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NL-12-019

May 15, 2012

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Mail Stop O-P1-17
Washington, DC 20555-0001

SUBJECT: 2011 Annual Radiological Environmental Operating Report
Indian Point Unit Nos. 1, 2 and 3
Docket Nos. 50-03, 50-247, 50-286
License Nos. DPR-5, DPR-26, DPR-64

Dear Sir or Madam:

Enclosed please find one copy of the Entergy Nuclear Operations, Inc. (Entergy) Indian Point Energy Center (IPEC) Annual Radiological Environmental Operating Report for the period January 1, 2011 to December 31, 2011.

This report is submitted in accordance with facility Technical Specification Appendix A section 6 of the provisional operating license for DPR-5 and section 5.6.2 for DPR-26, and DPR-64, Indian Point Unit Nos. 1, 2 and 3 respectively. There are no commitments are being made by this report.

Should you or your staff have any questions, please contact Mr. Robert Walpole, Manager, Licensing at 914-254-6710.

Sincerely,

RW/mb
cc: next page

IE25

Enclosure: 1. Annual Radiological Environmental Operating Report

cc: Mr. William Dean, Regional Administrator, NRC Region 1
Mr. Douglas Pickett, Senior Project Manager, NRC NRR DORL
IPEC NRC Resident Inspector's Office
Mr. Stephen Giebel, IPEC NRC Unit 1 Project Manager
Mr. Francis J. Murray, President and CEO, NYSERDA
Ms. Bridget Frymire, New York State Department of Public Service
Mr. Timothy Rice, Bureau of Hazardous Waste & Radiation Mgmt, NYSDEC

ENCLOSURE 1 TO NL-12-019

ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

ENTERGY NUCLEAR OPERATIONS, INC.
INDIAN POINT UNIT 1, 2, and 3 NUCLEAR POWER PLANTS
DOCKET Nos. 50-03, 50-247, and 50-286

ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

ENTERGY NUCLEAR

INDIAN POINT NUCLEAR GENERATING STATION
UNITS 1, 2, AND 3

Docket No. 50-003 Indian Point Unit 1 (IP1)
Docket No. 50-247 Indian Point Unit 2 (IP2)
Docket No. 50-286 Indian Point Unit 3 (IP3)

January 1 - December 31, 2011

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SECTION 1.0

EXECUTIVE SUMMARY

1.0 EXECUTIVE SUMMARY

INTRODUCTION

This report summarizes the results of the Radiological Environmental Monitoring Program (REMP) conducted in the vicinity of Indian Point Energy Center (IPEC) during the period from January 1 to December 31, 2011. This document has been prepared in accordance with the requirements of IPEC 1, Unit 2 and 3 Technical Specifications.

The REMP has been established to monitor the radiation and radioactivity released to the environment as a result of IPEC's operation. This program, initiated in 1958, includes the collection, analysis, and evaluation of radiological data in order to assess the impact of IPEC on the environment and on the general public.

SAMPLING AND ANALYSIS

The environmental sampling media collected in the vicinity of IPEC and at distant locations included air particulate filters, charcoal cartridges, soil, drinking water, ground water, broadleaf vegetation, river water, precipitation, shoreline sediment, bottom sediment, aquatic vegetation, fish, and invertebrates.

During 2011, there were 1003 samples collected from the atmospheric, aquatic, and terrestrial environments. In addition, 164 exposure measurements were obtained using environmental thermoluminescent dosimeters (TLDs).

A small number of inadvertent issues were encountered in 2011 in the collection of environmental samples in accordance with the IPEC Offsite Dose Calculation Manual (ODCM). Equipment failures and electrical outages resulted in a small number of instances in which lower than normal sampling volumes were collected at the airborne monitoring stations. A full description of all discrepancies encountered with the environmental monitoring program is presented in the Table B-1 of this report.

There were 1472 analyses performed on the environmental media samples. The analysis of the 2011 Indian Point environmental samples was performed by several laboratories. General Engineering Labs (GEL) of Charlestown, SC, performed the ground water analyses. Thermoluminescent dosimeters were analyzed by Environmental Dosimetry Company (formerly Stanford Associates) of Sterling, MA. The James A. Fitzpatrick Nuclear Power Plant (JAFNPP) Environmental Laboratory in Fulton, NY, performed most of the remaining analyses for the first three quarters of 2011. Teledyne Brown Engineering, Inc. of Knoxville, TN performed all the analyses of the fish samples, the Sr-90 analyses of sediments and most of the remaining analyses for the fourth quarter of 2011. Samples were analyzed as required by the IPEC ODCM.

LAND USE CENSUS

The annual land use census in the vicinity of IPEC was conducted as required by the IPEC ODCM in May through October. No dairy animals within 5 miles of the Station were located during the census. Due to the difficulty of locating individual gardens and determining those having an area greater than 500 square feet, broadleaf sampling was performed. Monthly broad leaf sampling may be used in lieu of a garden census.

RADIOLOGICAL IMPACT TO THE ENVIRONMENT

Most samples collected as part of the IPEC REMP continued to contain detectable amounts of naturally-occurring and man-made radioactive materials. There was no plant related activity detected in any of the terrestrial samples. Offsite ambient radiation measurements using environmental TLDs beyond the site boundary ranged between 55 and 90 milliRoentgens (mR) per year. The range of ambient radiation levels observed with the TLDs is consistent with natural background radiation levels for New York.

Monitoring of the aquatic environment in the area of the discharge indicated the presence of the following station related radionuclides: Tritium and Cs-137. These station related nuclide were only found in the mixing zone of the discharge at levels that were expected from routine plant operation. No other plant related activity was detected in any offsite samples. Trace amounts of I-131 were seen as a result of the Fukushima incident. The predominant radioactivity for all samples was from non-plant related sources, such as fallout from nuclear weapons tests and naturally occurring radionuclides.

RADIOLOGICAL IMPACT TO THE GENERAL PUBLIC

During 2011, radiation doses to the general public as a result of IPEC's operation continued to be well below the federal limits and much less than the dose due to other sources of man-made (e.g., X-rays, medical) and naturally-occurring (e.g., cosmic, radon) radiation.

The calculated total body dose to the maximally exposed member of the general public from radioactive effluents and ambient radiation resulting from IPEC operations for 2011 was approximately 0.2 millimrem (mrem) for the year. This conservative estimate is well below the Environmental Protection Agency's (EPA) annual dose limit to any member of the general public and is a fraction of a percent of the typical dose received from natural and other sources of man-made radiation.

CONCLUSIONS

The 2011 Radiological Environmental Monitoring Program for IPEC resulted in the collection and analysis of over a thousand environmental samples and measurements. The data obtained were used to determine the impact of IPEC's operation on the environment and on the general public.

An evaluation of direct radiation measurements, environmental sample analyses, and dose calculations demonstrates that all applicable federal criteria were met. Furthermore, radiation levels and resulting doses from station operation were a small fraction of those attributed to natural and man-made background radiation.

In summary, the levels of radionuclides in the environment surrounding Indian Point were within the historical ranges, i.e., previous levels resulting from natural and anthropogenic sources for the detected radionuclides. Further, IPEC operations in 2011 did not result in exposure to the public greater than environmental background levels.

Based on this information, there is no radiological impact on the environment or on the general public due to IPEC's operation.

SECTION 2

BACKGROUND

2.0 BACKGROUND

2.1 Site Description

The Indian Point site occupies 239 acres on the east bank of the Hudson River on a point of land at Mile Point 42.6. The site is located in the Village of Buchanan, Westchester County, New York. Three nuclear reactors, Indian Point Unit Nos. 1, 2 and 3, and associated buildings occupy approximately 35 acres. Unit 1 began operation in 1962 and was retired as a generating facility in 1974. Units 2 and 3 began operation 1974 and 1978. All three units 3 are owned and operated by Entergy Nuclear, although only Units 2 and 3 continue to operate.

2.2 Program Background

Environmental monitoring and surveillance have been conducted at Indian Point since 1958, four years prior to the start-up of Unit 1. The pre-operational program was designed and implemented to determine the background radioactivity and to measure the variations in activity levels from natural and other sources in the vicinity, as well as fallout from nuclear weapons tests. Accumulation of this background data permits the detection and assessment of environmental activity attributable to plant operations. Thus, as used in this report, background levels consist of those resulting from both natural and anthropogenic sources of environmental radioactivity

Results of the analyses from the indicator and control locations and a comparison to preoperational data are summarized in Section 4 of this report.

2.3 Program Objectives

The current environmental monitoring program is designed to meet three primary objectives:

1. To enable the identification and quantification of changes in the radioactivity of the area.
2. To measure radionuclide concentrations in the environment attributable to operations of the Indian Point site.
3. Compare plant related measurable results to those predicted by the effluent monitoring and modeling and determine if any adjustments need to be made to the effluent calculation methods or the environmental sampling program.

To identify changes in activity, the environmental sampling schedule requires that analyses be conducted for specific environmental media on a regular basis. The radioactivity profile of the environment is established and monitored through routine evaluation of the analytical results obtained.

The REMP designates sampling locations for the collection of environmental media for analysis. These sample locations are divided into indicator and control locations. Indicator locations are established near the site, where the presence of environmental radioactivity of plant origin is most likely to be detected. Control locations are established

farther away (and upwind/upstream, where applicable) from the site, where the level would not generally be affected by plant discharges. The use of indicator and control locations enables the identification of potential sources of detected radioactivity, thus meeting one of the program objectives.

Verification of expected radionuclide concentrations resulting from effluent releases attributable to the site is the third program objective. Verifying projected concentrations through the REMP is difficult since the environmental concentrations resulting from plant releases are typically too small to be detected. Plant related radionuclides were detected in 2011 in very low levels; however, residual radioactivity from atmospheric weapons tests and naturally occurring radioactivity were the predominant sources of radioactivity in the samples collected. Analysis of the 2011 REMP sample results confirms that radiological effluents were well below regulatory limits.

SECTION 3

PROGRAM DESCRIPTION

3.0 PROGRAM DESCRIPTION

To achieve the objectives of the REMP and ensure compliance with the ODCM, sampling and analysis of environmental media are performed as outlined in Table A-1 and described in section 3.3.

3.1 Sample Collection

Entergy personnel perform collection of environmental samples for the Indian Point site, with the exception of groundwater and fish/invertebrate samples.

The groundwater (monitoring well) samples are collected by a contracted environmental vendor, GZA Geo Environmental, Inc. Collection of fish and invertebrate samples is performed by a contracted environmental vendor - Normandeau Associates, Inc.

3.2 Sample Analysis

The analysis of the 2011 Indian Point environmental samples was performed by several laboratories. General Engineering Labs (GEL) of Charlestown, SC, performed the ground water analyses. Thermoluminescent dosimeters were analyzed by Environmental Dosimetry Company (formerly Stanford Associates) of Sterling, MA. The James A. Fitzpatrick Nuclear Power Plant (JAFNPP) Environmental Laboratory in Fulton, NY, performed most of the remaining analyses for the first three quarters of 2011. Teledyne Brown Engineering, Inc. of Knoxville, TN performed all the analyses of the fish samples, the Sr-90 analyses of sediments and most of the remaining analyses for the fourth quarter of 2011.

3.3 Sample Collection and Analysis Methodology

3.3.1 Direct Radiation

Direct gamma radiation is measured using integrating calcium sulfate thermoluminescent dosimeters (TLDs), which provide cumulative measurements of radiation exposure (i.e., total integrated exposures in milli-roentgen, mR) for a given period. The area surrounding the Indian Point site is divided into 16 compass sectors. Each sector has two TLD sample locations. The inner ring is located near the site boundary at approximately 1 mile (1.6 km). The outer ring is located at approximately 5 miles (8 km) from the site (6.7- 8.0 km), see Figures A-1 and A-2.

An additional TLD sample site is located at Roseton (20.7 miles north) as a control, and there are eight other TLD sample locations of special interest.

In total, there are 41 TLD sample sites, designated DR-1 through DR-41, with two TLDs at each site. TLDs are collected and processed on a quarterly basis. The results are reported as mR per standard quarter (91 days). The mR reported is the average of the two TLDs from each sample site.

3.3.2 Airborne Particulates and Radioiodine

Air samples were taken at eight locations varying in distance from 0.28 to 20.7 miles (0.4 to 33 km) from the plant. These locations represent one control at sampling station 23 (A5) and seven indicator locations. These indicator locations are at sampling stations 4 (A1), 5 (A4), 27, 29, 44, 94 (A2), and 95 (A3). The locations are shown on Figures A-1, A-2, and A-3. The air samples are collected continuously by means of fixed air particulate filters followed by in-line charcoal cartridges. Both are changed on a weekly basis. The filter and cartridge samples are analyzed for gross beta and radioiodine, respectively. In addition, gamma spectroscopy analysis (GSA) is performed on quarterly composites of the air particulate filters.

3.3.3 Hudson River Water

Hudson River water sampling is performed continuously at the intake structure (sampling station 9, Wa1) and at a point exterior to the discharge canal where Hudson River water and water from the discharge canal mix (sampling station 10, Wa2); see Figure A-1. An automatic composite sampler is used to take representative samples. On a weekly basis, accumulated samples are taken from both sample points. These weekly river water samples are composited for monthly GSA, and quarterly for tritium analysis.

3.3.4 Drinking Water

Samples of drinking water are collected monthly from the Camp Field Reservoir (3.4 miles NE, sample station 7, sample designation Wb1) and New Croton Reservoir (6.3 Mi SE, sample station 8); see Figure A-3. Each monthly sample is approximately 4 liters and is analyzed for gross beta and gamma-emitting radionuclides. They are also composited quarterly and analyzed for tritium.

3.3.5 Hudson River Shoreline Soil

Shoreline soil samples are collected at three indicator and two control locations along the Hudson River. The indicator locations are at sampling stations 53 (Wc1), 28, and 17. The control locations are at sampling stations 50 (Wc2) and 84. Figures A-1, A-2, and A-3 show these locations. The samples are gathered at a level above low tide and below high tide and are approximately 2-kg grab samples. These samples are collected at greater than 90 days apart and are analyzed by GSA and for strontium-90.

3.3.6 Broad Leaf Vegetation

Broad leaf vegetation samples are collected from three locations during the growing season. The indicator locations are sampling stations 94 (Ic2) and 95 (Ic1), and the control location is at sampling station 23 (Ic3). See Figures A-1 and A-2. The samples are collected monthly, when available, and analyzed by gamma spectroscopy. These samples consist of at least 1 kg of leafy vegetation and are used in the assessment of the food product and milk ingestion pathways.

3.3.7 Fish and Invertebrates

Fish and invertebrate samples are obtained from the Hudson River at locations upstream and downstream of the plant discharge. The indicator location (downstream sample point) is designated as sampling station 25 (Ib1) and the control location (upstream) is at sampling station 23 (Ib2). See Figures A-1 and A-2. These samples are collected in season or semiannually if they are not seasonal. The fish and invertebrates sampled are analyzed by gamma spectroscopy as well as for Sr-90 and for Ni-63.

3.3.8 Hudson River Aquatic Vegetation

During the spring and summer, aquatic vegetation samples are collected from the Hudson River at two indicator locations (sampling stations 17 and 28) and one control location (84); see Figure A-3. Samples of aquatic vegetation are obtained depending on sample availability. These samples are analyzed by gamma spectroscopy.

3.3.9 Hudson River Bottom Sediment

Bottom sediment and benthos are sampled at four locations: three indicator locations (sampling stations 10, 17, and 28) and one control location (84), along the Hudson River, once each spring and summer; see Figure A-3. These samples are obtained using a Peterson grab sampler or similar instrument. The bottom sediment samples are analyzed by gamma spectroscopy.

3.3.10 Precipitation

Precipitation samples are continuously collected at one indicator location (sampling station 44) and one control location (23); see Figure A-3. They are collected in sample bottles designed to hinder evaporation. They are composited quarterly and analyzed by GSA and for tritium.

3.3.11 Soil

Soil samples are collected from two indicator locations (sampling stations 94 and 95), and one control location (23) on an annual basis; see Figure A-3. They are approximately 2 kg in size and consist of about twenty 2-inch deep cores. The soil samples are analyzed by gamma spectroscopy.

3.3.12 Groundwater Samples

Groundwater samples were obtained semi-annually at Lafarge (106.) Samples are analyzed for tritium, Sr-90, Ni-63 and by gamma spectroscopy.

3.3.13 Land Use Census

Each year a land use census consisting of milch animal and residence surveys is conducted during the growing season to determine the current utilization of land within 5 miles (8 km) of the site. These surveys are used to determine whether there are changes in existing conditions that warrant changing the sampling program.

For example, the milch animal census is used to identify animals producing milk for human consumption within 5 miles (8 km) of Indian Point. This census consists of visual field surveys of the areas where a high probability of milch animals exists and confirmation through personnel such as feed suppliers who deal with farm animals and dairy associations (See Tables B-21 and B-22).

Visual inspections were made of the 5-mile area around the Indian Point Site during routine sample collections and emergency plan equipment inspections in the area throughout the year. An extensive land survey was conducted of the 5-mile area in an attempt to identify new residential areas, commercial developments and to identify milch animals in pasture.

Note: These actions were taken while performing quarterly environmental badge change out and field inspections through out the four surrounding counties.

- Orange County was surveyed during through the summer and fall.
- Rockland County was surveyed during summer and fall.
- Putnam County was surveyed during the summer and fall.
- Westchester County was surveyed during the spring, summer and fall.

Although there are presently no animals producing milk for human consumption within 5 miles (8 km) of the site, the census is performed to determine if a milk-sampling program needs to be conducted.

A residence census is also performed to identify the nearest residence(s) to the site in each of the 16 sectors surrounding Indian Point. See Table B-22.

A garden census was not performed, as the ODCM allows sampling of vegetation in two sectors near the site boundary in lieu of a garden census. The sectors are chosen to be in the pre-dominant wind directions with the highest predicted deposition rates.

3.4 Statistical Methodology

There is a number of statistical calculation methodologies used in evaluating the data from the Indian Point REMP. These methods include determination of Lower Limits of Detection (LLD) and Critical Levels (L_c), and estimation of the mean and associated propagated error.

3.4.1 Lower Limit of Detection (LLD) and Critical Level (L_c)

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

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

$$LLD = \frac{\frac{2.71}{T_s} + 3.29 s_b * \sqrt{1 + (\frac{T_b}{T_s})}}{E * V * k * Y * e^{-\lambda t}}$$

where:

LLD = The lower limit of detection as defined above (as picocurie per unit mass or volume)

T_s = The sample counting time in minutes

s_b = The standard deviation of the background counting rate or of the counting rate of a blank sample as appropriate (as counts per minute)

T_b = The background count time in minutes

E = The counting efficiency (as counts per transformation)

V = The sample size (in units of mass or volume)

k = A constant for the number of transformations per minute per unit of activity (normally, 2.22E+6 dpm per μCi)

Y = The fractional radiochemical yield (when applicable)

λ = The radioactive decay constant for the particular radionuclide

t = The elapsed time between midpoint of sample collection and time of counting

Note: The above LLD formula accounts for differing background and sample count times. The Radiological Environmental Monitoring Program, REMP, uses an LLD formula that assumes equal background and sample count times, in accordance with the RECS. When the above LLD formula is more appropriate for the effluents program, it may be used.

The constants 2.71 and 3.29 and the general LLD equation were derived from the following two sources:

1) Currie, L.A. "Limits for Qualitative Detection of Quantitative Determination". (Anal. Chem. 40:586-593, 1968); and,

2) Mayer, Dauer "Application of Systematic Error Bounds to Detection Limits for Practical Counting". (HP Journal 65(1): 89-91, 1993)

The value of Sb used in the calculation of the LLD for a detection system shall be based on the actual observed variance of the background counting rate or of the counting rate of the blank samples (as appropriate) rather than on an unverified theoretically predicted variance. In calculating the LLD for a radionuclide determined by gamma ray spectrometry, the background shall include the typical contributions of other radionuclides normally present in the samples. Typical values of E, V, Y, and t shall be used in the calculation. The background count rate is calculated from the background counts that are determined to be within ± one FWHM (Full-Width-at-Half-Maximum) energy band about the energy of the gamma ray peak used for the quantitative analysis for that radionuclide.

It should be recognized that the LLD is defined as an a priori (before the fact) limit representing the capability of a measurement process and not as an a posteriori (after the fact) limit for a particular measurement.

To handle the a posteriori problem, a decision level must be defined, which has been identified as the Critical Level. Following an experimental observation, one must decide whether or not a real signal was, in fact, detected. This type of binary qualitative decision is subject to two kinds of error: deciding that the radioactive material is present when it is not (a: Type I error), and the converse, failing to decide that it is present when it is (b: Type II error). The maximum acceptable Type I error (a), together with the standard deviation, Snet, of the net signal when the net signal equals zero, establish the Critical Level, Lc, upon which decisions may be based.

Operationally, an observed signal, S, must exceed L_c to yield the decision, detected.

$$L_c = k_a s_b (1+T_b/T_s)^{0.5}$$

where:

k_a is related to the standardized normal distribution and corresponds to a probability level of 1-a. For instance, selection of a = 0.01 corresponds to a 99% confidence level that activity is present. When determining the Lc for different measurement processes, it is allowable to set a at less than or equal to 0.05 as long as the following condition is met:

To set a for L_c determination at less than 0.05, the equation for the LLD (which places a less than or equal to 0.05) should be employed to verify that the calculated LLD is less than or equal to the LLDs specified in the RECS. This calculation, if necessary, will be performed on a case by case basis.

3.4.2 Determination of Mean and Propagated Error

Recounts of positive samples are occasionally performed. When the initial count reveals the presence of radioactivity, which may be attributed to plant operations, at a value greater than the L_c, two recounts may be used to verify the positive results. The recounts are not performed on samples with expected positive results; for example: air samples with positive results from gross beta analysis, since the results are usually positive due to natural

background radioactive material in the air. When a radionuclide is positively identified in two or more counts, the analytical result for the radionuclide is reported as the mean of the positive detections and the associated propagated error for that mean. In cases where more than one sample result is available, the mean of the sample results and the estimated error for the mean are reported in the Annual Report.

The mean (X) and the propagated error (PE) are calculated using the following equations:

$$X = \frac{\sum_{i=1}^{N} X_i}{N}$$

where: X_i = value of each individual observation
N = number of observations

$$PE = \frac{\sqrt{\sum_{i=1}^{N} (ERR_i)^2}}{N}$$

where: ERR_i = 1 sigma error of the individual analysis
N = number of observations

3.4.3 Table Statistics

The averages shown in the summary table (Table B-2) are the averages of the positive values in accordance with the NRC's Branch Technical Position (BTP) to Regulatory Guide 4.8 (Reference 1). Samples with "<" values are not included in the averages.

It should be noted that this statistic for the mean using only positive values tends to strongly bias the average high, particularly when only a few of the data are measurably positive. The REMP data show few positive values; thus the corresponding means are biased high. Exceptions to this include direct radiation measured by TLDs and gross beta radioactivity in air, which show positive monitoring results throughout the year.

In the data tables B-6 through B-20, values shown are based on the L_c value, unless otherwise noted. If a radionuclide was detected at or above the L_c value in two or more counts, the mean and error are calculated as per Section 3.4.2, and reported in the data table. Values listed as "<" in the data tables are the L_c values for that sample, unless otherwise noted. If multiple counts were performed on a sample and a radionuclide's values are "< L_c " each time, the largest critical level is reported in the data table.

The historical data tables contain the annual averages of the positive values for each year. The historical averages are calculated using only the positive values presented for 2000 through 2010. The 2011 average values are included in these historic tables for purposes of comparison.

SECTION 4

RESULTS AND DISCUSSION

4.0 RESULTS AND DISCUSSION

The 2011 Radiological Environmental Monitoring Program (REMP) was conducted in accordance with Indian Point's Offsite Dose Calculation Manual ODCM. The ODCM contains requirements for the number and distribution of sampling locations, the types of samples to be collected, and the types of analyses to be performed for measurement of radioactivity.

The REMP at Indian Point includes measurements of radioactivity levels in the following environmental pathways.

Direct Gamma Radiation
Airborne Particulates and Radioiodine
Hudson River Water
Drinking Water
Shoreline Soil
Terrestrial Broad Leaf Vegetation
Fish and Invertebrates
Aquatic Vegetation
Bottom Sediment
Precipitation
Soil
Groundwater

An annual land use and milch animal census is also part of the REMP.

To evaluate the contribution of plant operations to environmental radioactivity levels, other man-made and natural sources of environmental radioactivity, as well as the aggregate of past monitoring data, must be considered. It is not merely the detection of a radionuclide, but the evaluation of the location, magnitude, source, and history of its detection that determines its significance. Therefore, we have reported the data collected in 2011 and assessed the significance of the findings.

A summary of the results of the 2011 REMP is presented in Table B-2. This Table lists the mean and range of all positive results obtained for each of the media sampled at ODCM indicator and control locations. Discussions of these results and their evaluations are provided below.

The radionuclides detected in the environment can be grouped into three categories: (1) naturally occurring radionuclides; (2) radionuclides resulting from weapons testing and other non-plant related, anthropogenic sources; and (3) radionuclides that could be related to plant operations.

The environment contains a broad inventory of naturally occurring radionuclides which can be classified as, cosmic ray induced (e.g., Be-7, H-3) or geologically derived (e.g., Ra-226 and progeny, Th-228 and progeny, and K-40.) These radionuclides constitute the majority of the background radiation source and thus account for a majority of the annual background dose detected. Since the detected concentrations of these radionuclides were consistent at

indicator and control locations, and unrelated to plant operations, their presence is noted only in the data tables and will not be discussed further.

The second group of radionuclides detected in 2011 consists of those resulting from past weapons testing in the earth's atmosphere and more recent contamination resulting from the Fukushima event. Weapons testing in the 1950's and 1960's resulted in a significant atmospheric radionuclide inventory, which, in turn, contributed to the concentrations in the lower atmosphere and ecological systems. Although reduced in frequency, atmospheric weapons testing continued into the 1980's. The resultant radionuclide inventory of some radionuclides, although diminishing with time (e.g., through radioactive decay and natural dispersion processes), remains detectable.

In 2011, the detected radionuclide that may be attributable to past atmospheric weapons testing consisted of Cs-137 in several media. The levels detected were consistent with the historical levels of radionuclides resulting from weapons tests as measured in previous years. REMP samples for 2011 also indicated the presence of I-131 in several of the airborne and rainwater samples. Although I-131 can result from plant operation, this is not the case for these sample results. Given the following facts, these detectable concentrations of I-131are not a result of plant operation:

- The quantities of radioactive airborne effluents from IPEC during 2011 did not increase significantly compared to year 2010.
- The concentrations detected in the indicator samples were also identified in the control samples.
- When the 2011 positive levels of I-131 were detected in the airborne samples, it was also detected throughout much of the world, including much higher levels in the western parts of the United States. These detectable levels were the result of the Fukushima event (Reference 2)

As such, the atypical detection of I-131 in both indicator and control samples is credibly attributed to the trans-Pacific transport of airborne releases from Dai-Ichi, Fukushima following the March 11, 2011 Tohoku earthquake and is not related to the operations of IPEC.

The final group of radionuclides detected by the 2011 REMP comprises those that may be attributable to current plant operations. During 2011, Cs-137 and tritium (H-3) were the only potentially plant-related radionuclides detected in some environmental samples.

H-3 may be present in the local environment due to either natural occurrence, other man-made sources, or as a result of plant operations.

Cs-137 is ubiquitous in the environment from atmospheric testing debris and a lesser amount from the Chernobyl accident. In 2010, there were three detections of Cs-137 in shoreline soil (2 indicator samples and one control sample). In bottom sediment there were five positive detections of Cs-137 (all at indicator stations or near to plant.) The two discharge canal samples are consistent with historical values.

Shoreline sediment and bottom sediment samples showed detectable levels of Cs-137 somewhat higher at the indicator locations than at the control location at Cold Spring (distant location). The fact that there was no Cs-134 present (recent plant releases would contain Cs-134) and that there was detection also at a distant location indicates that the activity may

be due to atmospheric weapons testing, with some contribution from plant releases from several years past. Although there was an increase noted in several of the fourth quarter bottom sediment samples, this may be attributable to the significant redistribution of river sediments resulting from the historic flows in the Hudson River due to tropical storm Irene in the fall of 2011.

Strontium-90 (Sr-90) may also be present in the environment from atmospheric testing debris. None of the fish samples indicated any detectable levels of this isotope.

I-131 is also produced in fission reactors, but can result from non-plant related anthropogenic sources, e.g., medical administrations, such as in previous years. I-131 was not detected in 2011 in aquatic or terrestrial vegetation indicator and control locations.

Co-58 and Co-60 are activation/corrosion products also related to plant operations. They are produced by neutron activation in the reactor core. As Co-58 has a much shorter half-life, its absence "dates" the presence of Co-60 as residual from releases of both radionuclides in the past. If Co-58 and Co-60 are concurrently detected in environmental samples, then the source of these radionuclides is considered to be from recent releases. When significant concentrations of Co-60 are detected but no Co-58, there is an increased likelihood that the Co-60 is due to residual Co-60 from past operations. There was no Co-58 or Co-60 detected in the 2011 REMP, though they (Co-58 and Co-60) can be observed in historical data.

In the following sections, a summary of the results of the 2010 REMP is presented by sample medium and the significance of any positive findings discussed. It should be noted that naturally occurring radionuclides are omitted from the summary table (Table B-2) and further discussion.

4.1 Direct Radiation

The environmental TLDs used to measure the direct radiation were TLDs supplied and processed by Environmental Dosimetry Company. In 2011, the TLD program produced a consistent picture of ambient background radiation levels in the vicinity of the Indian Point Station. A summary of the annual TLD data is provided in Table B-2 and all the TLD data are presented in Tables B-3, B-4 and B-5. TLD sample site DR-40 is the control site for the direct radiation (DR) series of measurements.

Table B-3 provides the quarterly and annual average reported doses in mR per standard quarter for each of the direct radiation sample points, DR-1 through DR-41. The table also provides the sector for each of the DR sample points. Table B-4 provides the mean, standard deviation, minimum and maximum values in mR per standard quarter for the years 2001 through 2010. The 2011 means are also presented in Table B-4. Table B-5 presents the 2011 TLD data for the inner ring and outer ring of TLDs.

The 2011 mean value for the indicator direct radiation sample points was 13.9 mR per standard quarter – which represents no change from 2010. At those locations where the 2011 mean value was higher than historical means, they are within historical bounds for the respective locations.

The DR sample locations are arranged so that there are two concentric rings of TLDs around the Indian Point site. The inner ring (DR-1 to DR-16) is close to the site boundary.

The outer ring (DR-17 to DR-32) has a radius of approximately 5 miles from the three Indian Point units. The results for these two rings of TLDs are provided in Table B-5. The annual average for the inner ring was 13.6 mR per standard quarter and also average for the outer ring was 14.4 mR per standard quarter. The control location average for 2011 was 13.4 mR per standard quarter.

Table C-1 and Figure C-1 present the 10-year historical averages for the inner and outer rings of TLDs. The 2011 averages are consistent with the historical data. The 2011 and previous years' data show that there is no measurable direct radiation in the environment due to the operation of the Indian Point site.

4.2 Airborne Particulates and Radioiodine

An annual summary of the results of the 2011 air particulate filter and charcoal cartridge analyses is presented in Table B-2. As shown, there were no radionuclides detected in the air attributable to plant operations.

The results of the analyses of weekly air particulate filter samples for gross beta activity are presented in Table B-6, and the results of the GSA of the quarterly composites of these samples are in Table B-7.

