations. Naturally occurring potassium-40 and beryllium-7 were found at all sample locations.

A complete summary of sample results can be found Appendix B, Table B-12.

5.2.8 Oyster Creek Milk Sample Results

There are no dairy farms within a 10-mile radius of Oyster Creek. According to the Oyster Creek Year 2000 Land Use Survey, the closest dairy farm is about 30 miles away (Burlington County, New Jersey). Radiological data from milk taken at the closest dairy farm would not be statistically representative of the milk pathway to humans living near Oyster Creek. Therefore, no milk samples are collected for Oyster Creek.

5.3 Salem / Hope Creek Monitoring Results

5.3.1 Salem/Hope Creek Thermoluminescent Dosimetry Results

The Bureau of Nuclear Engineering's TLD program for Salem/Hope Creek consists of ten (10) offsite locations. Each location has two TLD badges that are exchanged at the end of each calendar quarter. Appendix A, Table A-6 provides details on TLD locations, site descriptions and distances from the Salem/Hope Creek Nuclear Generating Stations. Figure 10 depicts locations of the TLD badges.



Figure 10 – CREST and Thermoluminescent Dosimeter Locations, Salem/Hope Creek

All TLD badges are deployed, exchanged and analyzed by BNE staff. Appendix B, Table B-24 represents ambient radiation levels obtained from TLD badges in the surrounding area of Salem/Hope Creek during 2008. All TLD results were less than 20 milliroentgens (mR) per standard quarter (Std. Qtr.) with a range from 9.8 to 19.2 mR/Std. Qtr. These results are consistent with those observed in previous years.

The BNE participates in an intercomparison program by co-locating TLD badges obtained from Global Dosimetry Solutions, with BNE badges at a

number of locations in the environs of Salem/Hope Creek. This intercomparison program enables the BNE to document the precision and accuracy of its TLD data in order to identify any analytical or procedural problems in the current program. Results indicate that the BNE TLD data are consistent with the TLD results obtained by Global Dosimetry Solutions (Appendix B, Table B-25).

5.3.2 Salem/Hope Creek CREST Data Monitoring

Figure 10 identifies the locations of CREST stations around Salem/Hope Creek. Appendix B, Table B-27, provides graphical summaries of ambient radiation results for each CREST site. The monthly average ambient radiation level recorded at each station is graphed in milliroentgens per hour (mR/hr). One site (AI6) was piloting wireless data transmission during 2008, but did not capture enough data to provide a meaningful average radiation level and therefore does not have an associated data graph.

Normal background radiation levels range from 0.005 to 0.009 mR/hr around Salem/Hope Creek. The monthly average ambient radiation levels at all CREST stations located in the environment around the nuclear power plant sites fell within this range during 2008.

5.3.3 Salem/Hope Creek Air Sample Results

Air sampling was done at three locations. Figure 11 and Appendix A, Table A-5 indicate the location of air sampling sites at Salem/Hope Creek.

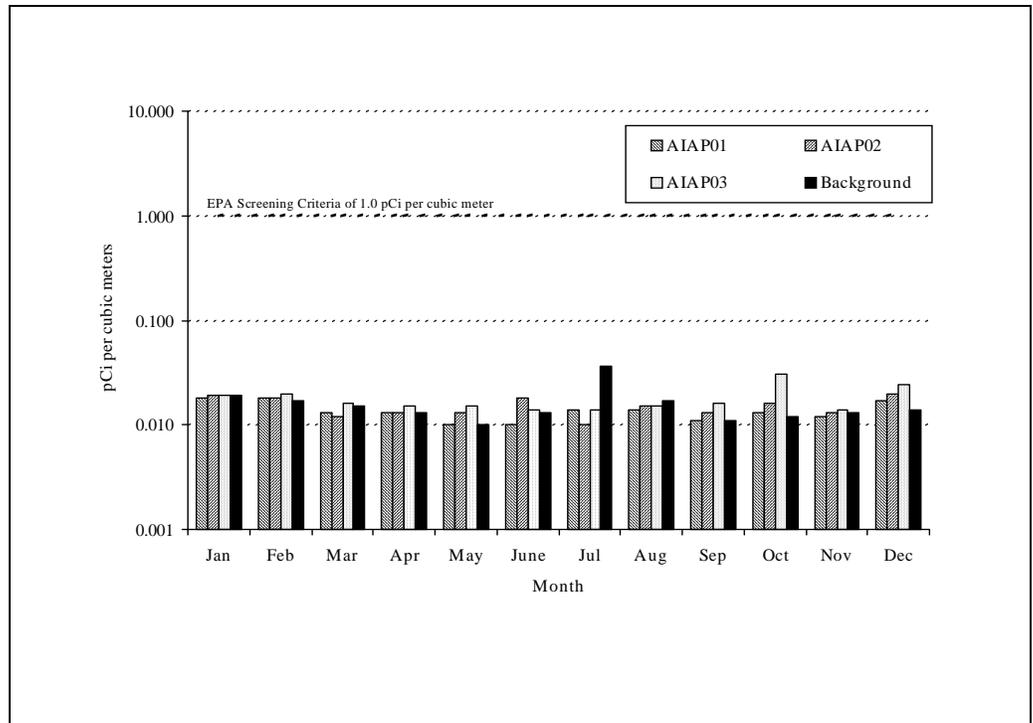


Figure 11 – Air Sample Locations, Salem/Hope Creek

5.3.3a Air Particulate Gross Beta Results

Gross beta activity is a measurement of all beta activity present, regardless of specific radionuclide source. Gross measurements are used as a method to screen samples for relative levels of radioactivity. Specific analyses of beta-emitting isotopes are done at the end of each calendar quarter, when samples are composited by location. Figure 12 graphically represents the average gross beta concentration in air for each of the BNE’s sampling locations around Salem/Hope Creek, including the background locations at Brendan T. Byrne State Forest in New Lisbon, New Jersey and Trenton, New Jersey. Results were not significantly different than the ambient background concentrations at Brendan T. Byrne State Forest and Trenton.

The highest gross beta concentration was 0.032 pCi/m^3 , well below the EPA’s Environmental Radiation Ambient Monitoring System (RadNet) screening criteria of 1.0 pCi/m^3 , but greater than the minimum detectable concentration of 0.0100 pCi/m^3 (Appendix C, Table C-1).



**Figure 12 – Average Gross Beta Concentrations in Airborne Particulates - 2008
Salem/Hope Creek**

5.3.3b Air Particulate Quarterly Composites (Sr-90)

Quarterly analysis of samples collected and analyzed in 2008 indicated no measurable Sr-90 concentrations in air. This was consistent to what was found at both background locations. Sr-90 is a beta emitting fission product present in radioactive fallout.²⁴

5.3.3c Air Particulate Quarterly Composites (Gamma Emitters)

No gamma emitting fission and activation products were detected in the air particulate portion of the bi-weekly air samples greater than the minimum detectable concentration (Appendix C, Table C-1). Beryllium-7, which is found naturally in the environment, was detected. This was consistent to what was found at both background locations (Trenton and Brendan T. Byrne State Forest).

5.3.3d Air Iodine Results

Iodine-131 was not detected in any of the air charcoal samples collected bi-weekly from the three continuous air-monitoring locations around the Salem/Hope Creek.

²⁴ See section 3.4, page 19, for sources of fallout.

A complete summary of all air sample results can be found in Appendix B, Table B-3 for air iodine, Table B-6 for air particulate gross beta and Table B-9 for air particulate quarterly composites.

5.3.4 Salem/Hope Creek Water Sample Results

Salem Units 1 & 2 and Hope Creek have different systems used for plant cooling. Hope Creek uses a cooling tower. The two units at Salem utilize water drawn from the Delaware River for cooling purposes.

Surface water samples are collected from two locations. These locations are at the Onsite Surface Water Inlet Building Discharge (approximately 0.2 miles) and along the west bank of the Delaware River upstream from the liquid discharge point of the Salem nuclear power plants (approximately 2.5 miles from the plant).

Well water samples are taken from the site's Administration Building. In addition, well samples are drawn from the following locations: the Elsinboro School (5.8 miles from the plant), Lower Alloways Creek School (5.1 miles from the plant) and the Lower Alloways Creek Police Station (6.5 miles from the plant). Sample locations are chosen in potential drinking water aquifers downstream and upstream of the site.

Surface and well water samples were analyzed for gamma emitting isotopes and for tritium (See Appendix B, Table B-19 and Table B-21). For the analysis of iodine-131 in both routine surface water and well water samples, the BNE requires its contract laboratory to achieve the EPA drinking water detection limit of 1.0 pCi/L. No gamma emitting isotopes were found in any routine surface water and well water samples collected during 2008. In addition, no tritium was found in either potable well water or surface water samples during 2008.

While not part of the BNE's routine REMP program, the BNE monitors for tritium and gamma emitting radionuclides in groundwater onsite at Artificial Island. The source of the tritium is the Salem Unit 1 spent fuel pool. Extensive monitoring and testing at the site indicates that tritium leakage has been contained within the Owner Controlled Area. No onsite or offsite dose consequences to workers or members of the public were identified. The BNE's onsite groundwater monitoring program was initiated because of tritium contamination detected in shallow groundwater near Salem Unit 1. PSE&G is taking remedial actions to address the tritium contamination and activities are closely monitored by the BNE. This project has been extended to include the collection and analysis of groundwater samples for Salem Unit 2 and Hope Creek. Groundwater samples are taken from wells located on company property that surrounds

each reactor. The samples are split between PSEG and the BNE. Results of the BNE's split samples are available on the BNE website at <http://www.nj.gov/dep/rpp/bne/welltab.htm>.

5.3.5 Salem/Hope Creek Aquatic Biota Sample Results

Samples of aquatic biota (fish/shellfish) are collected by the nuclear power plant operator and split with the BNE. Samples are analyzed for gamma emitting radionuclides and Sr-90. Samples of fish (striped bass, white perch, bluefish, catfish, American eel and carp) as well as hardshell crabs were collected from two locations, the Onsite Surface Water Inlet Building (within 0.2 miles of the plant) and along the western bank of the Delaware River (approximately 2.5 miles upstream from the plant).

No fission or activation products were detected in any fish or shellfish samples collected and analyzed during 2008 (results were less than the minimum detectable concentration for cobalt and cesium, Appendix C, Table C-1). In addition, no Sr-90 was found in any sample. Potassium-40, a naturally occurring radionuclide, was present in all samples.

A summary of fish/shellfish sample results can be found in Appendix B, Table B-11.

5.3.6 Salem/Hope Creek Vegetation - Sample Results

Vegetation samples were collected from three onsite locations and six farms ranging in distance from 3.9 to 25 miles of Salem/Hope Creek during the 2008 harvest season. Vegetation samples included cabbage, corn, tomatoes and peppers.

Sample analysis results from the edible vegetation were below minimum detectable levels (Appendix C, Table C-1) for fission and activation products at all locations. All samples contained potassium-40, which is a naturally occurring radionuclide found in the environment.

A complete summary of vegetation sample results can be found in Appendix B, Table B-15.

5.3.7 Salem/Hope Creek Aquatic Sediment Results

Aquatic sediment samples were collected from the following five locations, the Onsite Observation Building, Onsite Surface Water Inlet Building, the Cooling Tower Blowdown Discharge Line (Onsite), the

Onsite South Storm Drain Discharge Line and the west bank of the Delaware River, upstream of the nuclear power plant.

Sample analysis results from aquatic sediment samples were below minimum detectable levels (Appendix C, Table C-1) for fission and activation products for all locations. Naturally occurring potassium-40 was detected in all samples.

A complete summary of aquatic sediment sample results can be found in Appendix B, Table B-13.

5.3.8 Salem/Hope Creek Milk Sample Results

Milk samples were collected monthly from four farms, ranging from 7.6 to 17 miles from the plant.

Trace amounts of Sr-90 were found at all three farms, ranging from 0.72 to 2.23 pCi/L. Trace amounts of Sr-90 also were found at the background farm near Trenton, ranging from 0.95 to 1.06 pCi/L. Sr-90 is a beta emitting fission product present in radioactive fallout (atmospheric nuclear weapons tests conducted in the 1950's and 1960's) and in commercial nuclear power plants. It persists in the environment for an extended period because of its 28.1-year half-life. About 99.9% of strontium in the environment comes from fallout from atmospheric nuclear weapons testing²⁵. Although Sr-90 levels in the environment have decreased since atmospheric weapons testing were halted, Sr-90 will continue to be detected until it decays.

Figure 13 graphically displays historical trends for Sr-90 concentrations in milk for all regions across the nation. The average historical Sr-90 concentration in milk (1960-2008) for all EPA regions was 2.08 pCi/L. The average historical Sr-90 concentration in milk for Region 2, which includes New Jersey, was slightly above the national average (2.14 pCi/L), but well below EPA's acceptable risk level of 1 in 10,000 or 780 pCi/L. Levels of Sr-90 found in milk samples collected by the BNE at all locations are consistent with what is expected from environmental levels of Sr-90 as a result of weapons testing. No fission or activation products above the minimum detectable concentration (Appendix C, Table C-1) were found in any milk samples collected and analyzed during the year. A summary of results for milk samples can be found in Appendix B, Table B-17.

²⁵ NRC Fact Sheet on Radiation Monitoring at Nuclear Power Plants

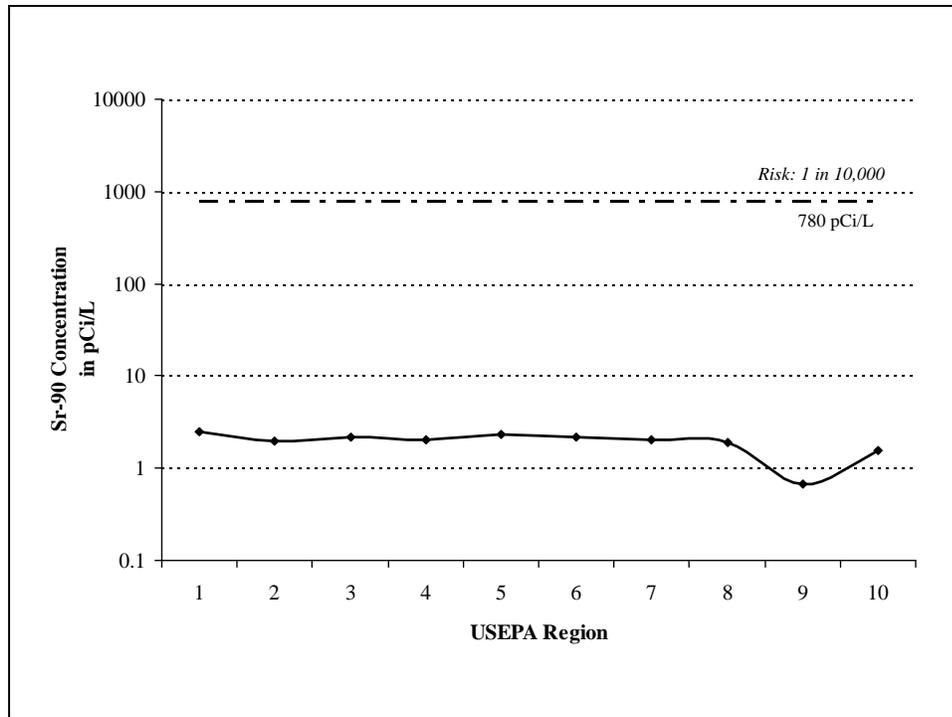


Figure 13 – Average Concentration of Strontium-90 in Milk in the US by EPA Region, 1960 through 2008

Appendix A - Sampling Locations

Table A-1
NJDEP / BNE
Radiological Environmental Monitoring Program

Sample Collection Summary for 2008

<i>Description</i>	<i>Parameters Analyzed For</i>	<i>Frequency</i>	<i>Number of Samples</i>
Milk	Gamma Emitters, Strontium-89/90 *	Monthly***	40
Air Particulate Filter	Gross Beta	Bi-Weekly	309
Air Particulate Composite	Gamma Emitters, Strontium-89/90	Quarterly	44
Air Charcoal	Iodine-131	Bi-Weekly	295
Aquatic Sediment	Gamma Emitters	Semi-Annually	17
Fish & Shellfish	Gamma Emitters Strontium-89/90 *	Semi-Annually	23
Vegetables	Gamma Emitters	Harvest Season Only	46
Surface Water	Gamma Emitters** Tritium	Monthly	52
Potable Well Water	Gamma Emitters** Tritium	Quarterly	24
Total Samples Collected			850

* Radiochemical analysis performed for Strontium-89/90, EPA Analytical Method 905.0.

** Radiochemical analysis performed for Iodine-131, EPA Analytical Method 902.0

*** Milk samples from the background location at Jones Farm near Trenton, NJ are sampled quarterly

Table A-2
NJDEP/BNE
Radiological Environmental Monitoring Program

Background Locations

<i>Sample Media</i>	<i>Station Code</i>	<i>Description of Site</i>
Milk	COMI01	State of New Jersey Dairy Farm – Ewing Township, NJ
Air Particulate Filter	COAP01	BNE Office, Arctic Parkway, Ewing, NJ
	COAP02	Brendan T. Byrne State Forest, New Lisbon, NJ
Air Particulate Composite	COAP01	BNE Office, Arctic Parkway, Ewing, NJ
	COAP02	Brendan T. Byrne State Forest, New Lisbon, NJ
Air Charcoal	COAI01	BNE Office, Arctic Parkway, Ewing, NJ
	COAI02	Brendan T. Byrne State Forest, New Lisbon, NJ
TLD	CO01	BNE Office, Arctic Parkway, Ewing, NJ
	CO02	Brendan T. Byrne State Forest, New Lisbon, NJ

Table A-3
NJDEP / BNE
Radiological Environmental Monitoring Program

Sample Locations and Descriptions
Oyster Creek Nuclear Generating Station

<i>Sample Medium</i>	<i>Station Code</i>	<i>Distance From Plant (miles)</i>	<i>Description of Site</i>
Milk	Not sampled	Not sampled	No milk-producing animals within 30-mile radius as per the Oyster Creek Land Use Survey for 2000
Air Particulate Filter	OCAP01	1.7	Waretown Municipal Building, SSE of site, on County Route 532, Waretown, NJ
	OCAP02	1.8	Sands Point Harbor, ESE of site on Bay Parkway, Waretown, NJ
	OCAP03	1.7	Forked River Marina, Forked River, NJ
	OCAP04	3.2	Lacey Township Recreation Bldg., Forked River, NJ
	OCAP05	5.6	JCP&L Substation, US Route 9, Bayville, NJ
	OCAP06	0.7	Finninger Farm, OC Dredge Site, Forked River, NJ*
Air Particulate Composite	OCAP01	1.7	Waretown Municipal Building, SSE of site, on County Route 532, Waretown, NJ
	OCAP02	1.8	Sands Point Harbor, ESE of site on Bay Parkway, Waretown, NJ
	OCAP03	1.7	Forked River Marina, Forked River, NJ
	OCAP04	3.2	Lacey Township Recreation Bldg., Forked River, NJ
	OCAP05	5.6	JCP&L Substation, US Route 9, Bayville, NJ
	OCAP06	0.7	Finninger Farm, OC Dredge Site, Forked River, NJ
Air Charcoal	OCAI01	1.7	Waretown Municipal Building, SSE of site, on County Route 532, Waretown, NJ
	OCAI02	1.8	Sands Point Harbor, ESE of site on Bay Parkway, Waretown, NJ
	OCAI03	1.7	Forked River Marina, Forked River, NJ
	OCAI04	3.2	Lacey Township Recreation Bldg., Forked River, NJ
	OCAI05	5.6	JCP&L Substation, US Route 9, Bayville, NJ
	OCAI06	0.7	Finninger Farm dredge site, Forked River, NJ *

* Air Charcoal sampling commenced at the Finninger Farm dredge site during April of 2008. Air sampler is maintained by the nuclear power plant operator. Samples are collected on a weekly basis and sent to the BNE for analysis.

Table A-3 (continued)
 NJDEP / BNE
 Radiological Environmental Monitoring Program

Sample Locations and Descriptions
 Oyster Creek Nuclear Generating Station Locations

<i>Sample Medium</i>	<i>Station Code</i>	<i>Distance From Plant (miles)</i>	<i>Description of Site</i>
Vegetables*	OCVE01	0.4	Oyster Creek Onsite Garden, east of US Route 9 and NORTH of the Oyster Creek Discharge Canal, Forked River, NJ
	OCVE02	23.1	Private Farm – NW wind compass sector
	OCVE03	0.4	Oyster Creek Onsite Garden, Discharge Canal, SE of site, east of US Route 9 and south of the inside fence, Waretown, NJ
Surface Water*	OCSW01	2.1	Barnegat Bay, east of site
	OCSW02	20	Great Bay / Little Egg Harbor, SSW of site
	OCSW03	3.6	Stouts Creek, ENE of site, Barnegat Bay
	OCSW04	0.4	Oyster Creek Discharge Canal, ESE of site, East of U.S. Route 9 Bridge
Well Water	OCWW01	0.1	Oyster Creek Administration Building (Onsite)
	OCWW02	1.7	Forked River Marina, Forked River, NJ

* Sample split with nuclear power plant operator

Table A-3 (continued)
 NJDEP / BNE
 Radiological Environmental Monitoring Program

Sample Locations and Descriptions
 Oyster Creek Nuclear Generating Station

<i>Sample Medium</i>	<i>Station Code</i>	<i>Distance From Plant (miles)</i>	<i>Description of Site</i>
Aquatic Sediment*	OCAQ01	2.1	Barnegat Bay, East of site
	OCAQ02	0.4	Oyster Creek Discharge Canal, ESE of site, East of U.S. Route 9 Bridge
	OCAQ03	20	Great Bay / Little Egg Harbor, SSW of site
	OCAQ04	3.6	Stouts Creek, ENE of site, Barnegat Bay
Fish & Shellfish*	OCFS01	3.6	Stouts Creek, ENE of site, Barnegat Bay
	OCFS02	2.1	Barnegat Bay, east of site
	OCFS03	20	Great Bay / Little Egg Harbor, SSW of site
	OCFS04	0.1	OCNGS Discharge Canal between Pump Discharges and US Route 9
	OCFS05	0.4	Oyster Creek Discharge Canal, ESE of site, East of U.S. Route 9 Bridge

* Sample split with nuclear power plant operator

Table A-4
NJDEP / BNE
Radiological Environmental Monitoring Program
CREST and Thermoluminescent Dosimetry Network
Oyster Creek Nuclear Generating Station

<i>ID</i>	<i>Distance From Plant (miles)</i>	<i>Description of Site</i>
OC-1	2.7	Ocean County Vocational School, Waretown, NJ
OC-2	1.8	Ocean Township (Waretown) Municipal Building, Waretown, NJ
OC-3	0.9	Sewage Pump Station on U.S. Route 9, Forked River, NJ
OC-4	1.3	Twin River Station, Forked River, NJ
OC-5	0.5	Sewage Pump Station, U.S. Route 9, Ocean Township, NJ
OC-6	0.5	Oyster Creek Generating Station Gate #2, North Access Road, Forked River, NJ
OC-7	0.7	Finninger Farm, Forked River, NJ
OC-8	1.8	Ocean County Memorial Park Cemetery, Waretown, NJ
OC-9	0.3	Oyster Creek Amergen Building #17, Forked River, NJ
OC-10	2.3	Sheffield and Derby Roads, Forked River, NJ
OC-11	1.9	Lakeside Drive, Forked River, NJ
OC-12	2.2	Forked River Game Farm, Forked River, NJ
OC-13	1.4	Lacey Township Restrooms, Lakeside Drive, Forked River, NJ
OC-14	1.1	Sands Point Park, Dock Avenue, Waretown, NJ
OC-15	1.5	Recreational Center, Waretown, NJ
OC-16	0.3	North Access Road, Forked River Site, Forked River, NJ
OC-20	6.6	Third Avenue, Barnegat Light, NJ
OC-21	3.5	Rose Hill Road & Barnegat Blvd., Barnegat Twp., NJ
OC-22	4.4	Bay Way & Claimore Avenue, Lanoka Harbor, NJ
OC-23	6.3	Island Beach State Park, Parking Lot A5

Note: Each sample location above contains a CREST monitor and TLD

Note: Stations OC-20, OC-21, OC-22 and OC-23 contain TLD badges only

Table A-5
NJDEP / BNE
Radiological Environmental Monitoring Program

Sample Locations and Descriptions
Salem / Hope Creek Nuclear Generating Station

<i>Sample Medium</i>	<i>Station Code</i>	<i>Distance From Plant (miles)</i>	<i>Description of Site</i>
Milk	AIMI01	12	Private Farm – ENE wind compass sector
	AIMI02	17	Private Farm – NE wind compass sector
	AIMI03	7.6	Private Farm – WNW wind compass sector
	AIMI05	13.8	Private Farm – WNW wind compass sector
Air Particulate Filter	AIAP01	5.6	Fort Elfsborg Rd., Elsinboro Township, NJ
	AIAP02	4.0	Plant Access Road
	AIAP03	5.1	Lower Alloways Creek School, Canton, NJ
Air Particulate Composite	AIAP01	5.6	Fort Elfsborg Rd., Elsinboro Township, NJ
	AIAP02	4.0	Plant Access Road
	AIAP03	5.1	Lower Alloways Creek School, Canton, NJ
Air Charcoal	AIAI01	5.6	Fort Elfsborg Rd., Elsinboro Township, NJ
	AIAI02	4.0	Plant Access Road
	AIAI03	5.1	Lower Alloways Creek School, Canton, NJ
Surface Water *	AISW01	0.2	Onsite, Surface Water Inlet Building Discharge
	AISW02	2.5	Delaware River, West Bank Upstream

* Sample split with nuclear power plant operator

Note: In order to maintain owner privacy, the BNE does not disclose the names of farms which provide environmental samples for analysis. All farms that provide vegetation and milk samples are within the Ingestion Pathway Zone.

Table A-5 (continued)
 NJDEP / BNE
 Radiological Environmental Monitoring Program

Sample Locations and Descriptions
 Salem / Hope Creek Nuclear Generating Station (*continued*)

<i>Sample Medium</i>	<i>Station Code</i>	<i>Distance From Plant (miles)</i>	<i>Description of Site</i>
Well Water *	AIWW01	5.8	Elsinboro School, Ft. Elfsborg Road, Elsinboro Township, NJ
	AIWW02	6.5	Lower Alloways Creek Police Station, 501 Locust Island Road, Hancocks Bridge, NJ
	AIWW03	Onsite	Salem Nuclear Generating Station, Admin Building
	AIWW04	5.1	Lower Alloways Creek School, Canton, NJ
Aquatic Sediment *	AIAQ01	0.2	Onsite, Observation Building
	AIAQ02	0.2	Onsite, Surface Water Inlet Building
	AIAQ03	0.3	Onsite, Cooling Tower Blowdown Discharge Line
	AIAQ04	0.7	Onsite, South Storm Drain Discharge Line
	AIAQ05	2.5	West Bank of Delaware River – Upstream
Fish & Shellfish*	AIFS01	0.2	Onsite, Surface Water Inlet Building
	AIFS02	2.5	Delaware River, West Bank Upstream
Vegetable *	AIVE01	25.0	Private Farm – NE wind compass sector
	AIVE05	7.5	Private Farm – NNE wind compass sector
	AIVE07	9.2	Private Farm – NNE wind compass sector
	AIVE08	6.5	Private Farm – NE wind compass sector
	AIVE10	7.2	Private Farm – NE wind compass sector
	AIVE12	0.55	Onsite, North of Salem Units 1 & 2 Nuclear Station, Owner Controlled Area
	AIVE13	0.57	Onsite, NW of Vent, Owner Controlled Area
	AIVE14	0.54	Onsite, NNW of Vent, Owner Controlled Area
AIVE15	3.9	Private Farm - SSW of Vent; Taylor's Bridge Spur	

* Sample split with nuclear power plant operator

Table A-6
NJDEP / BNE
Radiological Environmental Monitoring Program

CREST and Thermoluminescent Dosimetry Network
Salem / Hope Creek Nuclear Generating Station

<i>ID</i>	<i>Distance From Plant (miles)</i>	<i>Description of Site</i>
AI-1	1.0	Access Road, Security Checkpoint
AI-2	4.1	Poplar Road, Lower Alloways Creek Twp., NJ
AI-3	4.1	Money and Eagle Island Roads, Elsinboro Twp., NJ
AI-4	5.4	Fort Elfsborg Road and Hancocks Bridge Road – East, Elsinboro Twp., NJ
AI-5	5.6	Fort Elfsborg Road and Hancocks Bridge Road – West, Elsinboro Twp., NJ
AI-6	8.4	Stathems Neck Road, Greenwich Twp., NJ
AI-7	6.2	Stow Neck Road, Lower Alloways Creek Twp., NJ
AI-8	3.3	Alloways Creek Neck Road, Lower Alloways Creek Twp., NJ
AI-9	3.8	Alloways Creek Neck Road, Lower Alloways Creek Twp., NJ
AI-10	4.8	Abbotts Farm Road, Elsinboro Twp., NJ

Note: Each sample location above contains a CREST monitor and TLD

Appendix B – Sample Results

Table B-1

NJDEP / BNE

Radiological Environmental Monitoring Program

Background

Concentrations of I-131 in Bi-Weekly Air Iodine Samples 2008

<u>BNE Office (COAI01)</u>			
<u>Collection Period</u>		<u>I-131 (pCi/m³)</u>	
12/31/07	- 01/16/08	<	0.003
01/16/08	- 01/28/08	<	0.026
01/28/08	- 02/11/08	<	0.007
02/11/08	- 02/26/08	<	0.008
02/26/08	- 03/10/08	<	0.018
03/10/08	- 03/26/08	<	0.007
03/26/08	- 04/07/08	<	0.011
04/07/08	- 04/22/08	<	0.011
04/22/08	- 05/06/08	<	0.005
05/06/08	- 05/19/08	<	0.008
05/19/08	- 06/02/08	<	0.015
06/02/08	- 06/16/08	<	0.012
06/16/08	- 06/30/08	<	0.004
06/30/08	- 07/15/08	<	0.009
07/15/08	- 07/31/08	<	0.034
07/31/08	- 08/11/08	<	0.009
08/11/08	- 08/25/08	<	0.033
08/25/08	- 09/09/08	<	0.008
09/09/08	- 09/25/08	<	0.004
09/25/08	- 10/06/08	<	0.024
10/06/08	- 10/22/08	<	0.004
10/22/08	- 11/06/08	<	0.013*
11/06/08	- 11/17/08	<	0.024*
11/17/08	- 12/02/08	<	0.010*
12/02/08	- 12/15/08	<	0.008*
12/15/08	- 12/30/08	<	0.008*

Results in picoCuries per cubic meter (pCi/m³) +/- 2 Standard Deviations

* The result for this sample was recalculated by the BNE's contract laboratory due to an error in determining the sample volume during the time period of 10/21/08 through 12/30/08. This resulted in a higher detection limit due to the short half life of Iodine-131 (8.05 days). The re-calculated result was still below the contract lab's requirement of < 0.070 pCi/m³. (See Table C-1, Minimum Detectable Concentration Requirements for NJDEP/BNE Radiological Environmental Lab Services Contract.)

Table B-1 (continued)
 NJDEP / BNE
 Radiological Environmental Monitoring Program

Background
Concentrations of I-131 in Bi-Weekly Air Iodine Samples
2008

<u>Brendan T. Byrne State Forest (COAI02)</u>		
<u>Collection Period</u>		<u>I-131 (pCi/m³)</u>
12/28/07	- 01/15/08	< 0.005
01/15/08	- 01/29/08	< 0.009
01/29/08	- 02/13/08	< 0.008
02/13/08	- 02/27/08	< 0.004
02/27/08	- 03/11/08	< 0.012
03/11/08	- 03/24/08	< 0.009
03/24/08	- 04/08/08	< 0.014
04/08/08	- 04/23/08	< 0.012
04/23/08	- 05/06/08	< 0.007
05/06/08	- 05/19/08	< 0.008
05/19/08	- 06/03/08	< 0.019
06/03/08	- 06/17/08	< 0.015
06/17/08	- 07/01/08	< 0.005
07/01/08	- 07/14/08	< 0.008
07/14/08	- 07/28/08	< 0.004
07/28/08	- 08/13/08	< 0.004
08/13/08	- 08/26/08	< 0.016
08/26/08	- 09/10/08	< 0.010
09/10/08	- 09/23/08	< 0.006
09/23/08	- 10/07/08	< 0.016
10/07/08	- 10/21/08	< 0.008
10/21/08	- 11/06/08	< 0.026*
11/06/08	- 11/18/08	< 0.062*
11/18/08	- 12/03/08	< 0.019*
12/03/08	- 12/16/08	< 0.023*
12/16/08	- 12/30/08	< 0.011*

Results in picoCuries per cubic meter (pCi/m³) +/- 2 Standard Deviations

* The result for this sample was recalculated by the BNE's contract laboratory due to an error in determining the sample volume during the time period of 10/21/08 through 12/30/08. This resulted in a higher detection limit due to the short half life of Iodine-131 (8.05 days). The re-calculated result was still below the contract lab's requirement of < 0.070 pCi/m³. (See Table C-1, Minimum Detectable Concentration Requirements for NJDEP/BNE Radiological Environmental Lab Services Contract.)

B-1 (Continued)

Table B-2
NJDEP / BNE
Radiological Environmental Monitoring Program

Oyster Creek
Concentrations of I-131 in Bi-Weekly Air Iodine Samples
2008

<u>Waretown Municipal Building (OCAI01)</u>			
<u>Collection Period</u>		<u>I-131 (pCi/m³)</u>	
12/28/07	- 01/15/08	<	0.005
01/15/08	- 01/29/08	<	0.019
01/29/08	- 02/13/08	<	0.013
02/13/08	- 02/27/08	<	0.007
02/27/08	- 03/11/08	<	0.010
03/11/08	- 03/24/08	<	0.014
03/24/08	- 04/08/08	<	0.019
04/08/08	- 04/23/08	<	0.018
04/23/08	- 05/06/08	<	0.009
05/06/08	- 05/19/08	<	0.007
05/19/08	- 06/03/08	<	0.016
06/03/08	- 06/17/08	<	0.008
06/17/08	- 07/01/08	<	0.005
07/01/08	- 07/14/08	<	0.008
07/14/08	- 07/28/08	<	0.006
07/28/08	- 08/13/08	<	0.015
08/13/08	- 08/26/08	<	0.024
08/26/08	- 09/10/08	<	0.012
09/10/08	- 09/23/08	<	0.008
09/23/08	- 10/07/08	<	0.020
10/07/08	- 10/21/08	<	0.009
10/21/08	- 11/06/08	<	0.032*
11/06/08	- 11/18/08	<	0.058*
11/18/08	- 12/03/08	<	0.023*
12/03/08	- 12/16/08	<	0.028*
12/16/08	- 12/30/08	<	0.013*

Results in picoCuries per cubic meter (pCi/m³) +/- 2 Standard Deviations

* The result for this sample was recalculated by the BNE's contract laboratory due to an error in determining the sample volume during the time period of 10/21/08 through 12/30/08. This resulted in a higher detection limit due to the short half life of Iodine-131 (8.05 days). The re-calculated result was still below the contract lab's requirement of < 0.070 pCi/m³. (See Table C-1, Minimum Detectable Concentration Requirements for NJDEP/BNE Radiological Environmental Lab Services Contract.)

Table B-2 (continued)
NJDEP / BNE
Radiological Environmental Monitoring Program

Oyster Creek
Concentrations of I-131 in Bi-Weekly Air Iodine Samples
2008

<u>Sands Point Harbor (OCAI02)</u>			
<u>Collection Period</u>		<u>I-131 (pCi/m³)</u>	
12/28/07	- 01/15/08	<	0.006
01/15/08	- 01/29/08	<	0.022
01/29/08	- 02/13/08	<	0.015
02/13/08	- 02/27/08	<	0.009
02/27/08	- 03/11/08	<	0.017
03/11/08	- 03/24/08	<	0.009
03/24/08	- 04/08/08	<	0.022
04/08/08	- 04/23/08	<	0.022
04/23/08	- 05/06/08	<	0.010
05/06/08	- 05/19/08	<	0.017
05/19/08	- 06/03/08	<	0.032
06/03/08	- 06/17/08	<	0.020
06/17/08	- 07/01/08	<	0.009
07/01/08	- 07/14/08	<	0.014
07/14/08	- 07/28/08	<	0.019
07/28/08	- 08/13/08	<	0.008
08/13/08	- 08/26/08	<	0.029
08/26/08	- 09/10/08	<	0.017
09/10/08	- 09/23/08	<	0.011
09/23/08	- 10/07/08	<	0.029
10/07/08	- 10/21/08	<	0.014
10/21/08	- 11/06/08	<	0.047*
11/06/08	- 11/18/08	<	0.062*
11/18/08	- 12/03/08	<	0.034*
12/03/08	- 12/16/08	<	0.042*
12/16/08	- 12/30/08	<	0.020*

Results in picoCuries per cubic meter (pCi/m³) +/- 2 Standard Deviations

* The result for this sample was recalculated by the BNE's contract laboratory due to an error in determining the sample volume during the time period of 10/21/08 through 12/30/08. This resulted in a higher detection limit due to the short half life of Iodine-131 (8.05 days). The re-calculated result was still below the contract lab's requirement of < 0.070 pCi/m³. (See Table C-1, Minimum Detectable Concentration Requirements for NJDEP/BNE Radiological Environmental Lab Services Contract.)

B-2 (Continued)

Table B-2 (continued)
NJDEP / BNE
Radiological Environmental Monitoring Program

Oyster Creek
Concentrations of I-131 in Bi-Weekly Air Iodine Samples
2008

<u>Forked River Marina (OCAI03)</u>			
<u>Collection Period</u>		<u>I-131 (pCi/m³)</u>	
12/28/07	- 01/15/08	<	0.005
01/15/08	- 01/29/08	<	0.021
01/29/08	- 02/13/08	<	0.014
02/13/08	- 02/27/08	<	0.008
02/27/08	- 03/11/08	<	0.016
03/11/08	- 03/24/08	<	0.015
03/24/08	- 04/08/08	<	0.012
04/08/08	- 04/23/08	<	0.020
04/23/08	- 05/06/08	<	0.010
05/06/08	- 05/19/08	<	0.014
05/19/08	- 06/03/08	<	0.027
06/03/08	- 06/17/08	<	0.017
06/17/08	- 07/01/08	<	0.007
07/01/08	- 07/14/08	<	0.011
07/14/08	- 07/28/08	<	0.015
07/28/08	- 08/13/08	<	0.007
08/13/08	- 08/26/08	<	0.022
08/26/08	- 09/10/08	<	0.012
09/10/08	- 09/23/08	<	0.008
09/23/08	- 10/07/08	<	0.020
10/07/08	- 10/21/08	<	0.009
10/21/08	- 11/06/08	<	0.032*
11/06/08	- 11/18/08	<	0.059*
11/18/08	- 12/03/08	<	0.023*
12/03/08	- 12/16/08	<	0.037*
12/16/08	- 12/30/08	<	0.009*

Results in picoCuries per cubic meter (pCi/m³) +/- 2 Standard Deviations

* The result for this sample was recalculated by the BNE's contract laboratory due to an error in determining the sample volume during the time period of 10/21/08 through 12/30/08. This resulted in a higher detection limit due to the short half life of Iodine-131 (8.05 days). The re-calculated result was still below the contract lab's requirement of < 0.070 pCi/m³. (See Table C-1, Minimum Detectable Concentration Requirements for NJDEP/BNE Radiological Environmental Lab Services Contract.)

B-2 (Continued)

Table B-2 (continued)
NJDEP / BNE
Radiological Environmental Monitoring Program

Oyster Creek
Concentrations of I-131 in Bi-Weekly Air Iodine Samples
2008

<u>Lacey Township Recreation Building (OCAI04)</u>			
<u>Collection Period</u>		<u>I-131 (pCi/m³)</u>	
12/28/07	- 01/15/08	<	0.006
01/15/08	- 01/29/08	<	0.021
01/29/08	- 02/13/08	<	0.014
02/13/08	- 02/27/08	<	0.008
02/27/08	- 03/11/08	<	0.016
03/11/08	- 03/24/08	<	0.016
03/24/08	- 04/08/08	<	0.021
04/08/08	- 04/23/08	<	0.011
04/23/08	- 05/06/08	<	0.005
05/06/08	- 05/19/08	<	0.014
05/19/08	- 06/03/08	<	0.030
06/03/08	- 06/17/08	<	0.019
06/17/08	- 07/01/08	<	0.008
07/01/08	- 07/15/08	<	0.011
07/15/08	- 07/28/08	<	0.018
07/28/08	- 08/13/08	<	0.013
08/13/08	- 08/26/08	<	0.016
08/26/08	- 09/10/08	<	0.015
09/10/08	- 09/23/08	<	0.016
09/23/08	- 10/07/08	<	0.031
10/07/08	- 10/21/08	<	0.016
10/21/08	- 11/06/08	<	0.016*
11/06/08	- 11/18/08	<	0.005*
11/18/08	- 12/03/08	<	0.020*
12/03/08	- 12/16/08	<	0.015*
12/16/08	- 12/30/08	<	0.012*

Results in picoCuries per cubic meter (pCi/m³) +/- 2 Standard Deviations

* The result for this sample was recalculated by the BNE's contract laboratory due to an error in determining the sample volume during the time period of 10/21/08 through 12/30/08. This resulted in a higher detection limit due to the short half life of Iodine-131 (8.05 days). The re-calculated result was still below the contract lab's requirement of < 0.070 pCi/m³. (See Table C-1, Minimum Detectable Concentration Requirements for NJDEP/BNE Radiological Environmental Lab Services Contract.)

B-2 (Continued)

Table B-2 (continued)
NJDEP / BNE
Radiological Environmental Monitoring Program

Oyster Creek
Concentrations of I-131 in Bi-Weekly Air Iodine Samples
2008

<u>JCP&L Substation (OCAI05)</u>			
<u>Collection Period</u>		<u>I-131 (pCi/m³)</u>	
12/28/07	- 01/15/08	<	0.002
01/15/08	- 01/29/08	<	0.006
01/29/08	- 02/13/08		No Data
02/13/08	- 02/27/08		No Data
02/27/08	- 03/11/08		No Data
03/11/08	- 03/24/08	<	0.010
03/24/08	- 04/08/08	<	0.011
04/08/08	- 04/23/08	<	0.011
04/23/08	- 05/06/08	<	0.003
05/06/08	- 05/19/08	<	0.008
05/19/08	- 06/03/08	<	0.017
06/03/08	- 06/17/08	<	0.011
06/17/08	- 07/01/08	<	0.005
07/01/08	- 07/15/08	<	0.006
07/15/08	- 07/28/08	<	0.010
07/28/08	- 08/13/08	<	0.007
08/13/08	- 08/26/08	<	0.009
08/26/08	- 09/10/08	<	0.008
09/10/08	- 09/23/08	<	0.009
09/23/08	- 10/07/08	<	0.017
10/07/08	- 10/21/08	<	0.009
10/21/08	- 11/06/08	<	0.003*
11/06/08	- 11/18/08	<	0.007*
11/18/08	- 12/03/08	<	0.010*
12/03/08	- 12/16/08	<	0.027*
12/16/08	- 12/30/08	<	0.006*

Results in picoCuries per cubic meter (pCi/m³) +/- 2 Standard Deviations

“No Data” indicates no sample results due to maintenance issues with equipment

* The result for this sample was recalculated by the BNE’s contract laboratory due to an error in determining the sample volume during the time period of 10/21/08 through 12/30/08. This resulted in a higher detection limit due to the short half life of Iodine-131 (8.05 days). The re-calculated result was still below the contract lab’s requirement of < 0.070 pCi/m³. (See Table C-1, Minimum Detectable Concentration Requirements for NJDEP/BNE Radiological Environmental Lab Services Contract.)

Table B-2 (continued)
NJDEP / BNE
Radiological Environmental Monitoring Program

Oyster Creek
Concentrations of I-131 in Weekly Air Iodine Samples*
2008

<u>Finninger Farm, OC Dredge Site (OCAI06)</u>			
<u>Collection Period</u>		<u>I-131 (pCi/m³)</u>	
04/16/08	- 04/23/08	<	0.056
04/23/08	- 04/30/08	<	0.057
04/30/08	- 05/07/08	<	0.030
05/07/08	- 05/14/08	<	0.018
05/14/08	- 05/21/08	<	0.069
05/21/08	- 05/28/08	<	0.062
05/28/08	- 06/04/08	<	0.038
06/04/08	- 06/11/08	<	0.063
06/11/08	- 06/18/08	<	0.035
06/18/08	- 06/25/08	<	0.019
06/25/08	- 07/01/08	<	0.034
07/01/08	- 07/09/08	<	0.007
07/09/08	- 07/16/08	<	0.022
07/16/08	- 07/23/08	<	0.020
07/23/08	- 07/30/08	<	0.026
07/30/08	- 08/06/08	<	0.061
08/06/08	- 08/13/08	<	0.001
08/13/08	- 08/20/08	<	0.062
08/20/08	- 08/27/08	<	0.053
08/27/08	- 09/03/08	<	0.060
09/03/08	- 09/10/08	<	0.046
09/10/08	- 09/17/08	<	0.010
09/17/08	- 09/24/08	<	0.005
09/24/08	- 09/30/08	<	0.067
09/30/08	- 10/08/08	<	0.028
10/08/08	- 10/15/08	<	0.035

Results in picoCuries per cubic meter (pCi/m³) +/- 2 Standard Deviations

* Air Charcoal samples are collected by the licensee on a weekly basis. The collection of air charcoal at this site commenced during the week of 04/16/08.