Gross beta activity was found in air particulate samples throughout the year at all indicator and control locations. The average gross beta activity for the eight indicator air sample locations was 0.014 pCi/m^3 and the average for the control location was 0.014 pCi/m^3. The activities detected were consistent for all locations, with no significant differences in gross beta activity in any sample due to location. GSA of the quarterly composite air samples showed that no reactor-related radionuclides were detected and that only naturally-occurring radionuclides were present at detectable levels.

The mean annual gross beta concentrations and Cs-137 concentrations in air for the past 10 years are presented in Table C-2. From this table and Figure C-2, it can be seen that the average 2014 gross beta concentration was consistent with historical levels. Cs-137 has not been detected since 1987. This is consistent with the trend of decreasing ambient Cs-137 concentrations in recent years.

The charcoal cartridge analytical results are presented in Table B-8. "Less than" values are presented as sample critical level (L_c). Excluding the previously discussed samples from the March and April samples affected by Fukushima, there was no I-131 detected (LLD = 0.07 pCi/m^3) in the charcoal cartridge samples, which is consistent with historical trends.

From the data, it can be seen that no airborne radioactivity attributable to the operation of Indian Point was detected in 2011.

4.3 Hudson River Water

A summary of the radionuclides detected in the Hudson River water is contained in Table B-2. Data resulting from analysis of monthly Hudson River water samples for gamma emitters, and H-3 analysis of quarterly composites, are presented in Tables B-9 and B-10, respectively.

The only plant related activity detected was H-3. The levels are consistent with occasional historical detection of H-3. Additionally, Table C-3 indicates the absence of Cs-137 which is consistent with historical data.

4.4 Drinking Water

The annual program summary table (Table B-2) contains a summary of the 2011 drinking water sample analysis results. Results of the gamma spectroscopy analyses of the monthly drinking water samples are in Table B-11 and results of tritium analysis of quarterly composites are in Table B-12. Other than naturally occurring radionuclides, no radionuclides were detected in drinking water samples.

A summary and illustration of historic trends of drinking water are provided in Table C-4 and Figure C-4, respectively. An examination of the data indicates that operation of the Indian Point units had no detectable radiological impact on drinking water.

4.5 Hudson River Shoreline Soil

A summary of the radionuclide concentrations detected in the shoreline soil samples is contained in Table B-2. Table B-13 contains the results of the gamma spectroscopic and strontium-90 analyses of the shoreline soil samples.

In addition to the naturally occurring radionuclides, Cs-137 was identified in the Hudson River shoreline soil samples in 2011. Cs-137 was detected at the Verplanck location in both samples from that location, for a total of two positive values out of seven samples from indicator locations. Cs-137 was not detected at the control location (Manitou Inlet). The average concentration for the indicator locations that had positive indication of Cs-137 was 108 pCi/kg (dry) with a maximum concentration of 112 pCi/kg (dry.)

An historical look at Cs-137 detected in shoreline soil at indicator and control locations can be viewed in Table C-5 and Figure C-5. Cs-137 has been and continues to be present in this media, both at indicator and occasionally at the control location, at a consistent level over the past ten years. Cs-134 and Cs-137 are both discharged from the plant in similar quantities. The lack of Cs-134 activity is an indication that the primary source of the Cs-137 in the shoreline soil is legacy contamination from weapons fallout.

No Sr-90 was detected in any collected shoreline soil samples.

4.6 Broad Leaf Vegetation

Table B-2 contains a summary of the broad leaf vegetation sample analysis results. Data from analysis of the 2011 samples are presented in Table B-14.

Table C-6 contains an historical summary and Figure C-6 is an illustration of the broad leaf vegetation analysis results. The detection of low levels of Cs-137 has occurred sporadically at both indicator and control locations at relatively low concentrations for the past ten years. Cs-137 was not detected in 2011

4.7 Fish and Invertebrates

A summary of the fish and invertebrate sample analysis results is presented in Table B-2. Table B-15 contains the results of the analysis of fish and invertebrate samples for 2011. There were no plant related radionuclides detected.

A summary of historical fish and invertebrate analytical data is presented in Table C-7 and illustrated in Figure C-7. Available data are consistent with historical trends.

4.8 Aquatic Vegetation

A summary of the aquatic sample analysis results is presented in Table B-2. Table B-16 contains the results of the analysis of aquatic vegetation samples for 2011. No plant related radionuclides were detected.

4.9 Hudson River Bottom Sediment

A summary of the Hudson River bottom sediment analysis results is presented in Table B-2. Table B-17 contains the results of the analysis of bottom sediment samples for 2011. Cs-137 was detected at 5 of 6 indicator station samples and 1 of 2 control station (Cold Spring) samples. This frequency of detection is not unusual. Cs-134 was not detected in any bottom sediment samples. The lack of Cs-134 suggests that the primary source of the Cs-137 in bottom sediment is from historical plant releases over the years and from residual weapons test fallout.

The discharge canal bottom sediments were 97 pCi/kg and 200 pCi/kg on samples taken four months apart (average = 251 pCi/kg.). There is nothing in release data and in monitoring well data that corresponds to this difference. The results are somewhat less than to the 2009 and 2010 results. The average of all indicator detections is 321 pCi/kg (553 pCi/kg in 2010 and 493 pCi/kg in 2009.) This is consistent with historical annual average concentration for indicator locations.

This detection of Cs-137 in bottom sediment generally decreased from an average of 1200 pCi/kg in the early 1990s to 500 pCi/kg in the mid-1990s to a recent value of about 320 pCi/kg. Cs-134 has not been detected in bottom sediment since 2002.

4.10 Precipitation

A summary of the precipitation sample analysis results is presented in Table B-2. Table B-18 contains the results of the precipitation samples for 2011. Other than naturally occurring radionuclides, only I-131 and H-3 were detected in the precipitation samples. As discussed earlier the I-131 detected in the March 2011 rainwater samples was seen at both indicator and control locations and was due to the effects of Fukushima.

A review of historical data over the last 11 years indicates tritium had been detected in both indicator and control precipitation samples in 2000; however, there have been no instances of positive values until the 4th quarter of 2011.

4.11 Soil

A summary of the soil sample analysis results is presented in Table B-2. Table B-19 contains the results of the soil samples for 2011. Other than naturally occurring radionuclides, no activity was detected in any of the soil samples.

4.12 Groundwater

A summary of the groundwater samples for 2011 is contained in Table B-2. Data resulting from analysis of the groundwater samples for gamma emitters, tritium analysis, Ni-63 and Sr-90 are given in Table B-20.

No radionuclides other than naturally occurring ones were found in 2011.

4.13 Land Use Census

A census was performed in the vicinity of Indian Point in 2011. This census consisted of a milch animal and a residence census. Results of this census are presented in Tables B-21 and B-22.

The results of the 2011 census were generally same as the 2010 census results. The New York Agricultural Statistic Service showed there were no animals producing milk for human consumption found within 5 miles (8 km) of the plant. Field observations also yielded no milching animal locations within five miles.

The second part of this census revealed that the two nearest residences in different sectors are located 0.44 miles (0.71 km) ESE and 0.73 miles (1.13 km) S of the plant. The 2011 land use census indicated there were no new residences that were closer in proximity to IPEC.

The ODCM allows the sampling of broad leaf vegetation in two sectors at the site boundary in lieu of performing a garden census. Analysis results for these two sectors are discussed in Section 4.6 and presented in Table B-14, Table C-6 and Figure C-6.

4.14 Conclusion

The Radiological Environmental Monitoring Program is conducted each year to determine the radiological impact of Indian Point operations on the environment. The preceding discussions of the results of the 2011 REMP reveal that operations at the station did not result in an impact on the environment.

The 2011 REMP results demonstrate the relative contributions of different radionuclide sources, both natural and anthropogenic, to the environmental concentrations. The results indicate that the fallout from previous atmospheric weapons testing continues to contribute to detection of Cs-137 in some environmental samples. There are infrequent detections of plant related radionuclides in the environs; however, the radiological levels are very low and are significantly less than those from natural background and other anthropogenic sources.

SECTION 5

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APPENDIX A

ENVIRONMENTAL SAMPLING AND ANALYSIS REQUIREMENTS

APPENDIX A

Environmental media are sampled at the locations specified in Table A-1 and shown in Figures A-1, A-2, and A-3. The samples are analyzed according to criteria established in the ODCM. These requirements include: methods of sample collection; types of sample analysis; minimum sample size required; lower limit of detection, which must be attained for each medium, sample, or analysis type, and environmental concentrations requiring special reports.

Table A-1 provides the sampling station number, location, sector, and distance from Indian Point, sample designation code, and sample type. This table gives the complete listing of sample locations used in the 2011 REMP.

Three maps are provided to show the locations of REMP sampling. Figure A-1 shows the sampling locations within two miles of Indian Point. Figures A-2 and A-3 show the sampling locations within ten miles of Indian Point.

The ODCM required lower limits of detection (LLD) for Indian Point sample analyses are presented in Table A-2. These required lower limits of detection are not the same as the lower limits of detection or critical levels actually achieved by the laboratory. The laboratory's lower limits of detection and critical levels must be equal to or lower than the required levels presented in Table A-2.

Table A-3 provides the reporting level for radioactivity in various media. Sample results that exceed these levels and are due to plant operations require that a special report be submitted to the NRC.

In addition to the sampling outlined in Table A-1, there is an environmental surveillance requirement that an annual land use and milch animal census be performed. See Tables B-21 and B-22 for the milch animal and land use census.

TABLE A-1
INDIAN POINT REMP SAMPLING STATION LOCATIONS

SAMPLING STATION	SAMPLE DESIGNATION	LOCATION	DISTANCE	SAMPLE TYPES
3	DR8	Service Center Building	Onsite - 0.35 Mi (SSE) at 158°	Direct Gamma
4	A1 A1	Algonquin Gas Line	Onsite - 0.28 Mi (SW) at 234°	Air Particulate Radioiodine
5	A4 A4 DR10	NYU Tower	Onsite - 0.88 Mi (SSW) at 208°	Air Particulate Radioiodine Direct Gamma
7	Wb1	Camp Field Reservoir	3.4 Mi (NE) at 51°	Drinking Water
8	**	Croton Reservoir	6.3 Mi (SE) at 124°	Drinking Water
9	Wa1	Plant Inlet (Hudson River Intake)*	Onsite - 0.16 Mi (W) at 273°	HR Water
10	Wa2 **	Discharge Canal (Mixing Zone)	Onsite - 0.3 Mi (WSW) at 249°	HR Water HR Bottom Sediment
14	DR7	Water Meter House	Onsite - 0.3 Mi (SE) at 133°	Direct Gamma
17	** ** **	Off Verplanck	1.5 Mi (SSW) at 202.5°	HR Aquatic Vegetation HR Shoreline Soil HR Bottom Sediment
20	DR38	Cortlandt Yacht Club (AKA Montrose Marina)	1.5 Mi (S) at 180°	Direct Gamma
23	** A5 A5 DR40 Ic3 ** Ib2	Roseton*	20.7 Mi (N) at 357°	Precipitation Air Particulate, Radioiodine Direct Gamma Broad Leaf Vegetation Soil Fish & Invertebrates
25	Ib1	Downstream	Downstream	Fish & Invertebrates
27	** ** DR41	Croton Point	6.36 Mi (SSE) at 156°	Air Particulate Radioiodine Direct Gamma
28	** DR4 ** **	Lent's Cove	0.45 Mi (ENE) at 069°	HR Shoreline Soil Direct Gamma HR Bottom Sediment HR Aquatic Vegetation
29	** ** DR39	Grassy Point	3.37 Mi (SSW) at 196°	Air Particulate Radioiodine Direct Gamma

* = Control location
** = Locations listed do not have sample designation locations specified in the ODCM
HR = Hudson River R/S = Reuter Stokes

TABLE A-1
INDIAN POINT REMP SAMPLING STATION LOCATIONS

SAMPLING STATION	SAMPLE DESIGNATION	LOCATION	DISTANCE	SAMPLE TYPES
33	DR33	Hamilton Street (Substation)	2.88 Mi (NE) at 053°	Direct Gamma
34	DR9	South East Corner of Site	Onsite - 0.52 Mi (S) at 179°	Direct Gamma
35	DR5	Broadway & Bleakley Avenue	Onsite - 0.37 Mi (E) at 092°	Direct Gamma
38	DR34	Furnace Dock (Substation)	3.43 Mi (SE) at 141°	Direct Gamma
44	** ** **	Peekskill Gas Holder Bldg	1.84 Mi (NE) at 052°	Precipitation Air Particulate Radioiodine
50	Wc2	Manitou Inlet*	4.48 Mi (NNW) at 347°	HR Shoreline Soil
53	Wc1 DR11	White Beach	0.92 Mi (SW) at 226°	HR Shoreline Soil Direct Gamma
56	DR37	Verplanck - Broadway & 6th Street	1.25 Mi (SSW) at 202°	Direct Gamma
57	DR1	Roa Hook	2 Mi (N) at 005°	Direct Gamma
58	DR17	Route 9D - Garrison	5.41 Mi (N) at 358°	Direct Gamma
59	DR2	Old Pemart Avenue	1.8 Mi (NNE) at 032°	Direct Gamma
60	DR18	Gallows Hill Road & Sprout Brook Road	5.02 Mi (NNE) at 029°	Direct Gamma
61	DR36	Lower South Street & Franklin Street	1.3 Mi (NE) at 052°	Direct Gamma
62	DR19	Westbrook Drive (near the Community Center)	5.03 Mi (NE) at 062°	Direct Gamma
64	DR20	Lincoln Road - Cortlandt (School Parking Lot)	4.6 Mi (ENE) at 067°	Direct Gamma
66	DR21	Croton Avenue - Cortlandt	4.87 Mi (E) at 083°	Direct Gamma
67	DR22	Colabaugh Pond Road - Cortlandt	4.5 Mi (ESE) at 114°	Direct Gamma
69	DR23	Mt. Airy & Windsor Road	4.97 Mi (SE) at 127°	Direct Gamma
71	DR25	Warren Ave - Haverstraw	4.83 Mi (S) at 188°	Direct Gamma
72	DR26	Railroad Avenue & 9W - Haverstraw	4.53 Mi (SSW) at 203°	Direct Gamma
73	DR27	Willow Grove Road & Captain Faldermeyer Drive	4.97 Mi (SW) at 226°	Direct Gamma
74	DR12	West Shore Drive - South	1.59 Mi (WSW) at 252°	Direct Gamma
75	DR31	Palisades Parkway	4.65 Mi (NW) at 225°	Direct Gamma
76	DR13	West Shore Drive - North	1.21 Mi (W) at 276°	Direct Gamma
77	DR29	Palisades Parkway	4.15 Mi (W) at 272°	Direct Gamma
78	DR14	Rt. 9W across from R/S #14	1.2 Mi (WNW) at 295°	Direct Gamma

* = Control location

** = Locations listed do not have sample designation locations specified in the ODCM

HR = Hudson River R/S = Reuter Stokes

TABLE A-1
INDIAN POINT REMP SAMPLING STATION LOCATIONS

SAMPLING STATION	SAMPLE DESIGNATION	LOCATION	DISTANCE	SAMPLE TYPES
79	DR30	Anthony Wayne Park	4.57 Mi (WNW) at 296°	Direct Gamma
80	DR15	Route 9W South of Ayers Road	1.02 Mi (NW) at 317°	Direct Gamma
81	DR28	Palisades Pkwy - Lake Welch Exit	4.96 Mi (WSW) at 310°	Direct Gamma
82	DR16	Ayers Road	1.01 Mi (NNW) at 334°	Direct Gamma
83	DR32	Route 9W - Fort Montgomery	4.82 Mi (NNW) at 339°	Direct Gamma
84	** ** **	Cold Spring *	10.88 Mi (N) at 356°	HR Aquatic Vegetation HR Shoreline Soil HR Bottom Sediment
88	DR6	Reuter Stokes Pole #6	0.32 Mi (ESE) at 118°	Direct Gamma
89	DR35	Highland Ave & Sprout Brook Road (near rock cut)	2.89 Mi (NNE) at 025°	Direct Gamma
90	DR3	Charles Point	0.88 Mi (NE) at 047°	Direct Gamma
92	DR24	Warren Road - Cortlandt	3.84 Mi (SSE) at 149°	Direct Gamma
94	A2 A2 Ic2 **	IPEC Training Center	Onsite- 0.39 Mi (S) at 193°	Air Particulate Radioiodine Broad Leaf Vegetation Soil
95	A3 A3 Ic1 **	Meteorological Tower	Onsite - 0.46 Mi (SSW) at 208°	Air Particulate Radioiodine Broad Leaf Vegetation Soil
106	**	Lafarge Monitoring Well	0.63 mi SW	Groundwater

* = Control location

** = Locations listed do not have sample designation locations specified in the ODCM

HR = Hudson River R/S = Reuter Stokes

FIGURE A-1

SAMPLING LOCATIONS
Within Two Miles of Indian Point

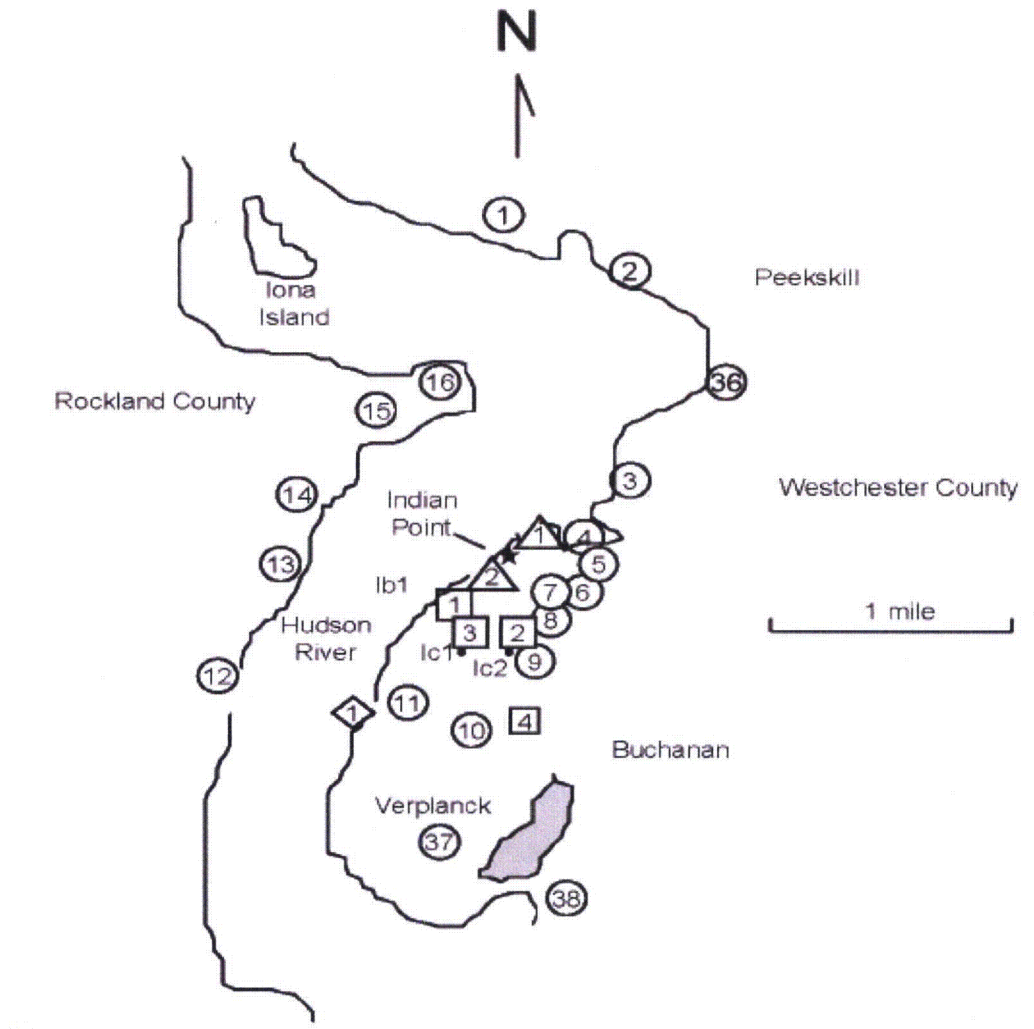
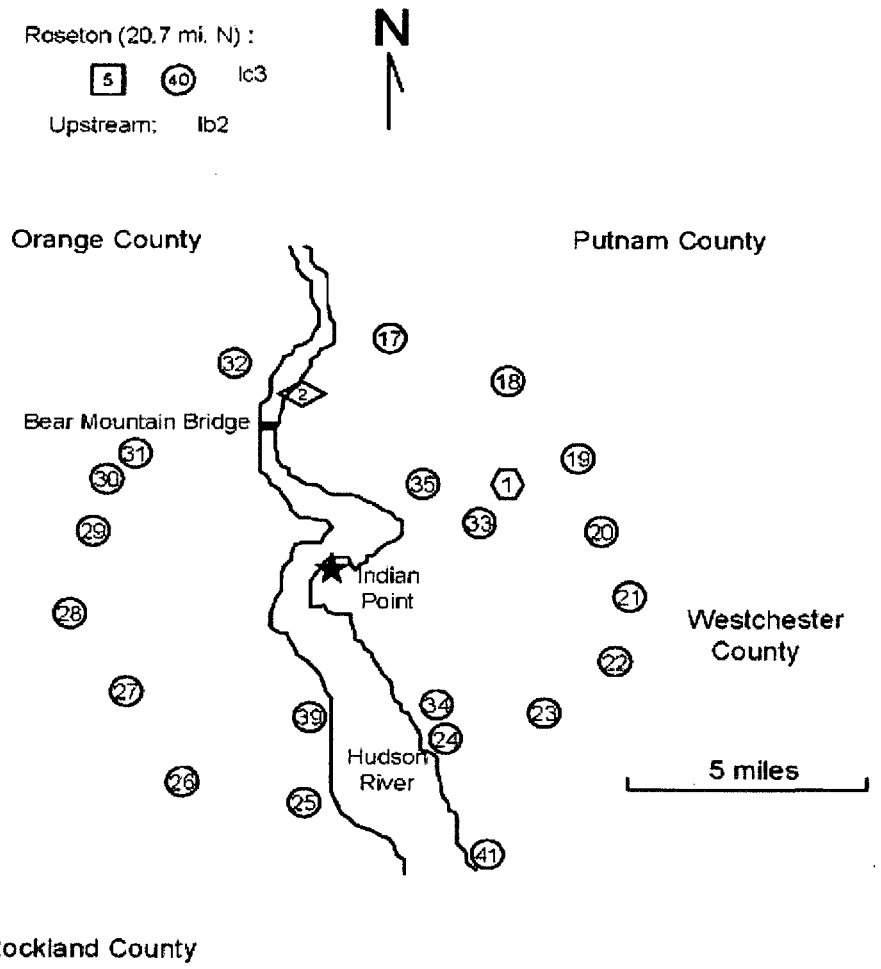


FIGURE A-2

SAMPLING LOCATIONS
Greater than Two Miles from Indian Point

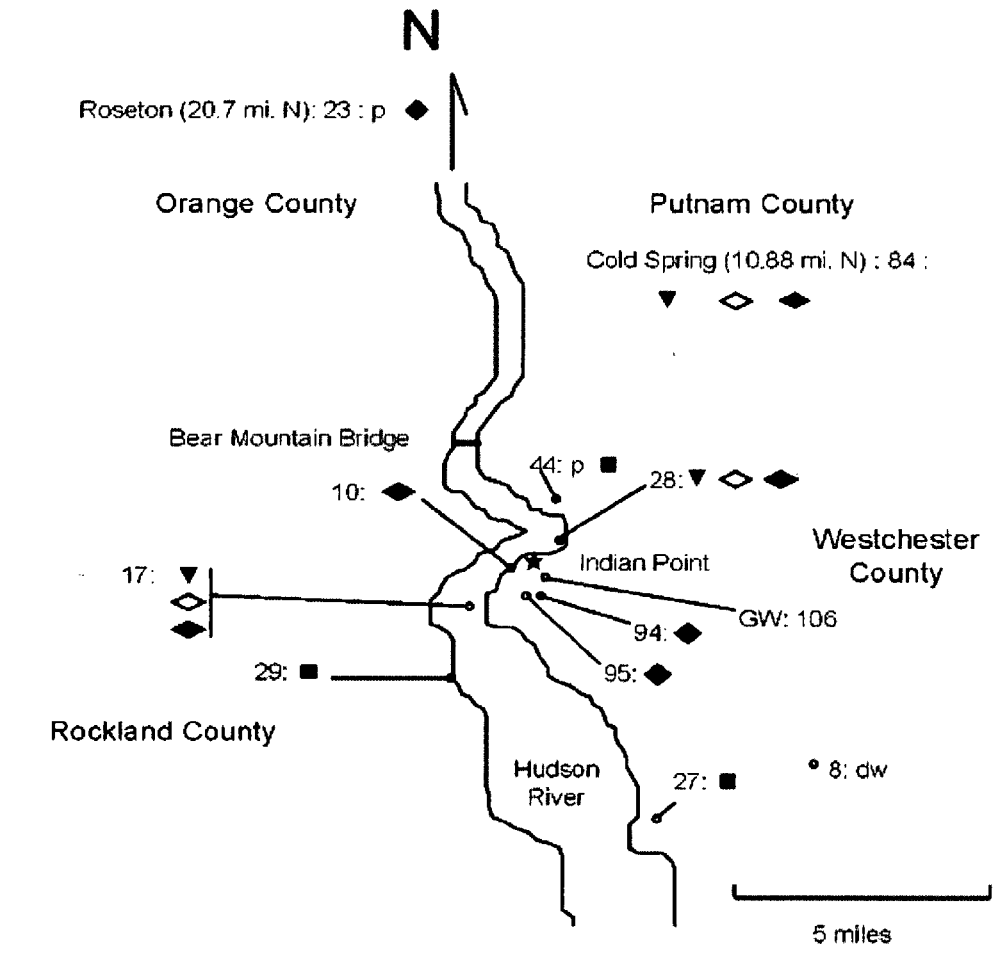


Key:

- O - Direct Radiation Sample Location DR#
- □ - Airborne Sampling Location A#
- ◇ - Hudson River Shoreline Soil Wc#
- Ic3 - Broadleaf Vegetation
- O - Waterborne: Drinking Wb#
- Ib2 - Fish and Invertebrates (where available upstream)

FIGURE A-3

SAMPLING LOCATIONS
Additional Sampling Locations



Key:
- ■ - Air Particulate & Radioiodine
- ▼ - Aquatic Vegetation
- ◆ - HR Bottom Sediment
- p - Precipitation
- dw - Drinking Water
- ◇ - HR Shoreline Soil
- ◆ - Soil
- GW - Monitoring Well, SW of Site Boundary

TABLE A-2

LOWER LIMIT OF DETECTION (LLD) REQUIREMENTS FOR ENVIRONMENTAL SAMPLES

RADIONUCLIDE ANALYSIS	WATER (pCi/L)	AIRBORNE PARTIUCLATE OR GASES (pCi/m^3)	FISH (pCi/kg, wet)	MILK (pCi/L)	FOOD PRODUCTS (pCi/kg, wet)	SOIL or SEDIMENT (pCi/kg, dry)
Gross Beta	4	0.01				
H-3	2,000 (d)					
Mn-54	15		130			
Fe-59	30		260			
Co-58	15		130			
Co-60	15		130			
Ni-63 (f)	30		100			
Zn-65	30		260			
Sr-90 (f)	1		5			5000
Zr-95	15					
Nb-95	15					
I-131	1 (d)	0.07		1	60	
Cs-134	15	0.05	130	15	60	150
Cs-137	18	0.06	150	18	80	180
Ba-140	15			15		
La-140	15			15		

TABLE A-2

LOWER LIMIT OF DETECTION (LLD) REQUIREMENTS FOR ENVIRONMENTAL SAMPLES

(a) This list does not mean that only these nuclides are to be considered. Other peaks that are identifiable, together with those of the above nuclides, shall also be analyzed and reported in the Annual Radiological Environmental Operating Report pursuant to Specification D 5.1.

(b) Required detection capabilities for thermoluminescent dosimeters used for environmental measurements are given in Regulatory Guide 4.13.

(c) The LLD is defined as the smallest concentration of radioactive material in a sample that will yield a net count, above system background, that will be detected with 95% probability with only 5% probability of falsely concluding that a blank observation represents a "real" signal.

It should be recognized that the LLD is defined as an a priori (before the fact) limit representing the capability of a measurement system and not as an a posteriori (after the fact) limit for a particular measurement. Analyses shall be performed in such a manner that the stated LLDs will be achieved under routine conditions. Occasionally background fluctuations, unavoidable small sample sizes, the presence of interfering nuclides, or other uncontrollable circumstances may render these LLDs unachievable. In such cases, the contributing factors shall be identified and described in the Annual Radiological Environmental Operating Report pursuant to RECS D 5.1.

(d) These LLDs are for drinking water samples. If no drinking water pathway exists, the LLDs may be increased to 3,000 for H-3 and 15 for I-131.

(e) These required lower limits of detection are associated only with the REMP requirements. The Radiological Ground Water Monitoring Program may involve unique reporting level criteria, independent of the REMP, and defined in station procedures.

(f) Sr-90 and Ni-63 are included in this table due to their historical presence in ground water and possible migration to the environment, per References 45 and 46.

TABLE A-3

REPORTING LEVELS FOR RADIOACTIVITY CONCENTRATIONS IN ENVIRONMENTAL SAMPLES

RADIONUCLIDE ANALYSIS	WATER (pCi/L)	AIRBORNE PARTIUCLATE OR GASES (pCi/m^3)	FISH (pCi/kg, wet)	MILK (pCi/L)	FOOD PRODUCTS (pCi/kg, wet)
H-3	20,000 *				
Mn-54	1,000		30,000		
Fe-59	400		10,000		
Co-58	1,000		30,000		
Co-60	300		10,000		
Ni-63 ***	300		1,000		
Zn-65	300		20,000		
Sr-90 ***	8*		40		
Zr-95	400				
Nb-95	400				
I-131	2 *	0.9		3	100
Cs-134	30	10	1,000	60	1,000
Cs-137	50	20	2,000	70	2,000
Ba-140	200			300	
La-140	200			300	

* Values provided are for drinking water pathways. If no drinking water pathway exists, higher values are allowed, as follows:

H-3	30,000 pCi/L (This is a 40 CFR 141 value)
Sr-90	12 pCi/L
I-131	20 pCi/L

** These reporting levels are associated only with the REMP requirements. The Radiological Ground Water Monitoring Program may involve unique reporting level criteria, independent of the REMP, and defined in station procedures.

*** Sr-90 and Ni-63 are included in this table due to their historical presence in ground water and possible migration to the environment, per References 45 and 46.

APPENDIX B

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM RESULTS SUMMARY

APPENDIX B

B.1 2011 Annual Radiological Environmental Monitoring Program Summary

The results of the 2011 radiological environmental sampling program are presented in Tables B-2 through B-20. Table B-2 is a summary table of the sample results for 2011. The format of this summary table conforms to the reporting requirements of the ODCM, NRC Regulatory Guide 4.8 (Reference 4), and NRC Branch Technical Position to Regulatory Guide 4.8 (Reference 14). In addition, the data obtained from the analysis of samples are provided in Tables B-3 through B-20.

REMP samples were analyzed by various counting methods as appropriate. The methods are; gross beta, gamma spectroscopy analysis, liquid scintillation, radiochemical analysis, and TLD processing. Gamma spectroscopy analysis was performed for the following radionuclides; Be-7, K-40, Mn-54, Co-58, Co-60, Fe-59, Zn-65, Zr-95, Nb-95, Ru-103, Ru-106, I-131, Cs-134, Cs-137, Ba/La-140, Ce-141, Ce-144, Ra-226 and Ac/Th-228. Radiochemical analyses were performed for Ni-63 and Sr-90 for specific media and locations as required in the ODCM.