Table B-2 (continued)
 NJDEP / BNE
 Radiological Environmental Monitoring Program

Oyster Creek
Concentrations of I-131 in Weekly Air Iodine Samples*
2008

<u>Finninger Farm, OC Dredge Site (OCAI06)</u>			
<i>(continued)</i>			
<u>Collection Period</u>		<u>I-131 (pCi/m³)</u>	
10/15/08	- 10/22/08	<	0.057
10/22/08	- 10/29/08	<	0.069
10/29/08	- 11/05/08	<	0.058
11/05/08	- 11/12/08	<	0.066
11/12/08	- 11/18/08	<	0.069
11/18/08	- 11/25/08	<	0.068
11/25/08	- 12/03/08	<	0.067
12/03/08	- 12/10/08	<	0.053
12/10/08	- 12/17/08	<	0.050
12/17/08	- 12/23/08	<	0.053
12/23/08	- 12/30/08	<	0.034

Results in picoCuries per cubic meter (pCi/m³) +/- 2 Standard Deviations

* Air Charcoal samples are collected by the licensee on a weekly basis. The collection of air charcoal at this site commenced during the week of 04/16/08

Table B-3
NJDEP / BNE
Radiological Environmental Monitoring Program

Salem / Hope Creek
Concentrations of I-131 in Bi-Weekly Air Iodine Samples
2008

<u>Fort Elfsborg Road (AIAI01)</u>			
<u>Collection Period</u>		<u>I-131 (pCi/m³)</u>	
12/31/07	- 01/16/08	<	0.004
01/16/08	- 01/28/08	<	0.018
01/28/08	- 02/11/08	<	0.008
02/11/08	- 02/26/08	<	0.005
02/26/08	- 03/10/08	<	0.005
03/10/08	- 03/25/08	<	0.006
03/25/08	- 04/07/08	<	0.015
04/07/08	- 04/22/08	<	0.011
04/22/08	- 05/05/08	<	0.007
05/05/08	- 05/19/08	<	0.003
05/19/08	- 06/02/08	<	0.019
06/02/08	- 06/16/08	<	0.015
06/16/08	- 06/30/08	<	0.005
06/30/08	- 07/15/08	<	0.004
07/15/08	- 07/30/08	<	0.004
07/30/08	- 08/11/08	<	0.006
08/11/08	- 08/25/08	<	0.015
08/25/08	- 09/09/08	<	0.005
09/09/08	- 09/25/08	<	0.003
09/25/08	- 10/06/08	<	0.018
10/06/08	- 10/22/08	<	0.004
10/22/08	- 11/06/08	<	0.007*
11/06/08	- 11/17/08	<	0.012*
11/17/08	- 12/02/08	<	0.008*
12/02/08	- 12/15/08	<	0.006*
12/15/08	- 12/30/08	<	0.002*

Results in picoCuries per cubic meter (pCi/m³) +/- 2 Standard Deviations

* The result for this sample was recalculated by the BNE's contract laboratory due to an error in determining the sample volume during the time period of 10/21/08 through 12/30/08. This resulted in a higher detection limit due to the short half life of Iodine-131 (8.05 days). The re-calculated result was still below the contract lab's requirement of < 0.070 pCi/m³. (See Table C-1, Minimum Detectable Concentration Requirements for NJDEP/BNE Radiological Environmental Lab Services Contract.)

Table B-3 (continued)
NJDEP / BNE
Radiological Environmental Monitoring Program

Salem / Hope Creek
Concentrations of I-131 in Bi-Weekly Air Iodine Samples
2008

<u>Plant Access Road (AIAI02)</u>		
<u>Collection Period</u>		<u>I-131 (pCi/m³)</u>
12/31/07	- 01/16/08	< 0.004
01/16/08	- 01/28/08	< 0.019
01/28/08	- 02/11/08	< 0.009
02/11/08	- 02/26/08	< 0.005
02/26/08	- 03/10/08	< 0.011
03/10/08	- 03/25/08	< 0.007
03/25/08	- 04/07/08	< 0.013
04/07/08	- 04/22/08	< 0.010
04/22/08	- 05/05/08	< 0.006
05/05/08	- 05/19/08	< 0.007
05/19/08	- 06/02/08	< 0.023
06/02/08	- 06/16/08	< 0.015
06/16/08	- 06/30/08	< 0.009
06/30/08	- 07/15/08	< 0.003
07/15/08	- 07/30/08	< 0.004
07/30/08	- 08/11/08	< 0.010
08/11/08	- 08/25/08	< 0.024
08/25/08	- 09/09/08	< 0.013
09/09/08	- 09/25/08	< 0.005
09/25/08	- 10/06/08	< 0.029
10/06/08	- 10/22/08	< 0.007
10/22/08	- 11/06/08	< 0.014*
11/06/08	- 11/17/08	< 0.021*
11/17/08	- 12/02/08	< 0.014*
12/02/08	- 12/15/08	< 0.010*
12/15/08	- 12/30/08	< 0.009*

Results in picoCuries per cubic meter (pCi/m³) +/- 2 Standard Deviations

* The result for this sample was recalculated by the BNE's contract laboratory due to an error in determining the sample volume during the time period of 10/21/08 through 12/30/08. This resulted in a higher detection limit due to the short half life of Iodine-131 (8.05 days). The re-calculated result was still below the contract lab's requirement of < 0.070 pCi/m³. (See Table C-1, Minimum Detectable Concentration Requirements for NJDEP/BNE Radiological Environmental Lab Services Contract.)

B-3 (continued)

Table B-3 (continued)
NJDEP / BNE
Radiological Environmental Monitoring Program

Salem / Hope Creek
Concentrations of I-131 in Bi-Weekly Air Iodine Samples
2008

<u>Lower Alloways Creek School (AIAI03)</u>			
<u>Collection Period</u>		<u>I-131 (pCi/m³)</u>	
12/31/07	- 01/16/08	<	0.006
01/16/08	- 01/28/08	<	0.029
01/28/08	- 02/11/08	<	0.015
02/11/08	- 02/26/08	<	0.008
02/26/08	- 03/10/08	<	0.019
03/10/08	- 03/25/08	<	0.010
03/25/08	- 04/07/08	<	0.025
04/07/08	- 04/22/08	<	0.019
04/22/08	- 05/05/08	<	0.011
05/05/08	- 05/19/08	<	0.010
05/19/08	- 06/02/08	<	0.032
06/02/08	- 06/16/08	<	0.027
06/16/08	- 06/30/08	<	0.009
06/30/08	- 07/15/08	<	0.011
07/15/08	- 07/30/08	<	0.009
07/30/08	- 08/11/08	<	0.009
08/11/08	- 08/25/08	<	0.030
08/25/08	- 09/09/08	<	0.030
09/09/08	- 09/25/08	<	0.005
09/25/08	- 10/06/08	<	0.036
10/06/08	- 10/22/08	<	0.009
10/22/08	- 11/06/08	<	0.022*
11/06/08	- 11/17/08	<	0.014*
11/17/08	- 12/02/08	<	0.016*
12/02/08	- 12/15/08	<	0.038*
12/15/08	- 12/30/08	<	0.011*

Results in picoCuries per cubic meter (pCi/m³) +/- 2 Standard Deviations

* The result for this sample was recalculated by the BNE's contract laboratory due to an error in determining the sample volume during the time period of 10/21/08 through 12/30/08. This resulted in a higher detection limit due to the short half life of Iodine-131 (8.05 days). The re-calculated result was still below the contract lab's requirement of < 0.070 pCi/m³. (See Table C-1, Minimum Detectable Concentration Requirements for NJDEP/BNE Radiological Environmental Lab Services Contract.)

B-3 (continued)

Table B-4
NJDEP / BNE
Radiological Environmental Monitoring Program

Background
Concentrations of Gross Beta in Bi-Weekly Air Particulate Samples
2008

<u>BNE Office (COAP01)</u>					
<u>Collection Period</u>		<u>Particulate Gross Beta</u> <u>(pCi/m³)</u>			
12/31/07	- 01/16/08	0.017	±	0.0014	
01/16/08	- 01/28/08	0.022	±	0.0020	
01/28/08	- 02/11/08	0.022	±	0.0017	
02/11/08	- 02/26/08	0.016	±	0.0016	
02/26/08	- 03/10/08	0.015	±	0.0016	
03/10/08	- 03/26/08	0.022	±	0.0017	
03/26/08	- 04/07/08	0.013	±	0.0013	
04/07/08	- 04/22/08	0.012	±	0.0013	
04/22/08	- 05/06/08	0.015	±	0.0014	
05/06/08	- 05/19/08	0.011	±	0.0013	
05/19/08	- 06/02/08	0.007	±	0.0010	
06/02/08	- 06/18/08	0.010	±	0.0012	
06/18/08	- 06/30/08	0.019	±	0.0017	
06/30/08	- 07/15/08	0.013	±	0.0013	
07/15/08	- 07/31/08	0.106	±	0.0080*	
07/31/08	- 08/11/08	0.013	±	0.0014	
08/11/08	- 08/25/08	0.025	±	0.0022	
08/25/08	- 09/09/08	0.008	±	0.0008	
09/09/08	- 09/25/08	0.012	±	0.0011	
09/25/08	- 10/06/08	0.010	±	0.0012	
10/06/08	- 10/22/08	0.007	±	0.0007	
10/22/08	- 11/06/08	0.011	±	0.0012	
11/06/08	- 11/17/08	0.014	±	0.0013	
11/17/08	- 12/02/08	0.014	±	0.0012	
12/02/08	- 12/15/08	0.014	±	0.0013	
12/15/08	- 12/30/08	0.011	±	0.0011	

Results in picoCuries per cubic meter (pCi/m³) +/- 2 Standard Deviations

* Higher result was due to air sampler malfunction which reduced the total sample volume

Table B-4 (continued)
 NJDEP / BNE
 Radiological Environmental Monitoring Program

Background
Concentrations of Gross Beta in Bi-Weekly Air Particulate Samples
2008

<u>Brendan T. Byrne State Forest (COAP02)</u>					
<u>Collection Period</u>			<u>Particulate Gross Beta</u> <u>(pCi/m³)</u>		
12/28/07	-	01/15/08	0.016	±	0.0013
01/15/08	-	01/29/08	0.021	±	0.0017
01/29/08	-	02/13/08	0.017	±	0.0013
02/13/08	-	02/27/08	0.015	±	0.0014
02/27/08	-	03/11/08	0.016	±	0.0014
03/11/08	-	03/24/08	0.011	±	0.0012
03/24/08	-	04/08/08	0.012	±	0.0012
04/08/08	-	04/23/08	0.011	±	0.0011
04/23/08	-	05/06/08	0.016	±	0.0014
05/06/08	-	05/19/08	0.013	±	0.0012
05/19/08	-	06/03/08	0.009	±	0.0010
06/03/08	-	06/17/08	0.012	±	0.0011
06/17/08	-	07/01/08	0.013	±	0.0012
07/01/08	-	07/14/08	0.012	±	0.0012
07/14/08	-	07/28/08	0.014	±	0.0012
07/28/08	-	08/13/08	0.014	±	0.0011
08/13/08	-	08/26/08	0.014	±	0.0013
08/26/08	-	09/10/08	0.012	±	0.0011
09/10/08	-	09/23/08	0.010	±	0.0011
09/23/08	-	10/07/08	0.011	±	0.0011
10/07/08	-	10/21/08	0.018	±	0.0014
10/21/08	-	11/06/08	0.011	±	0.0010
11/06/08	-	11/18/08	0.010	±	0.0008
11/18/08	-	12/03/08	0.015	±	0.0012
12/03/08	-	12/16/08	0.014	±	0.0012
12/16/08	-	12/30/08	0.017	±	0.0013

Results in picoCuries per cubic meter (pCi/m³) +/- 2 Standard Deviations

Table B-5
NJDEP / BNE
Radiological Environmental Monitoring Program

Oyster Creek
Concentrations of Gross Beta in Bi-Weekly Air Particulate Samples
2008

<u>Waretown Municipal Building (OCAP01)</u>			
<u>Collection Period</u>		<u>Particulate Gross Beta</u> <u>(pCi/m³)</u>	
12/28/07	- 01/15/08	0.015	± 0.0013
01/15/08	- 01/29/08	0.018	± 0.0016
01/29/08	- 02/13/08	0.018	± 0.0015
02/13/08	- 02/27/08	0.015	± 0.0015
02/27/08	- 03/11/08	0.014	± 0.0015
03/11/08	- 03/24/08	0.014	± 0.0015
03/24/08	- 04/08/08	0.014	± 0.0014
04/08/08	- 04/23/08	0.010	± 0.0012
04/23/08	- 05/06/08	0.017	± 0.0017
05/06/08	- 05/19/08	0.010	± 0.0013
05/19/08	- 06/03/08	0.010	± 0.0012
06/03/08	- 06/17/08	0.013	± 0.0013
06/17/08	- 07/01/08	0.013	± 0.0014
07/01/08	- 07/14/08	0.011	± 0.0013
07/14/08	- 07/28/08	0.016	± 0.0015
07/28/08	- 08/13/08	0.022	± 0.0027
08/13/08	- 08/26/08	0.012	± 0.0015
08/26/08	- 09/10/08	0.012	± 0.0012
09/10/08	- 09/23/08	0.012	± 0.0013
09/23/08	- 10/07/08	0.008	± 0.0010
10/07/08	- 10/21/08	0.015	± 0.0014
10/21/08	- 11/06/08	0.012	± 0.0011
11/06/08	- 11/18/08	0.010	± 0.0009
11/18/08	- 12/03/08	0.016	± 0.0014
12/03/08	- 12/16/08	0.014	± 0.0014
12/16/08	- 12/30/08	0.014	± 0.0014

Results in picoCuries per cubic meter (pCi/m³) +/- 2 Standard Deviations

Table B-5 (continued)
 NJDEP / BNE
 Radiological Environmental Monitoring Program

Oyster Creek
Concentrations of Gross Beta in Bi-Weekly Air Particulate Samples
2008

<u>Sands Point Harbor (OCAP02)</u>					
<u>Collection Period</u>		<u>Particulate Gross Beta</u>			
		<u>(pCi/m³)</u>			
12/28/07	- 01/15/08	0.016	±	0.0015	
01/15/08	- 01/29/08	0.020	±	0.0019	
01/29/08	- 02/13/08	0.018	±	0.0017	
02/13/08	- 02/27/08	0.016	±	0.0017	
02/27/08	- 03/11/08	0.013	±	0.0016	
03/11/08	- 03/24/08	0.017	±	0.0019	
03/24/08	- 04/08/08	0.014	±	0.0015	
04/08/08	- 04/23/08	0.011	±	0.0014	
04/23/08	- 05/06/08	0.013	±	0.0016	
05/06/08	- 05/19/08	0.014	±	0.0018	
05/19/08	- 06/03/08	0.010	±	0.0014	
06/03/08	- 06/17/08	0.014	±	0.0016	
06/17/08	- 07/01/08	0.014	±	0.0016	
07/01/08	- 07/14/08	0.011	±	0.0016	
07/14/08	- 07/28/08	0.015	±	0.0017	
07/28/08	- 08/13/08	0.015	±	0.0016	
08/13/08	- 08/26/08	0.012	±	0.0017	
08/26/08	- 09/10/08	0.014	±	0.0016	
09/10/08	- 09/23/08	0.013	±	0.0017	
09/23/08	- 10/07/08	0.005	±	0.0011	
10/07/08	- 10/21/08	0.016	±	0.0018	
10/21/08	- 11/06/08	0.011	±	0.0014	
11/06/08	- 11/18/08	0.012	±	0.0012	
11/18/08	- 12/03/08	0.015	±	0.0017	
12/03/08	- 12/16/08	0.016	±	0.0018	
12/16/08	- 12/30/08	0.029	±	0.0023	

Results in picoCuries per cubic meter (pCi/m³) +/- 2 Standard Deviations

Table B-5 (continued)
 NJDEP / BNE
 Radiological Environmental Monitoring Program

Oyster Creek
Concentrations of Gross Beta in Bi-Weekly Air Particulate Samples
2008

<u>Forked River Marina (OCAP03)</u>					
<u>Collection Period</u>			<u>Particulate Gross Beta (pCi/m³)</u>		
12/28/07	-	01/15/08	0.016	±	0.0014
01/15/08	-	01/29/08	0.021	±	0.0018
01/29/08	-	02/13/08	0.019	±	0.0017
02/13/08	-	02/27/08	0.016	±	0.0017
02/27/08	-	03/11/08	0.017	±	0.0017
03/11/08	-	03/24/08	0.013	±	0.0016
03/24/08	-	04/08/08	0.015	±	0.0015
04/08/08	-	04/23/08	0.011	±	0.0013
04/23/08	-	05/06/08	0.016	±	0.0017
05/06/08	-	05/19/08	0.011	±	0.0014
05/19/08	-	06/03/08	0.009	±	0.0012
06/03/08	-	06/17/08	0.014	±	0.0014
06/17/08	-	07/01/08	0.013	±	0.0014
07/01/08	-	07/14/08	0.011	±	0.0014
07/14/08	-	07/28/08	0.015	±	0.0015
07/28/08	-	08/13/08	0.015	±	0.0014
08/13/08	-	08/26/08	0.014	±	0.0015
08/26/08	-	09/10/08	0.013	±	0.0013
09/10/08	-	09/23/08	0.011	±	0.0013
09/23/08	-	10/07/08	0.011	±	0.0012
10/07/08	-	10/21/08	0.017	±	0.0015
10/21/08	-	11/06/08	0.011	±	0.0011
11/06/08	-	11/18/08	0.011	±	0.0009
11/18/08	-	12/03/08	0.014	±	0.0013
12/03/08	-	12/16/08	0.014	±	0.0014
12/16/08	-	12/30/08	0.021	±	0.0016

Results in picoCuries per cubic meter (pCi/m³) +/- 2 Standard Deviations

Table B-5 (continued)
NJDEP / BNE
Radiological Environmental Monitoring Program

Oyster Creek
Concentrations of Gross Beta in Bi-Weekly Air Particulate Samples
2008

<u>Lacey Twp. Recreation Building (OCAP04)</u>					
<u>Collection Period</u>			<u>Particulate Gross Beta</u> <u>(pCi/m³)</u>		
12/28/07	-	01/15/08	0.018	±	0.0015
01/15/08	-	01/29/08	0.021	±	0.0019
01/29/08	-	02/13/08	0.020	±	0.0017
02/13/08	-	02/27/08	0.017	±	0.0017
02/27/08	-	03/11/08	0.014	±	0.0016
03/11/08	-	03/24/08	0.022	±	0.0020
03/24/08	-	04/08/08	0.013	±	0.0015
04/08/08	-	04/23/08	0.016	±	0.0016
04/23/08	-	05/06/08	0.017	±	0.0018
05/06/08	-	05/19/08	0.012	±	0.0015
05/19/08	-	06/03/08	0.010	±	0.0013
06/03/08	-	06/17/08	0.014	±	0.0016
06/17/08	-	07/01/08	0.014	±	0.0015
07/01/08	-	07/15/08	0.010	±	0.0014
07/15/08	-	07/28/08	0.019	±	0.0018
07/28/08	-	08/13/08	0.015	±	0.0015
08/13/08	-	08/26/08	0.014	±	0.0016
08/26/08	-	09/10/08	0.013	±	0.0015
09/10/08	-	09/23/08	0.012	±	0.0015
09/23/08	-	10/07/08	0.011	±	0.0014
10/07/08	-	10/21/08	0.017	±	0.0018
10/21/08	-	11/06/08	0.013	±	0.0014
11/06/08	-	11/18/08	0.011	±	0.0011
11/18/08	-	12/03/08	0.015	±	0.0016
12/03/08	-	12/16/08	0.015	±	0.0017
12/16/08	-	12/30/08	No Data		No Data

Results in picoCuries per cubic meter (pCi/m³) +/- 2 Standard Deviations

“No Data” indicates no sample results due to maintenance issues with equipment

Table B-5 (continued)
NJDEP / BNE
Radiological Environmental Monitoring Program

Oyster Creek
Concentrations of Gross Beta in Bi-Weekly Air Particulate Samples
2008

<u>JCP&L Substation (OCAP05)</u>					
<u>Collection Period</u>			<u>Particulate Gross Beta</u>		
			<u>(pCi/m³)</u>		
12/28/07	-	01/15/08	0.016	±	0.0011
01/15/08	-	01/29/08	0.019	±	0.0014
01/29/08	-	02/13/08	No Data		No Data
02/13/08	-	02/27/08	No Data		No Data
02/27/08	-	03/11/08	0.023	±	0.0048
03/11/08	-	03/24/08	0.003	±	0.0007
03/24/08	-	04/08/08	0.011	±	0.0009
04/08/08	-	04/23/08	0.006	±	0.0008
04/23/08	-	05/06/08	0.015	±	0.0012
05/06/08	-	05/19/08	0.009	±	0.0010
05/19/08	-	06/03/08	0.007	±	0.0008
06/03/08	-	06/17/08	0.011	±	0.0010
06/17/08	-	07/01/08	0.012	±	0.0011
07/01/08	-	07/15/08	0.011	±	0.0010
07/15/08	-	07/28/08	0.015	±	0.0012
07/28/08	-	08/13/08	0.014	±	0.0011
08/13/08	-	08/26/08	0.012	±	0.0011
08/26/08	-	09/10/08	0.013	±	0.0011
09/10/08	-	09/23/08	0.011	±	0.0011
09/23/08	-	10/07/08	0.010	±	0.0010
10/07/08	-	10/21/08	0.016	±	0.0012
10/21/08	-	11/06/08	0.010	±	0.0009
11/06/08	-	11/18/08	0.011	±	0.0008
11/18/08	-	12/03/08	0.013	±	0.0011
12/03/08	-	12/16/08	0.014	±	0.0011
12/16/08	-	12/30/08	0.019	±	0.0013

Results in picoCuries per cubic meter (pCi/m³) +/- 2 Standard Deviations

“No Data” indicates no sample results due to maintenance issues with equipment

Table B-5 (continued)
 NJDEP / BNE
 Radiological Environmental Monitoring Program

Oyster Creek
Concentrations of Gross Beta in Weekly* Air Particulate Samples
2008

<u>Finnering Farm, OC Dredge Site (OCAP06)</u>				
<u>Collection Period</u>		<u>Particulate Gross Beta</u> <u>(pCi/m³)</u>		
01/02/08	- 01/09/08	0.028	±	0.0048
01/09/08	- 01/16/08	No Data		No Data
01/16/08	- 01/23/08	0.028	±	0.0047
01/23/08	- 01/30/08	0.037	±	0.0053
01/30/08	- 02/06/08	0.022	±	0.0043
02/06/08	- 02/14/08	0.021	±	0.0040
02/14/08	- 02/20/08	0.024	±	0.0053
02/20/08	- 02/27/08	0.027	±	0.0046
02/27/08	- 03/05/08	0.030	±	0.0109
03/05/08	- 03/12/08	0.023	±	0.0043
03/12/08	- 03/18/08	0.080	±	0.0079**
03/18/08	- 03/26/08	0.019	±	0.0035
03/26/08	- 04/02/08	0.022	±	0.0041
04/02/08	- 04/09/08	0.019	±	0.0039
04/09/08	- 04/16/08	0.014	±	0.0036
04/16/08	- 04/23/08	0.026	±	0.0044
04/23/08	- 04/30/08	0.023	±	0.0042
04/30/08	- 05/07/08	0.023	±	0.0041
05/07/08	- 05/14/08	0.017	±	0.0036
05/14/08	- 05/21/08	0.016	±	0.0039
05/21/08	- 05/28/08	0.013	±	0.0035
05/28/08	- 06/04/08	0.020	±	0.0040
06/04/08	- 06/11/08	0.021	±	0.0042
06/11/08	- 06/18/08	0.024	±	0.0042
06/18/08	- 06/25/08	0.016	±	0.0041
06/25/08	- 07/01/08	0.025	±	0.0047

Results in picoCuries per cubic meter (pCi/m³) +/- 2 Standard Deviations

* Air particulate samples are collected by the licensee on a weekly basis

“No Data” indicates no sample results due to maintenance issues with equipment

** Higher result was due to air sampler malfunction which reduced the total sample volume

Table B-5 (continued)
 NJDEP / BNE
 Radiological Environmental Monitoring Program

Oyster Creek
Concentrations of Gross Beta in Weekly* Air Particulate Samples
2008

<u>Finnering Farm, OC Dredge Site (OCAP06)</u>					
<u><i>(continued)</i></u>					
<u>Collection Period</u>			<u>Particulate Gross Beta</u>		
			<u>(pCi/m³)</u>		
07/01/08	-	07/09/08	0.023	±	0.0039
07/09/08	-	07/16/08	0.017	±	0.0040
07/16/08	-	07/23/08	0.027	±	0.0044
07/23/08	-	07/30/08	0.024	±	0.0043
07/30/08	-	08/06/08	0.021	±	0.0042
08/06/08	-	08/13/08	0.002	±	0.0004
08/13/08	-	08/20/08	0.024	±	0.0045
08/20/08	-	08/27/08	0.021	±	0.0043
08/27/08	-	09/03/08	0.019	±	0.0039
09/03/08	-	09/10/08	0.026	±	0.0044
09/10/08	-	09/17/08	0.001	±	0.0004
09/17/08	-	09/24/08	0.002	±	0.0004
09/24/08	-	09/30/08	0.018	±	0.0040
09/30/08	-	10/08/08	0.017	±	0.0037
10/08/08	-	10/15/08	0.029	±	0.0048
10/15/08	-	10/22/08	0.020	±	0.0042
10/22/08	-	10/29/08	0.018	±	0.0037
10/29/08	-	11/05/08	0.083	±	0.0071**
11/05/08	-	11/12/08	0.019	±	0.0028
11/12/08	-	11/18/08	0.016	±	0.0030
11/18/08	-	11/25/08	0.020	±	0.0041
11/25/08	-	12/03/08	0.025	±	0.0041
12/03/08	-	12/10/08	0.024	±	0.0041
12/10/08	-	12/17/08	0.019	±	0.0038
12/17/08	-	12/23/08	0.026	±	0.0050
12/23/08	-	12/30/08	0.031	±	0.0049

Results in picoCuries per cubic meter (pCi/m³) +/- 2 Standard Deviations

* Air particulate samples are collected by the licensee on a weekly basis

* Higher result was due to air sampler malfunction which reduced the total sample volume

Table B-6
NJDEP / BNE
Radiological Environmental Monitoring Program

Salem / Hope Creek
Concentrations of Gross Beta in Bi-Weekly Air Particulate Samples
2008

<u>Fort Elfsborg Road (AIAP01)</u>					
<u>Collection Period</u>			<u>Particulate Gross Beta</u> <u>(pCi/m³)</u>		
12/31/07	-	01/16/08	0.016	±	0.0012
01/16/08	-	01/28/08	0.020	±	0.0015
01/28/08	-	02/11/08	0.020	±	0.0014
02/11/08	-	02/26/08	0.017	±	0.0012
02/26/08	-	03/10/08	0.013	±	0.0012
03/10/08	-	03/25/08	0.013	±	0.0011
03/25/08	-	04/07/08	0.014	±	0.0012
04/07/08	-	04/22/08	0.011	±	0.0010
04/22/08	-	05/05/08	0.015	±	0.0013
05/05/08	-	05/19/08	0.011	±	0.0010
05/19/08	-	06/02/08	0.009	±	0.0010
06/02/08	-	06/16/08	0.012	±	0.0011
06/16/08	-	06/30/08	0.008	±	0.0009
06/30/08	-	07/15/08	0.013	±	0.0011
07/15/08	-	07/30/08	0.015	±	0.0010
07/30/08	-	08/11/08	0.015	±	0.0012
08/11/08	-	08/25/08	0.013	±	0.0010
08/25/08	-	09/09/08	0.012	±	0.0009
09/09/08	-	09/25/08	0.011	±	0.0009
09/25/08	-	10/06/08	0.011	±	0.0010
10/06/08	-	10/22/08	0.015	±	0.0010
10/22/08	-	11/06/08	0.011	±	0.0009
11/06/08	-	11/17/08	0.010	±	0.0007
11/17/08	-	12/02/08	0.014	±	0.0010
12/02/08	-	12/15/08	0.014	±	0.0011
12/15/08	-	12/30/08	0.019	±	0.0011

Results in picoCuries per cubic meter (pCi/m³) +/- 2 Standard Deviations

Table B-6 (continued)
 NJDEP / BNE
 Radiological Environmental Monitoring Program

Salem / Hope Creek
Concentrations of Gross Beta in Bi-Weekly Air Particulate Samples
2008

<u>Plant Access Road (AIAP02)</u>					
<u>Collection Period</u>			<u>Particulate Gross Beta</u> <u>(pCi/m³)</u>		
12/31/07	-	01/16/08	0.018	±	0.0013
01/16/08	-	01/28/08	0.020	±	0.0015
01/28/08	-	02/11/08	0.020	±	0.0014
02/11/08	-	02/26/08	0.017	±	0.0013
02/26/08	-	03/10/08	0.013	±	0.0012
03/10/08	-	03/25/08	0.010	±	0.0010
03/25/08	-	04/07/08	0.014	±	0.0011
04/07/08	-	04/22/08	0.011	±	0.0009
04/22/08	-	05/05/08	0.015	±	0.0012
05/05/08	-	05/19/08	0.015	±	0.0013
05/19/08	-	06/02/08	0.011	±	0.0012
06/02/08	-	06/16/08	0.013	±	0.0011
06/16/08	-	06/30/08	0.024	±	0.0020
06/30/08	-	07/15/08	0.006	±	0.0005
07/15/08	-	07/30/08	0.015	±	0.0010
07/30/08	-	08/11/08	0.016	±	0.0016
08/11/08	-	08/25/08	0.015	±	0.0014
08/25/08	-	09/09/08	0.013	±	0.0013
09/09/08	-	09/25/08	0.013	±	0.0012
09/25/08	-	10/06/08	0.012	±	0.0015
10/06/08	-	10/22/08	0.017	±	0.0016
10/22/08	-	11/06/08	0.014	±	0.0014
11/06/08	-	11/17/08	0.011	±	0.0010
11/17/08	-	12/02/08	0.015	±	0.0014
12/02/08	-	12/15/08	0.016	±	0.0015
12/15/08	-	12/30/08	0.025	±	0.0018

Results in picoCuries per cubic meter (pCi/m³) +/- 2 Standard Deviations

Table B-6 (continued)
 NJDEP / BNE
 Radiological Environmental Monitoring Program

Salem / Hope Creek
Concentrations of Gross Beta in Bi-Weekly Air Particulate Samples
2008

<u>Lower Alloways Creek School (AIAP03)</u>					
<u>Collection Period</u>			<u>Particulate Gross Beta (pCi/m³)</u>		
12/31/07	-	01/16/08	0.018	±	0.0016
01/16/08	-	01/28/08	0.020	±	0.0020
01/28/08	-	02/11/08	0.020	±	0.0018
02/11/08	-	02/26/08	0.019	±	0.0017
02/26/08	-	03/10/08	0.015	±	0.0017
03/10/08	-	03/25/08	0.017	±	0.0016
03/25/08	-	04/07/08	0.016	±	0.0017
04/07/08	-	04/22/08	0.012	±	0.0014
04/22/08	-	05/05/08	0.018	±	0.0018
05/05/08	-	05/19/08	0.013	±	0.0015
05/19/08	-	06/02/08	0.017	±	0.0017
06/02/08	-	06/16/08	0.015	±	0.0016
06/16/08	-	06/30/08	0.013	±	0.0015
06/30/08	-	07/15/08	0.012	±	0.0014
07/15/08	-	07/30/08	0.016	±	0.0016
07/30/08	-	08/11/08	0.016	±	0.0018
08/11/08	-	08/25/08	0.014	±	0.0016
08/25/08	-	09/09/08	0.027	±	0.0028
09/09/08	-	09/25/08	0.009	±	0.0010
09/25/08	-	10/06/08	0.013	±	0.0017
10/06/08	-	10/22/08	0.032	±	0.0022
10/22/08	-	11/06/08	0.030	±	0.0022
11/06/08	-	11/17/08	0.011	±	0.0011
11/17/08	-	12/02/08	0.016	±	0.0016
12/02/08	-	12/15/08	0.017	±	0.0017
12/15/08	-	12/30/08	0.031	±	0.0021

Results in picoCuries per cubic meter (pCi/m³) +/- 2 Standard Deviations

Table B-7
 NJDEP / BNE
 Radiological Environmental Monitoring Program

Background
Concentrations of Gamma Emitters and Strontium in
Quarterly Composite Air Samples
2008

<u>BNE Office (COAP01)</u>								
<u>Collection Period</u>		<u>Co-60</u>	<u>Cs-134</u>	<u>Cs-137</u>	<u>Be-7</u>	<u>Sr-89</u>	<u>Sr-90</u>	
12/31/07	- 03/26/08	< 0.86	< 0.78	< 1.02	81 ± 17	< 9.96	< 1.49	
03/26/08	- 06/30/08	< 0.88	< 1.66	< 1.15	70 ± 24	< 12.10	< 1.29	
06/30/08	- 10/06/08	< 1.01	< 1.15	< 1.22	72 ± 23	< 18.40	< 2.04	
10/06/08	- 12/30/08	< 1.16	< 1.02	< 0.92	53 ± 9	< 5.79	< 1.55	
<u>Brendan T. Byrne State Forest (COAP02)</u>								
<u>Collection Period</u>		<u>Co-60</u>	<u>Cs-134</u>	<u>Cs-137</u>	<u>Be-7</u>	<u>Sr-89</u>	<u>Sr-90</u>	
12/28/07	- 03/24/08	< 0.68	< 0.45	< 0.82	75 ± 17	< 7.41	< 1.51	
03/24/08	- 07/01/08	< 1.24	< 1.11	< 1.08	81 ± 26	< 12.50	< 0.92	
07/01/08	- 10/07/08	< 0.96	< 0.93	< 0.63	69 ± 20	< 24.80	< 1.70	
10/07/08	- 12/30/08	< 1.11	< 1.05	< 0.95	52 ± 13	< 4.65	< 1.37	

Results in 10^{-3} picoCuries per cubic meter (pCi/m³) +/- 2 Standard Deviations

Beryllium-7 (Be-7) is a naturally occurring radionuclide found in the environment.

Table B-8
NJDEP / BNE
Radiological Environmental Monitoring Program
Oyster Creek
Concentrations of Gamma Emitters and Strontium in
Quarterly Composite Air Samples
2008

Waretown Municipal Building (OCAP01)							
<u>Collection Period</u>		<u>Co-60</u>	<u>Cs-134</u>	<u>Cs-137</u>	<u>Be-7</u>	<u>Sr-89</u>	<u>Sr-90</u>
12/28/07	- 03/24/08	< 1.15	< 0.74	< 0.76	83 ± 15	< 9.25	< 1.67
03/24/08	- 07/01/08	< 1.29	< 1.56	< 1.03	68 ± 29	< 15.10	< 1.40
07/01/08	- 10/07/08	< 1.52	< 1.21	< 1.28	59 ± 30	< 34.40	< 2.25
10/07/08	- 12/30/08	< 1.23	< 1.07	< 1.07	45 ± 9	< 6.91	< 1.90
Sands Point Harbor (OCAP02)							
<u>Collection Period</u>		<u>Co-60</u>	<u>Cs-134</u>	<u>Cs-137</u>	<u>Be-7</u>	<u>Sr-89</u>	<u>Sr-90</u>
12/28/07	- 03/24/08	< 1.46	< 1.30	< 1.15	84 ± 16	< 11.30	< 1.93
03/24/08	- 07/01/08	< 1.20	< 1.96	< 1.66	86 ± 35	< 16.60	< 1.15
07/01/08	- 10/07/08	< 1.68	< 1.93	< 1.15	51 ± 22	< 38.20	< 2.68
10/07/08	- 12/30/08	< 1.70	< 2.30	< 1.87	90 ± 24	< 11.90	< 3.19
Forked River Marina (OCAP03)							
<u>Collection Period</u>		<u>Co-60</u>	<u>Cs-134</u>	<u>Cs-137</u>	<u>Be-7</u>	<u>Sr-89</u>	<u>Sr-90</u>
12/28/07	- 03/24/08	< 1.18	< 1.69	< 1.66	88 ± 23	< 10.60	< 1.50
03/24/08	- 07/01/08	< 2.09	< 1.81	< 1.33	72 ± 37	< 18.80	< 1.61
07/01/08	- 10/07/08	< 1.07	< 1.38	< 1.19	76 ± 24	< 22.60	< 1.77
10/07/08	- 12/30/08	< 1.24	< 1.29	< 1.11	60 ± 14	< 9.12	< 2.62
Lacey Township Recreation Building (OCAP04)							
<u>Collection Period</u>		<u>Co-60</u>	<u>Cs-134</u>	<u>Cs-137</u>	<u>Be-7</u>	<u>Sr-89</u>	<u>Sr-90</u>
12/28/07	- 03/24/08	< 1.47	< 0.70	< 0.94	77 ± 15	< 11.90	< 1.47
03/24/08	- 07/01/08	< 1.68	< 1.94	< 1.82	71 ± 32	< 12.70	< 1.48
07/01/08	- 10/07/08	< 1.80	< 1.62	< 1.95	< 36	< 26.50	< 2.61
10/07/08	- 12/30/08	< 1.73	< 1.42	< 1.57	53 ± 14	< 8.38	< 2.46

Results in 10^{-3} picoCuries per cubic meter (pCi/m³) +/- 2 Standard Deviations

Beryllium-7 (Be-7) is a naturally occurring radionuclide found in the environment.

Table B-8 (continued)
 NJDEP / BNE
 Radiological Environmental Monitoring Program
Oyster Creek
Concentrations of Gamma Emitters and Strontium in
Quarterly Composite Air Samples
2008

Jersey Central Power and Light Substation (OCAP05)								
Collection Period			Co-60	Cs-134	Cs-137	Be-7	Sr-89	Sr-90
12/28/07	-	03/24/08	< 0.81	< 0.95	< 0.95	58 ± 27	< 10.80	< 2.08
03/24/08	-	07/01/08	< 0.91	< 0.97	< 0.94	67 ± 16	< 10.50	< 0.98
07/01/08	-	10/07/08	< 0.94	< 0.69	< 0.87	70 ± 19	< 19.20	< 1.33
10/07/08	-	12/30/08	< 0.91	< 1.13	< 0.92	59 ± 11	< 4.48	< 1.54
Finninger Farm, OC Dredge Site (OCAP06)								
Collection Period			Co-60	Cs-134	Cs-137	Be-7	Sr-89	Sr-90
01/02/08	-	03/26/08	< 1.42	< 1.73	< 1.70	78 ± 27	< 17.20	< 3.64
03/26/08	-	07/01/08	< 2.70	< 3.82	< 3.18	< 59	< 38.40	< 2.87
07/01/08	-	09/30/08	< 1.08	< 1.22	< 1.03	46 ± 24	< 21.10	< 1.53
09/30/08	-	12/30/08	< 2.43	< 2.68	< 2.07	52 ± 20	< 16.10	< 4.64

Results in 10^{-3} picoCuries per cubic meter (pCi/m³) +/- 2 Standard Deviations

Beryllium-7 (Be-7) is a naturally occurring radionuclide found in the environment.

Table B-9
NJDEP / BNE
Radiological Environmental Monitoring Program
Salem / Hope Creek
Concentrations of Gamma Emitters and Strontium in
Quarterly Composite Air Samples
2008

Fort Elfsborg Road (AIAP01)							
Collection Period		Co-60	Cs-134	Cs-137	Be-7	Sr-89	Sr-90
12/31/07	- 03/25/08	< 0.61	< 0.70	< 0.75	65 ± 12	< 7.45	< 0.82
03/25/08	- 06/30/08	< 0.99	< 1.12	< 0.82	74 ± 19	< 10.30	< 0.87
06/30/08	- 10/06/08	< 0.57	< 0.81	< 0.68	60 ± 21	< 18.60	< 1.21
10/06/08	- 12/30/08	< 0.83	< 0.56	< 0.61	64 ± 11	< 3.32	< 0.84
Plant Access Road (AIAP02)							
Collection Period		Co-60	Cs-134	Cs-137	Be-7	Sr-89	Sr-90
12/31/07	- 03/25/08	< 1.08	< 1.29	< 1.23	59 ± 13	< 7.11	< 1.23
03/25/08	- 06/30/08	< 0.83	< 1.29	< 0.90	86 ± 20	< 9.19	< 0.92
06/30/08	- 10/06/08	< 0.60	< 0.91	< 0.91	57 ± 21	< 23.90	< 1.35
10/06/08	- 12/30/08	< 1.26	< 1.51	< 1.24	65 ± 13	< 9.20	< 2.15
Lower Alloways Creek School (AIAP03)							
Collection Period		Co-60	Cs-134	Cs-137	Be-7	Sr-89	Sr-90
12/31/07	- 03/25/08	< 1.03	< 0.84	< 0.62	62 ± 17	< 10.90	< 1.56
03/25/08	- 06/30/08	< 1.17	< 1.97	< 1.72	97 ± 34	< 14.90	< 1.41
06/30/08	- 10/06/08	< 1.49	< 1.65	< 1.47	55 ± 28	< 27.80	< 1.78
10/06/08	- 12/30/08	< 2.36	< 2.09	< 1.64	89 ± 18	< 9.43	< 3.00

Results in 10^{-3} picoCuries per cubic meter (pCi/m³) +/- 2 Standard Deviations

Beryllium-7 (Be-7) is a naturally occurring radionuclide found in the environment.

Table B-10
NJDEP / BNE
Radiological Environmental Monitoring Program

Oyster Creek
Concentrations of Gamma Emitters and Strontium in Fish/Shellfish Samples
2008

<u>Stouts Creek (OCFS01)</u>							
<u>Collection Date</u>	<u>Co-58</u>	<u>Co-60</u>	<u>Cs-134</u>	<u>Cs-137</u>	<u>K-40</u>	<u>Sr-89</u>	<u>Sr-90</u>
04/14/08 - Clams	< 15	< 12	< 15	< 14	1266 ± 206	< 185	< 74
10/06/08 – Clams	< 42	< 35	< 43	< 43	1104 ± 456	No Data	No Data
<u>East of Site – Barnegat Bay (OCFS02)</u>							
<u>Collection Date</u>	<u>Co-58</u>	<u>Co-60</u>	<u>Cs-134</u>	<u>Cs-137</u>	<u>K-40</u>	<u>Sr-89</u>	<u>Sr-90</u>
04/14/08 - Clams	< 17	< 19	< 15	< 18	1750 ± 310	< 217	< 138
10/06/08 - Clams	< 32	< 34	< 34	< 37	1258 ± 396	No Data	No Data
<u>Great Bay / Little Egg Harbor (OCFS03)</u>							
<u>Collection Date</u>	<u>Co-58</u>	<u>Co-60</u>	<u>Cs-134</u>	<u>Cs-137</u>	<u>K-40</u>	<u>Sr-89</u>	<u>Sr-90</u>
04/14/08 - Clams	< 16	< 18	< 15	< 14	1140 ± 238	< 180	< 85
10/07/08 - Clams	< 45	< 46	< 44	< 39	995 ± 505	No Data	No Data
04/16/08 –Striped Bass	< 22	< 21	< 20	< 20	3795 ± 409	< 15	< 4

Results in picoCuries per kilogram – WET (pCi/kg) +/- 2 Standard Deviations

Potassium-40 (K-40) is a naturally occurring radionuclide found in the environment.

“No Data” indicates not enough sample available to perform the analysis

Table B-10 (continued)
 NJDEP / BNE
 Radiological Environmental Monitoring Program

Oyster Creek
Concentrations of Gamma Emitters and Strontium in Fish/Shellfish Samples
2008

OCNGS Discharge Canal between Pump Discharges and US Route 9 (OCFS04)							
<u>Collection Date</u>	<u>Co-58</u>	<u>Co-60</u>	<u>Cs-134</u>	<u>Cs-137</u>	<u>K-40</u>	<u>Sr-89</u>	<u>Sr-90</u>
04/16/08–Bluefish	< 21	< 20	< 18	< 21	4066 ± 443	< 14	< 4
04/16/08–Striped Bass	< 20	< 18	< 17	< 19	3927 ± 326	< 15	< 5
04/16/08–Sea Trout	< 20	< 18	< 17	< 18	4283 ± 378	< 16	< 5
10/07/08–Drum	< 48	< 17	< 17	< 17	4162 ± 318	< 328*	< 19*
10/07/08–Bluefish	< 40	< 15	< 14	< 14	3802 ± 313	< 387*	< 32*
10/08/08–Striped Bass	< 53	< 19	< 20	< 19	4260 ± 314	< 307*	< 24*
10/09/08–Tautog	< 43	< 13	< 15	< 14	4135 ± 277	< 354*	< 24*
ESE of Site, EAST of U.S. Route 9 Bridge at the OCNGS Discharge Canal (OCFS05)							
<u>Collection Date</u>	<u>Co-58</u>	<u>Co-60</u>	<u>Cs-134</u>	<u>Cs-137</u>	<u>K-40</u>	<u>Sr-89</u>	<u>Sr-90</u>
04/16/08 – Striped Bass	< 22	< 21	< 17	< 20	4319 ± 395	< 15	< 5

Results in picoCuries per kilogram – WET (pCi/kg) +/- 2 Standard Deviations

Potassium-40 (K-40) is a naturally occurring radionuclide found in the environment.