B.2 Land Use Census

In accordance with Sections IP2-D3.5.2 and IP3-2.8 of the ODCM, a land use census was conducted to identify the nearest milch animal and the nearest residence. The results of the milch animal and land use census are presented in Tables B-21 and B-22, respectively. In lieu of identifying and sampling the nearest garden of greater than 50 m^2, at least three kinds of broad leaf vegetation were sampled near the site boundary in two sectors and at a designated control location (results are presented in Table B-14).

B.3 Sampling Deviations

During 2011, environmental sampling was performed for 12 unique media types addressed in the ODCM and for direct radiation. A total of 1167 samples of 1175 scheduled were obtained. Of the scheduled samples, 99.0% were collected and analyzed for the program. Sampling deviations are summarized in Table B-1. Discussions of the reasons for the deviations are provided in Table B-1a for the air samples and Table B-1b for other environmental media.

B.4 Analytical Deviations

There were no analytical deviations in 2011.

B.5 Special Reports

No special reports were required under the REMP.

TABLE B-1

Summary of Sampling Deviations - 2011

MEDIA	TOTAL SCHEDULED SAMPLES	NUMBER OF DEVIATIONS*	SAMPLING EFFICIENCY %	NUMBER OF ANALYSES**	REASON FOR DEVIATION
MEDIA					
PARTICULATES IN AIR	424	1	99.8%	455	See Table B-1a
CHARCOAL FILTER	424	1	99.8%	423	See Table B-1a
TLD	164	0	100%	328	
HUDSON RIVER WATER	24	0	100%	32	See Table B-1b
DRINKING WATER	24	0	100%	56	N/A
SHORELINE SOIL	10	1	90%	18	See Table B-1b
BROAD LEAF VEGETATION	54	0	100%	54	N/A
FISH & INVERTEBRATES	24	1	96%	69	See Table B-1b
AQUATIC VEGETATION	6	4	33%	2	See Table B-1b
HUDSON RIVER BOTTOM SEDIMENT	8	0	100%	8	N/A
SOIL	3	0	100%	3	N/A
PRECIPITATION	8	0	100%	16	N/A
GROUNDWATER SAMPLES	2	0	100%	8	N/A
TOTALS	1175	8	99.3%	1472	

TOTAL NUMBER OF SAMPLES COLLECTED = 1167

* Samples not collected or unable to be analyzed.

** Several sample types require more than one analysis

TABLES B-1a / B-1b

TABLE B-1a

2011 Air Sampling Deviations

STATION	WEEK	PROBLEM / ACTIONS TO PREVENT RECURRENCE
Roseton	16	GFCI was trippped; 74 hours lost. The GFCI was reset. CR-IP2-2011-01846
Roseton	20	44 hrs of sample time loss due to GFCI trip. Breaker was reset. CR-IP2-2011-02358 The air sample was moved to a new location.
Roseton	31	64.8 hours of sample lost; GFCI was tripped. The GFCI was reset and the air sampler was left running. CR-IP2-2011-03818
NYU tower	31	64 hours of sample lost; power was de-energilzed. Restored power. CR-IP2-2011-03817
Training Building	42	Technician discarded both air and charcoal filters. Small hole (size of a pen tip) found in air filter; CR-IP2-2011-05511. Technician instructed to consult supervision prior to discarding samples.
Croton Point	44	8.2 hours of sample time lost due to loss of power. CR-IP2-2011-05485
Peekskill	44	25 hours of sample time lost due to loss of power. CR-IP2-2011-05491
		Note: all but the one air particulate filter and one charcoal cartridge were analyzed

TABLE B-1b

2011 Other Media Deviations

STATION	Week	PROBLEM / ACTIONS TO PREVENT RECURRENCE
Hudson River Discharge	15	Composite sample container found empty; appeared to result from the failure of the hose on the peristaltic pump. Grab sample was taken. Hose repaired. CR-IP3-2011-02260
Cole Spring, Lents Cove, Verplank	25	The attempt to collection aquatic vegetation this spring was unsuccessful. There was no vegetation to be found at all the locations. CR-IP2-2011-03007
Roseton	20-26	Eel sample not availlable at this location (typically a seasonal species)
Cole Spring, Lents Cove, Discharge Canal, Verplank	39	Hurricane Irene resulted in flooding conditions in the river causing it to be unsafe to take. out the boat. The bottom sediment and aquatic vegetation samples were collected when conditions improved. CR-IP2-2011-04591
Lents Cove	42	Aquatic vegetation not avaiable at this location
Lents Cove	39-52	Only sediments accessible from the shore were obtained during week 39.
		Note: The only samples not obtained were the 1st half of 2011 blue crab sample at Roseton, the Week 25 aquatic vegetation and the Lents Cove aquatic vegetation and shoreline sediment samples.

TABLE B-2
ODCM ANNUAL SUMMARY - 2011

MEDIUM (UNITS) SEE TABLE	TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LLD (b)	INDICATOR LOCATIONS: MEAN (a) RANGE	LOCATION OF HIGHEST ANNUAL MEAN: LOCATIONS AND DESIGNATION MEAN (a) RANGE	CONTROL LOCATION: MEAN (a) RANGE	NUMBER OF NON-ROUTINE REPORTS
DIRECT RADIATION (mR / standard quarter) B-3	TLD Reads 164	N/A	*13.9 (160/160) / 9.7 - 20.1*	#81 Palisades Parkway (Lake Welch Exit - DR28) 4.96 Mi (WSW) at 310° 19.4 *(4/4) / 18.6 - 20.1*	*13.4 (4/4) / 12.7 - 13.9*	0
AIR PARTICULATES AND RADIOIODINE (pCi/m^3) B-6, B-7, B-8	GB (423)	0.01	*0.014 (370/370) / 0.001 - 0.027*	#4 Algonquin Gas Line 0.28 Mi (SW) at 234° 0.0138 (53/53) / 0.003-0.027	*0.0135 (53/53) / 0.004-0.024*	0
	I-131 (423)	0.07	<Lc	<Lc	<Lc	0
	GSA (32) Cs-134	0.05	<Lc	<Lc	<Lc	0
	GSA (32) Cs-137	0.06	<Lc	<Lc	<Lc	0
SURFACE HUDSON RIVER WATER (pCi/L) B-9, B-10	H-3 (8)	3000 (c)	*661 (1/4) / <L_c - 661*	#10 Discharge Canal 0.3 Mi (WSW) at 249° 661 (1/4) / <Lc - 661	<Lc	0
	GSA (24)					
	Mn-54	15	<Lc	<Lc	<Lc	0
	Co-58	15	<Lc	<Lc	<Lc	0
	Fe-59	30	<Lc	<Lc	<Lc	0
	Co-60	15	<Lc	<Lc	<Lc	0
	Zn-65	30	<Lc	<Lc	<Lc	0
	Zr/Nb-95	15	<Lc	<Lc	<Lc	0
	I-131	15	<Lc	<Lc	<Lc	0
	Cs-134	15	<Lc	<Lc	<Lc	0
	Cs-137	18	<Lc	<Lc	<Lc	0
	Ba/La-140	15	<Lc	<Lc	<Lc	0

(a) Positive values above L_c; Groundwater above MDC

(b) Required *a priori* LLD; see Table A-2

(c) Not a drinking water pathway; the required LLD is 3000 pCi/L

TABLE B-2
ODCM ANNUAL SUMMARY - 2011

MEDIUM (UNITS) SEE TABLE	TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LLD (b)	INDICATOR LOCATIONS: MEAN (a) RANGE	LOCATION OF HIGHEST ANNUAL MEAN: LOCATIONS AND DESIGNATION MEAN (a) RANGE	CONTROL LOCATION: MEAN (a) RANGE	NUMBER OF NON-ROUTINE REPORTS
DRINKING WATER (pCi/L) B-11, B-12	H-3 (8)	2000	<Lc	<Lc	N/A	0
	GSA (24)					
	Mn-54	15	<Lc	<Lc	N/A	0
	Co-58	15	<Lc	<Lc	N/A	0
	Fe-59	30	<Lc	<Lc	N/A	0
	Co-60	15	<Lc	<Lc	N/A	0
	Zn-65	30	<Lc	<Lc	N/A	0
	Zr/Nb-95	15	<Lc	<Lc	N/A	0
	I-131	15	<Lc	<Lc	N/A	0
	Cs-134	15	<Lc	<Lc	N/A	0
	Cs-137	18	<Lc	<Lc	N/A	0
	Ba/La-140	15	<Lc	<Lc	N/A	0
HUDSON RIVER SHORELINE SOIL (pCi/kg - dry) B-13	GSA (9)					
	Cs-134	150	<Lc	<Lc	<Lc	0
	Cs-137	180	*108 (2/7) / <L_c - 112*	#17 Off Verplanck 1.5 Mi (SSW) at 202.5° *108 (2/2) / 104 - 112*	<Lc	0
	Sr-90 (10)	5000	<Lc	<Lc	<Lc	0

(a) Positive values above L_c; Groundwater above MDC

(b) Required *a priori* LLD; see Table A-2

(c) Not a drinking water pathway; the required LLD is 3000 pCi/L

TABLE B-2
ODCM ANNUAL SUMMARY - 2011

MEDIUM (UNITS) SEE TABLE	TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LLD (b)	INDICATOR LOCATIONS: MEAN (a) RANGE	LOCATION OF HIGHEST ANNUAL MEAN: LOCATIONS AND DESIGNATION MEAN (a) RANGE	CONTROL LOCATION: MEAN (a) RANGE	NUMBER OF NON-ROUTINE REPORTS
BROADLEAF VEGETATION (pCi/kg - wet) B-14	GSA (54)					
	I-131	60	<Lc	<Lc	<Lc	0
	Co-60	N/A	<Lc	<Lc	<Lc	0
	Cs-134	60	<Lc	<Lc	<Lc	0
	Cs-137	80	<Lc	<Lc	<Lc	0
FISH AND INVERTEBRATES (pCi/kg - wet) B-15	GSA (23)					
	Mn-54	130	<Lc	<Lc	<Lc	0
	Co-58	130	<Lc	<Lc	<Lc	0
	Fe-59	260	<Lc	<Lc	<Lc	0
	Co-60	130	<Lc	<Lc	<Lc	0
	Zn-65	260	<Lc	<Lc	<Lc	0
	Cs-134	130	<Lc	<Lc	<Lc	0
	Cs-137	150	<Lc	<Lc	<Lc	0
	Ni-63 (24)	100	<Lc	<Lc	<Lc	0
	Sr-90 (24)	5	<Lc	<Lc	<Lc	0
AQUATIC VEGETATION (pCi/kg - WET) B-16	GSA(2)					
	Co-60	NONE	<Lc	<Lc	<Lc	0
	I-131	NONE	<Lc	<Lc	<Lc	0
	Cs-134	NONE	<Lc	<Lc	<Lc	0
Cs-137	NONE	<Lc	<Lc	<Lc	<Lc	0

(a) Positive values above L_c; Groundwater above MDC

(b) Required *a priori* LLD; see Table A-2

(c) Not a drinking water pathway; the required LLD is 3000 pCi/L

TABLE B-2
ODCM ANNUAL SUMMARY - 2011

MEDIUM (UNITS) SEE TABLE	TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LLD (b)	INDICATOR LOCATIONS: MEAN (a) RANGE	LOCATION OF HIGHEST ANNUAL MEAN: LOCATIONS AND DESIGNATION MEAN (a) RANGE	CONTROL LOCATION: MEAN (a) RANGE	NUMBER OF NON-ROUTINE REPORTS
BOTTOM SEDIMENT (pCi/kg - DRY) B-17	GSA(8)					
	Co-60	NONE	<Lc	<Lc	<Lc	0
	Cs-134	150	<Lc	<Lc	<Lc	0
	Cs-137	180	*321 (6/6) / 97 - 437*	#17 Off Verplanck 1.5 Mi (SSW) at 202.5° *366 (2/2) / 325 - 406*	#84 Cold Spring 10.88 Mi (N) at 356° 238 *(1/2) / <L_c - 238*	0
PRECIPITATION (pCi/L) B-18	GSA(8)					
	H-3 (8)	3000 (c)	<Lc	<Lc	<Lc	0
	Co-60	15	<Lc	<Lc	<Lc	0
	Cs-134	15	<Lc	<Lc	<Lc	0
	Cs-137	18	<Lc	<Lc	<Lc	0
SOIL (pCi/kg - DRY) B-19	GSA(3)					
	Co-60	NONE	<Lc	<Lc	<Lc	0
	Cs-134	150	<Lc	<Lc	<Lc	0
	Cs-137	180	<Lc	<Lc	<Lc	0
GROUNDWATER (pCi/L) B-20	GSA(2)					
	H-3 (2)	3000 (c)	<Lc	<Lc	N/A	0
	Co-60	15	<Lc	<Lc	N/A	0
	Ni-63 (2)	30	<Lc	<Lc	N/A	0
	Cs-137	18	<Lc	<Lc	N/A	0
	Sr-90 (2)	1	<Lc	<Lc	N/A	0

(a) Positive values above L_c; Groundwater above MDC
(b) Required *a priori* LLD; see Table A-2
(c) Not a drinking water pathway; the required LLD is 3000 pCi/L

TABLE B-3

2011 DIRECT RADIATION, QUARTERLY DATA
(mR per STANDARD QUARTER)

Station ID	Sector	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Mean	Annual Total
DR-01	N	14.50 ± 1.16	13.93 ± 0.82	14.96 ± 0.79	14.93 ± 0.65	14.6	58.3
DR-02	NNE	14.37 ± 1.09	13.51 ± 0.85	14.37 ± 0.65	14.54 ± 0.68	14.2	56.8
DR-03	NE	12.07 ± 1.03	10.35 ± 0.62	11.78 ± 0.59	11.68 ± 0.61	11.5	45.9
DR-04	ENE	13.93 ± 1.23	12.26 ± 0.62	13.54 ± 0.90	13.44 ± 0.88	13.3	53.2
DR-05	ENE	14.51 ± 1.07	12.46 ± 0.74	13.48 ± 0.84	13.33 ± 0.74	13.4	53.8
DR-06	ESE	14.34 ± 1.11	13.02 ± 0.70	14.37 ± 0.77	14.06 ± 0.60	14.0	55.8
DR-07	SE	15.33 ± 1.16	14.51 ± 0.85	16.06 ± 0.69	16.10 ± 1.24	15.5	62.0
DR-08	SSE	12.73 ± 1.25	10.82 ± 0.59	12.10 ± 0.77	11.58 ± 0.57	11.8	47.2
DR-09	S	13.69 ± 1.08	12.02 ± 0.75	13.59 ± 0.91	12.54 ± 0.78	13.0	51.8
DR-10	SSW	14.90 ± 1.23	13.02 ± 0.89	14.57 ± 0.56	13.84 ± 0.71	14.1	56.3
DR-11	SW	11.89 ± 0.96	9.65 ± 0.51	11.19 ± 0.52	10.91 ± 0.80	10.9	43.6
DR-12	WSW	16.05 ± 1.23	14.19 ± 0.83	14.81 ± 0.60	15.43 ± 0.78	15.1	60.5
DR-13	WSW	16.79 ± 1.30	14.82 ± 0.73	16.37 ± 0.86	17.62 ± 0.71	16.4	65.6
DR-14	WNW	13.03 ± 1.08	12.00 ± 0.76	12.63 ± 0.75	13.38 ± 0.81	12.8	51.0
DR-15	NW	13.59 ± 1.42	11.94 ± 0.83	13.09 ± 0.67	13.59 ± 0.70	13.1	52.2
DR-16	NNW	14.22 ± 1.32	13.06 ± 0.67	14.20 ± 0.64	14.85 ± 0.83	14.1	56.3
DR-17	N	14.83 ± 1.10	13.38 ± 0.71	14.27 ± 0.66	14.86 ± 0.78	14.3	57.3
DR-18	NNE	14.18 ± 1.15	13.12 ± 0.75	14.80 ± 0.60	14.39 ± 1.24	14.1	56.5
DR-19	NE	15.42 ± 1.19	14.52 ± 0.80	14.88 ± 0.77	14.76 ± 0.86	14.9	59.6
DR-20	ENE	13.67 ± 1.13	13.18 ± 0.78	14.09 ± 0.70	14.20 ± 0.93	13.8	55.1
DR-21	E	14.22 ± 1.09	12.95 ± 0.71	13.11 ± 0.91	14.02 ± 1.38	13.6	54.3
DR-22	ESE	11.90 ± 1.10	11.33 ± 0.59	10.98 ± 0.79	11.02 ± 0.54	11.3	45.2
DR-23	SE	14.02 ± 1.03	13.92 ± 0.81	14.20 ± 0.84	13.77 ± 0.72	14.0	55.9
DR-24	SSE	14.90 ± 1.22	14.45 ± 0.91	14.63 ± 0.67	14.82 ± 0.79	14.7	58.8
DR-25	S	13.07 ± 1.15	12.24 ± 0.75	11.97 ± 0.54	13.18 ± 1.84	12.6	50.5
DR-26	SSW	14.89 ± 1.16	14.18 ± 0.87	13.99 ± 0.96	14.34 ± 0.78	14.4	57.4
DR-27	SW	14.17 ± 1.19	13.38 ± 0.74	12.74 ± 0.82	14.59 ± 0.76	13.7	54.9
DR-28	NW	18.56 ± 1.36	19.48 ± 1.23	19.36 ± 1.02	20.06 ± 0.86	19.4	77.5
DR-29	W	13.84 ± 1.16	14.46 ± 0.86	14.02 ± 0.73	14.47 ± 0.86	14.2	56.8
DR-30	SNS	14.32 ± 1.20	14.17 ± 0.71	18.07 ± 0.98	15.31 ± 1.11	15.5	61.9
DR-31	WSW	16.26 ± 1.25	16.82 ± 1.00	16.12 ± 0.70	17.21 ± 0.91	16.6	66.4
DR-32	NNW	13.67 ± 1.40	13.35 ± 1.04	12.96 ± 0.52	13.33 ± 0.61	13.3	53.3
DR-33	NE	14.51 ± 1.35	13.00 ± 0.65	14.06 ± 0.59	13.21 ± 0.77	13.7	54.8
DR-34	SE	13.18 ± 1.20	12.64 ± 0.76	12.63 ± 0.56	12.93 ± 0.55	12.8	51.4
DR-35	NNE	13.18 ± 1.25	12.73 ± 0.78	12.61 ± 0.75	12.80 ± 0.85	12.8	51.3
DR-36	NE	15.93 ± 1.26	14.65 ± 0.87	15.22 ± 0.89	14.38 ± 0.73	15.0	60.2
DR-37	SSW	14.12 ± 1.04	13.51 ± 0.80	13.94 ± 0.61	13.68 ± 0.79	13.8	55.2
DR-38	S	12.23 ± 1.05	12.26 ± 0.69	12.74 ± 0.61	11.97 ± 0.64	12.3	49.2
DR-39	SSW	17.10 ± 1.24	14.77 ± 0.75	14.21 ± 0.80	14.87 ± 0.87	15.2	60.9
DR-40**	N	13.25 ± 1.08	12.72 ± 0.76	13.89 ± 0.58	13.78 ± 0.73	13.4	53.6
DR-41	SSE	13.49 ± 1.10	12.27 ± 0.75	12.86 ± 0.76	12.94 ± 0.83	12.9	51.6
AVERAGE (Indicator Locations)		14.3	13.3	14.0	14.1	13.9	55.7

** Control Location

TABLE B-4

DIRECT RADIATION, 2000 THROUGH 2010 DATA

(mR per Year)

Station ID	Mean (2001-2010)	Standard Deviation (2001-2010)	Minimum Value (2001-2010)	Maximum Value (2001-2010)	2011 Mean
DR-01	62.3	2.9	58.4	68.0	58.3
DR-02	58.0	1.9	53.6	60.0	56.8
DR-03	47.7	1.8	44.0	50.0	45.9
DR-04	54.3	3.5	46.8	58.8	53.2
DR-05	54.2	2.3	48.4	56.8	53.8
DR-06	54.2	3.3	46.4	57.6	55.8
DR-07	63.9	3.6	55.6	68.8	62.0
DR-08	50.8	3.2	46.6	56.4	47.2
DR-09	53.3	2.8	47.2	58.0	51.8
DR-10	57.0	2.2	53.2	60.0	56.3
DR-11	44.2	2.0	40.8	47.2	43.6
DR-12	66.1	4.5	60.8	76.0	60.5
DR-13	75.5	4.3	68.0	82.0	65.6
DR-14	53.1	1.9	50.0	56.0	51.0
DR-15	52.7	2.9	46.4	57.6	52.2
DR-16	58.4	2.0	55.2	61.6	56.3
DR-17	59.6	3.1	56.4	66.8	57.3
DR-18	56.6	2.2	52.4	59.1	56.5
DR-19	59.3	2.2	55.2	61.6	59.6
DR-20	53.1	2.8	47.6	58.8	55.1
DR-21	54.6	2.4	50.0	57.6	54.3
DR-22	45.3	2.6	40.4	50.8	45.2
DR-23	55.4	2.6	49.6	58.8	55.9
DR-24	56.6	2.8	49.2	58.8	58.8
DR-25	49.3	2.3	44.8	52.8	50.5
DR-26	55.1	2.4	50.4	58.8	57.4
DR-27	54.2	3.2	46.8	59.2	54.9
DR-28	70.9	8.9	57.2	79.1	77.5
DR-29	60.1	6.1	54.8	73.6	56.8
DR-30	59.7	4.4	52.4	68.0	61.9
DR-31	67.9	3.6	62.0	74.4	66.4
DR-32	52.0	2.9	46.0	57.2	53.3
DR-33	50.1	8.1	34.4	55.2	54.8
DR-34	51.8	4.4	43.2	60.8	51.4
DR-35	54.5	3.2	48.8	60.8	51.3
DR-36	59.2	3.2	52.4	65.6	60.2
DR-37	54.3	2.7	48.8	58.0	55.2
DR-38	51.7	3.3	48.0	58.4	49.2
DR-39	60.8	3.0	55.2	66.0	60.9
DR-40**	62.7	7.4	51.9	75.2	53.6
DR-41	51.0	2.9	44.4	55.2	51.6
Average	56.2		50.3	61.3	55.7

** Control Location

TABLE B-5

2011 DIRECT RADIATION
INNER AND OUTER RINGS
(mR per Year)

Inner Ring ID	Outer Ring ID	Sector	Inner Ring Annual Average	Outer Ring Annual Average
DR-01	DR-17	N	58.3	57.3
DR-02	DR-18	NNE	56.8	56.5
DR-03	DR-19	NE	45.9	59.6
DR-04	DR-20	ENE	53.2	55.1
DR-05	DR-21	E	53.8	54.3
DR-06	DR-22	ESE	55.8	45.2
DR-07	DR-23	SE	62.0	55.9
DR-08	DR-24	SSE	47.2	58.8
DR-09	DR-25	S	51.8	50.5
DR-10	DR-26	SSW	56.3	57.4
DR-11	DR-27	SW	43.6	54.9
DR-12	DR-28	WSW	60.5	77.5
DR-13	DR-29	W	65.6	56.8
DR-14	DR-30	WNW	51.0	61.9
DR-15	DR-31	NW	52.2	66.4
DR-16	DR-32	NNW	56.3	53.3
Average			54.4	57.6

TABLE B-6

IPEC

ENVIRONMENTAL AIRBORNE PARTICULATE SAMPLES - 2011

GROSS BETA ACTIVITY pCi/ m^3 ± 1 Sigma

SAMPLE STATION #

Week Number	Week End Date	4	5	94	95	23**	27	29	44
1	1/4/2011	0.021 ± 0.001	0.024 ± 0.002	0.023 ± 0.001	0.022 ± 0.001	0.024 ± 0.002	0.024 ± 0.002	0.022 ± 0.001	0.020 ± 0.001
2	1/10/2011	0.020 ± 0.002	0.018 ± 0.001	0.020 ± 0.002	0.017 ± 0.001	0.017 ± 0.001	0.021 ± 0.002	0.019 ± 0.001	0.018 ± 0.002
3	1/18/2011	0.007 ± 0.001	0.007 ± 0.001	0.008 ± 0.001	0.008 ± 0.001	0.007 ± 0.001	0.008 ± 0.001	0.008 ± 0.001	0.007 ± 0.001
4	1/24/2011	0.011 ± 0.001	0.014 ± 0.001	0.014 ± 0.001	0.013 ± 0.001	0.015 ± 0.002	0.015 ± 0.001	0.017 ± 0.001	0.014 ± 0.002
5	1/31/2011	0.016 ± 0.001	0.017 ± 0.001	0.017 ± 0.001	0.017 ± 0.001	0.016 ± 0.001	0.015 ± 0.001	0.017 ± 0.001	0.015 ± 0.001
6	2/7/2011	0.011 ± 0.001	0.012 ± 0.001	0.013 ± 0.001	0.015 ± 0.001	0.015 ± 0.001	0.014 ± 0.001	0.015 ± 0.001	0.015 ± 0.001
7	2/14/2011	0.015 ± 0.001	0.014 ± 0.001	0.010 ± 0.002	0.015 ± 0.001	0.015 ± 0.001	0.015 ± 0.001	0.016 ± 0.001	0.014 ± 0.001
8	2/22/2011	0.012 ± 0.001	0.012 ± 0.001	0.014 ± 0.001	0.014 ± 0.001	0.012 ± 0.001	0.012 ± 0.001	0.012 ± 0.001	0.014 ± 0.001
9	2/28/2011	0.010 ± 0.001	0.010 ± 0.001	0.011 ± 0.001	0.012 ± 0.001	0.010 ± 0.001	0.011 ± 0.001	0.013 ± 0.001	0.010 ± 0.001
10	3/6/2011	0.018 ± 0.001	0.018 ± 0.001	0.016 ± 0.001	0.018 ± 0.001	0.015 ± 0.001	0.016 ± 0.001	0.015 ± 0.001	0.015 ± 0.001
11	3/13/2011	0.011 ± 0.001	0.006 ± 0.001	0.010 ± 0.001	0.008 ± 0.001	0.010 ± 0.001	0.008 ± 0.001	0.009 ± 0.001	0.008 ± 0.001
12	3/20/2011	0.007 ± 0.001	0.010 ± 0.001	0.009 ± 0.001	0.007 ± 0.001	0.008 ± 0.001	0.009 ± 0.001	0.010 ± 0.001	0.009 ± 0.001
13	3/27/2011	0.020 ± 0.001	0.018 ± 0.001	0.023 ± 0.001	0.020 ± 0.001	0.020 ± 0.001	0.020 ± 0.001	0.020 ± 0.001	0.019 ± 0.001
14	4/3/2011	0.027 ± 0.002	0.025 ± 0.002	0.027 ± 0.001	0.024 ± 0.001	0.024 ± 0.002	0.026 ± 0.002	0.025 ± 0.001	0.026 ± 0.002
15	4/11/2011	0.023 ± 0.001	0.022 ± 0.001	0.023 ± 0.001	0.023 ± 0.001	0.022 ± 0.001	0.021 ± 0.001	0.022 ± 0.001	0.022 ± 0.001
16	4/18/2011	0.011 ± 0.001	0.011 ± 0.001	0.012 ± 0.001	0.010 ± 0.001	0.011 ± 0.002	0.013 ± 0.001	0.014 ± 0.001	0.014 ± 0.001
17	4/25/2011	0.014 ± 0.001	0.010 ± 0.001	0.011 ± 0.001	0.012 ± 0.001	0.010 ± 0.001	0.011 ± 0.001	0.010 ± 0.001	0.010 ± 0.001
18	5/2/2011	0.006 ± 0.001	0.005 ± 0.001	0.007 ± 0.001	0.005 ± 0.001	0.006 ± 0.001	0.005 ± 0.001	0.006 ± 0.001	0.004 ± 0.001
19	5/9/2011	0.007 ± 0.001	0.010 ± 0.001	0.009 ± 0.001	0.008 ± 0.001	0.011 ± 0.001	0.008 ± 0.001	0.008 ± 0.001	0.006 ± 0.001
20	5/16/2011	0.003 ± 0.001	0.005 ± 0.001	0.004 ± 0.001	0.005 ± 0.001	0.004 ± 0.001	0.004 ± 0.001	0.004 ± 0.001	0.006 ± 0.001
21	5/23/2011	0.005 ± 0.001	0.005 ± 0.001	0.004 ± 0.001	0.004 ± 0.001	0.005 ± 0.001	0.005 ± 0.001	0.005 ± 0.001	0.004 ± 0.001
22	5/31/2011	0.017 ± 0.002	0.017 ± 0.002	0.016 ± 0.001	0.014 ± 0.001	0.014 ± 0.001	0.015 ± 0.001	0.015 ± 0.001	0.016 ± 0.002
23	6/6/2011	0.012 ± 0.001	0.013 ± 0.001	0.011 ± 0.001	0.013 ± 0.001	0.014 ± 0.001	0.014 ± 0.001	0.013 ± 0.001	0.012 ± 0.001
24	6/13/2011	0.016 ± 0.001	0.013 ± 0.001	0.016 ± 0.001	0.015 ± 0.001	0.016 ± 0.001	0.017 ± 0.001	0.014 ± 0.001	0.013 ± 0.001
25	6/20/2011	0.009 ± 0.001	0.008 ± 0.001	0.008 ± 0.001	0.009 ± 0.001	0.008 ± 0.001	0.008 ± 0.001	0.010 ± 0.001	0.010 ± 0.001
26	6/27/2011	0.007 ± 0.001	0.007 ± 0.001	0.006 ± 0.001	0.005 ± 0.001	0.008 ± 0.001	0.005 ± 0.001	0.009 ± 0.001	0.006 ± 0.001