* Individual species sample collection was small (less than 1000g fish flesh), leading to a limited sample size for the required analyses and higher MDC's

Table B-11
NJDEP / BNE
Radiological Environmental Monitoring Program

Salem / Hope Creek
Concentrations of Gamma Emitters and Strontium in Fish/Shellfish Samples
2008

Onsite Surface Water Inlet Building (AIFS01)							
Collection Date	Co-58	Co-60	Cs-134	Cs-137	K-40	Sr-89	Sr-90
07/01/08 - Crabs	< 34	< 36	< 30	< 36	2349 ± 559	< 319	< 46
09/02/08 - Crabs	< 37	< 50	< 42	< 40	2001 ± 633	< 200	< 129
06/05/08 – Fish *	< 48	< 42	< 45	< 38	2819 ± 651	< 61	< 15
10/08/08 – Fish **	< 53	< 40	< 34	< 39	3969 ± 790	< 63	< 26
Delaware River – West Bank Upstream (AIFS02)							
Collection Date	Co-58	Co-60	Cs-134	Cs-137	K-40	Sr-89	Sr-90
07/01/08 - Crabs	< 53	< 31	< 40	< 25	2507 ± 689	< 354	< 47
09/02/08 - Crabs	< 63	< 58	< 40	< 35	3375 ± 740	< 227	< 89
06/05/08 – Fish ***	< 44	< 29	< 37	< 39	4140 ± 707	< 59	No Data
09/04/08 – Bluefish	< 78	< 36	< 50	< 46	3284 ± 784	< 90	< 19

Results in picoCuries per kilogram – WET (pCi/kg) +/- 2 Standard Deviations

Potassium-40 (K-40) is a naturally occurring radionuclide found in the environment.

* Fish consist of various species including Channel Catfish, Bluefish, and Striped Bass

** Fish consist of various species including Bluefish, Flounder and Striped Bass

*** Fish consist of various species including White Catfish, White Perch, Bluefish and Striped Bass

“No Data” indicates not enough fish sample available to perform the analysis

Table B-12
NJDEP / BNE
Radiological Environmental Monitoring Program

Oyster Creek
Concentrations of Gamma Emitters in Aquatic Sediment Samples
2008

<u>Barnegat Bay (OCAQ01)</u>						
<u>Collection Date</u>	<u>Be-7</u>	<u>Co-58</u>	<u>Co-60</u>	<u>Cs-134</u>	<u>Cs-137</u>	<u>K-40</u>
04/14/08	< 186	< 18	< 14	< 15	< 18	566 ± 244
10/06/08	79 ± 26	< 4	< 3	< 3	< 3	571 ± 43
<u>Oyster Creek Discharge Canal (OCAQ02)</u>						
<u>Collection Date</u>	<u>Be-7</u>	<u>Co-58</u>	<u>Co-60</u>	<u>Cs-134</u>	<u>Cs-137</u>	<u>K-40</u>
04/14/08	< 180	< 19	< 17	< 16	< 20	887 ± 247
10/08/08	199 ± 41	< 5	< 4	< 4	< 4	4095 ± 92
<u>Great Bay / Little Egg Harbor (OCAQ03)</u>						
<u>Collection Date</u>	<u>Be-7</u>	<u>Co-58</u>	<u>Co-60</u>	<u>Cs-134</u>	<u>Cs-137</u>	<u>K-40</u>
04/16/08	< 193	< 22	< 23	< 19	< 22	10930 ± 560
10/07/08	184 ± 52	< 6	< 5	< 4	< 5	13170 ± 162
<u>Stouts Creek (OCAQ04)</u>						
<u>Collection Date</u>	<u>Be-7</u>	<u>Co-58</u>	<u>Co-60</u>	<u>Cs-134</u>	<u>Cs-137</u>	<u>K-40</u>
04/14/08	< 126	< 14	< 14	< 12	< 14	1394 ± 199
10/06/08	103 ± 33	< 4	< 3	< 3	< 3	1282 ± 59

Results in picoCuries per kilogram – DRY (pCi/kg) +/- 2 Standard Deviations

Potassium-40 (K-40) and Beryllium-7 (Be-7) are naturally occurring radionuclides found in the environment.

Table B-13
NJDEP / BNE
Radiological Environmental Monitoring Program

Salem / Hope Creek
Concentrations of Gamma Emitters in Aquatic Sediment Samples
2008

<u>Onsite Observation Building (AIAQ01)</u>						
<u>Collection Date</u>	<u>Be-7</u>	<u>Co-58</u>	<u>Co-60</u>	<u>Cs-134</u>	<u>Cs-137</u>	<u>K-40</u>
06/09/08	< 71	< 6	< 6	< 5	< 5	2228 ± 177
<u>Surface Water Inlet Building (AIAQ02)</u>						
<u>Collection Date</u>	<u>Be-7</u>	<u>Co-58</u>	<u>Co-60</u>	<u>Cs-134</u>	<u>Cs-137</u>	<u>K-40</u>
05/30/08	< 95	< 9	< 8	< 8	< 8	2256 ± 232
11/20/08	< 94	< 9	< 5	< 5	< 7	6656 ± 295
<u>Onsite – Cooling Tower Blowdown Discharge Line (AIAQ03)</u>						
<u>Collection Date</u>	<u>Be-7</u>	<u>Co-58</u>	<u>Co-60</u>	<u>Cs-134</u>	<u>Cs-137</u>	<u>K-40</u>
05/30/08	< 118	< 13	< 11	< 11	< 13	7702 ± 458
11/20/08	< 128	< 12	< 9	< 8	< 8	8241 ± 359
<u>Onsite – South Storm Drain Discharge Line (AIAQ04)</u>						
<u>Collection Date</u>	<u>Be-7</u>	<u>Co-58</u>	<u>Co-60</u>	<u>Cs-134</u>	<u>Cs-137</u>	<u>K-40</u>
05/30/08	< 116	< 12	< 10	< 10	< 11	5348 ± 391
11/20/08	< 87	< 9	< 5	< 5	< 6	9091 ± 317
<u>West Bank of Delaware River - Upstream (AIAQ05)</u>						
<u>Collection Date</u>	<u>Be-7</u>	<u>Co-58</u>	<u>Co-60</u>	<u>Cs-134</u>	<u>Cs-137</u>	<u>K-40</u>
05/30/08	< 144	< 14	< 13	< 12	< 15	11170 ± 463
11/20/08	< 118	< 10	< 8	< 7	< 7	11870 ± 391

Results in picoCuries per kilogram – DRY (pCi/kg) +/- 2 Standard Deviations

Potassium-40 (K-40) and Beryllium-7 (Be-7) are naturally occurring radionuclides found in the environment.

Table B-14
NJDEP / BNE
Radiological Environmental Monitoring Program

Oyster Creek
Concentrations of Gamma Emitters in Vegetable Samples
2008

Oyster Creek Onsite Garden (OCVE01)						
<u>Sample</u>	<u>Collection</u>	<u>Co-58</u>	<u>Co-60</u>	<u>Cs-134</u>	<u>Cs-137</u>	<u>K-40</u>
	<u>Date</u>					
Cabbage	07/16/08	< 12	< 10	< 9	< 11	2825 ± 269
Collards	07/16/08	< 16	< 14	< 12	< 15	1867 ± 271
Kale	07/16/08	< 12	< 15	< 9	< 14	1921 ± 265
Cabbage	08/12/08	< 21	< 18	< 18	< 18	2572 ± 354
Collards	08/12/08	< 18	< 19	< 19	< 19	2436 ± 378
Kale	08/12/08	< 14	< 13	< 13	< 15	2356 ± 273
Cabbage	09/09/08	< 7	< 6	< 5	< 6	2310 ± 119
Collards	09/09/08	< 8	< 6	< 6	< 7	1662 ± 121
Kale	09/09/08	< 6	< 5	< 5	< 5	1594 ± 116
Cabbage	10/16/08	< 16	< 16	< 14	< 14	2256 ± 312
Collards	10/16/08	< 23	< 21	< 18	< 22	2788 ± 435
Kale	10/16/08	< 32	< 27	< 23	< 28	3632 ± 645
Private Farm – NW Sector (OCVE02)						
<u>Sample</u>	<u>Collection</u>	<u>Co-58</u>	<u>Co-60</u>	<u>Cs-134</u>	<u>Cs-137</u>	<u>K-40</u>
	<u>Date</u>					
Cabbage	07/16/08	< 13	< 9	< 11	< 11	1958 ± 241
Collards	07/16/08	< 15	< 16	< 13	< 12	3613 ± 329
Kale	07/16/08	< 15	< 20	< 10	< 11	3634 ± 292
Cabbage	08/12/08	< 17	< 16	< 14	< 17	2200 ± 306
Collards	08/12/08	< 17	< 15	< 14	< 16	4962 ± 359
Mustard*	08/12/08	< 21	< 16	< 18	< 18	5127 ± 447
Cabbage	09/10/08	< 5	< 6	< 5	< 5	1988 ± 110
Collards	09/10/08	< 7	< 7	< 6	< 7	4208 ± 158
Kale	09/10/08	< 7	< 6	< 6	< 6	3686 ± 147
Cabbage	10/16/08	< 13	< 11	< 11	< 12	1721 ± 256
Collards	10/16/08	< 23	< 25	< 16	< 24	4695 ± 533
Kale	10/16/08	< 28	< 26	< 20	< 23	4273 ± 513

* Mustard Greens replaced Kale, which was not available from OCVE02 on 08/12/08

Results in picoCuries per kilogram – WET (pCi/kg) +/- 2 Standard Deviations

Potassium-40 (K-40) is a naturally occurring radionuclide found in the environment.

Table B-14 (continued)
 NJDEP / BNE
 Radiological Environmental Monitoring Program

Oyster Creek
Concentrations of Gamma Emitters in Vegetable Samples
2008

Oyster Creek Onsite Garden (OCVE03)						
<u>Sample</u>	<u>Collection</u>	<u>Co-58</u>	<u>Co-60</u>	<u>Cs-134</u>	<u>Cs-137</u>	<u>K-40</u>
	<u>Date</u>					
Cabbage	07/16/08	< 11	< 10	< 9	< 11	1793 ± 214
Collards	07/16/08	< 18	< 17	< 12	< 17	2424 ± 306
Kale	07/16/08	< 16	< 16	< 11	< 13	2440 ± 296
Cabbage	08/12/08	< 9	< 10	< 9	< 10	1766 ± 215
Collards	08/12/08	< 18	< 19	< 16	< 20	2384 ± 342
Kale	08/12/08	< 14	< 13	< 13	< 14	2373 ± 249
Cabbage	09/09/08	< 6	< 5	< 5	< 6	1948 ± 108
Collards	09/09/08	< 8	< 7	< 6	< 6	2923 ± 128
Kale	09/09/08	< 7	< 5	< 5	< 6	2939 ± 129
Collards	10/16/08	< 19	< 20	< 18	< 22	3896 ± 432
Kale	10/16/08	< 23	< 28	< 26	< 25	4375 ± 573

Table B-15
NJDEP / BNE
Radiological Environmental Monitoring Program

Salem / Hope Creek
Concentrations of Gamma Emitters in Vegetable Samples
2008

<u>Private Farm – NE (AIVE01)</u>						
<u>Sample</u>	<u>Collection Date</u>	<u>Co-58</u>	<u>Co-60</u>	<u>Cs-134</u>	<u>Cs-137</u>	<u>K-40</u>
Cabbage	07/26/08	< 10	< 7	< 7	< 7	1709 ± 193
<u>Private Farm – NNE (AIVE05)</u>						
<u>Sample</u>	<u>Collection Date</u>	<u>Co-58</u>	<u>Co-60</u>	<u>Cs-134</u>	<u>Cs-137</u>	<u>K-40</u>
Tomatoes	07/26/08	< 13	< 11	< 11	< 12	2334 ± 260
Corn	07/26/08	< 9	< 9	< 8	< 8	1590 ± 188
Peppers	08/03/08	< 4	< 5	< 3	< 4	1690 ± 83
<u>Private Farm – NNE (AIVE07)</u>						
<u>Sample</u>	<u>Collection Date</u>	<u>Co-58</u>	<u>Co-60</u>	<u>Cs-134</u>	<u>Cs-137</u>	<u>K-40</u>
Peppers	07/26/08	< 9	< 12	< 11	< 11	1193 ± 199
<u>Private Farm – NE (AIVE08)</u>						
<u>Sample</u>	<u>Collection Date</u>	<u>Co-58</u>	<u>Co-60</u>	<u>Cs-134</u>	<u>Cs-137</u>	<u>K-40</u>
Corn	08/03/08	< 4	< 4	< 3	< 3	1807 ± 76
<u>Private Farm – NE (AIVE10)</u>						
<u>Sample</u>	<u>Collection Date</u>	<u>Co-58</u>	<u>Co-60</u>	<u>Cs-134</u>	<u>Cs-137</u>	<u>K-40</u>
Tomatoes	07/27/08	< 6	< 4	< 4	< 5	1354 ± 95

Results in picoCuries per kilogram – WET (pCi/kg) +/- 2 Standard Deviations

Potassium-40 (K-40) is a naturally occurring radionuclide found in the environment.

Table B-15 (continued)
 NJDEP / BNE
 Radiological Environmental Monitoring Program
Salem / Hope Creek
Concentrations of Gamma Emitters in Vegetable Samples
2008

<u>Onsite – (AIVE12)</u>						
<u>Sample</u>	<u>Collection Date</u>	<u>Co-58</u>	<u>Co-60</u>	<u>Cs-134</u>	<u>Cs-137</u>	<u>K-40</u>
Cabbage	12/18/08	< 6	< 5	< 5	< 5	2853 ± 117
<u>Onsite – (AIVE13)</u>						
<u>Sample</u>	<u>Collection Date</u>	<u>Co-58</u>	<u>Co-60</u>	<u>Cs-134</u>	<u>Cs-137</u>	<u>K-40</u>
Cabbage	12/18/08	< 6	< 4	< 5	< 5	2670 ± 129
<u>Onsite – (AIVE14)</u>						
<u>Sample</u>	<u>Collection Date</u>	<u>Co-58</u>	<u>Co-60</u>	<u>Cs-134</u>	<u>Cs-137</u>	<u>K-40</u>
Cabbage	12/18/08	< 7	< 6	< 6	< 7	3068 ± 168
<u>Private Farm - (AIVE15)</u>						
<u>Sample</u>	<u>Collection Date</u>	<u>Co-58</u>	<u>Co-60</u>	<u>Cs-134</u>	<u>Cs-137</u>	<u>K-40</u>
Cabbage	12/18/08	< 7	< 5	< 6	< 6	1855 ± 135

Results in picoCuries per kilogram – WET (pCi/kg) +/- 2 Standard Deviations

Potassium-40 (K-40) is a naturally occurring radionuclide found in the environment.

Table B-16
NJDEP / BNE
Radiological Environmental Monitoring Program

Background
Concentrations of Gamma Emitters and Strontium in Milk Samples
2008

State of New Jersey Dairy Farm (COMI01)					
<u>Collection Date</u>	<u>Cs-137</u>	<u>I-131</u>	<u>K-40</u>	<u>Sr-89</u>	<u>Sr-90</u>
02/11/08	< 4.05	< 0.31	1392 ± 143	< 0.56	0.95 ± 0.36
05/05/08	< 4.95	< 0.49	1316 ± 141	< 0.74	< 0.56
08/19/08	< 2.82	< 0.84	1127 ± 116	< 0.78	1.06 ± 0.51
11/17/08	< 4.61	< 0.71	1346 ± 108	< 0.60	< 0.27

Results in picoCuries per Liter (pCi/L) +/- 2 Standard Deviations

Potassium-40 (K-40) is a naturally occurring radionuclide found in the environment.

Table B-17
NJDEP / BNE
Radiological Environmental Monitoring Program

Salem / Hope Creek
Concentrations of Gamma Emitters and Strontium in Milk Samples
2008

Private Farm – ENE (AIMI01)					
<u>Collection Date</u>	<u>Cs-137</u>	<u>I-131</u>	<u>K-40</u>	<u>Sr-89</u>	<u>Sr-90</u>
01/08/08	< 4.23	< 0.86	1093 ± 94	< 0.82	1.05 ± 0.51
02/04/08	< 4.66	< 0.67	1180 ± 116	< 0.56	< 0.44
03/03/08	< 4.12	< 0.90	1145 ± 98	< 0.68	< 0.59
04/07/08	< 4.61	< 0.87	1227 ± 115	< 0.57	< 0.32
05/05/08	< 8.91	< 0.61	1212 ± 133	< 0.84	0.77 ± 0.51
06/02/08	< 2.07	< 0.86	1247 ± 55	< 0.71	< 0.64
07/07/08	< 1.56	< 0.98	1286 ± 41	< 0.94	< 0.60
08/04/08	< 5.01	< 0.94	1308 ± 118	< 0.73	0.87 ± 0.36
09/02/08	< 5.03	< 0.60	1215 ± 104	< 0.52	< 0.40
10/06/08	< 3.19	< 0.81	1268 ± 76	< 0.98	0.72 ± 0.41
11/03/08	< 0.98	< 0.81	1583 ± 58	< 0.71	< 0.40
12/01/08	< 4.52	< 0.94	1569 ± 100	< 0.78	0.73 ± 0.42
Private Farm – NE (AIMI02)					
<u>Collection Date</u>	<u>Cs-137</u>	<u>I-131</u>	<u>K-40</u>	<u>Sr-89</u>	<u>Sr-90</u>
01/08/08	< 2.94	< 0.84	1137 ± 87	< 0.92	1.79 ± 0.65
02/04/08	< 5.53	< 0.60	1217 ± 146	< 0.62	< 0.33
03/03/08	< 3.91	< 0.74	1281 ± 98	< 0.68	< 0.58
04/07/08	< 5.19	< 0.68	1190 ± 121	< 0.98	0.73 ± 0.43
05/05/08	< 8.76	< 0.70	1258 ± 155	< 0.69	0.75 ± 0.42
06/02/08	< 1.61	< 0.97	1245 ± 46	< 0.74	0.86 ± 0.52
07/07/08	< 1.58	< 0.86	1081 ± 41	< 0.87	0.72 ± 0.39
08/04/08	< 4.79	< 0.82	1181 ± 99	< 0.90	1.19 ± 0.51
09/02/08	< 5.27	< 0.90	1246 ± 142	< 0.99	0.95 ± 0.49
10/06/08	< 2.86	< 0.83	1312 ± 62	< 0.95	< 0.46
11/03/08	< 1.10	< 0.80	1493 ± 61	< 0.90	1.04 ± 0.43
12/01/08	< 4.44	< 0.65	1293 ± 93	< 0.50	0.85 ± 0.35

Results in picoCuries per Liter (pCi/L) +/- 2 Standard Deviations

Potassium-40 (K-40) is a naturally occurring radionuclide found in the environment.

Table B-17 (continued)
 NJDEP / BNE
 Radiological Environmental Monitoring Program

Salem / Hope Creek
Concentrations of Gamma Emitters and Strontium in Milk Samples
2008

Private Farm – WNW (AIMI03)					
<u>Collection Date</u>	<u>Cs-137</u>	<u>I-131</u>	<u>K-40</u>	<u>Sr-89</u>	<u>Sr-90</u>
01/08/08	< 4.57	< 0.80	1280 ± 106	< 0.63	0.98 ± 0.39
02/04/08	< 4.38	< 0.46	1496 ± 127	< 0.76	0.85 ± 0.32
03/03/08	< 3.55	< 0.76	1365 ± 90	< 0.67	< 0.62
04/08/08	< 5.14	< 0.51	1285 ± 131	< 0.47	< 0.29
05/05/08	< 6.49	< 0.56	1218 ± 118	< 0.56	< 0.49
06/02/08*	< 1.76	< 0.93	1298 ± 48	No Data	No Data
Private Farm – WNW (AIMI05)					
<u>Collection Date</u>	<u>Cs-137</u>	<u>I-131</u>	<u>K-40</u>	<u>Sr-89</u>	<u>Sr-90</u>
07/07/08	< 1.66	< 0.88	1312 ± 45	< 0.96	< 1.00
08/04/08	< 4.44	< 0.90	1288 ± 110	< 0.68	< 0.50
09/03/08	< 5.33	< 0.59	926 ± 149	< 0.47	< 0.33
10/06/08	< 3.03	< 0.76	1446 ± 75	< 0.94	< 0.42
11/03/08	< 1.29	< 0.79	1618 ± 63	< 0.81	< 0.45
12/01/08	< 5.08	< 0.70	1524 ± 110	< 0.99	2.23 ± 0.87

“No Data” indicates no Strontium-89/90 analysis was performed due to limited sample size.

*Milk samples from farm AIMI03 were unavailable from July through December 2008; therefore samples from farm AIMI05 were taken instead. Both farms are in the WNW wind compass sector.

Results in picoCuries per Liter (pCi/L) +/- 2 Standard Deviations

Potassium-40 (K-40) is a naturally occurring radionuclide found in the environment.

Table B-18
NJDEP / BNE
Radiological Environmental Monitoring Program

Oyster Creek
Concentrations of Gamma Emitters and Tritium (H-3) in Surface Water
2008

<u>Barnegat Bay (OCSW01)</u>						
<u>Collection Date</u>	<u>Co-58</u>	<u>Co-60</u>	<u>Cs-134</u>	<u>Cs-137</u>	<u>H-3</u>	<u>I-131</u>
04/14/08	< 5.52	< 6.70	< 4.62	< 6.00	< 239	< 0.68
10/06/08	< 7.33	< 6.99	< 6.31	< 7.11	< 249	< 0.60
<u>Great Bay / Little Egg Harbor (OCSW02)</u>						
<u>Collection Date</u>	<u>Co-58</u>	<u>Co-60</u>	<u>Cs-134</u>	<u>Cs-137</u>	<u>H-3</u>	<u>I-131</u>
01/08/08	< 4.71	< 5.16	< 4.46	< 4.58	< 239	< 0.92
02/14/08	< 9.83	< 9.28	< 8.32	< 9.37	< 245	< 0.90
03/12/08	< 5.87	< 6.44	< 5.05	< 4.97	< 239	< 0.74
04/02/08	< 5.94	< 5.35	< 5.48	< 5.53	< 243	< 0.69
05/07/08	< 5.85	< 6.61	< 5.99	< 6.90	< 261	< 1.00
06/11/08	< 4.85	< 5.65	< 4.77	< 5.05	< 222	< 0.75
07/01/08	< 6.89	< 5.65	< 4.97	< 6.17	< 254	< 0.63
08/06/08	< 3.46	< 3.77	< 3.42	< 3.88	< 258	< 0.45
09/03/08	< 3.13	< 3.49	< 2.78	< 2.99	< 261	< 0.70
10/07/08	< 5.23	< 4.99	< 4.73	< 4.62	< 249	< 0.74
11/05/08	< 4.29	< 4.54	< 4.02	< 4.03	< 253	< 0.85
12/03/08	< 6.66	< 7.75	< 6.64	< 6.86	< 253	< 0.58
<u>Stouts Creek (OCSW03)</u>						
<u>Collection Date</u>	<u>Co-58</u>	<u>Co-60</u>	<u>Cs-134</u>	<u>Cs-137</u>	<u>H-3</u>	<u>I-131</u>
04/15/08	< 5.37	< 5.84	< 5.63	< 5.93	< 240	< 0.57
10/06/08	< 4.38	< 4.73	< 3.95	< 4.66	< 250	< 0.59

Results in picoCuries per Liter (pCi/L) +/- 2 Standard Deviations

Table B-18 (continued)
 NJDEP / BNE
 Radiological Environmental Monitoring Program

Oyster Creek
Concentrations of Gamma Emitters and Tritium (H-3) in Surface Water
2008

Oyster Creek Discharge Canal (OCSW04)						
<u>Collection Date</u>	<u>Co-58</u>	<u>Co-60</u>	<u>Cs-134</u>	<u>Cs-137</u>	<u>H-3</u>	<u>I-131</u>
01/09/08	< 7.42	< 9.41	< 7.00	< 7.76	< 236	< 0.81
02/14/08	< 5.33	< 5.28	< 4.77	< 4.75	< 243	< 0.99
03/12/08	< 5.40	< 6.18	< 4.43	< 6.02	< 238	< 1.00
04/02/08	< 5.06	< 6.63	< 4.64	< 5.87	< 242	< 0.80
05/07/08	< 7.14	< 7.14	< 6.59	< 6.49	< 262	< 0.83
06/11/08	< 6.82	< 7.18	< 6.41	< 7.60	< 223	< 0.88
07/01/08	< 5.60	< 5.69	< 4.52	< 5.61	< 252	< 0.46
08/06/08	< 6.45	< 6.66	< 5.91	< 6.79	< 264	< 0.45
09/03/08	< 6.32	< 6.90	< 6.28	< 6.41	< 266	< 0.73
10/08/08	< 4.62	< 4.89	< 4.16	< 5.10	< 249	< 0.82
11/05/08	< 6.36	< 7.09	< 6.37	< 7.57	< 248	< 0.52
12/03/08	< 3.91	< 4.22	< 3.82	< 4.38	< 250	< 0.61

Results in picoCuries per Liter (pCi/L) +/- 2 Standard Deviations

Table B-19
NJDEP / BNE
Radiological Environmental Monitoring Program

Salem / Hope Creek
Concentrations of Gamma Emitters and Tritium (H-3) in Surface Water
2008

Surface Water Inlet Building Discharge (AISW01)						
<u>Collection Date</u>	<u>Co-58</u>	<u>Co-60</u>	<u>Cs-134</u>	<u>Cs-137</u>	<u>H-3</u>	<u>I-131</u>
01/07/08	< 4.58	< 4.45	< 4.15	< 5.26	< 238	< 0.84
02/04/08	< 6.53	< 7.61	< 6.08	< 7.79	< 253	< 0.79
03/03/08	< 5.17	< 5.82	< 4.90	< 6.04	< 235	< 0.87
04/08/08	< 10.11	< 10.48	< 8.22	< 9.95	< 243	< 0.53
05/05/08	< 8.28	< 9.35	< 8.57	< 8.44	< 231	< 0.60
06/05/08	< 5.61	< 5.80	< 5.54	< 5.89	< 241	< 0.87
07/07/08	< 5.66	< 4.86	< 4.89	< 5.22	< 243	< 0.57
08/04/08	< 7.24	< 6.82	< 6.10	< 6.77	< 244	< 0.56
09/02/08	< 4.94	< 3.74	< 3.60	< 4.16	< 296	< 1.07*
10/07/08	< 6.74	< 6.25	< 5.97	< 6.80	< 239	< 0.82
11/07/08	< 3.74	< 3.50	< 3.44	< 3.71	< 251	< 0.58
12/03/08	< 4.09	< 3.74	< 4.02	< 4.43	< 242	< 0.72
West Bank – Delaware River (AISW02)						
<u>Collection Date</u>	<u>Co-58</u>	<u>Co-60</u>	<u>Cs-134</u>	<u>Cs-137</u>	<u>H-3</u>	<u>I-131</u>
01/07/08	< 4.26	< 5.13	< 4.10	< 5.06	< 237	< 0.92
02/04/08	< 3.79	< 3.98	< 3.67	< 4.44	< 254	< 0.88
03/03/08	< 5.70	< 6.32	< 5.95	< 5.12	< 236	< 0.91
04/08/08	< 5.91	< 5.55	< 5.20	< 5.44	< 247	< 0.71
05/05/08	< 11.73	< 6.92	< 6.24	< 6.69	< 231	< 0.68
06/05/08	< 4.14	< 3.58	< 3.51	< 3.88	< 246	< 0.86
07/07/08	< 6.03	< 5.43	< 5.10	< 5.41	< 245	< 0.49
08/04/08	< 5.10	< 4.57	< 4.45	< 5.10	< 245	< 0.68
09/02/08	< 6.61	< 6.51	< 5.69	< 6.34	< 298	< 0.82
10/07/08	< 4.25	< 3.37	< 3.14	< 3.52	< 237	< 0.75
11/07/08	< 3.78	< 3.78	< 3.13	< 3.73	< 245	< 0.59
12/03/08	< 3.69	< 4.14	< 4.23	< 4.62	< 243	< 0.74

Results in picoCuries per Liter (pCi/L) +/- 2 Standard Deviations

* Sample result was in excess of the 1.0 pCi/L detection level due to low chemical yield. Low chemical yield is a result of the delay in time between sample collection and analysis along with I-131 decay due to its short half-life (8 days).

Table B-20
NJDEP / BNE
Radiological Environmental Monitoring Program

Oyster Creek
Concentrations of Gamma Emitters and Tritium (H-3) in Well Water
2008

Oyster Creek Administration Building Onsite (OCWW01)						
<u>Collection Date</u>	<u>Co-58</u>	<u>Co-60</u>	<u>Cs-134</u>	<u>Cs-137</u>	<u>H-3</u>	<u>I-131</u>
01/29/08	< 5.85	< 6.41	< 5.75	< 5.62	< 242	< 0.70
04/15/08	< 4.95	< 5.28	< 4.61	< 5.13	< 243	< 0.68
07/28/08	< 2.33	< 2.41	< 2.16	< 2.45	< 271	< 0.48
10/21/08	< 3.07	< 3.28	< 3.05	< 3.21	< 249	< 0.71
Forked River Marina (OCWW02)						
<u>Collection Date</u>	<u>Co-58</u>	<u>Co-60</u>	<u>Cs-134</u>	<u>Cs-137</u>	<u>H-3</u>	<u>I-131</u>
01/29/08	< 5.72	< 5.64	< 5.74	< 5.66	< 237	< 0.64
04/25/08	< 5.35	< 5.55	< 4.82	< 5.70	< 255	< 0.86
07/28/08	< 4.40	< 4.83	< 3.95	< 4.45	< 282	< 0.59
10/21/08	< 3.20	< 4.30	< 3.37	< 2.94	< 262	< 0.62

Results in picoCuries per Liter (pCi/L) +/- 2 Standard Deviations

Table B-21
NJDEP / BNE
Radiological Environmental Monitoring Program

Salem / Hope Creek
Concentrations of Gamma Emitters and Tritium (H-3) in Well Water
2008

<u>Elsinboro School (AIWW01)</u>						
<u>Collection Date</u>	<u>Co-58</u>	<u>Co-60</u>	<u>Cs-134</u>	<u>Cs-137</u>	<u>H-3</u>	<u>I-131</u>
01/28/08	< 5.51	< 6.28	< 4.85	< 4.63	< 241	< 0.70
04/23/08	< 5.19	< 5.36	< 5.65	< 5.66	< 254	< 0.77
07/30/08	< 2.05	< 2.17	< 2.16	< 2.36	< 266	< 0.58
10/22/08	< 3.05	< 3.16	< 3.14	< 3.76	< 248	< 0.69
<u>Lower Alloways Creek Police Station (AIWW02)</u>						
<u>Collection Date</u>	<u>Co-58</u>	<u>Co-60</u>	<u>Cs-134</u>	<u>Cs-137</u>	<u>H-3</u>	<u>I-131</u>
01/28/08	< 5.34	< 5.64	< 5.36	< 6.13	< 246	< 0.64
04/23/08	< 5.10	< 5.54	< 4.34	< 5.16	< 255	< 0.70
07/30/08	< 2.18	< 1.90	< 2.08	< 2.18	< 272	< 0.69
10/22/08	< 3.32	< 3.00	< 2.95	< 3.13	< 251	< 0.68
<u>Salem Administration Building (AIWW03)</u>						
<u>Collection Date</u>	<u>Co-58</u>	<u>Co-60</u>	<u>Cs-134</u>	<u>Cs-137</u>	<u>H-3</u>	<u>I-131</u>
01/28/08	< 9.20	< 9.20	< 8.57	< 9.57	< 243	< 0.83
04/28/08	< 5.11	< 5.48	< 4.39	< 5.56	< 252	< 0.65
07/30/08	< 2.37	< 2.62	< 2.57	< 2.52	< 275	< 0.53
10/22/08	< 3.07	< 3.72	< 3.24	< 2.85	< 255	< 0.66
<u>Lower Alloways Creek School (AIWW04)</u>						
<u>Collection Date</u>	<u>Co-58</u>	<u>Co-60</u>	<u>Cs-134</u>	<u>Cs-137</u>	<u>H-3</u>	<u>I-131</u>
01/28/08	< 5.12	< 5.15	< 5.22	< 5.66	< 246	< 0.61
04/23/08	< 5.65	< 5.55	< 5.01	< 5.58	< 256	< 0.60
07/30/08	< 4.14	< 5.24	< 3.68	< 4.74	< 275	< 0.54
10/22/08	< 3.14	< 3.46	< 3.03	< 3.02	< 255	< 0.70

Results in picoCuries per Liter (pCi/L) +/- 2 Standard Deviations

Table B-22
NJDEP / BNE
Radiological Environmental Monitoring Program

Background
Thermoluminescent Dosimetry Data
Quarterly Results for 2008

<u>Station</u>	<u>Location</u>	<u>1st Quarter</u>		<u>2nd Quarter</u>		<u>3rd Quarter</u>		<u>4th Quarter</u>	
		<u>Result</u>	<u>%CV</u>	<u>Result</u>	<u>%CV</u>	<u>Result</u>	<u>%CV</u>	<u>Result</u>	<u>%CV</u>
CO01	BNE Office, Arctic Parkway, Ewing, NJ	8.7	4.5	14.1	2.2	15.5	1.1	15.3	1.1
CO02	Brendan T. Byrne State Forest, New Lisbon, NJ	10.3	2.6	10.3	2.2	11.1	2.4	11.3	3.5

Results are reported in units of milliroentgens (mR)

CV is the coefficient of variation; the ratio of the standard deviation to the mean, and is normally reported as a percentage

All exposures were normalized to 91 days (a standard quarter)

Table B-23
NJDEP / BNE
Radiological Environmental Monitoring Program

Oyster Creek
Thermoluminescent Dosimetry Data
Quarterly Results for 2008

<u>Station</u>	<u>Location</u>	<u>1st Quarter</u>		<u>2nd Quarter</u>		<u>3rd Quarter</u>		<u>4th Quarter</u>	
		<u>Result</u>	<u>%CV</u>	<u>Result</u>	<u>%CV</u>	<u>Result</u>	<u>%CV</u>	<u>Result</u>	<u>%CV</u>
1	Ocean County Vocational School	13.7	2.0	9.0	1.3	9.7	1.1	10.0	1.9
2	Ocean Twp. Municipal Building	9.8	3.5	9.6	2.6	10.7	2.4	10.9	0.9
3	Sewage Pumping Station, Forked River	11.1	14.0	10.2	2.0	11.3	1.8	11.7	0.3
4	Twin River Station, Forked River	9.2	3.4	8.8	4.2	10.1	2.2	10.6	3.1
5	Sewage Pumping Station, Ocean Twp.	10.5	5.6	10.1	2.0	10.8	2.6	11.2	0.9
6	Oyster Creek, Gate #2, Forked River	11.5	9.2	10.5	0.9	11.5	1.7	11.8	2.2
7	Finninger Farm, Forked River	8.6	2.3	8.6	2.1	9.5	3.0	9.7	0.9
8	Ocean Co. Memorial Cemetery, Waretown	8.6	0.8	9.0	2.6	9.8	0.6	11.5	13.0
9	Oyster Creek Building 17, Forked River	9.8	1.4	10.1	1.5	11.0	2.8	11.4	1.7
10	Sheffield & Derby Rd, Forked River	9.1	0.9	9.5	2.1	10.5	2.6	10.8	3.6
11	Lakeside Drive, Forked River	9.9	5.5	9.8	2.3	10.5	1.8	10.8	1.3
12	Forked River Game Farm, Forked River	9.6	1.4	9.8	1.8	10.8	1.5	11.0	0.7

Results are reported in units of milliroentgens (mR)

CV is the coefficient of variation; the ratio of the standard deviation to the mean, and is normally reported as a percentage.

All exposures were normalized to 91 days (a standard quarter)

Table B-23 (continued)
 NJDEP / BNE
 Radiological Environmental Monitoring Program

Oyster Creek
Thermoluminescent Dosimetry Data
Quarterly Results for 2008

<u>Station</u>	<u>Location</u>	<u>1st Quarter</u>		<u>2nd Quarter</u>		<u>3rd Quarter</u>		<u>4th Quarter</u>	
		<u>Result</u>	<u>%CV</u>	<u>Result</u>	<u>%CV</u>	<u>Result</u>	<u>%CV</u>	<u>Result</u>	<u>%CV</u>
13	Restrooms, Lakeside Dr., Forked River	9.5	0.5	9.6	2.7	12.9	28.5	10.8	1.1
14	Sands Pt. Park, Dock Ave., Waretown	10.7	5.5	10.7	2.9	11.9	1.8	11.7	1.9
15	Recreation Center, Waretown	8.8	4.9	9.3	2.1	10.4	1.9	*	*
16	North Access Rd., Forked River	10.1	1.8	10.2	2.7	11.2	1.6	11.7	3.7
20	Third Avenue, Barnegat Light	8.7	1.0	8.5	2.4	9.2	3.0	9.8	1.0
21	Rose Hill Road & Barnegat Blvd	10.7	4.1	9.9	4.2	10.7	1.0	11.3	1.1
22	Bay Way & Claimore Avenue	10.0	2.5	9.9	1.4	10.8	1.7	11.1	2.6
23	Island Beach State Park, Parking Lot A5	9.1	6.2	8.5	3.4	9.3	1.5	9.4	0.8

Results are reported in units of milliroentgens (mR).

CV is the coefficient of variation; the ratio of the standard deviation to the mean, and is normally reported as a percentage.

All exposures were normalized to 91 days (a standard quarter).

* Holder containing TLD was missing due to vandalism

Table B-24
NJDEP / BNE
Radiological Environmental Monitoring Program

Salem / Hope Creek
Thermoluminescent Dosimetry Data
Quarterly Results for 2008

<u>Station</u>	<u>Location</u>	<u>1st Quarter</u>		<u>2nd Quarter</u>		<u>3rd Quarter</u>		<u>4th Quarter</u>	
		<u>Result</u>	<u>%CV</u>	<u>Result</u>	<u>%CV</u>	<u>Result</u>	<u>%CV</u>	<u>Result</u>	<u>%CV</u>
1	Access Road – Security Checkpoint	12.0	10.9	11.0	1.0	12.4	1.3	12.5	1.6
2	Poplar Road, Lower Alloways	12.3	7.3	11.6	3.0	13.3	3.1	13.0	4.5
3	Money and Eagle Island Road	12.5	4.2	12.5	2.3	14.2	3.6	14.7	2.4
4	Ft. Elfsborg / Hancocks – East	12.8	1.2	13.1	1.4	14.9	0.8	14.9	1.9
5	Ft. Elfsborg / Hancocks – West	18.1	4.5	17.0	2.9	19.2	1.4	18.9	4.1
6	Stathems Neck Road	11.7	7.8	12.2	7.7	13.3	0.7	13.3	2.1
7	Stow Neck Road Lower Alloways	10.0	5.3	10.2	3.9	11.0	1.0	11.5	1.0
8	Alloways Creek Neck Road - Middle	9.8	11.8	9.9	1.8	10.7	2.3	11.3	2.2
9	Alloways Creek Neck Road - North	12.4	3.8	13.4	6.4	14.4	2.0	13.8	1.9
10	Abbotts Farm Road	9.8	3.7	10.0	2.4	11.0	0.9	11.5	0.9

Results are reported in units of milliroentgens (mR)

CV is the coefficient of variation; the ratio of the standard deviation to the mean, and is normally reported as a percentage. All exposures were normalized to 90 days (a standard quarter)

All exposures were normalized to 91 days (a standard quarter).

Table B-25
NJDEP / BNE
Radiological Environmental Monitoring Program

Comparison of NJDEP and Global Dosimetry Solutions Thermoluminescent Dosimetry Data for Salem / Hope Creek

Quarterly Results for Co-located Dosimeters for 2008

<u>Station</u>	<u>Location</u>	<u>1st Quarter</u>				<u>2nd Quarter</u>				<u>3rd Quarter</u>				<u>4th Quarter</u>			
		<u>NJDEP</u>		<u>Global</u>		<u>NJDEP</u>		<u>Global</u>		<u>NJDEP</u>		<u>Global</u>		<u>NJDEP</u>		<u>Global</u>	
		<u>Result</u>	<u>%CV</u>	<u>Result</u>	<u>%CV</u>												
1	Access Road – Security Checkpoint	12.0	11.0	10.6	2.6	11.0	1.0	7.8	4.5	12.4	1.3	7.5	5.9	12.5	1.6	10.4	5.0
2	Poplar Road, Lower Alloways	12.3	7.3	12.1	16.6	11.6	3.0	9.0	5.0	13.3	3.1	8.5	3.0	13.0	4.5	11.4	7.0
5	Ft. Elfsborg / Hancocks – West	18.1	4.5	16.4	2.4	17.0	2.9	13.6	2.1	19.2	1.41	13.9	4.4	18.9	4.1	16.9	3.3
9	Alloways Creek Neck Road - North	12.4	3.8	12.2	3.1	13.4	6.4	9.6	4.8	14.4	2.00	10.7	4.0	13.8	1.9	12.7	4.4

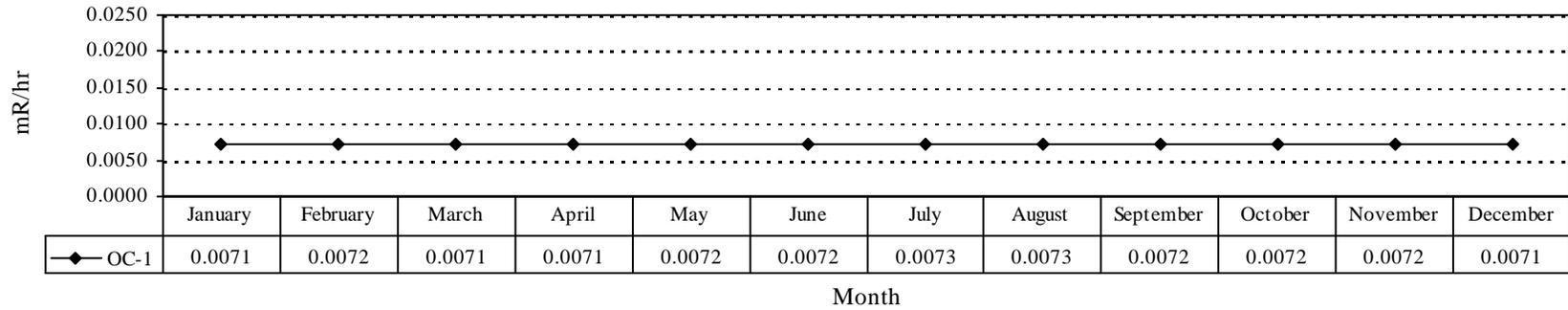
Results are reported in units of milliroentgens (mR)

CV is the coefficient of variation; the ratio of the standard deviation to the mean, and is normally reported as a percentage

All exposures were normalized to 91 days (a standard quarter)

Table B-26
 Oyster Creek – Continuous Radiological Environmental Surveillance Telemetry (CREST) Data