** Control sample location

TABLE B-6

IPEC

ENVIRONMENTAL AIRBORNE PARTICULATE SAMPLES - 2011

GROSS BETA ACTIVITY pCi/ m^3 ± 1 Sigma

SAMPLE STATION #

Week Number	Week End Date	4	5	94	95	23**	27	29	44
27	7/5/2011	0.010 ± 0.001	0.009 ± 0.001	0.011 ± 0.001	0.009 ± 0.001	0.011 ± 0.001	0.011 ± 0.001	0.011 ± 0.001	0.011 ± 0.001
28	7/11/2011	0.015 ± 0.001	0.016 ± 0.001	0.012 ± 0.001	0.016 ± 0.001	0.015 ± 0.001	0.016 ± 0.001	0.016 ± 0.001	0.016 ± 0.002
29	7/18/2011	0.016 ± 0.001	0.014 ± 0.001	0.015 ± 0.001	0.015 ± 0.001	0.012 ± 0.001	0.013 ± 0.001	0.015 ± 0.001	0.014 ± 0.001
30	7/25/2011	0.023 ± 0.002	0.023 ± 0.002	0.023 ± 0.001	0.021 ± 0.001	0.018 ± 0.001	0.022 ± 0.002	0.021 ± 0.001	0.022 ± 0.002
31	8/1/2011	0.011 ± 0.001	0.008 ± 0.001	0.010 ± 0.001	0.010 ± 0.001	0.010 ± 0.002	0.012 ± 0.001	0.011 ± 0.001	0.011 ± 0.001
32	8/8/2011	0.012 ± 0.001	0.012 ± 0.001	0.012 ± 0.001	0.014 ± 0.001	0.014 ± 0.001	0.016 ± 0.001	0.011 ± 0.001	0.011 ± 0.001
33	8/15/2011	0.010 ± 0.001	0.014 ± 0.001	0.011 ± 0.001	0.012 ± 0.001	0.010 ± 0.001	0.011 ± 0.001	0.011 ± 0.001	0.010 ± 0.001
34	8/22/2011	0.013 ± 0.001	0.014 ± 0.001	0.013 ± 0.001	0.012 ± 0.001	0.015 ± 0.001	0.014 ± 0.001	0.014 ± 0.001	0.012 ± 0.001
35	8/29/2011	0.012 ± 0.001	0.014 ± 0.001	0.012 ± 0.001	0.012 ± 0.001	0.011 ± 0.001	0.011 ± 0.001	0.011 ± 0.001	0.013 ± 0.001
36	9/6/2011	0.016 ± 0.001	0.016 ± 0.001	0.017 ± 0.001	0.019 ± 0.001	0.016 ± 0.001	0.015 ± 0.001	0.015 ± 0.001	0.016 ± 0.001
37	9/13/2011	0.009 ± 0.001	0.008 ± 0.001	0.008 ± 0.001	0.009 ± 0.001	0.011 ± 0.001	0.007 ± 0.001	0.008 ± 0.001	0.009 ± 0.001
38	9/19/2011	0.015 ± 0.001	0.013 ± 0.001	0.015 ± 0.001	0.015 ± 0.001	0.016 ± 0.001	0.018 ± 0.002	0.017 ± 0.001	0.013 ± 0.001
39	9/26/2011	0.008 ± 0.001	0.004 ± 0.001	0.006 ± 0.001	0.005 ± 0.001	0.009 ± 0.001	0.004 ± 0.001	0.008 ± 0.001	0.008 ± 0.001
40	10/3/2011	0.012 ± 0.001	0.012 ± 0.001	0.011 ± 0.001	0.009 ± 0.001	0.012 ± 0.001	0.012 ± 0.001	0.011 ± 0.001	0.010 ± 0.001
41	10/11/2011	0.022 ± 0.001	0.016 ± 0.001	0.020 ± 0.001	0.021 ± 0.001	0.020 ± 0.001	0.020 ± 0.001	0.019 ± 0.001	0.022 ± 0.001
42	10/17/2011	0.017 ± 0.001	0.012 ± 0.001	no data	0.015 ± 0.001	0.015 ± 0.001	0.014 ± 0.001	0.014 ± 0.001	0.012 ± 0.001
43	10/24/2011*	0.012 ± 0.001	0.011 ± 0.001	0.011 ± 0.001	0.011 ± 0.001	0.012 ± 0.001	0.010 ± 0.001	0.007 ± 0.001	0.014 ± 0.001
44	10/31/2011	0.012 ± 0.002	0.011 ± 0.002	0.011 ± 0.002	0.011 ± 0.001	0.012 ± 0.001	0.011 ± 0.002	0.012 ± 0.001	0.010 ± 0.001
45	11/7/2011	0.016 ± 0.001	0.014 ± 0.001	0.014 ± 0.001	0.014 ± 0.001	0.012 ± 0.001	0.014 ± 0.001	0.013 ± 0.001	0.014 ± 0.001
46	11/14/2011	0.023 ± 0.002	0.025 ± 0.002	0.024 ± 0.001	0.024 ± 0.001	0.023 ± 0.002	0.024 ± 0.002	0.025 ± 0.001	0.021 ± 0.002
47	11/21/2011	0.015 ± 0.001	0.018 ± 0.001	0.017 ± 0.001	0.017 ± 0.001	0.017 ± 0.001	0.021 ± 0.002	0.016 ± 0.001	0.019 ± 0.002
48	11/28/2011	0.018 ± 0.001	0.014 ± 0.001	0.014 ± 0.001	0.016 ± 0.001	0.016 ± 0.001	0.016 ± 0.001	0.015 ± 0.001	0.015 ± 0.001
49	12/5/2011	0.012 ± 0.001	0.011 ± 0.001	0.012 ± 0.001	0.012 ± 0.001	0.012 ± 0.001	0.011 ± 0.001	0.012 ± 0.001	0.010 ± 0.001
50	12/12/2011	0.015 ± 0.001	0.013 ± 0.001	0.017 ± 0.001	0.014 ± 0.001	0.016 ± 0.001	0.014 ± 0.001	0.012 ± 0.001	0.011 ± 0.001
51	12/19/2011	0.026 ± 0.002	0.024 ± 0.002	0.022 ± 0.001	0.021 ± 0.001	0.024 ± 0.002	0.022 ± 0.002	0.021 ± 0.001	0.023 ± 0.002
52	12/27/2011	0.014 ± 0.001	0.015 ± 0.001	0.014 ± 0.001	0.014 ± 0.001	0.014 ± 0.001	0.016 ± 0.001	0.012 ± 0.001	0.013 ± 0.001
53	1/3/2012	0.012 ± 0.001	0.014 ± 0.001	0.013 ± 0.001	0.013 ± 0.001	0.012 ± 0.001	0.012 ± 0.001	0.012 ± 0.001	0.014 ± 0.001

* locations 4,5,27,94 & 95 were changed out on 10/26 (9 day samples for this week and 5 day samples the following week)

** Control sample location

TABLE B-7
CONCENTRATIONS OF GAMMA EMITTERS IN QUARTERLY COMPOSITES
OF SITE AIR PARTICULATE SAMPLES - 2011
Results in Units of 10E-3 pCi/ m^3 ± 1 Sigma

SAMPLE LOCATIONS - 1ST QTR 2011

Nuclide	Algonquin Sta #4	NYU Tower #5	Croton Point #27	Training Bldg #94	Met Tower #95	Roseton** #23	Grassy Point #29	Peekskill #44
Be-7	94.2 +/- 12.0	104.3 +/- 12.3	112.1 +/- 12.5	100.2 +/- 12.5	104.8 +/- 11.3	134.3 +/- 13.3	90.0 +/- 9.7	97.8 +/- 12.4
Cs-134	< 0.9	< 0.7	< 0.5	< 0.8	< 0.6	< 0.7	< 0.3	< 0.9
Cs-137	< 0.5	< 0.5	< 0.5	< 0.5	< 0.7	< 0.6	< 0.4	< 0.3
Zr-95	< 1.2	< 1.6	< 1.2	< 1.9	< 1.4	< 0.7	< 0.8	< 1.7
Nb-95	< 1.3	< 1.1	< 0.6	< 1.7	< 0.8	< 0.6	< 0.8	< 0.9
Co-58	< 0.6	< 0.6	< 0.7	< 1.2	< 1.0	< 0.4	< 0.6	< 0.4
Mn-54	< 0.4	< 0.6	< 0.7	< 0.5	< 0.6	< 0.8	< 0.3	< 0.7
Zn-65	< 1.6	< 1.1	< 0.8	< 2.0	< 1.2	< 1.3	< 1.6	< 1.0
Co-60	< 0.4	< 0.4	< 0.6	< 0.6	< 0.7	< 0.5	< 0.3	< 0.6
K-40	< 7.4	< 7.7	< 3.8	< 5.8	< 5.0	< 4.3	< 4.2	< 6.7

** Control Sample Location

SAMPLE LOCATIONS - 2ND QTR 2011

Nuclide	Algonquin Sta #4	NYU Tower #5	Croton Point #27	Training Bldg #94	Met Tower #95	Roseton** #23	Grassy Point #29	Peekskill #44
Be-7	102.2 +/- 12.3	82.3 +/- 11.9	118.7 +/- 13.0	93.3 +/- 11.7	104.9 +/- 12.1	88.7 +/- 12.7	94.6 +/- 10.2	94.5 +/- 12.7
Cs-134	< 0.7	< 1.1	< 0.9	< 0.8	< 0.7	< 0.9	< 0.6	< 0.6
Cs-137	< 0.6	< 0.5	< 0.6	< 0.5	< 0.4	< 0.5	< 0.3	< 0.5
Zr-95	< 1.9	< 1.4	< 1.2	< 1.0	< 0.6	< 1.1	< 0.7	< 1.5
Nb-95	< 1.5	< 1.6	< 1.9	< 0.9	< 0.6	< 2.3	< 0.6	< 1.1
Co-58	< 0.9	< 0.8	< 0.8	< 0.6	< 1.0	< 1.0	< 0.6	< 0.9
Mn-54	< 0.3	< 0.7	< 0.6	< 0.4	< 0.5	< 0.8	< 0.5	< 0.7
Zn-65	< 1.4	< 2.0	< 1.0	< 1.4	< 0.8	< 0.7	< 1.1	< 1.4
Co-60	< 0.8	< 0.8	< 0.4	< 0.3	< 0.5	< 0.6	< 0.3	< 0.5
K-40	< 4.6	42.5 +/- 9.3	< 7.6	< 3.0	< 3.6	< 5.6	< 3.5	< 5.1

** Control Sample Location

TABLE B-7
CONCENTRATIONS OF GAMMA EMITTERS IN QUARTERLY COMPOSITES
OF SITE AIR PARTICULATE SAMPLES - 2011
Results in Units of 10E-3 pCi/ m^3 ± 1 Sigma

SAMPLE LOCATIONS - 3RD QTR 2011

Nuclide	Algonquin Sta #4	NYU Tower #5	Croton Point #27	Training Bldg #94	Met Tower #95	Roseton** #23	Grassy Point #29	Peekskill #44
Be-7	111.7 +/- 13.1	118.7 +/- 12.7	110.9 +/- 12.0	88.5 +/- 10.7	102.5 +/- 12.4	87.9 +/- 12.9	80.6 +/- 10.0	106.5 +/- 13.9
Cs-134	< 1.1	< 0.9	< 0.5	< 0.6	< 0.7	< 0.9	< 0.6	< 0.4
Cs-137	< 0.6	< 0.6	< 0.3	< 0.2	< 0.7	< 0.6	< 0.2	< 0.8
Zr-95	< 2.2	< 1.9	< 1.4	< 1.1	< 1.3	< 1.4	< 1.2	< 1.1
Nb-95	< 1.4	< 1.4	< 1.2	< 1.0	< 1.5	< 1.2	< 1.3	< 0.9
Co-58	< 0.8	< 0.7	< 0.5	< 0.4	< 1.0	< 0.7	< 0.5	< 1.0
Mn-54	< 0.4	< 0.3	< 0.3	< 0.3	< 0.6	< 0.4	< 0.4	< 0.6
Zn-65	< 1.6	< 1.5	< 1.6	< 1.2	< 1.9	< 1.7	< 1.2	< 1.5
Co-60	< 0.6	< 0.7	< 0.5	< 0.6	< 0.9	< 0.6	< 0.6	< 0.5
K-40	< 10.3	< 4.2	< 5.3	< 4.8	< 5.7	< 8.4	< 4.3	< 4.7

** Control Sample Location

SAMPLE LOCATIONS - 4TH QTR 2011

Nuclide	Algonquin Sta #4	NYU Tower #5	Croton Point #27	Training Bldg #94	Met Tower #95	Roseton** #23	Grassy Point #29	Peekskill #44
Be-7	50.9 +/- 9.2	50.1 +/- 5.9	75.4 +/- 7.3	70.6 +/- 6.0	54.3 +/- 6.0	58.6 +/- 7.3	45.7 +/- 6.7	59.8 +/- 5.0
Cs-134	< 2.4	< 1.3	< 1.9	< 1.7	< 1.5	< 2.3	< 1.7	< 1.4
Cs-137	< 1.7	< 1.1	< 1.4	< 1.5	< 1.3	< 1.5	< 1.3	< 1.1
Zr-95	< 2.7	< 2.2	< 2.9	< 2.2	< 1.9	< 3.4	< 2.5	< 1.7
Nb-95	< 2.1	< 1.3	< 2.2	< 1.7	< 1.6	< 1.8	< 1.7	< 1.3
Co-58	< 1.8	< 0.9	< 2.0	< 1.6	< 1.4	< 1.7	< 1.4	< 1.1
Mn-54	< 1.6	< 0.9	< 1.3	< 1.5	< 1.0	< 1.5	< 1.1	< 0.8
Zn-65	< 3.5	< 2.5	< 4.5	< 4.4	< 3.5	< 5.0	< 3.4	< 3.6
Co-60	< 1.9	< 1.3	< 1.3	< 1.8	< 1.4	< 1.5	< 1.4	< 1.1
K-40	< 19.2	< 22.5	< 26.9	< 17.8	< 23.4	< 29.8	< 21.6	< 19.6

** Control Sample Location

TABLE B-8

IPEC

ENVIRONMENTAL CHARCOAL CARTRIDGE SAMPLES - 2011

I-131 ACTIVITY pCi/ m^3 ± 1 Sigma

SAMPLE STATION #

Week Number	Week End Date	4	5	94	95	23**	27	29	44
1	01/04/11	< 0.019	< 0.019	< 0.023	< 0.021	< 0.016	< 0.023	< 0.013	< 0.015
2	01/10/11	< 0.019	< 0.017	< 0.026	< 0.028	< 0.018	< 0.033	< 0.012	< 0.030
3	01/18/11	< 0.020	< 0.019	< 0.022	< 0.019	< 0.017	< 0.020	< 0.013	< 0.019
4	01/24/11	< 0.023	< 0.023	< 0.032	< 0.017	< 0.026	< 0.025	< 0.025	< 0.021
5	01/31/11	< 0.021	< 0.021	< 0.023	< 0.016	< 0.021	< 0.026	< 0.020	< 0.029
6	02/07/11	< 0.019	< 0.016	< 0.010	< 0.019	< 0.017	< 0.014	< 0.014	< 0.016
7	02/14/11	< 0.020	< 0.023	< 0.063	< 0.023	< 0.025	< 0.022	< 0.014	< 0.020
8	02/22/11	< 0.022	< 0.018	< 0.030	< 0.012	< 0.017	< 0.019	< 0.010	< 0.014
9	02/28/11	< 0.022	< 0.024	< 0.020	< 0.021	< 0.027	< 0.027	< 0.011	< 0.028
10	03/06/11	< 0.025	< 0.023	< 0.014	< 0.022	< 0.021	< 0.019	< 0.013	< 0.032
11	03/13/11	< 0.023	< 0.018	< 0.012	< 0.015	< 0.018	< 0.017	< 0.015	< 0.021
12	03/20/11	< 0.018	< 0.016	< 0.018	< 0.023	< 0.020	< 0.031	< 0.016	< 0.018
13	03/27/11	0.057±0.01	0.044±0.01	0.051±0.01	0.039±0.01	0.045±0.01	0.041±0.01	0.059±0.01	0.042±0.01
14	04/03/11	0.065±0.008	0.080±0.009	0.084±0.007	0.076±0.008	0.062±0.008	0.064±0.008	0.064±0.007	0.062±0.008
15	04/11/11	0.047±0.006	0.043±0.006	0.042±0.005	0.051±0.006	0.050±0.007	0.044±0.006	0.041±0.0004	0.044±0.007
16	04/18/11	< 0.026	< 0.023	< 0.019	< 0.019	< 0.035	< 0.021	< 0.012	< 0.034
17	04/25/11	< 0.027	< 0.018	< 0.018	< 0.020	< 0.020	< 0.025	< 0.015	< 0.018
18	05/02/11	< 0.020	< 0.023	< 0.018	< 0.014	< 0.021	< 0.025	< 0.019	< 0.028
19	05/09/11	< 0.027	< 0.021	< 0.019	< 0.023	< 0.027	< 0.019	< 0.017	< 0.032
20	05/16/11	< 0.022	< 0.019	< 0.019	< 0.025	< 0.030	< 0.021	< 0.013	< 0.021
21	05/23/11	< 0.022	< 0.023	< 0.023	< 0.018	< 0.025	< 0.014	< 0.024	< 0.023
22	05/31/11	< 0.020	< 0.029	< 0.016	< 0.017	< 0.021	< 0.021	< 0.016	< 0.019
23	06/06/11	< 0.022	< 0.012	< 0.016	< 0.028	< 0.024	< 0.029	< 0.014	< 0.027
24	06/13/11	< 0.020	< 0.019	< 0.016	< 0.027	< 0.024	< 0.022	< 0.013	< 0.028
25	06/20/11	< 0.025	< 0.025	< 0.014	< 0.030	< 0.022	< 0.011	< 0.014	< 0.023
26	06/27/11	< 0.019	< 0.018	< 0.019	< 0.019	< 0.024	< 0.020	< 0.016	< 0.024

** Control sample location

TABLE B-8

IPEC

ENVIRONMENTAL CHARCOAL CARTRIDGE SAMPLES - 2011

I-131 ACTIVITY pCi/ m^3 ± 1 Sigma

SAMPLE STATION #

Week Number	Week End Date	4	5	94	95	23**	27	29	44
27	07/05/11	< 0.024	< 0.023	< 0.016	< 0.027	< 0.015	< 0.019	< 0.014	< 0.013
28	07/11/11	< 0.021	< 0.033	< 0.018	< 0.028	< 0.022	< 0.021	< 0.015	< 0.024
29	07/18/11	< 0.024	< 0.023	< 0.020	< 0.024	< 0.021	< 0.018	< 0.014	< 0.028
30	07/25/11	< 0.032	< 0.014	< 0.019	< 0.019	< 0.025	< 0.014	< 0.019	< 0.015
31	08/01/11	< 0.025	< 0.031	< 0.018	< 0.019	< 0.036	< 0.016	< 0.017	< 0.027
32	08/08/11	< 0.017	< 0.018	< 0.018	< 0.018	< 0.020	< 0.018	< 0.019	< 0.025
33	08/15/11	< 0.015	< 0.016	< 0.024	< 0.017	< 0.020	< 0.021	< 0.014	< 0.019
34	08/22/11	< 0.025	< 0.019	< 0.022	< 0.019	< 0.026	< 0.004	< 0.017	< 0.025
35	08/29/11	< 0.026	< 0.018	< 0.020	< 0.023	< 0.020	< 0.011	< 0.018	< 0.023
36	09/06/11	< 0.020	< 0.014	< 0.015	< 0.022	< 0.020	< 0.012	< 0.011	< 0.015
37	09/13/11	< 0.023	< 0.022	< 0.013	< 0.020	< 0.020	< 0.014	< 0.018	< 0.025
38	09/19/11	< 0.018	< 0.028	< 0.029	< 0.019	< 0.027	< 0.024	< 0.017	< 0.020
39	09/26/11	< 0.017	< 0.027	< 0.020	< 0.019	< 0.017	< 0.027	< 0.017	< 0.025
40	10/03/11	< 0.024	< 0.018	< 0.020	< 0.020	< 0.025	< 0.026	< 0.019	< 0.028
41	10/11/11	< 0.025	< 0.026	< 0.024	< 0.020	< 0.022	< 0.025	< 0.017	< 0.024
42	10/17/11	< 0.007	< 0.006	***	< 0.006	< 0.010	< 0.006	< 0.008	< 0.011
43	10/24/11 *	< 0.028	< 0.028	< 0.026	< 0.021	< 0.036	< 0.027	< 0.027	< 0.038
44	10/31/11	< 0.030	< 0.030	< 0.027	< 0.044	< 0.035	< 0.031	< 0.026	< 0.043
45	11/07/11	< 0.026	< 0.026	< 0.024	< 0.028	< 0.031	< 0.025	< 0.024	< 0.033
46	11/14/11	< 0.043	< 0.043	< 0.040	< 0.049	< 0.056	< 0.042	< 0.041	< 0.059
47	11/21/11	< 0.040	< 0.040	< 0.037	< 0.022	< 0.025	< 0.040	< 0.018	< 0.026
48	11/28/11	< 0.019	< 0.018	< 0.017	< 0.017	< 0.018	< 0.018	< 0.014	< 0.019
49	12/05/11	< 0.029	< 0.029	< 0.027	< 0.033	< 0.036	< 0.029	< 0.027	< 0.038
50	12/12/11	< 0.020	< 0.020	< 0.018	< 0.020	< 0.022	< 0.019	< 0.017	< 0.024
51	12/19/11	< 0.021	< 0.022	< 0.020	< 0.022	< 0.024	< 0.021	< 0.018	< 0.025
52	12/27/11	< 0.018	< 0.018	< 0.017	< 0.017	< 0.018	< 0.018	< 0.013	< 0.018
53	01/03/12	< 0.020	< 0.019	< 0.018	< 0.020	< 0.022	< 0.019	< 0.016	< 0.024

* locations 4,5,27,94 & 95 were changed out on 10/26 (9 day samples for this week and 5 day samples the following week)

** Control sample location

*** Small puncture on particulate filter, both filter and cartridge discarded by REMP technician

TABLE B-9
CONCENTRATIONS OF GAMMA EMITTERS IN SURFACE WATER SAMPLES – 2011
Results in Units of pCi/liter ± 1 Sigma
#9 PLANT INLET (HUDSON RIVER INTAKE)

Date	1/31/2011	2/28/2011	3/27/2011	4/25/2011	5/31/2011	6/27/2011
NUCLIDE						
I-131	< 4.05	< 3.13	< 3.85	< 3.23	< 3.64	< 2.96
Cs-134	< 0.61	< 0.67	< 0.73	< 0.73	< 0.67	< 0.69
Cs-137	< 0.83	< 0.92	< 1.10	< 0.92	< 0.96	< 0.95
Zr-95	< 1.60	< 1.90	< 2.18	< 1.94	< 1.84	< 1.67
Nb-95	< 1.15	< 1.09	< 1.33	< 1.14	< 1.24	< 1.12
Co-58	< 0.97	< 0.95	< 1.17	< 1.14	< 1.08	< 0.86
Mn-54	< 0.82	< 0.85	< 1.18	< 0.96	< 0.89	< 0.88
Fe-59	< 2.52	< 2.68	< 2.52	< 2.48	< 3.10	< 2.79
Zn-65	< 1.03	< 1.95	< 2.28	< 2.14	< 2.14	< 1.91
Co-60	< 0.84	< 0.81	< 1.08	< 0.92	< 0.99	< 0.94
K-40	51.66 +/- 7.39	36.68 +/- 7.34	114.8 +/- 11.91	35.61 +/- 8.21	45.21 +/- 8.13	< 8.64
Ba/La-140	< 2.50	< 2.14	< 2.73	< 2.12	< 2.43	< 2.03
Date	7/25/2011	8/30/2011	9/26/2011	11/1/2011	11/28/2011	12/27/2011
NUCLIDE						
I-131	< 3.02	< 3.78	< 4.08	< 7.58	< 7.79	< 10.4
Cs-134	< 1.09	< 0.83	< 1.47	< 4.60	< 4.59	< 4.49
Cs-137	< 1.06	< 1.07	< 1.19	< 4.45	< 4.35	< 6.64
Zr-95	< 2.03	< 2.14	< 2.27	< 8.95	< 6.56	< 9.38
Nb-95	< 1.48	< 1.48	< 1.41	< 4.98	< 3.76	< 5.75
Co-58	< 1.11	< 1.27	< 1.38	< 3.47	< 3.88	< 5.54
Mn-54	< 1.02	< 1.16	< 1.29	< 4.77	< 3.26	< 4.53
Fe-59	< 2.95	< 3.33	< 3.44	< 11.3	< 8.20	< 11.3
Zn-65	< 2.22	< 1.60	< 2.68	< 8.49	< 8.25	< 11.1
Co-60	< 1.10	< 1.05	< 1.24	< 4.25	< 4.38	< 5.64
K-40	183.2 +/- 12.94	120.0 +/- 12.63	19.46 +/- 9.87	< 68.90	< 61.8	< 60.3
Ba/La-140	< 2.32	< 3.04	< 3.12	< 9.32	< 5.33	< 9.17

TABLE B-9 (Continued)
CONCENTRATIONS OF GAMMA EMITTERS IN SURFACE WATER SAMPLES – 2011
Results in Units of pCi/liter ± 1 Sigma
#10 DISCHARGE CANAL (MIXING ZONE)

Date	1/31/2011	2/28/2011	3/27/2011	4/25/2011	5/31/2011	6/27/2011
NUCLIDE						
I-131	< 3.92	< 3.40	< 2.68	< 3.73	< 3.48	< 2.92
Cs-134	< 1.08	< 0.85	< 1.17	< 1.39	< 0.77	< 0.83
Cs-137	< 1.10	< 1.04	< 1.03	< 1.07	< 1.11	< 1.17
Zr-95	< 1.77	< 2.08	< 2.05	< 2.12	< 2.22	< 1.82
Nb-95	< 1.20	< 1.27	< 1.28	< 1.63	< 1.54	< 1.25
Co-58	< 1.11	< 1.16	< 1.10	< 1.34	< 1.17	< 1.09
Mn-54	< 0.98	< 1.02	< 0.99	< 1.17	< 1.16	< 1.10
Fe-59	< 3.37	< 3.18	< 2.97	< 3.52	< 3.44	< 2.94
Zn-65	< 2.39	< 2.48	< 2.20	< 1.40	< 2.60	< 2.63
Co-60	< 0.86	< 0.98	< 1.11	< 1.00	< 1.15	< 1.13
K-40	122.4 +/- 10.77	119.5 +/- 12.16	202.3 +/- 13.17	131.2 +/- 12.81	75.98 +/- 10.99	131.9 +/- 11.99
Ba/La-140	< 2.57	< 2.53	< 2.09	< 2.62	< 2.69	< 2.92
Date	7/25/2011	8/30/2011	9/26/2011	11/1/2011	11/28/2011	12/27/2011
NUCLIDE						
I-131	< 2.79	< 4.34	< 3.40	< 8.81	< 13.3	< 8.60
Cs-134	< 0.70	< 1.39	< 0.87	< 5.43	< 6.32	< 5.12
Cs-137	< 0.93	< 1.15	< 1.12	< 5.65	< 6.69	< 4.66
Zr-95	< 1.72	< 2.43	< 2.26	< 9.95	< 15.4	< 8.76
Nb-95	< 1.25	< 1.49	< 1.51	< 6.23	< 6.81	< 5.05
Co-58	< 0.98	< 1.25	< 1.14	< 3.92	< 7.09	< 5.51
Mn-54	< 0.90	< 1.24	< 1.10	< 5.65	< 6.84	< 4.31
Fe-59	< 2.67	< 4.29	< 3.17	< 10.8	< 14.4	< 9.45
Zn-65	< 1.13	< 2.50	< 1.38	< 12.0	< 10.2	< 8.82
Co-60	< 0.84	< 1.12	< 1.03	< 4.67	< 6.09	< 4.70
K-40	40.59 +/- 8.03	79.5 +/- 12.38	144.2 +/- 12.97	< 46.7	< 60.1	< 84.2
Ba/La-140	< 1.70	< 3.47	< 2.23	< 8.40	< 10.0	< 9.10

TABLE B-10
CONCENTRATIONS OF TRITIUM IN SURFACE WATER SAMPLES – 2011
(QUARTERLY COMPOSITE SAMPLES)

Results in Units of pCi/l ± 1 Sigma

STATION CODE	PERIOD	DATE		TRITIUM
		Start	End	
PLANT INTAKE (HUDSON RIVER) (09, INLET) **	First Quarter	12/28/10	03/27/11	<417
	Second Quarter	03/27/11	06/27/11	< 424
	Third Quarter	06/27/11	09/26/11	< 412
	Fourth Quarter	09/26/11	01/00/00	< 190
DISCHARGE CANAL (10, MIXING ZONE)	First Quarter	12/28/10	03/27/11	661 +/- 92
	Second Quarter	03/27/11	06/27/11	< 424
	Third Quarter	06/27/11	09/26/11	< 412
	Fourth Quarter	09/26/11	01/00/00	< 182

** Control Sample location

TABLE B-11
CONCENTRATIONS OF GAMMA EMITTERS IN SURFACE WATER SAMPLES – 2011
Results in Units of pCi/liter ± 1 Sigma
CAMP FIELD RESERVOIR

Date	1/19/2011	2/14/2011	3/13/2011	4/11/2011	5/16/2011	6/20/2011
NUCLIDE						
I-131	< 4.22	< 2.44	< 2.31	< 2.31	< 2.10	< 4.03
Cs-134	< 2.05	< 2.38	< 2.30	< 1.44	< 2.02	< 1.94
Cs-137	< 3.23	< 1.95	< 1.90	< 2.08	< 2.43	< 3.44
Zr-95	< 4.83	< 2.91	< 3.93	< 2.63	< 3.39	< 5.54
Nb-95	< 3.46	< 2.22	< 2.53	< 1.91	< 2.03	< 3.16
Co-58	< 2.94	< 2.21	< 2.25	< 1.79	< 1.92	< 3.02
Mn-54	< 3.26	< 1.97	< 1.79	< 1.75	< 1.76	< 2.86
Fe-59	< 9.55	< 5.02	< 5.74	< 4.38	< 5.39	< 9.15
Zn-65	< 9.84	< 5.29	< 4.89	< 4.91	< 4.01	< 8.42
Co-60	< 4.10	< 2.02	< 2.37	< 1.56	< 2.16	< 3.35
K-40	290.6 +/- 44.90	162.7 +/- 24.10	88.56 +/- 22.31	< 17.84	179.5 +/- 26.11	292.3 +/- 42.31
Ba/La-140	< 4.74	< 2.89	< 3.11	< 1.93	< 3.08	< 3.76
Gross Beta	1.97 +/- 0.53	2.58 +/- 0.60	2.70 +/- 0.90	1.14 +/- 0.20	1.58 +/- 0.50	1.74 +/- 0.40
Date	7/11/2011	8/8/2011	9/26/2011	10/18/2011	11/15/2011	12/21/2011
NUCLIDE						
I-131	< 3.01	< 2.32	< 3.55	< 13.6	< 6.29	< 8.01
Cs-134	< 2.01	< 1.06	< 2.03	< 5.89	< 5.91	< 3.93
Cs-137	< 1.88	< 2.20	< 2.92	< 5.99	< 6.43	< 4.37
Zr-95	< 4.47	< 2.97	< 3.48	< 9.60	< 9.29	< 8.07
Nb-95	< 2.82	< 1.26	< 2.49	< 7.23	< 6.46	< 6.17
Co-58	< 2.25	< 1.68	< 2.45	< 5.66	< 5.71	< 4.46
Mn-54	< 2.58	< 1.87	< 2.25	< 5.95	< 6.00	< 5.16
Fe-59	< 6.18	< 4.76	< 6.92	< 12.5	< 11.1	< 8.86
Zn-65	< 4.95	< 3.92	< 7.05	< 10.6	< 11.4	< 11.0
Co-60	< 2.38	< 1.87	< 2.59	< 4.79	< 5.15	< 4.15
K-40	146.8 +/- 25.17	< 13.63	203.6 +/- 37.55	< 53.0	< 107	< 48.7
Ba/La-140	< 1.78	< 2.84	< 4.40	< 8.44	< 7.23	< 9.02
Gross Beta	2.61 +/- 0.50	3.86 +/- 0.57	2.10 +/- 0.50	< 2.29	< 1.74	1.52 +/- 0.50

TABLE B-11(Continued)
CONCENTRATIONS OF GAMMA EMITTERS IN SURFACE WATER SAMPLES – 2011
Results in Units of pCi/liter ± 1 Sigma
NEW CROTON RESERVOIR

Date	1/19/2011	2/14/2011	3/13/2011	4/11/2011	5/16/2011	6/20/2011
NUCLIDE						
I-131	< 2.66	< 4.08	< 2.70	< 2.11	< 2.02	< 3.50
Cs-134	< 1.42	< 2.00	< 2.50	< 2.93	< 1.33	< 3.17
Cs-137	< 1.85	< 2.41	< 2.52	< 2.53	< 1.49	< 2.41
Zr-95	< 3.42	< 4.50	< 3.77	< 3.43	< 2.63	< 3.82
Nb-95	< 1.75	< 2.91	< 2.59	< 1.73	< 2.05	< 2.18
Co-58	< 1.87	< 2.97	< 2.58	< 2.20	< 1.95	< 2.53
Mn-54	< 1.38	< 2.71	< 2.75	< 1.79	< 1.87	< 3.10
Fe-59	< 2.97	< 6.53	< 6.64	< 3.76	< 3.64	< 9.11
Zn-65	< 4.36	< 6.11	< 7.88	< 5.06	< 4.52	< 5.67
Co-60	< 1.37	< 2.76	< 2.69	< 1.61	< 2.14	< 1.69
K-40	< 17.08	186.7 +/- 36.59	< 20.25	76.98 +/- 20.98	< 19.94	206.8 +/- 37.01
Ba/La-140	< 2.62	< 2.56	< 4.69	< 2.10	< 2.91	< 2.81
Gross Beta	1.90 +/- 0.50	2.42 +/- 0.50	2.07 +/- 0.80	0.87 +/- 0.19	2.17 +/- 0.50	2.03 +/- 0.40
Date	7/11/2011	8/8/2011	9/26/2011	10/18/2100	11/15/2011	12/19/2011
NUCLIDE						
I-131	< 2.30	< 2.36	< 2.71	< 10.6	< 7.85	< 14.1
Cs-134	< 1.25	< 2.66	< 1.19	< 5.03	< 6.33	< 3.27
Cs-137	< 1.95	< 2.15	< 1.75	< 5.40	< 7.52	< 4.07
Zr-95	< 2.82	< 3.27	< 3.51	< 9.07	< 7.74	< 6.85
Nb-95	< 1.91	< 2.13	< 2.31	< 6.65	< 6.26	< 4.22
Co-58	< 1.85	< 2.02	< 1.82	< 5.84	< 5.75	< 2.78
Mn-54	< 1.08	< 2.11	< 1.72	< 5.13	< 6.34	< 3.58
Fe-59	< 4.77	< 3.81	< 5.86	< 11.6	< 13.9	< 9.27
Zn-65	< 4.20	< 5.40	< 4.87	< 11.0	< 11.8	< 8.44
Co-60	< 2.08	< 2.08	< 1.92	< 5.86	< 6.18	< 4.85
K-40	< 17.08	83.5 +/- 23.16	177 +/- 26.76	< 51.7	< 118	< 34.1
Ba/La-140	< 2.17	< 2.95	< 3.42	< 10.2	< 8.03	< 9.49
Gross Beta	2.52 +/- 0.50	4.03 +/- 0.50	2.80 +/- 0.50	< 2.24	< 1.72	2.53 +/- 0.55

TABLE B-12
CONCENTRATIONS OF TRITIUM IN DRINKING WATER SAMPLES – 2011
(QUARTERLY COMPOSITE SAMPLES)

Results in Units of pCi/l ± 1 Sigma

STATION CODE	PERIOD	DATE		TRITIUM
CAMP FIELD RESERVOIR	First Quarter	12/13/10	03/13/11	< 409
	Second Quarter	03/13/11	06/20/11	< 425
	Third Quarter	06/20/11	09/26/11	< 412
	Fourth Quarter	09/26/11	12/19/11	< 194
NEW CROTON RESEVOIR	First Quarter	12/13/10	03/13/11	< 409
	Second Quarter	03/13/11	06/20/11	< 425
	Third Quarter	06/20/11	09/26/11	< 412
	Fourth Quarter	09/26/11	12/19/11	< 193

TABLE B-13
CONCENTRATIONS OF RADIONUCLIDES IN SHORELINE SEDIMENT SAMPLES – 2011
Results in Units of pCi/kg ± 1 Sigma

Sample Location / Date		COLD SPRING SHORELINE 6/14/2011	LENTS COVE SHORELINE 6/16/2011	MANITOU SHORELINE 6/14/2011	VERPLANCK SHORELINE 6/16/2011	WHITE BEACH SHORELINE 6/16/2011
Client ID	Req.	ISS842511	ISS282511	ISS502511	ISS172511	ISS532511
Radionuclide	CL (pCi)					
Be-7		< 282.9	< 338.9	< 387.0	< 214.9	< 118.1
I-131		< 65.1	< 48.9	< 71.6	< 34.4	< 26.1
Cs-134	**75**	< 19.2	< 32.8	< 37.2	< 19.6	< 15.7
Cs-137	**90**	< 39.0	< 45.8	< 45.9	104.1 +/- 25.4	< 19.8
Zr-95		< 64.6	< 70.4	< 82.0	< 40.5	< 36.2
Nb-95		< 48.6	< 43.8	< 70.3	< 26.1	< 19.0
Co-58		< 43.8	< 40.4	< 46.3	< 23.5	< 15.4
Mn-54		< 41.2	< 42.8	< 53.3	< 20.8	< 17.7
Zn-65		< 68.1	< 53.6	< 77.3	< 36.0	< 64.5
Fe-59		< 135.5	< 108.1	< 129.7	< 64.0	< 48.3
Co-60		< 44.0	< 37.6	< 42.1	< 26.9	< 22.3
Ba/La-140		< 73.0	< 50.0	< 97.4	< 21.7	< 20.6
Ru-103		< 34.4	< 44.5	< 54.6	< 23.3	< 23.2
Ru-106		< 327.1	< 407.0	< 515.6	< 246.5	< 208.1
Ce-141		< 51.6	< 57.4	< 82.0	< 38.5	< 31.7
Ce-144		< 190.5	< 235.1	< 333.1	< 182.6	< 117.1
AcTh-228		574.3 +/- 122.3	1627.0 +/- 170.0	1818.0 +/- 215.1	691.3 +/- 94.3	131.6 +/- 64.9
Ra-226		< 703.2	5046.0 +/- 796.3	5336.0 +/- 965.7	2077.0 +/- 475.1	619.3 +/- 299.7
K-40		36910.0 +/- 1270.0	13900.0 +/- 861.4	13430.0 +/- 1073.0	16240.0 +/- 682.4	12230.0 +/- 644.9
Sr-90		< 27.2	< 34.9	< 29.9	< 31.0	< 31.5

TABLE B-13
CONCENTRATIONS OF RADIONUCLIDES IN SHORELINE SEDIMENT SAMPLES – 2011
Results in Units of pCi/kg ± 1 Sigma

Sample Location / Date		COLD SPRING SHORELINE 9/20/2011	MANITOU SHORELINE 9/20/2011	VERPLANCK SHORELINE 9/20/2011	WHITE BEACH SHORELINE 9/20/2011
Client ID	Req. CL (pCi)	ISS843911	ISS503911	ISS173911	ISS533911
Radionuclide					
Be-7		< 248.7	< 226.0	< 166.0	< 186.0
I-131		< 55.5	< 61.1	< 46.0	< 37.2
Cs-134	**75**	< 21.2	< 41.4	< 17.9	< 13.6
Cs-137	**90**	< 31.2	< 29.1	111.6 +/- 24.3	< 19.8
Zr-95		< 52.1	< 44.6	< 43.5	< 35.4
Nb-95		< 38.6	< 44.1	< 30.4	< 19.9
Co-58		< 30.3	< 35.2	< 29.2	< 17.5
Mn-54		< 33.0	< 31.1	< 22.0	< 18.8
Zn-65		< 101.4	< 46.4	< 96.9	< 42.5
Fe-59		< 128.5	< 83.8	< 82.6	< 65.9
Co-60		< 35.1	< 29.0	< 22.6	< 18.0
Ba/La-140		< 43.9	< 60.2	< 34.9	< 27.6
Ru-103		< 31.3	< 35.8	< 24.8	< 21.6
Ru-106		< 261.9	< 339.5	< 272.9	< 216.1
Ce-141		< 49.0	< 64.5	< 39.9	< 31.1
Ce-144		< 176.5	< 217.9	< 144.8	< 119.5
AcTh-228		281.4 +/- 96.4	713.2 +/- 116.3	535.7 +/- 103.6	237.1 +/- 60.8
Ra-226		< 631.6	1813.0 +/- 564.9	1474.0 +/- 428.0	752.6 +/- 348.9
K-40		36860.0 +/- 1174.0	14370.0 +/- 823.5	16930.0 +/- 771.5	8437.0 +/- 509.1
Sr-90		< 32.0	< 33.9	< 27.7	< 29.4

TABLE B-14
CONCENTRATIONS OF GAMMA EMITTERS IN BROADLEAF VEGETATION SAMPLES – 2011
Results in Units of pCi/kg ± 1 Sigma
#95 Meteorological Tower

Sample Location Date		MET TOWER 5/23/2011	MET TOWER 5/23/2011	MET TOWER 5/23/2011	MET TOWER 6/27/2011	MET TOWER 6/27/2011	MET TOWER 6/27/2011
Client ID	Req. CL (pCi)	IBV952111S1	IBV952111S2	IBV952111S3	IBV952611S1	IBV952611S2	IBV952611S3
Radionuclide		RAGWEED	MULLEN	BURDOCK	BURDOCK	RAGWEED	MULLEIN
Be-7		1349.0 +/- 95.1	888.5 +/- 132.1	1129.0 +/- 110.2	1459.0 .+/- 120.9	1437.0 +/- 140.5	1555.0 +/- 157.0
I-131	**50**	< 13.56	< 22.61	< 13.80	< 12.13	< 15.44	< 20.00
Cs-134	**50**	< 12.10	< 11.49	< 13.04	< 8.87	< 17.79	< 13.42
Cs-137	**50**	< 8.56	< 16.76	< 9.76	< 13.07	< 14.04	< 14.46
Zr-95		< 11.77	< 27.70	< 17.57	< 21.31	< 27.83	< 20.73
Nb-95		< 9.59	< 22.20	< 10.66	< 13.57	< 16.50	< 13.73
Co-58		< 8.77	< 14.23	< 10.98	< 12.95	< 12.63	< 14.66
Mn-54		< 7.84	< 16.12	< 11.70	< 11.47	< 13.89	< 13.17
Zn-65		< 27.49	< 22.58	< 31.74	< 32.24	< 38.65	< 43.86
Fe-59		< 28.14	< 47.10	< 27.17	< 27.01	< 40.42	< 42.57
Co-60		< 9.12	< 15.76	< 10.31	< 10.43	< 14.94	< 14.49
Ba/La-140		< 7.60	< 22.55	< 10.67	< 16.35	< 15.89	< 21.53
Ru-103		< 9.32	< 15.10	< 11.23	< 11.21	< 14.30	< 15.74
Ru-106		< 90.08	< 143.60	< 96.31	< 120.50	< 129.00	< 162.90
Ce-141		< 12.33	< 22.52	< 14.28	< 15.66	< 19.28	< 20.46
Ce-144		< 45.40	< 74.92	< 58.30	< 60.63	< 74.01	< 90.20
AcTh-228		< 34.36	< 67.16	< 40.81	< 42.96	< 57.08	< 54.34
Ra-226		< 134.90	< 278.20	< 217.60	468.2 +/- 191.5	< 271.10	< 293.50
K-40		5477.0 +/- 239.1	5916.0 +/- 374.2	5222.0 +/- 277.1	8440.0 +/- 357.4	9785.0 +/- 436.3	7137.0 +/- 380.6

TABLE B-14 (Continued)
CONCENTRATIONS OF GAMMA EMITTERS IN BROADLEAF VEGETATION SAMPLES – 2011
Results in Units of pCi/kg ± 1 Sigma
#95 Meteorological Tower

Sample Location Date		MET TOWER 7/18/2011	MET TOWER 7/18/2011	MET TOWER 7/18/2011	MET TOWER 8/15/2011	MET TOWER 8/15/2011	MET TOWER 8/15/2011
Client ID	Req. CL (pCi)	IBV952911S1	IBV952911S2	IBV952911S3	IBV953311S1	IBV953311S2	IBV953311S3
Radionuclide		RAGWEED	BITTERSWEET	COTTONWOOD	COTTON	WILD GRAPE	RAGWEED
Be-7		1656.0 +/- 119.1	232.7 +/- 146.0	1057.0 +/- 115.5	1923.0 +/- 117.1	1583.0 +/- 127.2	3374.0 +/- 200.6
I-131	**50**	< 13.50	< 25.40	< 15.10	< 11.23	< 15.04	< 15.67
Cs-134	**50**	< 15.86	< 16.10	< 17.71	< 13.96	< 9.10	< 14.28
Cs-137	**50**	< 9.58	< 26.89	< 15.55	< 11.03	< 12.68	< 16.33
Zr-95		< 16.52	< 30.80	< 22.70	< 19.61	< 20.53	< 26.43
Nb-95		< 9.74	< 23.53	< 13.04	< 13.70	< 12.22	< 18.86
Co-58		< 11.53	< 18.76	< 15.26	< 9.96	< 9.97	< 18.11
Mn-54		< 12.08	< 19.82	< 10.92	< 11.23	< 11.68	< 16.70
Zn-65		< 31.65	< 79.78	< 35.03	< 21.96	< 26.23	< 46.86
Fe-59		< 25.48	< 84.76	< 35.30	< 34.77	< 32.02	< 52.57
Co-60		< 12.62	< 29.72	< 15.17	< 8.81	< 11.39	< 19.47
Ba/La-140		< 7.80	< 35.30	< 15.84	< 14.60	< 18.27	< 20.82
Ru-103		< 12.62	< 23.84	< 12.99	< 10.27	< 12.62	< 16.28
Ru-106		< 93.55	< 224.70	< 143.20	< 109.30	< 133.50	< 165.70
Ce-141		< 15.73	< 28.22	< 15.41	< 13.89	< 15.85	< 21.27
Ce-144		< 63.09	< 113.30	< 69.71	< 56.37	< 70.68	< 86.64
AcTh-228		< 49.57	< 94.14	< 51.62	< 40.60	< 39.73	< 70.16
Ra-226		< 229.30	< 421.80	771.7 +/- 222.9	650.7 +/- 213.7	490.6 +/- 196.3	< 308.10
K-40		8857.0 +/- 352.2	5841.0 +/- 454.4	7578.0 +/- 359.5	4843.0 +/- 265.9	2415.0 +/- 196.5	7804.0 +/- 430.6

TABLE B-14 (Continued)
CONCENTRATIONS OF GAMMA EMITTERS IN BROADLEAF VEGETATION SAMPLES – 2011
Results in Units of pCi/kg ± 1 Sigma

#95 Meteorological Tower

Sample Location Date		MET TOWER 9/13/2011	MET TOWER 9/13/2011	MET TOWER 9/13/2011	MET TOWER 10/11/2011	MET TOWER 10/11/2011	MET TOWER 10/11/2011
Client ID	Req. CL (pCi)	IBV953711S1	IBV953711S2	IBV953711S3	IBV954111S1	IBV954111S2	IBV954111S3
Radionuclide		RAGWEED	COTTONWOOD	GRAPE LEAVES	KNOTWEED	RAGWEED	SAWGRASS
Be-7		5209.0 +/- 188.6	2353.0 +/- 165.2	1233.0 +/- 124.7	1136.0 +/- 141.2	7182.0 +/- 219.9	4786.0 +/- 209.0
I-131	**50**	< 15.04	< 13.58	< 12.80	< 22.90	< 21.43	< 23.51
Cs-134	**50**	< 8.82	< 11.81	< 10.91	< 9.89	< 9.32	< 18.69
Cs-137	**50**	< 10.63	< 10.09	< 12.47	< 15.14	< 13.09	< 17.57
Zr-95		< 17.83	< 19.25	< 19.92	< 25.68	< 21.79	< 25.26
Nb-95		< 12.07	< 15.63	< 11.44	< 16.82	< 11.15	< 18.40
Co-58		< 10.63	< 14.12	< 12.99	< 15.06	< 13.07	< 16.41
Mn-54		< 12.01	< 12.90	< 10.73	< 13.00	< 10.86	< 15.49
Zn-65		< 30.07	< 42.44	< 32.71	< 35.56	< 36.36	< 21.03
Fe-59		< 30.43	< 42.71	< 35.48	< 37.81	< 32.14	< 47.72
Co-60		< 12.51	< 13.78	< 15.06	< 15.97	< 14.07	< 13.31
Ba/La-140		< 11.05	< 15.41	< 17.64	< 23.56	< 12.26	< 22.62
Ru-103		< 11.30	< 10.27	< 11.37	< 14.36	< 12.57	< 16.79
Ru-106		< 116.60	< 159.60	< 149.50	< 121.80	< 118.50	< 147.50
Ce-141		< 14.55	< 15.87	< 14.96	< 16.22	< 19.66	< 21.55
Ce-144		< 72.96	< 75.00	< 63.45	< 70.39	< 73.09	< 85.36
AcTh-228		52.7 +/- 28.8	< 56.35	< 25.05	< 56.50	< 37.13	< 49.19
Ra-226		497.5 +/- 185.0	< 226.30	< 231.10	< 250.20	562.6 +/- 199.4	1030.0 +/- 273.0
K-40		8162.0 +/- 333.4	6658.0 +/- 372.8	3420.0 +/- 276.7	4449.0 +/- 309.3	9078.0 +/- 339.1	6694.0 +/- 340.1

TABLE B-14
CONCENTRATIONS OF GAMMA EMITTERS IN BROADLEAF VEGETATION SAMPLES – 2011
Results in Units of pCi/kg ± 1 Sigma
#94 IPEC Training Center

Sample Location Date		TRAINING BLDG 5/23/2011	TRAINING BLDG 5/23/2011	TRAINING BLDG 5/23/2011	TRAINING BLDG 6/27/2011	TRAINING BLDG 6/27/2011	TRAINING BLDG 6/27/2011
Client ID	Req. CL (pCi)	IBV94211S1	IBV942111S2	IBV942111S3	IBV942611S1	IBV942611S3	IBV942611S2
Radionuclide		BURDOCK	RAGWEED	MULLEIN	GRAPE	MULLEIN	RAGWEED
Be-7		1914.0 +/- 168.4	1439.0 +/- 123.3	913.3 +/- 50.8	725.5 +/- 107.1	531.8 +/- 115.1	1767.0 +/- 168.0
I-131	**50**	< 24.93	< 15.88	< 6.87	< 14.41	< 21.29	< 22.46
Cs-134	**50**	< 13.90	< 17.22	< 3.06	< 19.08	< 20.25	< 25.66
Cs-137	**50**	< 23.49	< 13.33	< 4.27	< 10.46	< 16.33	< 21.04
Zr-95		< 35.71	< 21.20	< 6.66	< 23.39	< 29.08	< 34.52
Nb-95		< 16.79	< 12.57	< 4.53	< 12.48	< 17.28	< 20.47
Co-58		< 23.20	< 15.42	< 4.62	< 11.33	< 15.15	< 18.13
Mn-54		< 19.56	< 12.48	< 4.37	< 13.00	< 14.39	< 20.51
Zn-65		< 33.67	< 35.05	< 6.72	< 41.47	< 50.71	< 62.54
Fe-59		< 71.48	< 29.37	< 10.83	< 37.98	< 52.35	< 63.49
Co-60		< 23.58	< 13.64	< 4.47	< 12.18	< 6.70	< 23.11
Ba/La-140		< 21.81	< 19.31	< 5.69	< 14.55	< 20.25	< 29.58
Ru-103		< 18.95	< 13.84	< 4.58	< 11.76	< 17.51	< 19.86
Ru-106		< 202.20	< 119.30	< 37.17	< 176.80	< 173.60	< 231.00
Ce-141		< 23.39	< 15.90	< 5.88	< 17.94	< 22.81	< 23.67
Ce-144		< 105.60	< 67.48	< 26.99	< 80.28	< 87.05	< 93.09
AcTh-228		< 68.28	< 49.46	< 11.81	< 60.89	< 70.47	< 83.86
Ra-226		< 399.10	769.3 +/- 211.9	< 84.09	< 216.50	< 328.80	483.5 +/- 256.0
K-40		7086.0 +/- 433.2	6067.0 +/- 315.6	3191.0 +/- 118.5	4764.0 +/- 318.4	5666.0 +/- 415.2	9661.0 +/- 520.1

TABLE B-14 (Continued)
CONCENTRATIONS OF GAMMA EMITTERS IN BROADLEAF VEGETATION SAMPLES – 2011
Results in Units of pCi/kg ± 1 Sigma
#94 IPEC Training Center

Sample Location Date		TRAINING BLDG 7/18/2011	TRAINING BLDG 7/18/2011	TRAINING BLDG 7/18/2011	TRAINING BLDG 8/15/2011	TRAINING BLDG 8/15/2011	TRAINING BLDG 8/15/2011
Client ID	Req. CL (pCi)	IBV942911S1	IBV942911S2	IBV942911S3	IBV943311S1	IBV943311S2	IBV943311S3
Radionuclide		COMMON MU	RAGWEED	BITTERSWE	COTTON	RAGWEED	CATALPA
Be-7		558.1 +/- 74.5	907.9 +/- 103.3	554.6 +/- 76.4	2205.0 +/- 128.4	3519.0 +/- 156.0	1946.0 +/- 119.9
I-131	**50**	< 12.46	< 13.87	< 10.13	< 9.69	< 12.08	< 11.09
Cs-134	**50**	< 7.83	< 8.69	< 7.52	< 13.41	< 15.58	< 14.84
Cs-137	**50**	< 7.86	< 13.18	< 8.87	< 6.74	< 10.40	< 10.87
Zr-95		< 18.77	< 20.92	< 14.86	< 13.44	< 17.10	< 17.69
Nb-95		< 9.85	< 13.23	< 9.16	< 9.53	< 9.51	< 10.09
Co-58		< 8.40	< 11.13	< 7.27	< 8.59	< 11.37	< 11.12
Mn-54		< 8.80	< 13.95	< 8.89	< 8.94	< 10.03	< 9.47
Zn-65		< 26.26	< 39.74	< 25.54	< 25.81	< 30.29	< 32.36
Fe-59		< 22.56	< 51.18	< 25.37	< 25.93	< 26.22	< 31.78
Co-60		< 11.11	< 18.07	< 7.94	< 7.88	< 10.24	< 13.66
Ba/La-140		< 11.47	< 11.17	< 9.51	< 11.42	< 8.53	< 8.04
Ru-103		< 9.10	< 10.87	< 8.16	< 8.29	< 9.91	< 8.39
Ru-106		< 104.90	< 118.80	< 86.00	< 122.30	< 109.50	< 105.20
Ce-141		< 13.72	< 14.06	< 11.92	< 13.98	< 15.06	< 13.52
Ce-144		< 56.94	< 58.09	< 46.55	< 59.44	< 59.50	< 54.81
AcTh-228		< 34.11	< 51.04	< 28.98	< 35.86	< 36.82	< 37.75
Ra-226		456.9 +/- 161.2	323.6 +/- 188.9	< 135.70	< 187.70	< 225.20	< 223.00
K-40		5476.0 +/- 243.8	9259.0 +/- 377.5	3765.0 +/- 228.1	3599.0 +/- 245.1	6024.0 +/- 295.3	2353.0 +/- 204.3

TABLE B-14 (Continued)
CONCENTRATIONS OF GAMMA EMITTERS IN BROADLEAF VEGETATION SAMPLES – 2011
Results in Units of pCi/kg ± 1 Sigma

#94 IPEC Training Center

Sample Location		TRAINING BLDG	TRAINING BLDG	TRAINING BLDG	TRAINING BLDG	TRAINING BLDG	TRAINING BLDG
Date		9/13/2011	9/13/2011	9/13/2011	10/11/2011	10/11/2011	10/11/2011
Client ID	Req. CL (pCi)	IBV943711S1	IBV943711S2	IBV943711S3	IBV944111S1	IBV944111S2	IBV944111S3
Radionuclide		RAGWEED	CATALPA	GRAPE LE	RAGWEED	SAWGRASS	BURDOCK
Be-7		5820.0 +/- 275.4	4618.0 +/- 245.0	1544.0 +/- 146.4	6242.0 +/- 255.2	6935.0 +/- 284.9	874.9 +/- 78.1
I-131	**50**	< 23.83	< 25.83	< 19.09	< 22.19	< 24.89	< 12.44
Cs-134	**50**	< 17.22	< 14.82	< 10.20	< 20.30	< 11.84	< 6.64
Cs-137	**50**	< 18.58	< 20.89	< 13.42	< 14.80	< 20.04	< 8.51
Zr-95		< 36.86	< 27.58	< 20.89	< 23.80	< 28.71	< 14.95
Nb-95		< 20.46	< 16.07	< 17.54	< 14.48	< 16.47	< 7.87
Co-58		< 21.24	< 22.46	< 16.20	< 16.21	< 16.50	< 7.43
Mn-54		< 19.67	< 21.15	< 14.17	< 14.32	< 13.37	< 7.01
Zn-65		< 31.77	< 30.37	< 46.52	< 43.76	< 53.12	< 24.84
Fe-59		< 56.30	< 52.99	< 41.80	< 41.87	< 63.63	< 29.33
Co-60		< 14.71	< 24.31	< 10.61	< 17.67	< 14.66	< 9.10
Ba/La-140		< 22.15	< 35.23	< 14.48	< 22.42	< 24.91	< 14.73
Ru-103		< 19.83	< 22.15	< 16.04	< 12.25	< 17.73	< 7.91
Ru-106		< 172.50	< 184.00	< 157.30	< 154.80	< 160.90	< 97.62
Ce-141		< 27.45	< 25.62	< 18.01	< 19.55	< 22.89	< 14.78
Ce-144		< 106.70	< 95.49	< 69.38	< 74.32	< 93.29	< 51.66
AcTh-228		< 69.74	< 75.56	< 62.02	< 40.83	130.2 +/- 47.8	< 33.91
Ra-226		< 388.40	< 427.50	< 264.20	< 306.40	< 344.90	< 187.10
K-40		6668.0 +/- 417.3	3334.0 +/- 327.4	4473.0 +/- 318.8	7570.0 +/- 403.9	5212.0 +/- 362.7	5841.0 +/- 252.7

TABLE B-14
CONCENTRATIONS OF GAMMA EMITTERS IN BROADLEAF VEGETATION SAMPLES – 2011
Results in Units of pCi/kg ± 1 Sigma
#23 Roseton **

Sample Location Date		ROSETON 5/23/2011	ROSETON 5/23/2011	ROSETON 5/23/2011	ROSETON 6/27/2011	ROSETON 6/27/2011	ROSETON 6/27/2011
Client ID	Req. CL (pCi)	IBV232111S1	IBV232111S2	IBV232111S3	IBV232611S2	IBV232611S3	IBV232611S1
Radionuclide		MULLEIN	RAGWEED	CATALPA	RAGWEED	BURDOCK	MULLEIN
Be-7		904.9 +/- 68.0	1211.0 +/- 72.7	317.1 +/- 51.4	949.2 +/- 104.1	690.4 +/- 85.1	678.1 +/- 119.5
I-131	**50**	< 10.12	< 9.10	< 13.98	< 13.00	< 11.63	< 16.35
Cs-134	**50**	< 7.93	< 7.95	< 5.69	< 16.81	< 13.35	< 10.69
Cs-137	**50**	< 4.96	< 5.91	< 7.45	< 8.49	< 11.38	< 11.58
Zr-95		< 10.57	< 8.90	< 13.61	< 21.74	< 18.67	< 26.78
Nb-95		< 6.35	< 7.25	< 7.16	< 11.52	< 10.50	< 15.07
Co-58		< 5.64	< 5.95	< 8.64	< 11.42	< 9.47	< 15.68
Mn-54		< 5.76	< 5.22	< 7.14	< 10.26	< 8.81	< 14.63
Zn-65		< 16.07	< 16.10	< 27.22	< 29.78	< 27.61	< 43.18
Fe-59		< 16.39	< 22.22	< 32.43	< 36.95	< 29.72	< 37.77
Co-60		< 6.45	< 5.69	< 8.64	< 13.89	< 10.27	< 13.30
Ba/La-140		< 7.00	< 6.02	< 11.50	< 16.81	< 13.75	< 16.80
Ru-103		< 5.44	< 6.60	< 8.57	< 9.22	< 8.82	< 14.03
Ru-106		< 58.32	< 54.50	< 72.92	< 131.40	< 120.30	< 142.90
Ce-141		< 8.79	< 8.35	< 11.20	< 16.66	< 11.70	< 20.78
Ce-144		< 36.11	< 31.72	< 38.98	< 61.61	< 53.65	< 74.59
AcTh-228		< 22.81	< 20.92	< 27.53	< 46.72	< 44.98	< 51.01
Ra-226		< 114.30	< 115.60	< 152.60	< 223.00	662.3 +/- 154.4	< 287.80
K-40		2777.0 +/- 161.1	4883.0 +/- 186.8	2503.0 +/- 168.2	7693.0 +/- 385.7	7370.0 +/- 318.1	6315.0 +/- 356.4

** Control Sample Location

TABLE B-14 (Continued)
CONCENTRATIONS OF GAMMA EMITTERS IN BROADLEAF VEGETATION SAMPLES – 2011
Results in Units of pCi/kg ± 1 Sigma
#23 Roseton **

Sample Location Date		ROSETON 7/18/2011	ROSETON 7/18/2011	ROSETON 7/18/2011	ROSETON 8/15/2011	ROSETON 8/15/2011	ROSETON 8/15/2011
Client ID	Req. CL (pCi)	IBV232911S2	IBV232911S3	IBV232911S1	IBV233311S1	IBV233311S2	IBV233311S3
Radionuclide		CATALPA	BURDOCK	RAGWEED	RAGWEED	CATALPA	MULLEIN
Be-7		2330.0 +/- 183.7	715.9 +/- 135.6	1205.0 +/- 150.1	2656.0 +/- 127.2	1058.0 +/- 83.2	2202.0 +/- 121.0
I-131	**50**	< 18.00	< 17.66	< 22.23	< 9.30	< 7.98	< 9.13
Cs-134	**50**	< 16.48	< 9.28	< 14.26	< 11.51	< 6.06	< 13.53
Cs-137	**50**	< 17.59	< 10.47	< 20.50	< 11.28	< 7.96	< 9.87
Zr-95		< 26.04	< 25.44	< 28.65	< 18.05	< 13.89	< 15.83
Nb-95		< 15.32	< 16.11	< 17.28	< 10.11	< 5.57	< 9.41
Co-58		< 16.33	< 19.57	< 16.72	< 8.20	< 9.07	< 11.30
Mn-54		< 17.21	< 20.67	< 18.76	< 8.50	< 7.97	< 10.92
Zn-65		< 27.79	< 49.26	< 25.71	< 27.76	< 18.91	< 31.40
Fe-59		< 50.45	< 61.77	< 47.04	< 29.30	< 21.40	< 28.41
Co-60		< 18.35	< 20.28	< 15.64	< 9.90	< 8.64	< 9.54
Ba/La-140		< 23.58	< 23.54	< 18.32	< 6.89	< 7.54	< 10.22
Ru-103		< 14.58	< 15.01	< 14.74	< 9.23	< 7.50	< 8.89
Ru-106		< 184.90	< 170.80	< 180.80	< 92.92	< 73.89	< 108.30
Ce-141		< 21.76	< 20.40	< 23.19	< 12.42	< 11.34	< 10.80
Ce-144		< 83.02	< 87.85	< 112.50	< 50.57	< 48.51	< 49.32
AcTh-228		< 57.16	< 67.11	< 66.09	< 34.83	< 21.93	< 34.46
Ra-226		< 312.50	938.8 +/- 251.0	660.7 +/- 255.1	634.2 +/- 166.3	406.5 +/- 133.2	< 144.50
K-40		3321.0 +/- 305.5	6679.0 +/- 435.1	8424.0 +/- 416.2	7377.0 +/- 293.8	2256.0 +/- 152.8	3330.0 +/- 220.7

** Control Sample Location

TABLE B-14 (Continued)
CONCENTRATIONS OF GAMMA EMITTERS IN BROADLEAF VEGETATION SAMPLES – 2011
Results in Units of pCi/kg ± 1 Sigma