OC 1
2008 Ambient Radiation Levels



OC 2
2008 Ambient Radiation Levels

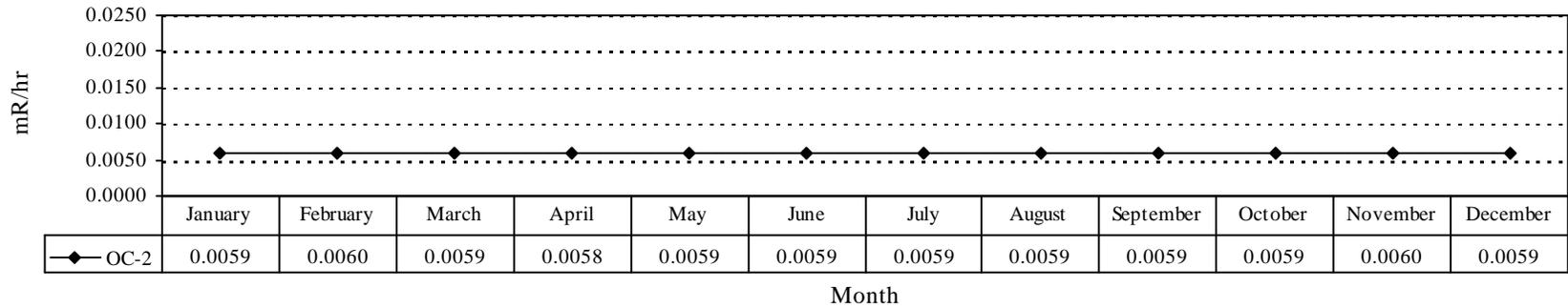
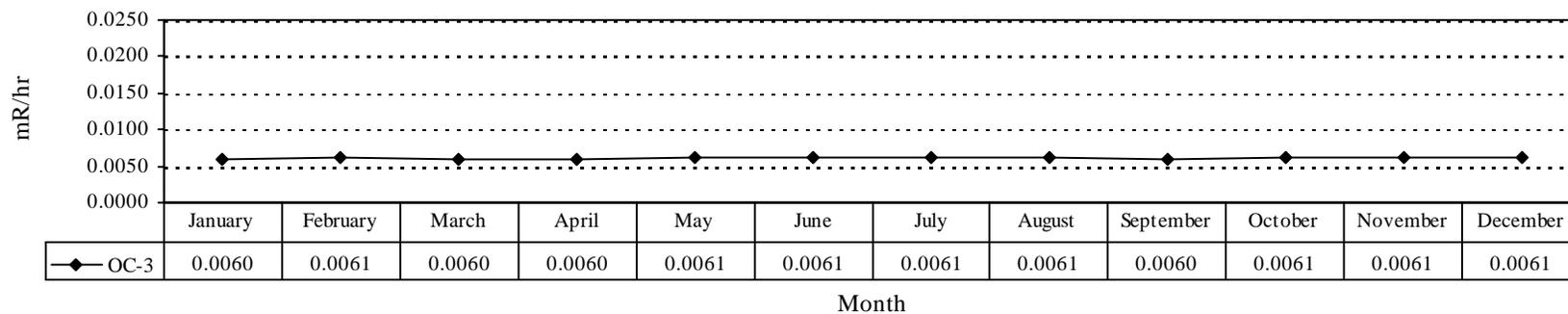


Table B-26 (continued)
 Oyster Creek – Continuous Radiological Environmental Surveillance Telemetry (CREST) Data

**OC 3
 2008 Ambient Radiation Levels**



**OC 4
 2008 Ambient Radiation Levels**

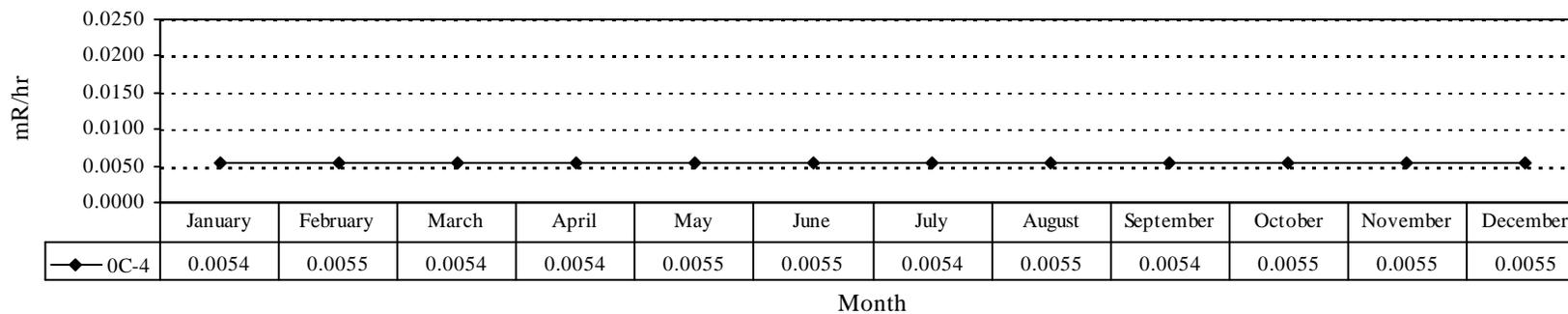
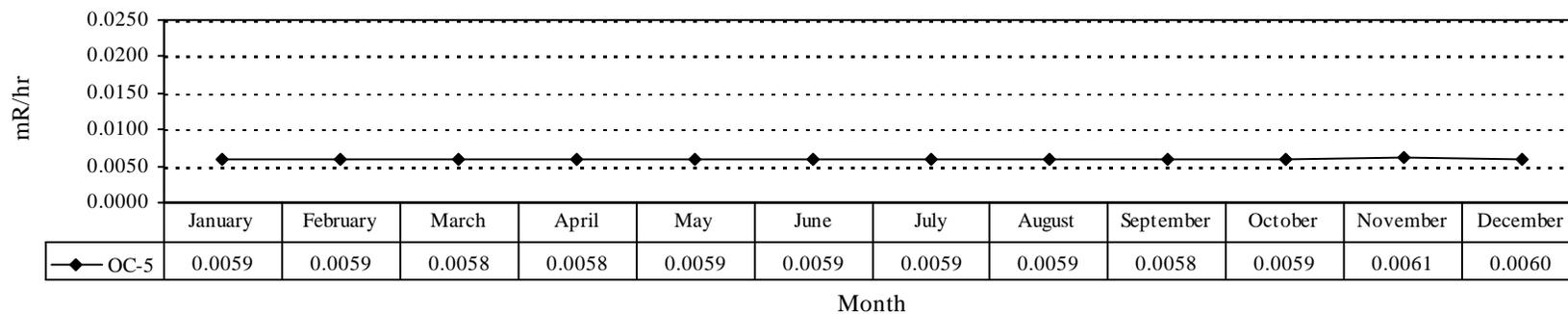


Table B-26 (continued)
 Oyster Creek – Continuous Radiological Environmental Surveillance Telemetry (CREST) Data

OC 5
2008 Ambient Radiation Levels



OC 6
2008 Ambient Radiation Levels

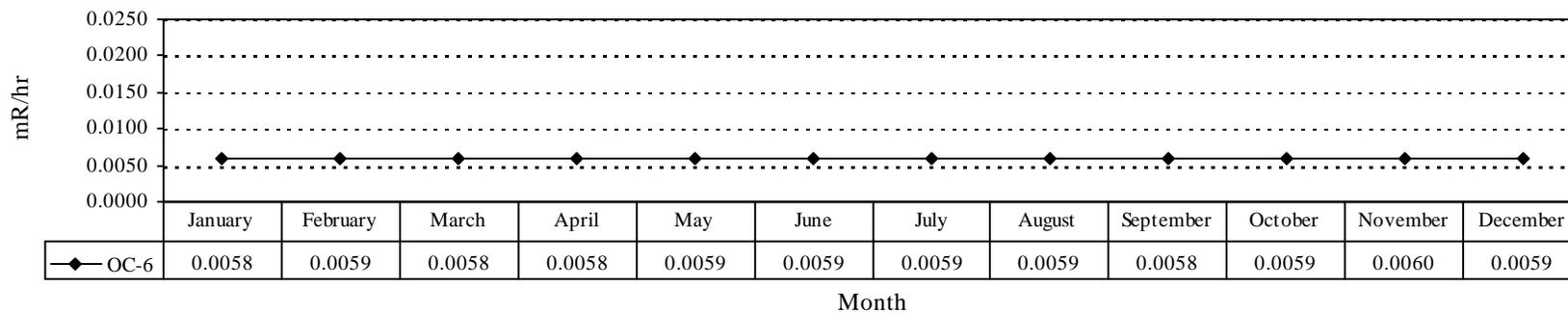
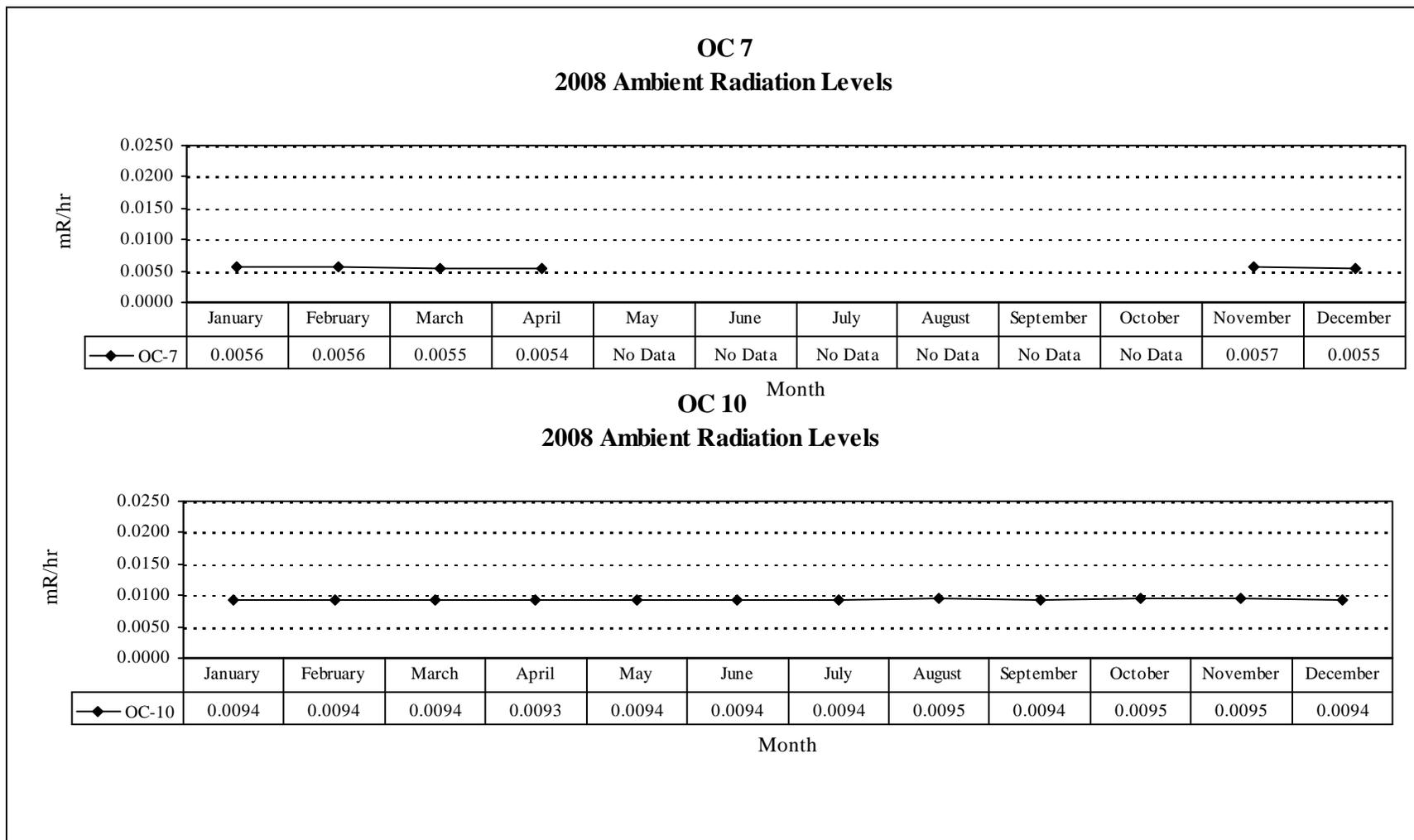


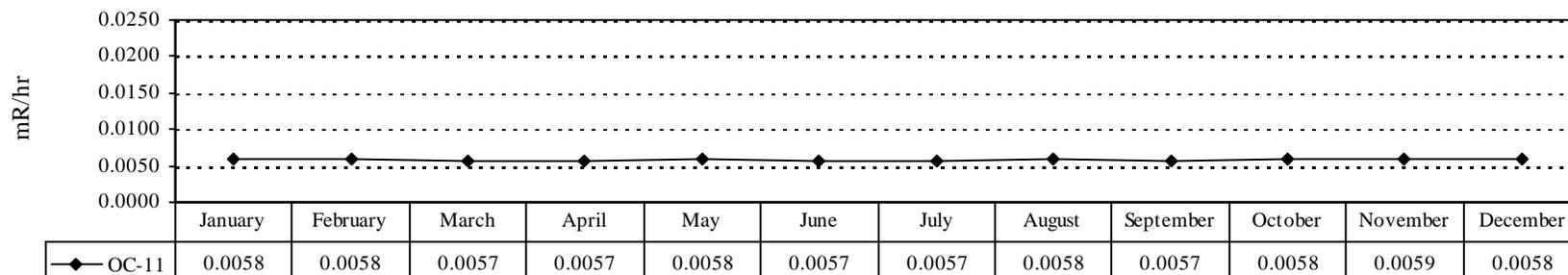
Table B-26 (continued)
 Oyster Creek – Continuous Radiological Environmental Surveillance Telemetry (CREST) Data



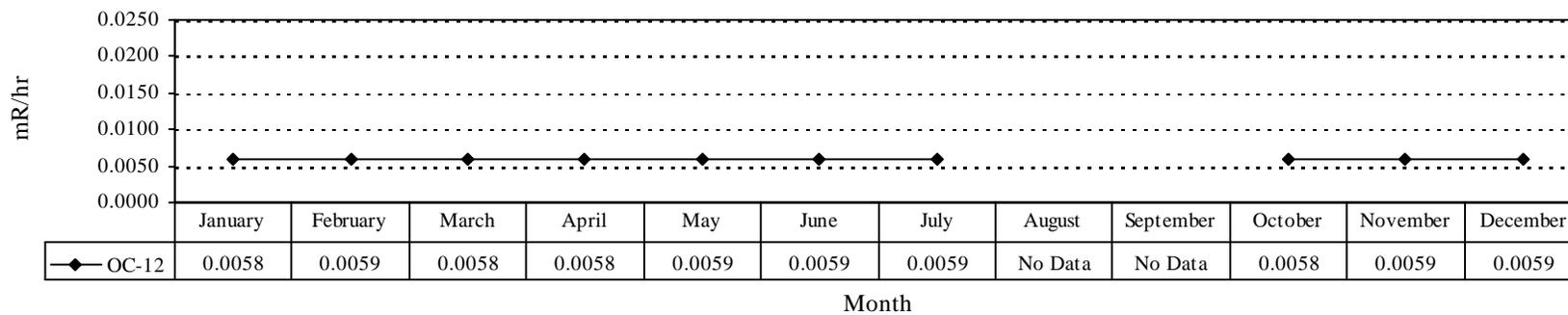
Blank months indicate "No Data Available"

Table B-26 (continued)
 Oyster Creek – Continuous Radiological Environmental Surveillance Telemetry (CREST) Data

OC 11
2008 Ambient Radiation Levels



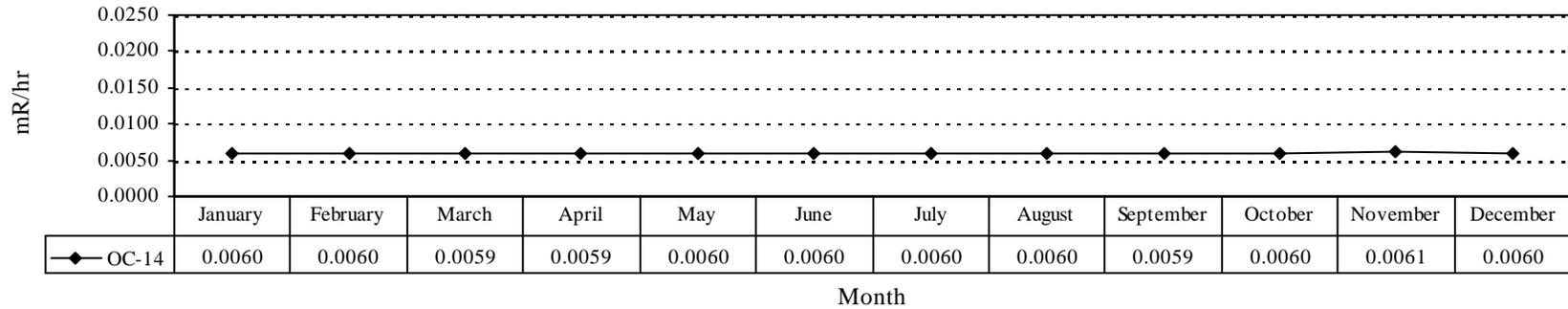
OC 12
2008 Ambient Radiation Levels



Blank months indicate "No Data Available"

Table B-26 (continued)
 Oyster Creek – Continuous Radiological Environmental Surveillance Telemetry (CREST) Data

OC 14
2008 Ambient Radiation Levels



OC 15
2008 Ambient Radiation Levels

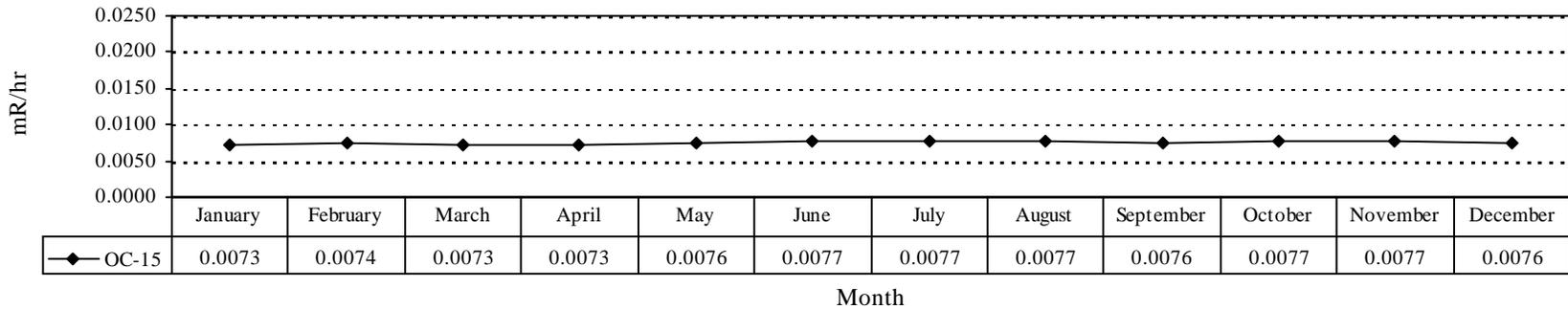


Table B-26 (continued)
 Oyster Creek – Continuous Radiological Environmental Surveillance Telemetry (CREST) Data

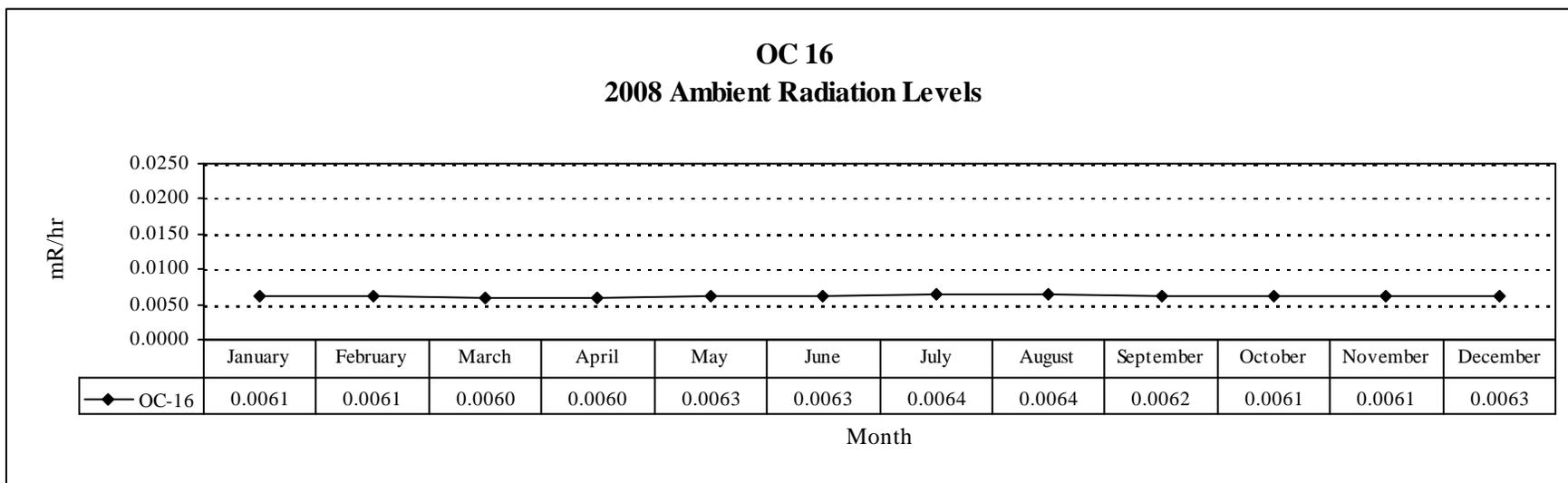
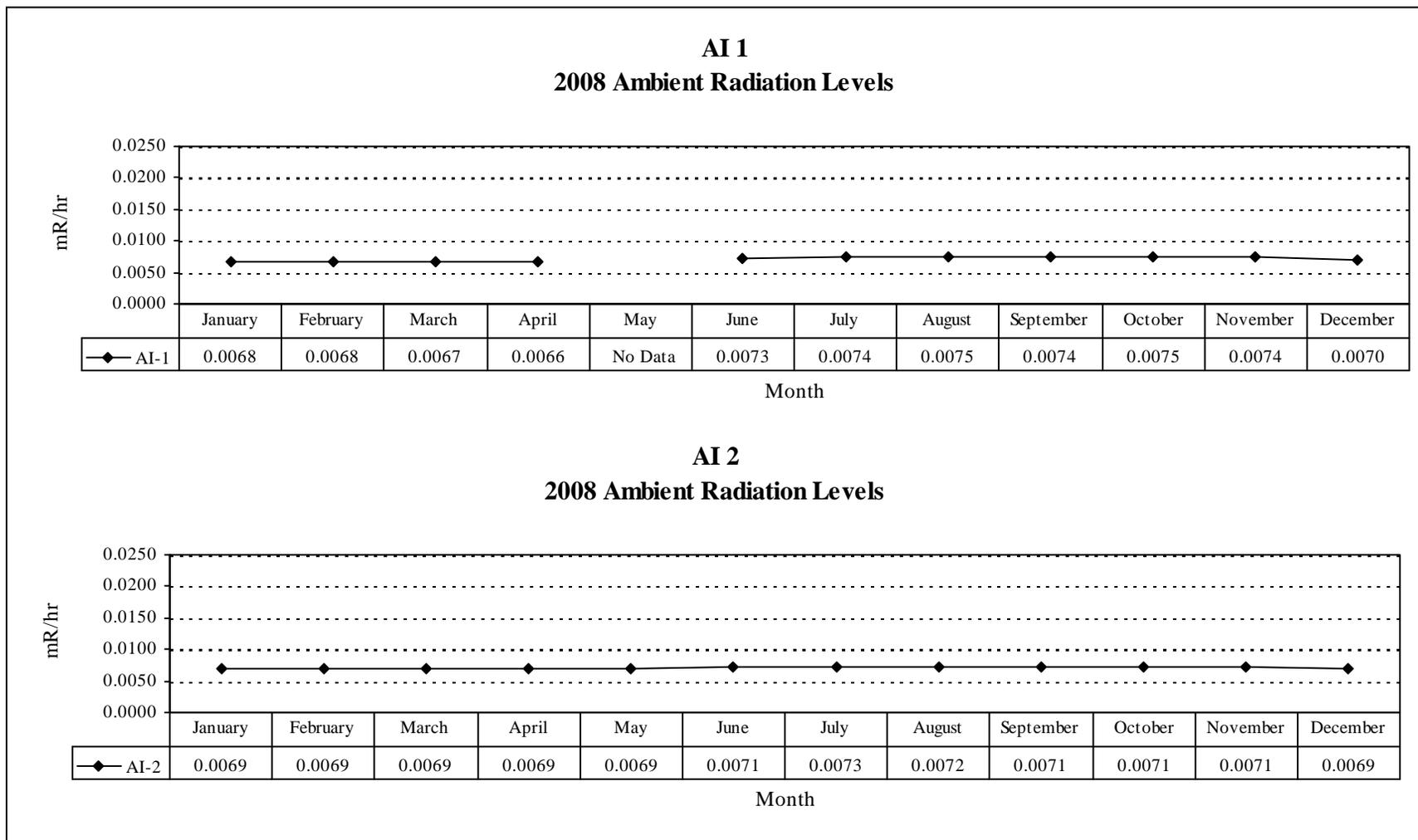