#23 Roseton **

Sample Location Date		ROSETON 9/13/2011	ROSETON 9/13/2011	ROSETON 9/13/2011	ROSETON 10/11/2011	ROSETON 10/11/2011	ROSETON 10/11/2011
Client ID	Req. CL (pCi)	IBV233711S1	IBV233711S2	IBV233711S3	IBV234111S1	IBV234111S2	IBV234111S3
Radionuclide		RAGWEED	CATALPA	BURDOCK	RAGWEED	CATALPA	WILD GRAPE
Be-7		6154.0 +/- 202.8	5367.0 +/- 235.2	1346.0 +/- 107.0	8723.0 +/- 254.6	3114.0 +/- 147.8	2841.0 +/- 141.7
I-131	**50**	< 13.36	< 15.63	< 11.28	< 23.12	< 11.34	< 19.41
Cs-134	**50**	< 13.19	< 11.02	< 7.89	< 9.05	< 10.62	< 9.64
Cs-137	**50**	< 10.30	< 13.18	< 8.77	< 11.52	< 9.12	< 12.93
Zr-95		< 16.01	< 23.38	< 17.70	< 19.18	< 15.03	< 19.49
Nb-95		< 14.35	< 14.64	< 10.89	< 14.44	< 9.93	< 9.95
Co-58		< 13.47	< 10.86	< 11.46	< 13.08	< 8.31	< 13.41
Mn-54		< 11.68	< 13.25	< 10.68	< 11.51	< 8.07	< 11.70
Zn-65		< 28.52	< 48.03	< 34.65	< 33.87	< 19.60	< 15.08
Fe-59		< 39.00	< 42.81	< 28.05	< 41.35	< 30.89	< 26.69
Co-60		< 11.92	< 11.26	< 9.26	< 12.44	< 6.46	< 8.77
Ba/La-140		< 13.74	< 15.28	< 10.69	< 15.20	< 14.98	< 15.28
Ru-103		< 12.16	< 11.41	< 10.05	< 11.34	< 10.11	< 11.48
Ru-106		< 103.20	< 158.00	< 84.11	< 137.80	< 90.44	< 113.50
Ce-141		< 16.84	< 20.50	< 15.32	< 19.78	< 12.35	< 19.81
Ce-144		< 64.70	< 83.81	< 53.59	< 86.65	< 50.37	< 77.81
AcTh-228		< 38.60	< 51.28	< 36.66	< 46.06	< 27.06	< 46.03
Ra-226		435.8 +/- 196.1	< 278.10	414.3 +/- 177.8	< 281.30	294.3 +/- 134.9	< 235.70
K-40		7803.0 +/- 333.6	3508.0 +/- 297.7	5912.0 +/- 277.5	7034.0 +/- 335.7	2317.0 +/- 177.5	2206.0 +/- 181.4

** Control Sample Location

TABLE B-15
CONCENTRATIONS OF RADIONUCLIDES IN FISH/INVERTEBATES - 2011
Results in pCi/kg dry +/- 1 Sigma

23 Roseton (Control)

Sample Date:		5/27/2011	6/2/2011	6/9/2011	6/9/2011	6/9/2011	8/10/2011
		STRIPED BASS	WHITE PERCH	SUNFISH	CATFISH	AMERICAN EEL	SUNFISH
Nuclide	Req. CL						
Be-7		< 1340	< 1190	< 1050	< 877	< 688	< 94
K-40		3660 ± 545	3540 ± 438	3610 ± 477	3210 ± 399	2920 ± 332	2830 ± 60
Mn-54	65	< 85	< 66	< 56	< 43	< 54	< 5
Co-58	65	< 117	< 110	< 74	< 65	< 73	< 9
Fe-59	130	< 490	< 324	< 221	< 236	< 215	< 31
Co-60	65	< 77	< 48	< 53	< 54	< 55	< 7
Zn-65	130	< 159	< 139	< 131	< 123	< 114	< 12
Zr-95		< 219	< 198	< 180	< 139	< 148	< 17
Nb-95		< 140	< 112	< 102	< 84	< 97	< 10
Ru-103		< 231	< 178	< 151	< 139	< 108	< 15
Ru-106		< 693	< 590	< 475	< 483	< 387	< 44
I-131		< 39400	< 18300	< 10400	< 8430	< 8440	< 3100
Cs134	65	< 63	< 61	< 58	< 48	< 43	< 4
Cs137	75	< 74	< 59	< 47	< 53	< 50	< 5
Ba-140		< 12400	< 7550	< 5020	< 4430	< 3890	< 869
Ce-141		< 369	< 337	< 275	< 243	< 219	< 28
Ce-144		< 377	< 388	< 354	< 315	< 283	< 29
Ra-226		< 1230	< 1190	< 1200	< 1040	< 1010	< 89
Th-228		< 123	< 110	< 100	< 82	< 82	< 7
Ni-63	100	< 38	< 46	< 49	< 37	< 40	< 52
Sr-90	5	< 4.0	< 1.2	< 4.0	< 3.7	< 3.6	< 4.2

TABLE B-15
CONCENTRATIONS OF RADIONUCLIDES IN FISH/INVERTEBATES - 2011
Results in pCi/kg dry +/- 1 Sigma

23 Roseton (Control)

Sample Date:		8/10/2011 CATFISH	8/16/2011 WHITE PERCH	8/19/2011 AMERICAN EEL	8/19/2011 BLUE CRAB	8/19/2011 STRIPED BASS	
Nuclide	Req. CL						
Be-7		< 653	< 906	< 1450	< 633	< 714	
K-40		3010 ± 369	3980 ± 421	3300 ± 505	2180 ± 253	3790 ± 323	
Mn-54	65	< 52	< 48	< 59	< 40	< 41	
Co-58	65	< 78	< 91	< 125	< 55	< 75	
Fe-59	130	< 237	< 236	< 254	< 196	< 233	
Co-60	65	< 38	< 58	< 56	< 36	< 45	
Zn-65	130	< 115	< 114	< 131	< 85	< 80	
Zr-95		< 150	< 176	< 223	< 105	< 133	
Nb-95		< 78	< 104	< 98	< 66	< 87	
Ru-103		< 145	< 151	< 169	< 99	< 113	
Ru-106		< 442	< 478	< 605	< 321	< 424	
I-131		< 9950	< 21300	< 20400	< 11300	< 17400	
Cs134	65	< 49	< 47	< 65	< 32	< 42	
Cs137	75	< 48	< 54	< 63	< 31	< 39	
Ba-140		< 5220	< 7840	< 8800	< 5300	< 5650	
Ce-141		< 215	< 237	< 351	< 173	< 236	
Ce-144		< 249	< 287	< 367	< 218	< 260	
Ra-226		< 978	< 985	< 1280	< 721	< 925	
Th-228		< 73	< 85	< 126	< 59	< 76	
Ni-63	100	< 38	< 47	< 45	< 59	< 43	
Sr-90	5	< 5.0	< 2.6	< 4.6	< 4.7	< 4.6	

TABLE B-15
CONCENTRATIONS OF RADIONUCLIDES IN FISH/INVERTEBATES - 2011
Results in pCi/kg dry +/- 1 Sigma

25 Downstream (Hudson River)

Sample Date:		5/27/2011 STRIPED BASS	5/27/2011 WHITE PERCH	6/1/2011 AMERICAN EEL	6/5/2011 SUNFISH	6/14/2011 BLUE CRAB	6/17/2011 CATFISH
Nuclide	Req. CL						
Be-7		< 1370	< 1170	< 833	< 859	< 640	< 681
K-40		4510 ± 515	2980 ± 436	4300 ± 460	3870 ± 450	2870 ± 327	3060 ± 389
Mn-54	65	< 76	< 64	< 56	< 57	< 39	< 45
Co-58	65	< 131	< 102	< 91	< 65	< 78	< 59
Fe-59	130	< 415	< 266	< 241	< 251	< 190	< 150
Co-60	65	< 72	< 54	< 46	< 42	< 59	< 54
Zn-65	130	< 199	< 93	< 106	< 116	< 87	< 98
Zr-95		< 254	< 213	< 166	< 138	< 138	< 117
Nb-95		< 136	< 101	< 96	< 93	< 79	< 66
Ru-103		< 234	< 186	< 162	< 141	< 104	< 92
Ru-106		< 602	< 542	< 458	< 497	< 409	< 374
I-131		< 33100	< 34400	< 19500	< 14600	< 5390	< 4550
Cs134	65	< 69	< 51	< 49	< 48	< 35	< 45
Cs137	75	< 72	< 53	< 42	< 45	< 39	< 41
Ba-140		< 13200	< 11300	< 7750	< 5690	< 3220	< 2850
Ce-141		< 379	< 348	< 282	< 256	< 269	< 198
Ce-144		< 368	< 403	< 292	< 346	< 387	< 313
Ra-226		< 1320	< 1260	< 1030	< 949	< 1080	< 1010
Th-228		< 118	< 95	< 86	< 102	< 86	< 81
Ni-63	100	< 36	< 47	< 40	< 45	< 100	< 38
Sr-90	5	< 3.6	< 2.8	< 4.0	< 2.5	< 3.3	< 3.4

TABLE B-15
CONCENTRATIONS OF RADIONUCLIDES IN FISH/INVERTEBATES - 2011
Results in pCi/kg dry +/- 1 Sigma

25 Downstream (Hudson River)

Sample Date:		8/10/2011 CATFISH	8/11/2011 WHITE PERCH	8/11/2011 SUNFISH	8/22/2011 BLUE CRAB	8/24/2011 STRIPED BASS	8/25/2011 AMERICAN EEL
Nuclide	Req. CL						
Be-7		< 632	< 932	< 795	< 782	< 704	< 794
K-40		3720 ± 290	3090 ± 465	3470 ± 457	2050 ± 375	3600 ± 500	3920 ± 457
Mn-54	65	< 34	< 48	< 76	< 41	< 58	< 55
Co-58	65	< 60	< 79	< 88	< 73	< 75	< 74
Fe-59	130	< 227	< 240	< 200	< 213	< 171	< 186
Co-60	65	< 39	< 49	< 58	< 51	< 82	< 63
Zn-65	130	< 80	< 134	< 141	< 88	< 149	< 132
Zr-95		< 139	< 176	< 142	< 135	< 139	< 143
Nb-95		< 57	< 104	< 106	< 81	< 101	< 86
Ru-103		< 101	< 159	< 137	< 134	< 103	< 103
Ru-106		< 329	< 437	< 434	< 324	< 555	< 530
I-131		< 31100	< 26000	< 2760	< 15500	< 2610	< 2170
Cs134	65	< 30	< 49	< 58	< 39	< 55	< 50
Cs137	75	< 32	< 45	< 67	< 46	< 60	< 64
Ba-140		< 7710	< 8720	< 2180	< 6680	< 1870	< 1940
Ce-141		< 176	< 279	< 189	< 223	< 167	< 157
Ce-144		< 181	< 292	< 368	< 263	< 313	< 309
Ra-226		< 579	< 1030	< 1110	< 949	< 1190	< 1110
Th-228		< 42	< 99	< 113	< 73	< 91	< 101
Ni-63	100	< 40	< 51	< 52	< 57	< 42	< 41
Sr-90	5	< 4.3	< 4.2	< 2.9	< 4.4	< 4.5	< 4.05

TABLE B-16
CONCENTRATIONS OF GAMMA EMITTERS IN AQUATIC VEGETATION SAMPLES – 2011
Results in Units of pCi/kg ± 1 Sigma

Sample Location Date		VERPLANK 10/18/2012	LENTS COVE	COLD SPRING 10/18/2012			
Client ID		L48193-1	I48193-2	I48193-3			
Radionuclide	Req. CL (pCi)						
Be-7		233 +/- 57.5		198 +/- 54.5			
I-131	**30**	< 28.3		< 31.3			
Cs-134	**30**	< 12.7		< 11.5			
Cs-137	**40**	< 16.2		< 12.3			
Zr-95		< 24.0	No	< 23.1			
Nb-95		< 14.9		< 14.9			
Co-58		< 13.3	Sample	< 11.9			
Mn-54		< 12.0		< 10.7			
Zn-65		< 25.8	Available	< 27.8			
Fe-59		< 29.8		< 27.4			
Co-60		< 14.8		< 13.8			
Ba/La-140		< 20.7		< 21.4			
Ru-103		< 14.7		< 13.1			
Ru-106		< 128		< 107			
Ce-141		< 25.1		< 26.8			
Ce-144		< 92.5		< 101			
AcTh-228		54.4 +/- 15.1		61.0 +/- 9.4			
Ra-226		< 309.0		< 361.0			
K-40		2350 +/- 145		2180.0 +/- 123.0			

* all sites did not have available samples in first half of 2011

TABLE B-17
CONCENTRATIONS OF GAMMA EMITTERS IN BOTTOM SEDIMENT SAMPLES – 2011
Results in Units of pCi/kg ± 1 Sigma

Sample Location / Date		COLD SPRING 6/14/2011	LENTS COVE 6/14/2011	VERPLANCK 6/16/2011	DISCHARGE CANAL 6/16/2011	COLD SPRING 10/18/2011	LENTS COVE 10/18/2011	VERPLANK 10/18/2011	DISCHARGE CANAL 10/18/2011
Client ID		IBS842511	IBS282511	IBS172511	IBS102511				
Radionuclide	Req. CL (pCi)								
Be-7		< 297.1	< 398.5	< 430.7	< 243.2	< 733	< 685	< 819	< 655
I-131		< 54.3	< 79.1	< 91.4	< 36.5	< 325	< 317	< 350	< 196
Cs-134	**75**	< 43.0	< 37.9	< 40.4	< 30.4	< 67.1	< 67.9	< 83.7	< 53.7
Cs-137	**90**	< 38.9	255.7 +/- 48.0	325.1 +/- 58.3	96.9 +/- 28.3	238 +/- 33.1	437 +/- 42.0	406 +/- 61.5	200 +/- 30.6
Zr-95		< 65.8	< 85.6	< 89.8	< 63.4	< 153	< 152	< 195	< 104
Nb-95		< 42.4	< 57.7	< 61.1	< 36.2	< 89.0	< 93.4	< 112	< 77.8
Co-58		< 32.8	< 45.5	< 59.7	< 26.2	< 69.7	< 71.1	< 93.0	< 58.4
Mn-54		< 29.7	< 46.1	< 52.8	< 30.4	< 74.3	< 75.5	< 96.7	< 50.6
Zn-65		< 58.1	< 149.5	< 213.7	< 87.4	< 169	< 161	< 242	< 146
Fe-59		< 122.7	< 75.3	< 188.9	< 95.4	< 186	< 181	< 206	< 171
Co-60		< 33.9	< 49.0	< 87.4	< 35.4	< 93.7	< 85.4	< 105	< 74.5
Ba/La-140		< 33.8	< 63.4	< 94.7	< 49.1	< 160	< 130	< 209	< 131
Ru-103		< 39.5	< 51.3	< 72.3	< 25.3	< 91.4	< 84.8	< 103	< 60.6
Ru-106		< 407.5	< 468.2	< 658.5	< 312.2	< 631	< 695	< 708	< 524
Ce-141		< 53.2	< 79.9	< 57.8	< 37.6	< 156	< 147	< 163	< 91.7
Ce-144		< 226.4	< 315.5	< 312.0	< 174.1	< 465	< 469	< 459	< 285.0
AcTh-228		856.1 +/- 140.8	1051.0 +/- 191.1	1336.0 +/- 219.1	< 111.6	1220 +/- 66.5	1200 +/- 62.0	1540 +/- 72.0	710 +/- 39.1
Ra-226		2495 +/- 723	2039 +/- 811	2406 +/- 937	1208 +/- 495	< 1950	2430 +/- 665	2800 +/- 735	< 913.0
K-40		35500 +/- 1232	21140 +/- 1181	25220 +/- 1505	16710 +/- 936	20200 +/- 860	18600 +/- 890	16700 +/- 1010	19000 +/- 860

TABLE B-18
CONCENTRATIONS OF GAMMA EMITTERS IN RAINWATER SAMPLES – 2011
Results in Units of pCi/L ± 1 Sigma

Sample Location		ROSETON RAINWATER	ROSETON RAINWATER	ROSETON RAINWATER	ROSETON RAINWATER	PEEKSKILL RAINWATER	PEEKSKILL RAINWATER	PEEKSKILL RAINWATER	PEEKSKILL RAINWATER
End Date		3/27/2011	6/27/2011	9/26/2011	12/27/2011	3/27/2011	6/27/2011	9/26/2011	12/27/2011
Client ID / Radionuclide	Req. CL (pCi)	IRF231Q11	IRF232Q11	IRF233911		IRF441Q11	IRF442Q11	IRF443911	
H-3		< 410	< 424	< 412	< 190	< 410	< 424	< 412	396 +/- 70.5
Be-7		40.2 +/- 5.9	< 23.8	< 24.4	< 42.2	32.9 +/- 6.1	< 45.3	< 29.5	< 44.3
I-131		14.3 +/- 4.6	< 20.0	< 22.7	< 8.1	25.8 +/- 3.9	< 27.9	< 20.9	< 9.2
Cs-134	7.5	< 0.6	< 1.5	< 2.3	< 3.8	< 1.2	< 4.3	< 2.5	< 4.6
Cs-137	9	< 0.9	< 2.2	< 2.0	< 3.9	< 0.9	< 3.4	< 2.5	< 4.4
Zr-95		< 2.1	< 5.6	< 3.6	< 8.3	< 2.5	< 7.9	< 6.1	< 8.5
Nb-95		< 1.7	< 4.5	< 3.7	< 5.2	< 1.9	< 6.4	< 4.8	< 4.9
Co-58		< 1.2	< 3.2	< 2.4	< 4.2	< 1.4	< 4.6	< 3.6	< 4.7
Mn-54		< 0.9	< 2.4	< 1.7	< 3.4	< 1.1	< 3.5	< 2.4	< 4.4
Zn-65		< 2.1	< 5.6	< 4.2	< 8.8	< 2.1	< 11.6	< 4.5	< 8.2
Fe-59		< 4.0	< 8.8	< 8.0	< 7.3	< 3.9	< 18.2	< 10.1	< 8.8
Co-60	7.5	< 0.9	< 2.0	< 2.0	< 3.9	< 1.1	< 3.2	< 2.5	< 4.8
Ba/La-140		< 5.0	< 11.1	< 11.3	< 6.3	< 6.9	< 8.2	< 9.8	< 7.0
Ru-103		< 1.9	< 2.6	< 4.3	< 5.0	< 2.0	< 6.8	< 5.2	< 5.4
Ru-106		< 10.2	< 25.2	< 19.7	< 35.4	< 10.7	< 35.7	< 24.5	< 46.0
Ce-141		< 3.1	< 8.0	< 6.4	< 8.9	< 3.8	< 11.2	< 8.8	< 8.9
Ce-144		< 6.8	< 18.2	< 15.5	< 32.6	< 8.4	< 23.5	< 16.3	< 35.0
AcTh-228		< 3.2	< 6.9	19.1 +/- 5.4	< 7.3	< 3.5	< 11.6	< 7.2	< 10.1
Ra-226		92.5 +/- 9.3	< 44.8	95.6 +/- 32.5	< 97.5	80.1 +/- 9.8	< 73.3	113 +/- 39.7	< 119
K-40		73.9 +/- 5.1	78.0 +/- 23.1	< 18.6	< 61.6	34.6 +/- 4.6	271 +/- 41.2	51.8 +/- 20.3	< 85.9

TABLE B-19
CONCENTRATIONS OF GAMMA EMITTERS IN SOIL SAMPLES – 2011
Results in Units of pCi/kg ± 1 Sigma

Sample Location Date		ROSETON 9/19/2011	MET TOWER 9/19/2011	TRAINING BLDG 9/19/2011
Client ID		ISO233811	ISO953811	ISO943811
Radionuclide	Req. CL (pCi)			
Be-7		402.1 +/- 160.2	< 274.3	< 175.1
I-131		< 32.5	< 45.8	< 21.3
Cs-134	**75**	< 19.8	< 46.8	< 20.5
Cs-137	**90**	< 24.7	< 38.0	< 21.2
Zr-95		< 43.4	< 54.0	< 32.2
Nb-95		< 28.2	< 35.8	< 33.5
Co-58		< 25.8	< 39.5	< 21.4
Mn-54		< 25.6	< 37.9	< 26.0
Zn-65		< 36.9	< 132.2	< 27.8
Fe-59		< 61.4	< 108.0	< 59.4
Co-60		< 27.0	< 40.4	< 26.2
Ba/La-140		< 29.1	< 23.0	< 24.4
Ru-103		< 27.1	< 32.4	< 22.0
Ru-106		< 267.4	< 346.3	< 230.8
Ce-141		< 47.8	< 51.0	< 34.4
Ce-144		< 213.1	< 244.1	< 151.5
AcTh-228		726.6 +/- 109.2	689.4 +/- 133.2	419.9 +/- 84.5
Ra-226		< 711.6	1428.0 +/- 546.5	1264.0 +/- 422.8
K-40		18210.0 +/- 782.6	13070.0 +/- 980.3	12920.0 +/- 674.1

TABLE B-20

CONCENTRATIONS OF RADIONUCLIDES IN MONITORING WELL SAMPLES
Results in pCi/L ± 3 sigma

Monitoring Well **Sample Name** **Sample Date**		**MW-LAF** MW-LAF-002-015 5/2/2011	**MW-LAF** MW-LAF-002-016 12/13/2011
Radionuclide	Req. MDC		
H-3		< 343	< 479
Cs-137	**18**	< 8.6	< 11.1
Co-60		< 7.7	< 12.9
Sr-90	**1**	< 1.66	< 1.75
Ni-63		< 18.3	< 12.2

Note 1: Less than values "<" are Minimum Detectable Concentration (MDC) values.
Note 2: A sample is positive if the result is greater than or equal to the MDC.

Table B-21
LAND USE CENSUS - RESIDENCE and MILCH ANIMAL RESULTS
2011

The 2011 land use census indicated there were no new residences that were closer in proximity to IPEC. NEM maintains a complete nearest residence survey with updated distances.

No milch animals were observed during this reporting period within the 5-mile zone. There are no animals producing milk for human consumption within five miles of Indian Point.

TABLE B-22
LAND USE CENSUS
2011

INDIAN POINT ENERGY CENTER

UNRESTRICTED AREA BOUNDARY AND NEAREST RESIDENCES

Sector	Compass Point	Distance to site Boundary from Unit 2 Plant Vent (meters)	Distance to site Boundary from Unit 3 Plant Vent (meters)	Distance to nearest resident, from Unit 1 superheater (meters)	Address of nearest resident, Last Census
1	N	RIVER	RIVER	1788	41 River Road Tomkins Cove
2	NNE	RIVER	RIVER	3111	Chateau Rive Apts. John St. Peekskill
3	NE	550	636	1907	211 Viewpoint Terrace, Peekskill
4	ENE	600	775	1478	1018 Lower South St. Peekskill
5	E	662	785	1371	1103 Lower South St. Peekskill
6	ESE	569	622	715	461 Broadway Buchanan
7	SE	553	564	1168	223 First St. Buchanan
8	SSE	569	551	1240	5 Pheasant's Run Buchanan
9	S	700	566	1133	320 Broadway Verplanck
10	SSW	755	480	1574	240 Eleventh St. Verplanck
11	SW	544	350	3016	8 Spring St. Tomkins Cove
12	WSW	RIVER	RIVER	2170	9 West Shore Dr. Tomkins Cove
13	W	RIVER	RIVER	1919	712 Rt. 9W Tomkins Cove
14	WNW	RIVER	RIVER	1752	770 Rt. 9W Tomkins Cove
15	NW	RIVER	RIVER	1693	807 Rt. 9W Tomkins Cove
16	NNW	RIVER	RIVER	1609	4 River Rd. Tomkins Cove

APPENDIX C

HISTORICAL TRENDS

APPENDIX C

The past ten years of historical data for various radionuclides and media are presented both in tabular form and graphical form to facilitate the comparison of 2011 data with historical values. Although other samples were taken and analyzed, values were only tabulated and plotted where positive indications were present.

Averaging the positive values in these tables can result in a biased high value, especially, when the radionuclide is detected in only one or two quarters for the year.

TABLE C-1

DIRECT RADIATION ANNUAL SUMMARY

2001-2011

Average Quarterly Dose (mR/Quarter)			
Year	Inner Ring	Outer Ring	Control Location
2001	15.0	15.0	17.0
2002	15.0	15.0	14.0
2003	14.3	13.9	14.7
2004	13.0	13.0	14.0
2005	14.1	14.1	15.9
2006	13.9	14.3	17.5
2007	14.4	14.6	18.8
2008	14.5	14.2	17.3
2009	14.5	14.2	17.3
2010	14.0	14.3	13.0
2011	**13.6**	**14.4**	**13.4**
Historical Average 2001-2010	14.3	14.3	15.9

FIGURE C-1

DIRECT RADIATION, ANNUAL SUMMARY
2001 to 2011

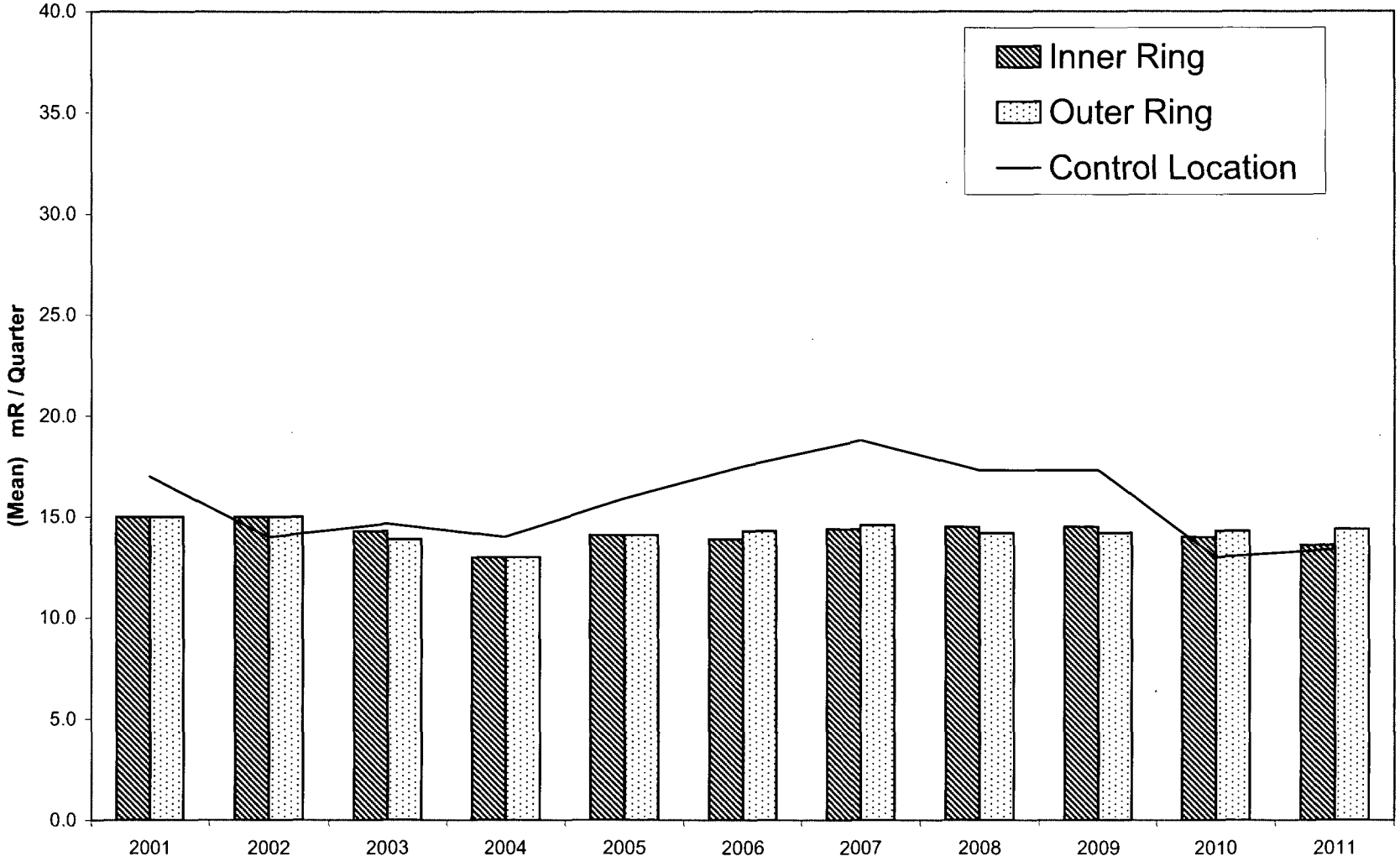


TABLE C-2

RADIONUCLIDES IN AIR
2001 to 2011
(pCi/m^3)

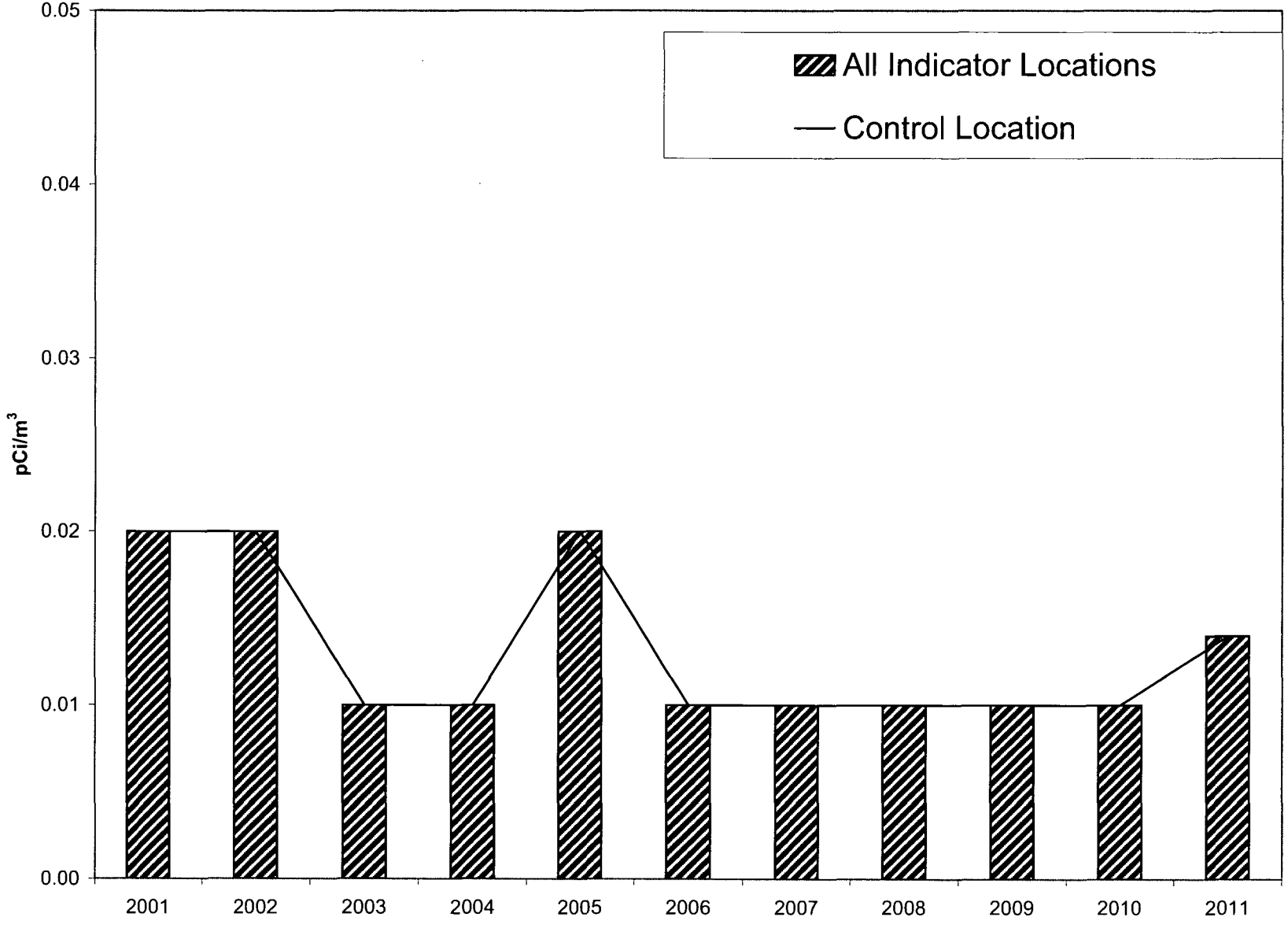
Year	Gross Beta		Cs-137	
	All Indicator Locations	Control Location	All Indicator Locations	Control Location
2001	0.02	0.02	< Lc	< Lc
2002	0.02	0.02	< Lc	< Lc
2003	0.01	0.01	< Lc	< Lc
2004	0.01	0.01	< Lc	< Lc
2005	0.02	0.02	< Lc	< Lc
2006	0.01	0.01	< Lc	< Lc
2007	0.01	0.01	< Lc	< Lc
2008	0.01	0.01	< Lc	< Lc
2009	0.01	0.01	< Lc	< Lc
2010	0.01	0.01	< Lc	< Lc
2011	**0.014**	**0.014**	**< L_c**	**< L_c**
Historical Average 2001-2010	0.01	0.01	< L_c	< L_c

Critical Level (L_c) is less than the ODCM required LLD.