Table B-27

Salem / Hope Creek – Continuous Radiological Environmental Surveillance Telemetry (CREST) Data

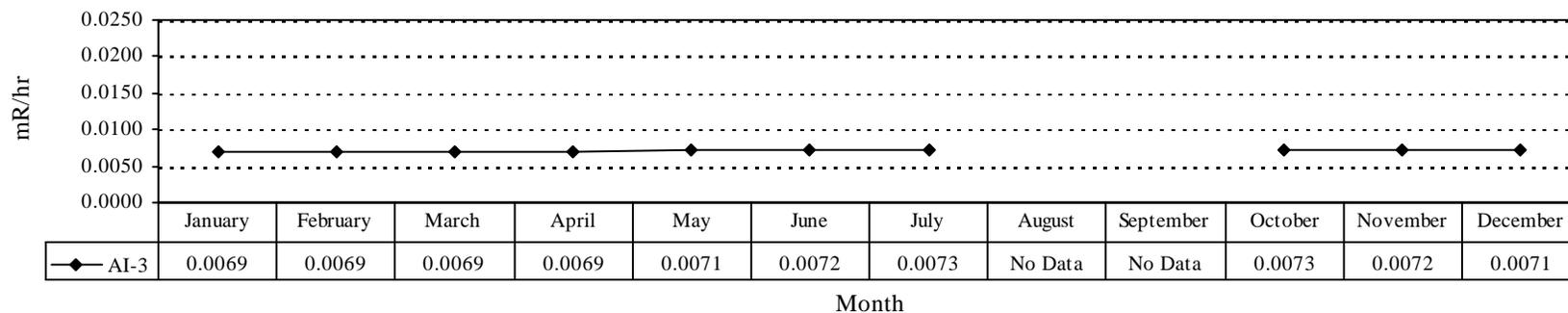


Blank months indicate “No Data Available”

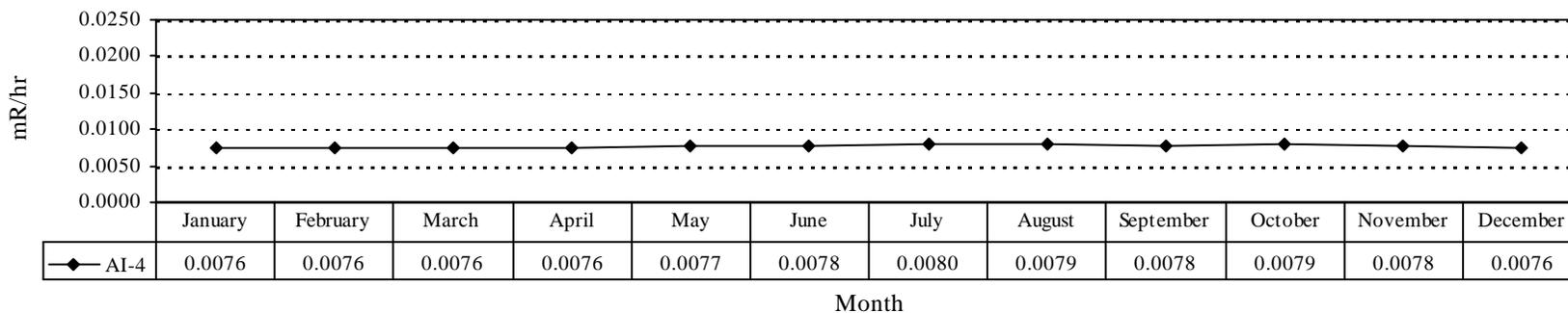
Table B-27 (continued)

Salem / Hope Creek – Continuous Radiological Environmental Surveillance Telemetry (CREST) Data

**AI 3
2008 Ambient Radiation Levels**



**AI 4
2008 Ambient Radiation Levels**

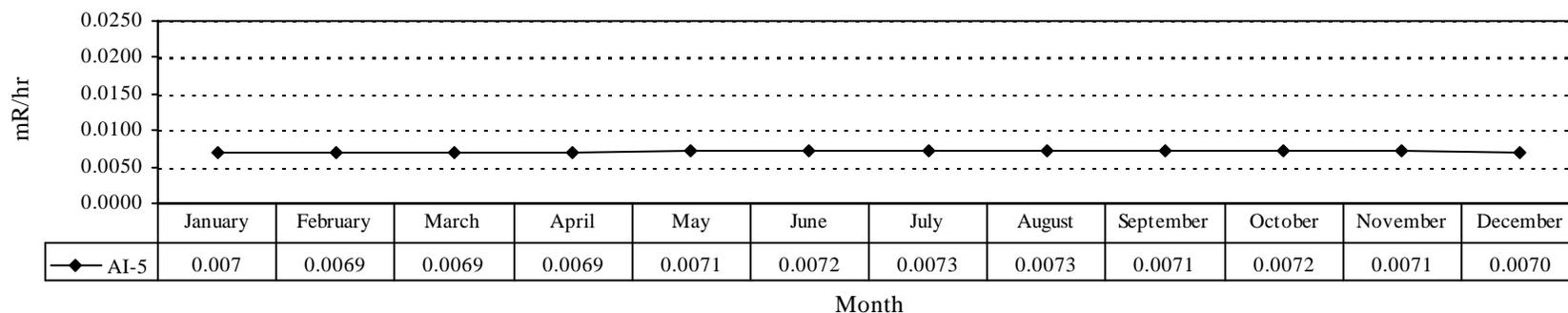


Blank months indicate "No Data Available"

Table B-27 (continued)

Salem / Hope Creek – Continuous Radiological Environmental Surveillance Telemetry (CREST) Data

**AI 5
2008 Ambient Radiation Levels**



**AI 7
2008 Ambient Radiation Levels**

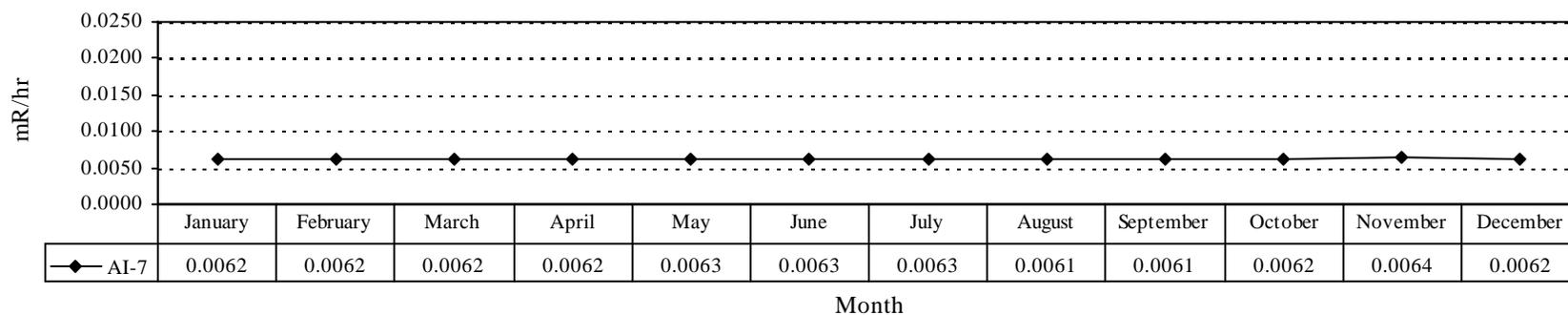
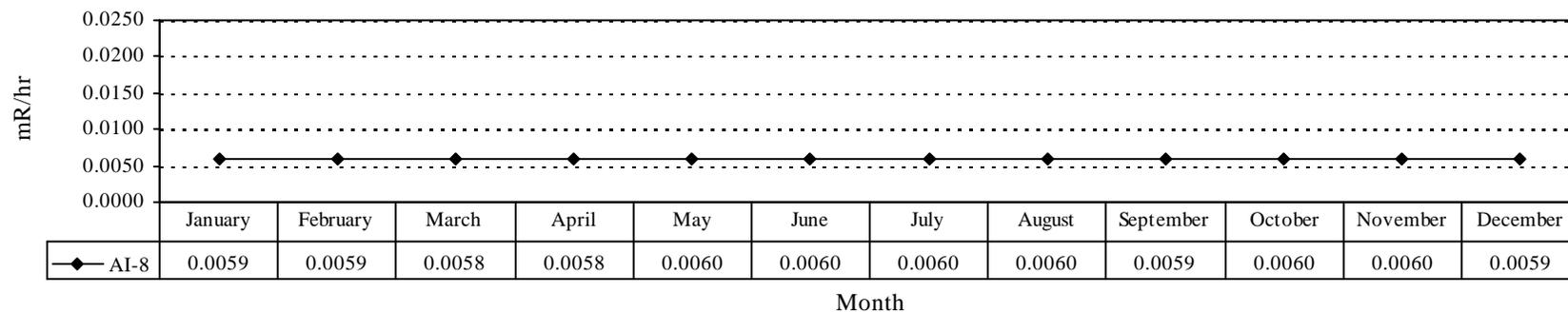


Table B-27 (continued)

Salem / Hope Creek – Continuous Radiological Environmental Surveillance Telemetry (CREST) Data

**AI 8
2008 Ambient Radiation Levels**



**AI 9
2008 Ambient Radiation Levels**

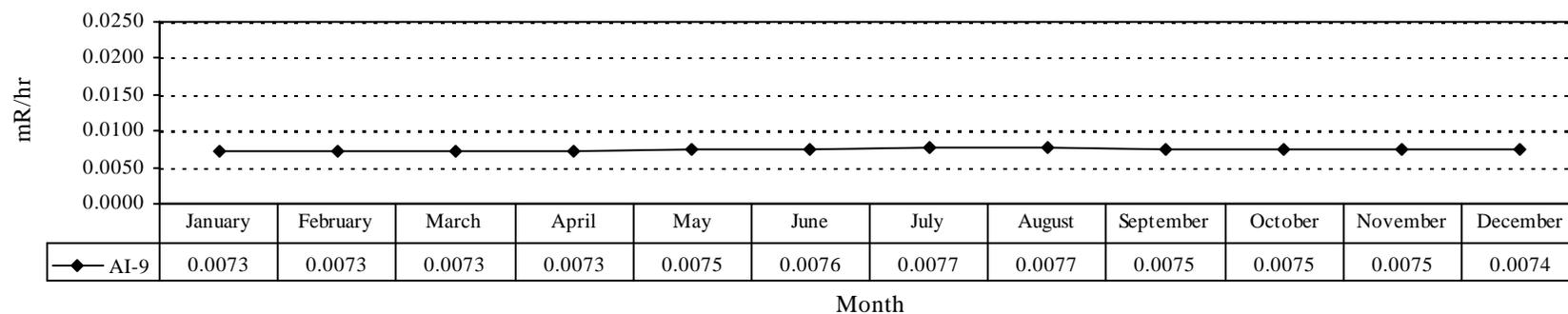
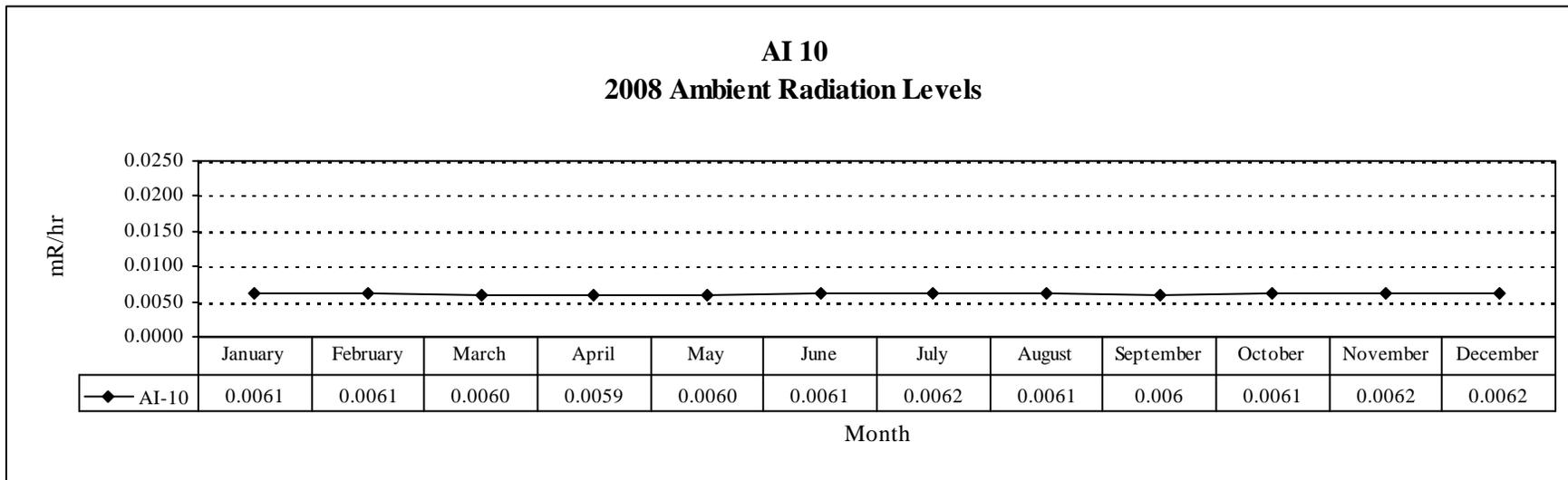


Table B-27 (continued)

Salem / Hope Creek – Continuous Radiological Environmental Surveillance Telemetry (CREST) Data



Appendix C

Table C-1
NJDEP/BNE

Radiological Environmental Monitoring Program

Minimum Detectable Concentration Requirements For NJDEP/BNE Radiological Environmental Lab Services Contract						
NUCLIDE	AIR pCi/M³	WATER* pCi/L	SOILS/ SEDIMENT pCi/Kg (dry)	MILK pCi/L	FISH/ INVERTIBRATE pCi/Kg (wet)	VEGETABLE pCi/Kg
Gross Beta	0.01***	4*				
Tritium		1000*				
Mn-54		15***			130***	
Fe-59		30***			260***	
Co-58		15***	30		130***	
Co-60		15*	30		130***	
Zn-65		30***			260***	
Sr-89		10*		1	1000	
Sr-90		2*		1	1000	
Zr-95		10				
Nb-95		10				
I-131	0.07***	1**	100	1**	10	60***
Cs-134	0.01	10	150***	15***	130***	60***
Cs-137	0.01	18***	180***	18***	150***	80***
Ba-140		60***		15		
La-140		15***		15***		
Ra-226		0.5	500			
Ra-228		0.5				

* From EPA Safe Drinking Water Regulation 40 CFR 141.25(c)(1)&(2).

** Based on Radiochemical analysis performed for Iodine-131, EPA Analytical Method 902.0

*** Detection capabilities for Environmental Sample Analysis, Nuclear Regulatory Commission Branch Technical Position, Revision 1, November 1979

Table C-2
GLOSSARY OF TERMS

ADAMS:	Agency-wide Documents Access and Management System. The NRC's web-based access tool that enables an individual to search for NRC public documents. Access to ADAMS is through the NRC website at <u>http://www.nrc.gov/reading-rm/adams/web-based.html</u> .
Background Location:	Removed from the influence of a source. A background station is a sampling location that is away from the influence of a potential source (of man-made radioactivity in this case).
Background Radiation:	The amount of radiation to which a member of the population is exposed from natural sources, such as terrestrial radiation due to naturally occurring radionuclides in the soil, cosmic radiation originating in outer space, radioactive substances found in building materials, and naturally occurring radionuclides deposited in the human body.
Bottom Feeder:	A fish, such as a catfish, carp, or flounder, which exists on or near the bottom of a body of water. Shellfish are also bottom feeders.
Composite:	A collection of more than one sample of the same medium (e.g. milk, air particulate or water) such that multiple samples can be analyzed as a single sample.
Coefficient of Variation	The coefficient of variation represents the ratio of the standard deviation to the mean, and is normally reported as a percentage. It is a useful statistic for comparing the degree of variation from one data series to another, even if the means are drastically different from each other.
Curie (Ci):	The quantity of any radionuclide in which the number of disintegrations per second is 37 billion. It is a measure of radioactivity.
Dose:	The mean energy imparted by ionizing radiation to an irradiated medium per unit mass. Dose is measured in rads.

Table C-2 (continued)
GLOSSARY OF TERMS

Effluent:	Material that is released from a source. For the purpose of this report, radioactive effluent is the radioactivity released from each commercial nuclear power plant.
Element Correction Factor	A coefficient applied to normalize the response of an individual element of a TLD to the mean response exhibited by a group of “reference dosimeters”.
Gamma Emitters:	Gamma emitting radionuclides are isotopes that emit gamma radiation. Examples of gamma emitting radionuclides are Cesium-137, Cesium-134 and Cobalt-60.
Gamma Ray:	Short-wavelength electromagnetic radiation of nuclear origin.
Gross Beta:	A measurement of all beta activity present, regardless of specific radionuclide source. Gross measurements are used as a method to screen samples for relative levels of radioactivity.
Ingestion Pathway Zone:	An emergency planning zone that extends about 50 miles in radius around a nuclear plant. The primary concern within this zone is the ingestion of food and liquid that is contaminated by radioactivity.
Isotopes:	Nuclides that have the same number of protons in their nuclei, and hence the same atomic number, but that differ in the number of neutrons, and therefore in mass number. The chemical properties of isotopes of a particular element are almost identical. Examples of isotopes are Iodine-131 and Iodine-133.
MegaWatt Thermal:	Refers to thermal power produced (MWt). A nuclear power plant utilizes a reactor to generate heat (thermal output) which creates steam to drive a turbine to generate electricity.
MicroRem (μ Rem):	A submultiple of a Rem equal to one one-hundred thousand of a Rem.
MilliRem (mRem):	A submultiple of a Rem equal to one one-thousand of a Rem.
Milliroentgen (mR):	A submultiple of the roentgen equal to one one-thousand of a roentgen.

Table C-2 (continued)
GLOSSARY OF TERMS

Minimum Detectable Concentration (MDC):	The Minimum Detectable Concentration (MDC) is the smallest concentration of radioactivity in a sample that can be detected with a 5% probability of erroneously detecting radioactivity, when in fact none was present (Type I error) and also, a 5% probability of not detecting radioactivity, when in fact it is present (Type II error). Often used interchangeably with Minimum Detectable Activity, since the difference between the two terms is only one of units conversion.
NAREL:	National Air and Radiation Environmental Laboratory. Samples from the EPA's RadNet program are analyzed at this facility. See http://www.epa.gov/narel/
NJDEP/BNE	New Jersey Department of Environmental Protection, Bureau of Nuclear Engineering. This group independently monitors radiation in the environment outside the site boundaries of New Jersey's nuclear power generating stations (Artificial Island and Oyster Creek).
Nuclide:	A species of atom characterized by the constitution of its nucleus, which is specified by its atomic mass and atomic number (Z). The atomic number is its number of protons while the atomic mass is its number of protons plus neutrons.
Owner Controlled Area	An area outside of a restricted area, but inside the site boundary, to which the licensee can limit access for any reason.
Picocurie:	The measurement of radioactivity in the environment is expressed in picocuries. A picocurie is one trillionth (10^{-12}) of a curie.
Predator Fish:	Fish that feed off of other species of fish.
Pressurized Ion Chamber:	An integrating instrument that measures the total dose over a given timeframe. It is referred to as a PIC.
Rad:	A unit of radiation absorbed dose.
Radioactivity:	The property of some nuclides of spontaneously emitting particles or radiation.

Table C-2 (continued)
GLOSSARY OF TERMS

Radioisotope:	A radioactive atomic species of an element with the same atomic number usually identical chemical properties (eg., stable and the radioisotope [Tritium]).
Radionuclide:	A radioactive species of an atom characterized by the constitution of its nucleus.
RadNet:	Formerly known as ERAMS, RadNet is a national network of monitoring stations that regularly collect air, precipitation, drinking water, and milk samples for analysis of radioactivity. RadNet also documents the status and trends of environmental radioactivity. These data are published by NAREL in a quarterly report entitled <i>Environmental Radiation Data</i> . RadNet information can also be found be at: <u>http://www.epa.gov/narel/radnet/</u> .
Rem:	A unit of radiation dose equivalent in man. Different types of ionizing radiation produce varying amounts of biological effects based on how and where the energy is imparted. To account for these differences, quality and modifying factors have been developed. The dose equivalent is designed to normalize all ionizing radiation to a common scale so that radiation protection standards can be developed.
Roentgen (R):	The special unit of radiation exposure to X or gamma radiation. One roentgen creates 2.58E-4 coulomb of electric charge per kilogram of air. The roentgen expresses the amount of energy imparted by X or gamma radiation in a given volume of air.
Sigma	Referred to as ‘the standard deviation’, sigma is the most common measure of statistical dispersion, measuring how ‘spread out’ the values in the dataset are. If the data points are all close to the mean, then the standard deviation is close to zero. If all data values are equal, the standard deviation is zero.

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