$<L_c$ indicates no positive values above sample critical level.

FIGURE C-2

RADIONUCLIDES IN AIR - GROSS BETA
2001 to 2011



* Includes ODCM and non-ODCM indicator locations.

Gross Beta ODCM required LLD = 0.01 pCi/m^3

TABLE C-3

RADIONUCLIDES IN HUDSON RIVER WATER
2001 to 2011
(pCi/L)

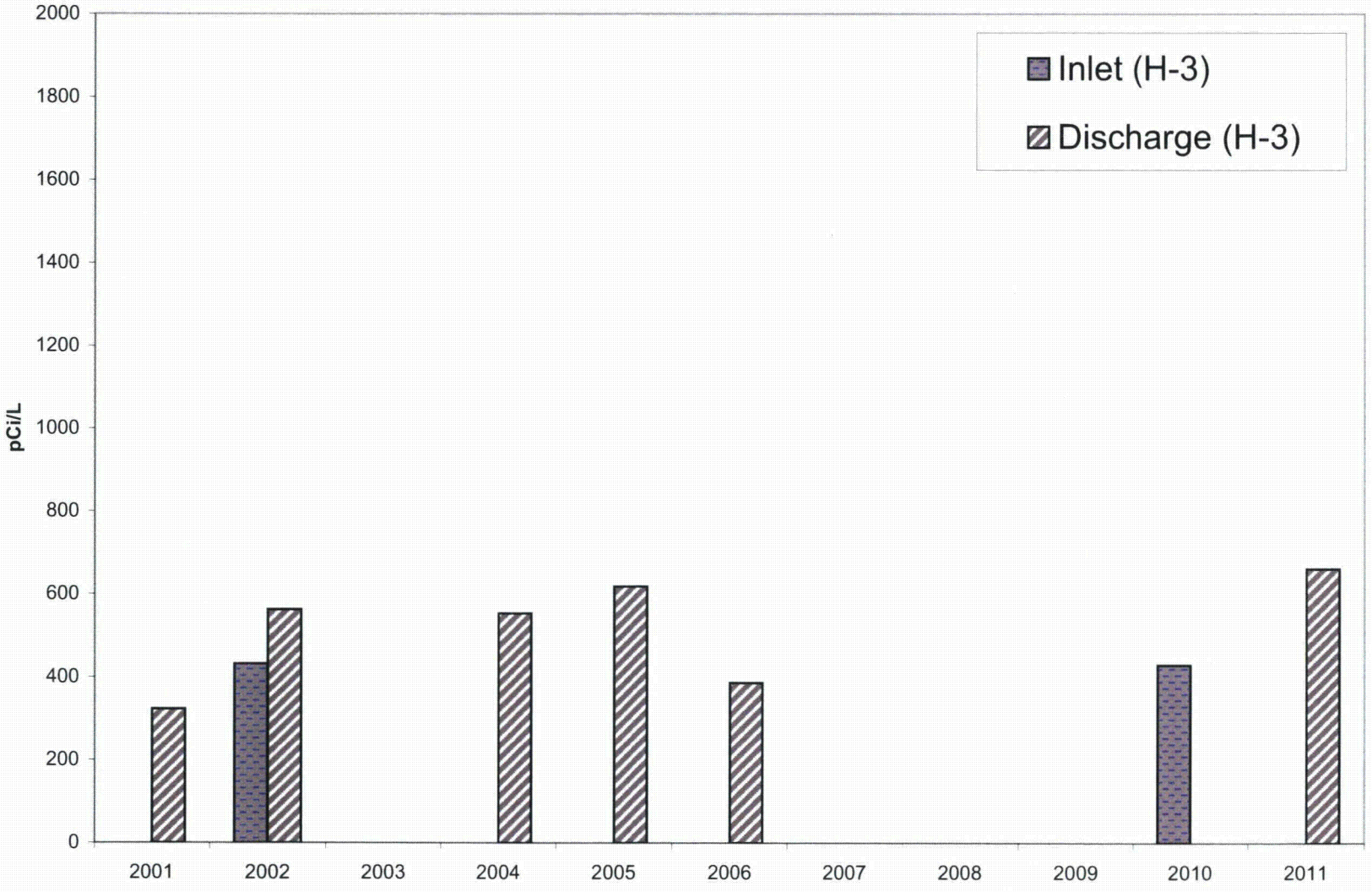
	Tritium (H-3)		Cs-137	
Year	**Inlet**	**Discharge**	**Inlet**	**Discharge**
2001	< Lc	323	< Lc	< Lc
2002	432	562	< Lc	< Lc
2003	< Lc	< Lc	< Lc	< Lc
2004	< Lc	553	< Lc	< Lc
2005	< Lc	618	< Lc	< Lc
2006	< Lc	386	< Lc	< Lc
2007	< Lc	< Lc	< Lc	< Lc
2008	< Lc	< Lc	< Lc	< Lc
2009	< Lc	< Lc	< Lc	< Lc
2010	428	< Lc	< Lc	< Lc
2011	**< Lc**	**661**	**< L_c**	**< L_c**
Historical Average 2001-2000	430	488	< L_c	< L_c

Critical Level (L_c) is less than the ODCM required LLD.

<L_c indicates no positive values above sample critical level.

FIGURE C-3

RADIONUCLIDES IN HUDSON RIVER WATER
2001 to 2011



Tritium ODCM required LLD = 3000 pCi/L

TABLE C-4

RADIONUCLIDES IN DRINKING WATER
2001 to 2011
(pCi/L)

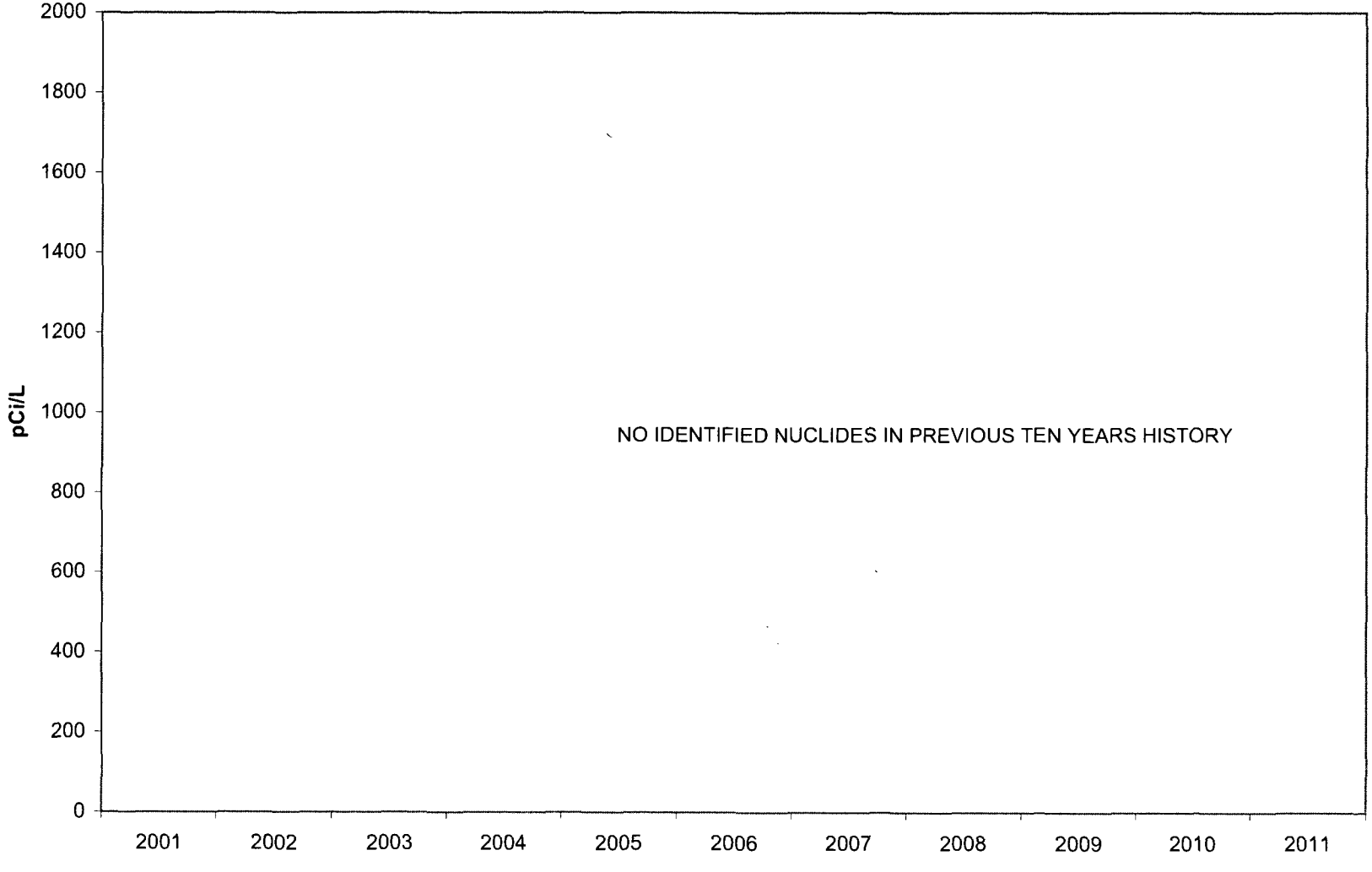
Year	Tritium (H-3)	Cs-137
2001	< Lc	< Lc
2002	< Lc	< Lc
2003	< Lc	< Lc
2004	< Lc	< Lc
2005	< Lc	< Lc
2006	< Lc	< Lc
2007	< Lc	< Lc
2008	< Lc	< Lc
2009	< Lc	< Lc
2010	< Lc	< Lc
2011	**< L_c**	**< L_c**
Historical Average 2001-2010	< L_c	< L_c

Critical Level (L_c) is less than the ODCM required LLD.

<L_c indicates no positive values above sample critical level.

FIGURE C-4

RADIONUCLIDES IN DRINKING WATER
2001 to 2011



Tritium ODCM required LLD = 2000 pCi/L

TABLE C-5

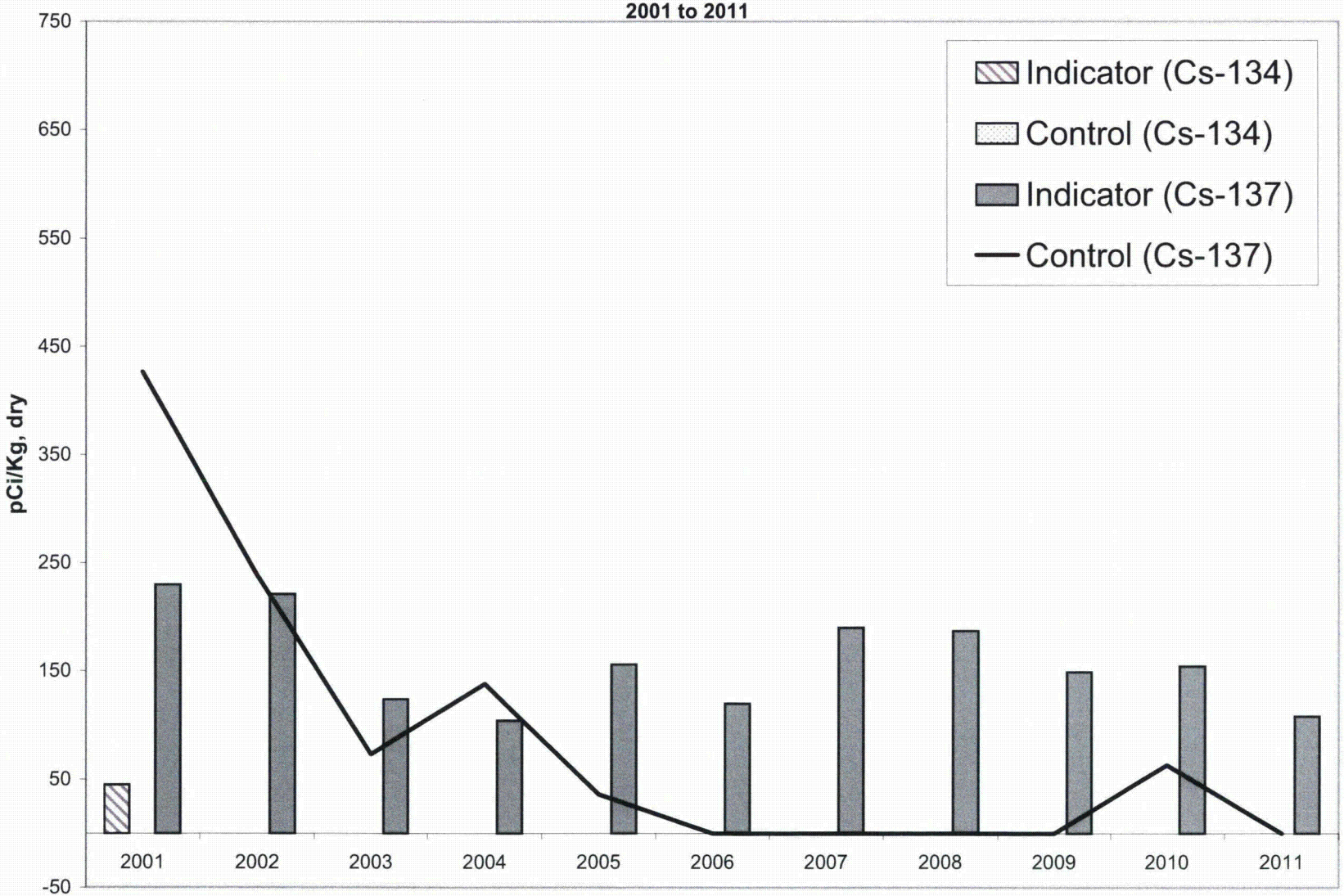
RADIONUCLIDES IN SHORELINE SOIL
2001 to 2011
(pCi/Kg, dry)

	Cs-134		Cs-137	
Year	Indicator	Control	Indicator	Control
2001	45	< Lc	230	427
2002	< Lc	< Lc	221	238
2003	< Lc	< Lc	124	73
2004	< Lc	< Lc	104	138
2005	< Lc	< Lc	156	36
2006	< Lc	< Lc	120	< Lc
2007	< Lc	< Lc	190	< Lc
2008	< Lc	< Lc	187	< Lc
2009	< Lc	< Lc	149	< Lc
2010	< Lc	< Lc	154	63
2011	**< L_c**	**< L_c**	**108**	**< L_c**
Historical Average 2001-2010	45	< L_c	164	163

Critical Level (L_c) is less than the RETS required LLD.

<L_c indicates no positive values above sample critical level.

FIGURE C-5
RADIONUCLIDES IN SHORELINE SOIL
2001 to 2011



Cs-134 ODCM required LLD = 150 pCi/Kg, dry
Cs-137 ODCM required LLD = 175 pCi/Kg, dry

TABLE C-6

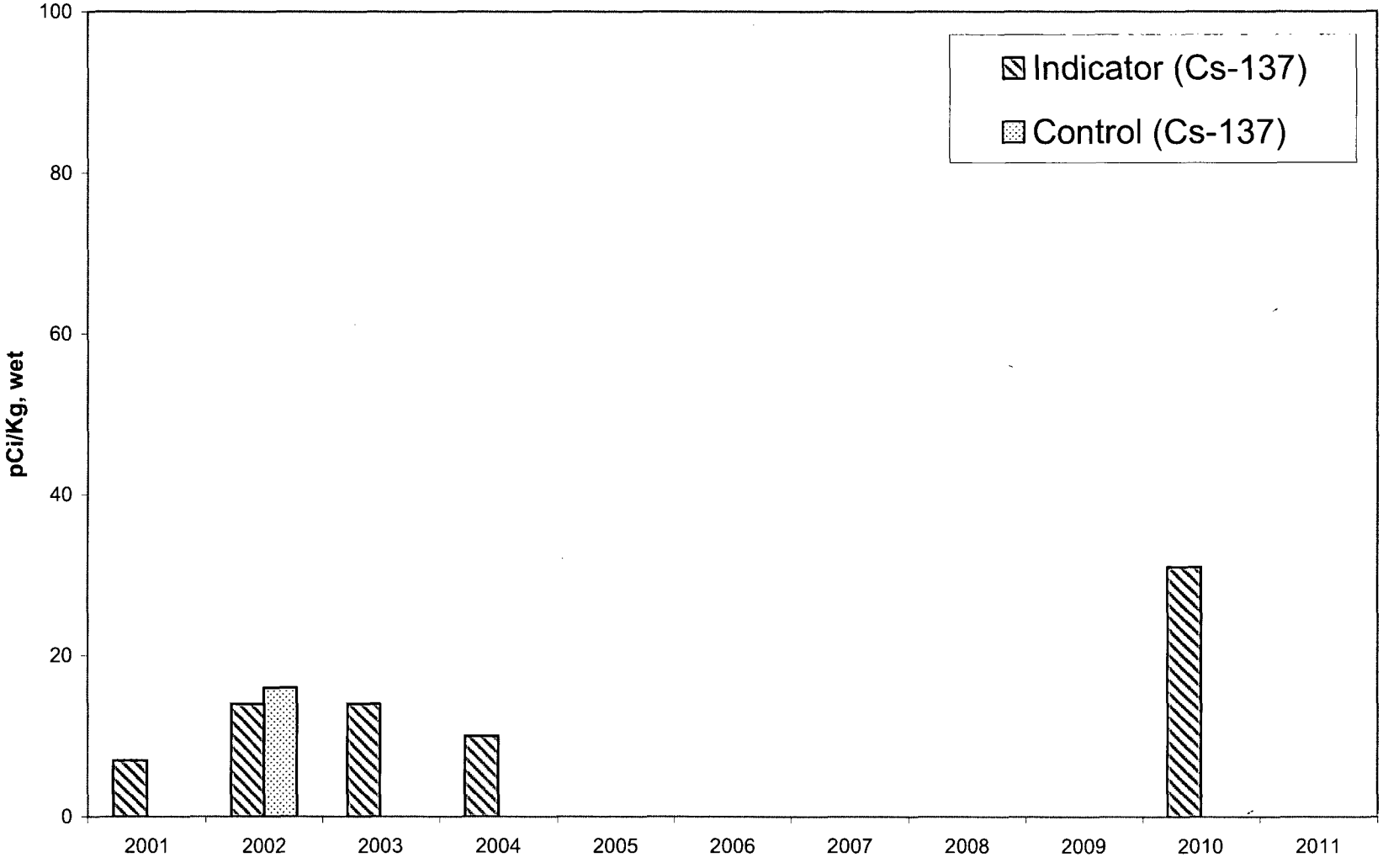
BROAD LEAF VEGETATION - Cs-137
2001 to 2011
(pCi/Kg, wet)

	Cs-137	
Year	**Indicator**	**Control**
2001	7	< Lc
2002	14	16
2003	14	< Lc
2004	10	< Lc
2005	< Lc	< Lc
2006	< Lc	< Lc
2007	< Lc	< Lc
2008	< Lc	< Lc
2009	< Lc	< Lc
2010	31	< Lc
2011	**< Lc**	**< L_c**
Historical Average 2001-2010	15	16

Critical Level (L_c) is less than the ODCM required LLD.

$<L_c$ indicates no positive values above sample critical level.

FIGURE C-6
BROAD LEAF VEGETATION - Cs-137
2001 to 2011



ODCM required LLD = 80 pCi/Kg, wet

TABLE C-7

FISH AND INVERTEBRATES - Cs-137
2001 to 2011
(pCi/Kg, dry)

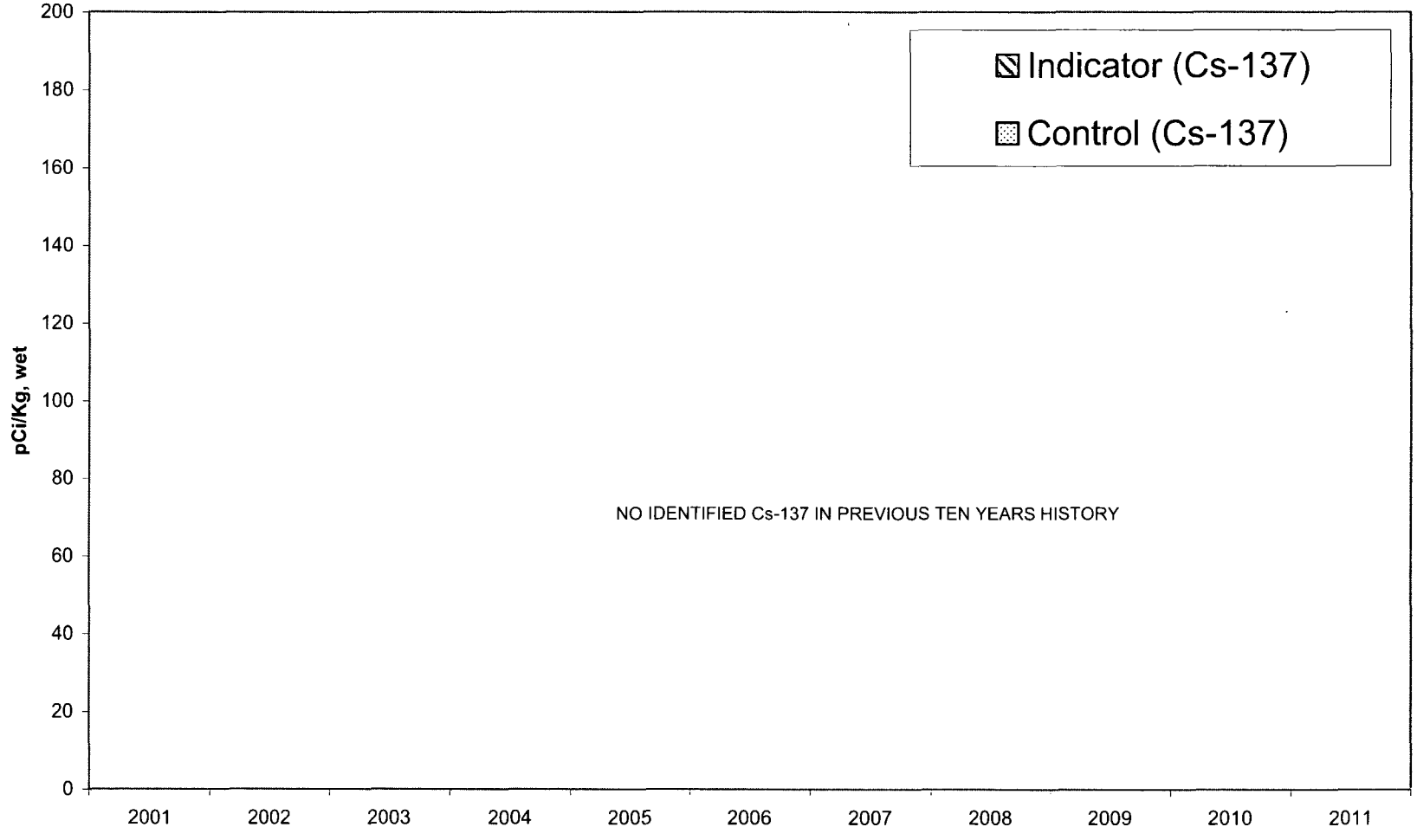
	Cs-137	
Year	Indicator	Control
2001	< Lc	< Lc
2002	< Lc	< Lc
2003	< Lc	< Lc
2004	< Lc	< Lc
2005	< Lc	< Lc
2006	< Lc	< Lc
2007	< Lc	< Lc
2008	< Lc	< Lc
2009	< Lc	< Lc
2010	< Lc	< Lc
2011	**< L_c**	**< L_c**
Historical Average 2001-2010	< L_c	< L_c

Critical Level (L_c) is less than the ODCM required LLD.

$<L_c$ indicates no positive values above sample critical level.

FIGURE C-7

FISH AND INVERTEBRATES - Cs-137
2001 to 2011



Cs-137 ODCM required LLD = 150 pCi/Kg, wet

APPENDIX D

INTERLABORATORY COMPARISON PROGRAM

APPENDIX D

INTERLABORATORY COMPARISON PROGRAM

This section presents the results of the interlaboratory comparison program for the J. A. Fitzpatrick Environmental Laboratory, Teledyne Brown Engineering Environmental Services and Environmental Dosimetry Company. Since General Engineering Labs only analyzed 2 samples, their interlaboratory data is not presented. However, their results can be provided upon request.

D.1 Program Description – JA Fitzpatrick Interlaboratory Comparison Program

The J.A. Fitzpatrick Environmental Laboratory participates in an Interlaboratory Comparison Program. The Interlaboratory Comparison Program includes sample media for which samples are routinely collected and for which comparison samples are commercially available. Participation in an Interlaboratory Comparison Program ensures that independent checks on the precision and accuracy of the measurement of radioactive material in the environmental samples are performed as part of the Quality Assurance Program for environmental monitoring. To fulfill the requirement for an Interlaboratory Comparison Program, the James A. FitzPatrick Nuclear Power Plant (JAF) Environmental Laboratory has engaged the services of Eckert & Ziegler Analytics, Incorporated in Atlanta, Georgia.

Analytics supplies sample media as blind sample spikes, which contain certified levels of radioactivity unknown to the analysis laboratory. These samples are prepared and analyzed by the JAF Environmental Laboratory using standard laboratory procedures. Analytics issues a statistical summary report of the results. The JAF Environmental Laboratory uses predetermined acceptance criteria methodology for evaluating the laboratory's performance.

The JAF Environmental Laboratory also analyzes laboratory blanks. The analysis of laboratory blanks provides a means to detect and measure radioactive contamination of analytical samples. The analysis of analytical blanks also provides information on the adequacy of background subtraction. Laboratory blank results are analyzed using control charts.

D.2 Program Schedule

SAMPLE MEDIA	LABORATORY ANALYSIS	SAMPLE PROVIDER ANALYTICS
Water	Gross Beta	3
Water	Tritium	5
Water	I-131	4
Water	Mixed Gamma	4
Air	Gross Beta	3
Air	I-131	4
Air	Mixed Gamma	2
Milk	I-131	3
Milk	Mixed Gamma	3
Soil	Mixed Gamma	1
Vegetation	Mixed Gamma	2
TOTAL SAMPLE INVENTORY		34

D.3 Acceptance Criteria

Each sample result is evaluated to determine the accuracy and precision of the laboratory's analysis result. The sample evaluation method is discussed below.

D.3.1 Sample Results Evaluation

Samples provided by Analytics are evaluated using what is specified as the NRC method. This method is based on the calculation of the ratio of results reported by the participating laboratory (QC result) to the Vendor Laboratory Known value (reference result).

An Environmental Laboratory analytical result is evaluated using the following calculation:

The value for the error resolution is calculated.

$$\text{Error Resolution} = \frac{\text{Reference Result}}{\text{Reference Results Error (1 sigma)}}$$

Using the appropriate row under the Error Resolution column in Table D.3-1, a corresponding Ratio of Agreement interval is given.

The value for the ratio is then calculated.

$$\text{Ratio of agreement} = \frac{\text{QC Result}}{\text{Reference Result}}$$

If the value falls within the agreement interval, the result is acceptable.

TABLE D.3-1

ERROR RESOLUTION	RATIO OF AGREEMENT
< 4	No Comparison
4 to 7	0.5-2.0
8 to 15	0.6-1.66
16 to 50	0.75-1.33
51 to 200	0.8-1.25
>200	0.85-1.18

This acceptance test is generally referred to as the "NRC" method. The acceptance criteria are contained in Procedure EN-CY-102. The NRC method generally results in an acceptance range of approximately ± 25% of the Known value when applied to sample results from the Eckert & Ziegler Analytics Interlaboratory Comparison Program. This method is used as the procedurally required assessment method and requires the generation of a deviation from QA/QC program report when results are unacceptable.

D.4 Program Results Summary

The Interlaboratory Comparison Program numerical results are provided on Section D.4.2.

D.4.1 Eckert & Ziegler Analytics QA Samples Results

Thirty-four QA blind spike samples were analyzed as part of Analytics 2011 Interlaboratory Comparison Program. The following sample media were evaluated as part of the comparison program.

- Air Charcoal Cartridge: I-131
- Air Particulate Filter: Gross Beta, Mixed Gamma Emitters
- Water: Gross Beta, Tritium, I-131, Mixed Gamma Emitters
- Milk: I-131, Mixed Gamma Emitters
- Vegetation: Mixed Gamma Emitters
- Soil: Mixed Gamma Emitters

The JAF Environmental Laboratory performed 133 individual analyses on the 34 QA samples. Of the 133 analyses performed, 133 were in agreement using the NRC acceptance criteria for a 100% agreement ratio.

There were no nonconformities in the 2011 program.

D.4.2 Numerical Results Tables

Data tables in this section were obtained from Section 8 of the annual QA Report for the J.A. Fitzpatrick Environmental Laboratory.

Table D.4-1
INTERLABORATORY INTERCOMPARISON PROGRAM
Gross Beta Analysis of Air Particulate Filter

DATE	SAMPLE ID NO.	MEDIUM	ANALYSIS	JAF ELAB RESULTS pCi ±1 sigma	REFERENCE LAB* pCi ±1 sigma	RATIO (1)
06/16/2011	E7633-05	Air Particulate Filter	Gross Beta	9.32E+01 ± 1.36E+00 9.11E+01 ± 1.34E+00 9.17E+01 ± 1.35E+00 Mean = 9.20E+01 ± 7.79E-01	8.55E+01 ± 1.43E+00	1.08 A
06/16/2011	E7618-09	Air Particulate Filter	Gross Beta	7.61E+01 ± 1.20E+00 7.93E+01 ± 1.30E+00 7.64E+01 ± 1.20E+00 Mean = 7.73E+01 ± 7.10E-01	7.29E+01 ± 1.22E+00	1.06 A
12/08/2011	E8254-05	Air Particulate Filter	Gross Beta	1.01E+02 ± 2.74E+00 9.96E+01 ± 2.72E+00 1.01E+02 ± 2.74E+00 9.98E+01 ± 2.72E+00 9.89E+01 ± 2.71E+00 9.79E+01 ± 2.69E+00 1.05E+02 ± 2.78E+00 1.08E+02 ± 2.81E+00 9.97E+01 ± 2.70E+00 9.14E+01 ± 2.69E+00 9.14E+01 ± 2.71E+00 9.81E+01 ± 2.79E+00 Mean = 9.94E+01 ± 8.00E-01	8.96E+01 ± 1.50E+00	1.11 A

(1) Ratio = Reported/Analytics.
* Sample provided by Analytics, Inc.

A=Acceptable
U=Unacceptable

Table D.4-1 (Continued)
I-131 Gamma Analysis of Air Charcoal

DATE	SAMPLE ID NO.	MEDIUM	ANALYSIS	JAF ELAB RESULTS pCi ±1 sigma	REFERENCE LAB* pCi ±1 sigma	RATIO (1)
03/17/2011	E7437-09	Air Charcoal Cartridge	I-131	9.63E+01 ± 3.30E+00 9.73E+01 ± 1.50E+00 9.80E+01 ± 3.20E+00 Mean = 9.72E+01 ± 1.57E+00	9.62E+01 ± 1.61E+00	1.01 A
06/16/2011	E7636-05	Air Charcoal Cartridge	I-131	9.53E+01 ± 2.70E+00 1.00E+02 ± 2.70E+00 8.61E+01 ± 2.80E+00 Mean = 9.38E+01 ± 1.57E+00	8.67E+01 ± 1.45E+00	1.08 A
09/15/2011	E8125-05	Air Charcoal Cartridge	I-131	8.05E+01 ± 3.00E+00 8.32E+01 ± 3.20E+00 8.40E+01 ± 3.10E+00 Mean = 8.26E+01 ± 1.80E+00	8.05E+01 ± 1.34E+00	1.03 A
09/15/2011	E8127-09	Air Charcoal Cartridge	I-131	7.23E+01 ± 4.30E+00 7.21E+01 ± 4.50E+00 8.06E+01 ± 4.60E+00 Mean = 7.50E+01 ± 2.60E+00	8.05E+01 ± 1.34E+00	0.93 A

(1) Ratio = Reported/Analytics.
* Sample provided by Analytics, Inc.

A=Acceptable
U=Unacceptable

Table D.4-1 (Continued)
Gross Beta Analysis of Water

DATE	SAMPLE ID NO.	MEDIUM	ANALYSIS	JAF ELAB RESULTS pCi/liter ±1 sigma	REFERENCE LAB* pCi/liter ±1 sigma	RATIO (1)
03/17/2011	E7479-05	Water	Gross Beta	2.51E+02 ± 2.50E+00 2.52E+02 ± 2.50E+00 2.54E+02 ± 2.50E+00 2.55E+02 ± 2.50E+00 Mean = 2.53E+02 ± 1.30E+00	2.47E+02 ± 4.13E+00	1.02 A
06/16/2011	E7638-05	Water	Gross Beta	2.33E+02 ± 2.40E+00 2.32E+02 ± 2.40E+00 2.34E+02 ± 2.40E+00 Mean = 2.33E+02 ± 1.39E+00	2.51E+02 ± 4.18E+00	0.93 A
09/15/2011	E8126-05	Water	Gross Beta	2.54E+02 ± 3.30E+00 2.57E+02 ± 3.30E+00 2.50E+02 ± 3.30E+00 Mean = 2.54E+02 ± 1.90E+00	2.49E+02 ± 4.16E+00	1.02 A

(1) Ratio = Reported/Analytics.
A=Acceptable
* Sample provided by Analytics, Inc.
U=Unacceptable

Table D.4-1 (Continued)
Tritium Analysis of Water

DATE	SAMPLE ID NO.	MEDIUM	ANALYSIS	JAF ELAB RESULTS pCi/liter ±1 sigma	REFERENCE LAB* pCi/liter ±1 sigma	RATIO (1)
03/17/2011	E7476-05	Water	H-3	4.31E+03 ± 1.63E+02 4.67E+03 ± 1.66E+02 4.65E+03 ± 1.66E+02 Mean = 4.55E+03 ± 9.50E+01	4.53E+03 ± 7.57E+01	1.00 A
06/16/2011	E7632-05	Water	H-3	8.33E+02 ± 1.34E+02 9.23E+02 ± 1.35E+02 9.08E+02 ± 1.35E+02 Mean = 8.88E+02 ± 7.78E+01	9.05E+02 ± 1.51E+01	0.98 A
09/15/2011	E8121-05	Water	H-3	9.15E+02 ± 1.31E+02 1.00E+03 ± 1.32E+02 9.57E+02 ± 1.32E+02 Mean = 9.58E+02 ± 7.60E+01	7.92E+02 ± 1.32E+02	1.21 A
12/08/2011	E8181-09	Water	H-3	1.06E+04 ± 2.09E+02 1.02E+04 ± 2.08E+02 1.01E+04 ± 2.11E+02 Mean = 1.03E+04 ± 1.21E+02	1.09E+04 ± 1.82E+02	0.94 A
12/08/2011	E8182-09	Water	H-3	1.03E+04 ± 2.06E+02 1.03E+04 ± 2.08E+02 1.01E+04 ± 2.10E+02 Mean = 1.03E+04 ± 1.20E+02	1.09E+04 ± 1.82E+02	0.94 A

(1) Ratio = Reported/Analytics.
A=Acceptable
* Sample provided by Analytics, Inc.
U=Unacceptable

Table D.4-1 (Continued)
INTERLABORATORY INTERCOMPARISON PROGRAM
Gamma Analysis of Air Particulate Filter

DATE	SAMPLE ID NO.	MEDIUM	ANALYSIS	JAF ELAB RESULTS pCi ±1 sigma	REFERENCE LAB* pCi ±1 sigma	RATIO (1)
03/17/2011	E7478-05	Air Particulate Filter	Cr-51	2.21E+02 ± 1.59E+01 2.24E+02 ± 1.80E+01 2.33E+02 ± 1.37E+01 Mean = 2.26E+02 ± 9.22E+00	2.30E+02 ± 3.84E+00	0.98 A
			Cs-134	1.17E+02 ± 4.50E+00 1.11E+02 ± 4.90E+00 1.15E+02 ± 3.80E+00 Mean = 1.14E+02 ± 2.55E+00	1.01E+02 ± 1.68E+00	1.13 A
			Cs-137	1.69E+02 ± 4.50E+00 1.59E+02 ± 4.80E+00 1.65E+02 ± 3.80E+00 Mean = 1.64E+02 ± 2.52E+00	1.58E+02 ± 2.64E+00	1.04 A
			Co-58	9.00E+01 ± 3.50E+00 8.40E+01 ± 4.10E+00 9.00E+01 ± 3.20E+00 Mean = 8.81E+01 ± 2.08E+00	8.73E+01 ± 1.46E+00	1.01 A
			Mn-54	2.11E+02 ± 5.20E+00 2.21E+02 ± 5.80E+00 2.18E+02 ± 4.50E+00 Mean = 2.17E+02 ± 2.98E+00	2.05E+02 ± 3.43E+00	1.06 A
			Fe-59	1.44E+02 ± 5.20E+00 1.38E+02 ± 6.10E+00 1.56E+02 ± 4.60E+00 Mean = 1.46E+02 ± 3.09E+00	1.34E+02 ± 2.24E+00	1.09 A
			Zn-65	2.26E+02 ± 8.80E+00 2.12E+02 ± 9.80E+00 2.08E+02 ± 7.60E+00 Mean = 2.15E+02 ± 5.04E+00	2.01E+02 ± 3.36E+00	1.07 A
			Co-60	1.27E+02 ± 3.40E+00 1.32E+02 ± 3.80E+00 1.30E+02 ± 2.90E+00 Mean = 1.30E+02 ± 1.94E+00	1.32E+02 ± 2.21E+00	0.98 A

(1) Ratio = Reported/Analytics.
A=Acceptable
U=Unacceptable

* Sample provided by Analytics, Inc.

Table D.4-1 (Continued)
INTERLABORATORY INTERCOMPARISON PROGRAM
Gamma Analysis of Air Particulate Filter

DATE	SAMPLE ID NO.	MEDIUM	ANALYSIS	JAF ELAB RESULTS pCi ±1 sigma	REFERENCE LAB* pCi ±1 sigma	RATIO (1)
09/15/2011	E8123-05	Air Particulate Filter	Ce-141	6.84E+01 ± 2.80E+00 7.11E+01 ± 2.70E+00 7.35E+01 ± 2.80E+00 Mean = 7.10E+01 ± 1.60E+00	6.96E+01 ± 1.16E+00	1.02 A
			Cr-51	2.17E+02 ± 1.84E+01 2.32E+02 ± 1.79E+01 2.28E+02 ± 1.80E+01 Mean = 2.26E+02 ± 1.05E+01	2.36E+02 ± 3.94E+00	0.96 A
			Cs-134	1.15E+02 ± 8.70E+00 1.15E+02 ± 8.50E+00 1.11E+02 ± 8.20E+00 Mean = 1.14E+02 ± 4.89E+00	1.34E+02 ± 2.23E+00	0.85 A
			Cs-137	1.24E+02 ± 4.30E+00 1.14E+02 ± 4.20E+00 1.15E+02 ± 4.00E+00 Mean = 1.18E+02 ± 2.41E+00	1.19E+02 ± 1.98E+00	0.99 A
			Co-58	1.04E+02 ± 4.10E+00 1.08E+02 ± 4.10E+00 1.08E+02 ± 4.00E+00 Mean = 1.07E+02 ± 2.35E+00	1.02E+02 ± 1.70E+00	1.05 A
			Mn-54	1.75E+02 ± 5.20E+00 1.67E+02 ± 5.10E+00 1.79E+02 ± 4.80E+00 Mean = 1.74E+02 ± 2.91E+00	1.57E+02 ± 2.63E+00	1.11 A
			Fe-59	6.17E+01 ± 4.90E+00 6.86E+01 ± 4.80E+00 6.35E+01 ± 4.30E+00 Mean = 6.46E+01 ± 2.70E+00	5.72E+01 ± 9.55E-01	1.13 A
			Zn-65	1.97E+02 ± 1.01E+01 2.18E+02 ± 9.80E+00 2.25E+02 ± 9.00E+00 Mean = 2.13E+02 ± 5.57E+00	1.88E+02 ± 3.14E+00	1.13 A
			Co-60	1.61E+02 ± 4.20E+00 1.59E+02 ± 4.10E+00 1.64E+02 ± 3.90E+00 Mean = 1.61E+02 ± 2.35E+00	1.64E+02 ± 2.74E+00	0.98 A

(1) Ratio = Reported/Analytics.
A=Acceptable
U=Unacceptable

* Sample provided by Analytics, Inc.

Table D.4-1 (Continued)
INTERLABORATORY INTERCOMPARISON PROGRAM
Gamma Analysis of Soil

DATE	SAMPLE ID NO.	MEDIUM	ANALYSIS	JAF ELAB RESULTS pCi/g ±1 sigma	REFERENCE LAB* pCi/g ±1 sigma	RATIO (1)
06/16/2011	E7635-05	Soil	Ce-141	1.89E-01 ± 2.20E-02 1.89E-01 ± 2.00E-02 1.93E-01 ± 2.09E-02 Mean = 1.90E-01 ± 1.21E-02	1.54E-01 ± 2.57E-03	1.24 A
			Cr-51	3.16E-01 ± 9.66E-03 3.65E-01 ± 9.37E-03 3.42E-01 ± 9.45E-03 Mean = 3.41E-01 ± 5.48E-03	3.97E-01 ± 6.63E-03	0.86 A
			Cs-134	3.58E-01 ± 3.38E-03 3.63E-01 ± 3.32E-03 3.49E-01 ± 3.86E-03 Mean = 3.57E-01 ± 2.04E-03	3.66E-01 ± 6.10E-03	0.97 A
			Cs-137	3.08E-01 ± 1.90E-02 3.54E-01 ± 1.90E-02 3.47E-01 ± 2.09E-02 Mean = 3.36E-01 ± 1.13E-02	3.55E-01 ± 5.93E-03	0.95 A
			Co-58	2.92E-01 ± 1.78E-02 2.95E-01 ± 1.74E-02 2.90E-01 ± 1.95E-02 Mean = 2.92E-01 ± 1.05E-02	2.92E-01 ± 4.88E-03	1.00 A
			Mn-54	3.04E-01 ± 1.74E-02 2.81E-01 ± 1.70E-02 2.85E-01 ± 1.98E-02 Mean = 2.90E-01 ± 1.05E-02	2.66E-01 ± 4.44E-03	1.09 A
			Fe-59	2.33E-01 ± 1.96E-02 2.53E-01 ± 2.07E-02 2.48E-01 ± 2.28E-02 Mean = 2.45E-01 ± 1.22E-02	2.38E-01 ± 3.97E-03	1.03 A
			Zn-65	5.22E-01 ± 3.25E-02 5.57E-01 ± 3.39E-02 5.53E-01 ± 3.85E-02 Mean = 5.44E-01 ± 2.02E-02	5.02E-01 ± 8.39E-03	1.08 A
			Co-60	4.02E-01 ± 1.46E-02 3.86E-01 ± 1.49E-02 3.69E-01 ± 1.65E-02 Mean = 3.86E-01 ± 8.87E-03	3.75E-01 ± 6.26E-03	1.03 A

(1) Ratio = Reported/Analytics.
A=Acceptable
U=Unacceptable

* Sample provided by Analytics, Inc.

Table D.4-1 (Continued)
INTERLABORATORY INTERCOMPARISON PROGRAM
Gamma Analysis of Vegetation

DATE	SAMPLE ID NO.	MEDIUM	ANALYSIS	JAF ELAB RESULTS pCi/g ±1 sigma	REFERENCE LAB* pCi/g ±1 sigma	RATIO (1)
06/16/2011	E7637-05	Vegetation	Ce-141	2.74E-01 ± 1.29E-02 2.70E-01 ± 1.52E-02 3.04E-01 ± 1.36E-02 Mean = 2.83E-01 ± 8.04E-03	3.07E-01 ± 5.13E-03	0.92 A
			Cr-51	7.39E-01 ± 7.34E-02 7.67E-01 ± 8.79E-02 8.63E-01 ± 7.11E-02 Mean = 7.90E-01 ± 4.49E-02	7.92E-01 ± 1.32E-02	1.00 A
			Cs-134	6.64E-01 ± 3.52E-02 6.60E-01 ± 4.13E-03 6.29E-01 ± 2.84E-03 Mean = 6.51E-01 ± 1.19E-02	7.29E-01 ± 1.22E-02	0.89 A
			Cs-137	4.94E-01 ± 1.63E-02 5.06E-01 ± 1.91E-02 5.11E-01 ± 1.52E-02 Mean = 5.04E-01 ± 9.78E-03	5.30E-01 ± 8.86E-03	0.95 A
			Co-58	5.79E-01 ± 1.71E-02 5.56E-01 ± 1.92E-02 5.95E-01 ± 1.54E-02 Mean = 5.77E-01 ± 9.99E-03	5.83E-01 ± 9.73E-03	0.99 A
			Mn-54	5.20E-01 ± 1.66E-02 5.12E-01 ± 1.93E-02 4.87E-01 ± 1.48E-02 Mean = 5.06E-01 ± 9.82E-03	5.30E-01 ± 8.85E-03	0.96 A
			Fe-59	4.87E-01 ± 1.89E-02 5.14E-01 ± 2.30E-02 4.70E-01 ± 1.67E-02 Mean = 4.90E-01 ± 1.14E-02	4.74E-01 ± 7.91E-03	1.03 A
			Zn-65	1.10E+00 ± 3.70E-02 9.41E-01 ± 4.33E-02 9.83E-01 ± 3.14E-02 Mean = 1.01E+00 ± 2.17E-02	1.00E+00 ± 1.67E-02	1.01 A
			Co-60	7.18E-01 ± 1.52E-02 7.16E-01 ± 1.74E-02 6.80E-01 ± 1.30E-02 Mean = 7.05E-01 ± 8.84E-03	7.48E-01 ± 1.25E-02	0.94 A

(1) Ratio = Reported/Analytics.
A=Acceptable
U=Unacceptable

* Sample provided by Analytics, Inc.

Table D.4-1 (Continued)
INTERLABORATORY INTERCOMPARISON PROGRAM
Gamma Analysis of Vegetation

DATE	SAMPLE ID NO.	MEDIUM	ANALYSIS	JAF ELAB RESULTS pCi/g ±1 sigma	REFERENCE LAB* pCi/g ±1 sigma	RATIO (1)
09/15/2011	E8128-09	Vegetation	Ce-141	1.51E-01 ± 1.34E-02 1.67E-01 ± 1.73E-02 1.63E-01 ± 1.48E-02 Mean = 1.60E-01 ± 8.81E-03	1.69E-01 ± 2.82E-03	0.95 A
			Cr-51	6.32E-01 ± 8.21E-02 5.53E-01 ± 1.14E-01 6.62E-01 ± 9.49E-03 Mean = 6.16E-01 ± 4.69E-02	5.73E-01 ± 9.57E-03	1.07 A
			Cs-134	3.32E-01 ± 2.88E-02 3.43E-01 ± 3.18E-02 2.71E-01 ± 3.27E-02 Mean = 3.15E-01 ± 1.80E-02	3.25E-01 ± 5.42E-03	0.97 A
			Cs-137	2.99E-01 ± 1.41E-02 2.56E-01 ± 1.61E-02 2.81E-01 ± 1.59E-02 Mean = 2.79E-01 ± 8.89E-03	2.88E-01 ± 4.81E-03	0.97 A
			Co-58	2.73E-01 ± 1.44E-02 2.56E-01 ± 1.61E-02 2.58E-01 ± 1.64E-02 Mean = 2.62E-01 ± 9.04E-03	2.47E-01 ± 4.12E-03	1.06 A
			Mn-54	4.00E-01 ± 1.57E-02 4.30E-01 ± 1.98E-02 3.66E-01 ± 1.89E-02 Mean = 3.99E-01 ± 1.05E-02	3.82E-01 ± 6.38E-03	1.04 A
			Fe-59	1.58E-01 ± 1.64E-02 1.55E-01 ± 2.13E-02 1.09E-01 ± 1.93E-02 Mean = 1.41E-01 ± 1.10E-02	1.39E-01 ± 2.32E-03	1.01 A
			Zn-65	4.19E-01 ± 2.89E-02 4.93E-01 ± 3.85E-02 4.77E-01 ± 3.56E-02 Mean = 4.63E-01 ± 2.00E-02	4.57E-01 ± 7.63E-03	1.01 A
			Co-60	3.88E-01 ± 1.26E-02 3.66E-01 ± 1.52E-02 3.95E-01 ± 1.51E-02 Mean = 3.83E-01 ± 8.29E-03	3.97E-01 ± 6.64E-03	0.96 A

(1) Ratio = Reported/Analytics.
A=Acceptable
U=Unacceptable

* Sample provided by Analytics, Inc.

Table D.4-1 (Continued)
INTERLABORATORY INTERCOMPARISON PROGRAM
Gamma Analysis of Milk

DATE	SAMPLE ID NO.	MEDIUM	ANALYSIS	JAF ELAB RESULTS pCi/liter ±1 sigma	REFERENCE LAB* pCi/liter ±1 sigma	RATIO (1)
03/17/2011	E7438-09	Milk	Cr-51	2.64E+02 ± 4.13E+01 3.12E+02 ± 2.32E+01 2.95E+02 ± 5.59E+01 Mean = 2.90E+02 ± 1.60E+01	2.98E+02 ± 4.98E+00	0.97 A
			Cs-134	1.35E+02 ± 7.50E+00 1.33E+02 ± 4.70E+00 1.36E+02 ± 9.80E+00 Mean = 1.35E+02 ± 3.10E+00	1.30E+02 ± 2.18E+00	1.04 A
			Cs-137	2.06E+02 ± 8.80E+00 2.08E+02 ± 5.00E+00 2.19E+02 ± 1.06E+01 Mean = 2.11E+02 ± 3.50E+00	2.05E+02 ± 3.43E+00	1.03 A
			Co-58	1.26E+02 ± 7.20E+00 1.22E+02 ± 4.00E+00 1.16E+02 ± 9.30E+00 Mean = 1.21E+02 ± 2.90E+00	1.13E+02 ± 1.89E+00	1.07 A
			Mn-54	2.82E+02 ± 1.00E+01 2.75E+02 ± 5.60E+00 2.79E+02 ± 1.20E+01 Mean = 2.79E+02 ± 5.50E+00	2.66E+02 ± 4.45E+00	1.05 A
			Fe-59	1.74E+02 ± 1.07E+01 1.84E+02 ± 6.00E+00 1.98E+02 ± 1.40E+01 Mean = 1.85E+02 ± 6.20E+00	1.75E+02 ± 2.91E+00	1.06 A
			Zn-65	2.75E+02 ± 1.71E+01 2.87E+02 ± 9.60E+00 3.24E+02 ± 2.13E+01 Mean = 2.95E+02 ± 9.60E+00	2.61E+02 ± 4.36E+00	1.13 A
			Co-60	1.84E+02 ± 6.60E+00 1.69E+02 ± 3.60E+00 1.61E+02 ± 7.80E+00 Mean = 1.71E+02 ± 3.60E+00	1.72E+02 ± 2.87E+00	1.00 A
			I-131	1.08E+02 ± 8.40E+00 1.04E+02 ± 4.50E+00 9.75E+01 ± 9.50E+00 Mean = 1.03E+02 ± 4.50E+00	9.69E+01 ± 1.62E+00	1.07 A
			I-131**	9.54E+01 ± 6.50E+00 1.03E+02 ± 2.60E+00 9.18E+01 ± 3.60E+00 Mean = 9.67E+01 ± 2.60E+00	9.69E+01 ± 1.62E+00	1.00 A

(1) Ratio = Reported/Analytics.
A=Acceptable
U=Unacceptable

* Sample provided by Analytics, Inc.

** Result determined by Resin Extraction/Gamma Spectral Analysis.

Table D.4-1 (Continued)
INTERLABORATORY INTERCOMPARISON PROGRAM
Gamma Analysis of Milk

DATE	SAMPLE ID NO.	MEDIUM	ANALYSIS	JAF ELAB RESULTS pCi/liter ±1 sigma	REFERENCE LAB* pCi/liter ±1 sigma	RATIO (1)
06/16/2011	E7634-05	Milk	Ce-141	8.61E+01 ± 5.92E+00 8.57E+01 ± 7.98E+00 8.47E+01 ± 7.23E+00 Mean = 8.55E+01 ± 4.10E+00	7.99E+01 ± 1.33E+00	1.07 A
			Cr-51	2.09E+02 ± 2.64E+01 2.21E+02 ± 4.24E+01 2.38E+02 ± 3.70E+01 Mean = 2.23E+02 ± 2.07E+01	2.06E+02 ± 3.44E+00	1.08 A
			Cs-134	1.81E+02 ± 9.37E+00 1.79E+02 ± 1.25E+01 1.59E+02 ± 1.31E+01 Mean = 1.73E+02 ± 6.80E+00	1.90E+02 ± 3.17E+00	0.91 A
			Cs-137	1.35E+02 ± 4.67E+00 1.45E+02 ± 6.51E+00 1.36E+02 ± 6.38E+00 Mean = 1.39E+02 ± 3.41E+00	1.38E+02 ± 2.30E+00	1.00 A
			Co-58	1.58E+02 ± 4.86E+00 1.53E+02 ± 6.56E+00 1.53E+02 ± 6.98E+00 Mean = 1.55E+02 ± 3.58E+00	1.52E+02 ± 2.53E+00	1.02 A
			Mn-54	1.36E+02 ± 4.79E+00 1.41E+02 ± 6.81E+00 1.38E+02 ± 6.46E+00 Mean = 1.38E+02 ± 3.51E+00	1.38E+02 ± 2.30E+00	1.00 A
			Fe-59	1.33E+02 ± 5.64E+00 1.45E+02 ± 8.64E+00 1.27E+02 ± 7.70E+00 Mean = 1.35E+02 ± 4.29E+00	1.23E+02 ± 2.06E+00	1.10 A
			Zn-65	2.66E+02 ± 9.97E+00 2.62E+02 ± 1.44E+01 2.61E+02 ± 1.38E+01 Mean = 2.63E+02 ± 7.43E+00	2.61E+02 ± 4.35E+00	1.01 A
			Co-60	1.96E+02 ± 4.09E+00 1.96E+02 ± 5.91E+00 2.05E+02 ± 5.69E+00 Mean = 1.99E+02 ± 3.06E+00	1.95E+02 ± 3.25E+00	1.02 A
			I-131	1.12E+02 ± 5.24E+00 9.23E+01 ± 7.65E+00 1.01E+02 ± 8.95E+00 Mean = 1.02E+02 ± 4.30E+00	1.03E+02 ± 1.72E+00	0.99 A
			I-131**	9.23E+01 ± 1.18E+00 8.98E+01 ± 1.68E+00 9.25E+01 ± 1.26E+00 Mean = 9.15E+01 ± 8.03E-01	1.03E+02 ± 1.72E+00	0.89 A

(1) Ratio = Reported/Analytics.
A=Acceptable
U=Unacceptable

* Sample provided by Analytics, Inc.

** Result determined by Resin Extraction/Gamma Spectral Analysis.

Table D.4-1 (Continued)
INTERLABORATORY INTERCOMPARISON PROGRAM
Gamma Analysis of Milk

DATE	SAMPLE ID NO.	MEDIUM	ANALYSIS	JAF ELAB RESULTS pCi/liter ±1 sigma	REFERENCE LAB* pCi/liter ±1 sigma	RATIO (1)
09/15/2011	E8124-05	Milk	Ce-141	7.92E+01 ± 7.50E+00 6.47E+01 ± 5.20E+00 6.98E+01 ± 6.40E+00 Mean = 7.12E+01 ± 3.72E+00	6.67E+01 ± 1.11E+00	1.07 A
			Cr-51	1.87E+02 ± 3.55E+01 2.43E+02 ± 2.58E+01 2.24E+02 ± 2.93E+01 Mean = 2.18E+02 ± 1.76E+01	2.26E+02 ± 3.78E+00	0.96 A
			Cs-134	1.12E+02 ± 1.17E+01 1.24E+02 ± 8.50E+00 1.16E+02 ± 9.50E+00 Mean = 1.17E+02 ± 5.77E+00	1.28E+02 ± 2.14E+00	0.92 A
			Cs-137	1.11E+02 ± 6.00E+00 1.11E+02 ± 4.50E+00 1.15E+02 ± 4.90E+00 Mean = 1.12E+02 ± 2.99E+00	1.14E+02 ± 1.90E+00	0.99 A
			Co-58	1.04E+02 ± 5.80E+00 1.07E+02 ± 4.40E+00 9.31E+01 ± 4.50E+00 Mean = 1.01E+02 ± 2.85E+00	9.75E+01 ± 1.63E+00	1.04 A
			Mn-54	1.68E+02 ± 6.90E+00 1.57E+02 ± 5.10E+00 1.54E+02 ± 5.60E+00 Mean = 1.60E+02 ± 3.42E+00	1.51E+02 ± 2.52E+00	1.06 A
			Fe-59	6.19E+01 ± 7.00E+00 6.58E+01 ± 4.90E+00 5.52E+01 ± 5.40E+00 Mean = 6.10E+01 ± 3.37E+00	5.48E+01 ± 9.15E-01	1.11 A
			Zn-65	1.94E+02 ± 1.36E+01 1.91E+02 ± 9.40E+00 1.99E+02 ± 1.06E+01 Mean = 1.95E+02 ± 6.55E+00	1.80E+02 ± 3.01E+00	1.08 A
			Co-60	1.59E+02 ± 5.30E+00 1.65E+02 ± 4.10E+00 1.55E+02 ± 4.40E+00 Mean = 1.60E+02 ± 2.67E+00	1.57E+02 ± 2.62E+00	1.02 A
			I-131	8.69E+01 ± 6.60E+00 9.79E+01 ± 5.30E+00 9.77E+01 ± 5.80E+00 Mean = 9.42E+01 ± 3.42E+00	8.92E+01 ± 1.49E+00	1.06 A
			I-131**	7.98E+01 ± 1.10E+00 7.95E+01 ± 1.00E+00 7.85E+01 ± 1.60E+00 Mean = 7.93E+01 ± 7.28E-01	8.92E+01 ± 1.49E+00	0.89 A

(1) Ratio = Reported/Analytics.
A=Acceptable
U=Unacceptable

* Sample provided by Analytics, Inc.

** Result determined by Resin Extraction/Gamma Spectral Analysis.

Table D.4-1 (Continued)
INTERLABORATORY INTERCOMPARISON PROGRAM
Gamma Analysis of Water

DATE	SAMPLE ID NO.	MEDIUM	ANALYSIS	JAF ELAB RESULTS pCi/liter ±1 sigma	REFERENCE LAB* pCi/liter ±1 sigma	RATIO (1)
03/17/2011	E7477-05	Water	Cr-51	1.86E+02 ± 1.85E+01 2.05E+02 ± 1.00E+01 2.22E+02 ± 2.57E+01 Mean = 2.04E+02 ± 1.11E+01	1.96E+02 ± 3.27E+00	1.04 A
			Cs-134	9.40E+01 ± 3.32E+00 9.20E+01 ± 2.32E+00 9.10E+01 ± 5.06E+00 Mean = 9.22E+01 ± 2.16E+00	8.56E+01 ± 1.43E+00	1.08 A
			Cs-137	1.43E+02 ± 3.86E+00 1.42E+02 ± 2.49E+00 1.34E+02 ± 5.55E+00 Mean = 1.40E+02 ± 2.40E+00	1.35E+02 ± 2.25E+00	1.04 A
			Co-58	8.10E+01 ± 2.96E+00 7.70E+01 ± 1.97E+00 7.40E+01 ± 4.54E+00 Mean = 7.72E+01 ± 1.92E+00	7.44E+01 ± 1.24E+00	1.04 A
			Mn-54	1.87E+02 ± 4.33E+00 1.83E+02 ± 2.82E+00 1.89E+02 ± 6.38E+00 Mean = 1.86E+02 ± 2.74E+00	1.75E+02 ± 2.92E+00	1.06 A
			Fe-59	1.21E+02 ± 4.09E+00 1.28E+02 ± 2.83E+00 1.15E+02 ± 6.22E+00 Mean = 1.21E+02 ± 2.65E+00	1.15E+02 ± 1.91E+00	1.05 A
			Zn-65	1.98E+02 ± 7.05E+00 1.91E+02 ± 4.62E+00 1.87E+02 ± 1.03E+01 Mean = 1.92E+02 ± 4.44E+00	1.72E+02 ± 2.87E+00	1.12 A
			Co-60	1.17E+02 ± 2.65E+00 1.15E+02 ± 1.80E+00 1.16E+02 ± 3.97E+00 Mean = 1.16E+02 ± 1.70E+00	1.13E+02 ± 1.88E+00	1.03 A
			I-131	9.26E+01 ± 3.25E+00 9.59E+01 ± 2.12E+00 9.53E+01 ± 4.53E+00 Mean = 9.46E+01 ± 1.99E+00	9.40E+01 ± 1.57E+00	1.01 A
			I-131**	9.00E+01 ± 9.50E-01 8.41E+01 ± 2.19E+00 9.09E+01 ± 2.14E+00 Mean = 8.83E+01 ± 1.07E+00	9.40E+01 ± 1.57E+00	0.94 A

(1) Ratio = Reported/Analytics.
A=Acceptable
U=Unacceptable

* Sample provided by Analytics, Inc.

** Result determined by Resin Extraction/Gamma Spectral Analysis.

Table D.4-1 (Continued)
INTERLABORATORY INTERCOMPARISON PROGRAM
Gamma Analysis of Water

DATE	SAMPLE ID NO.	MEDIUM	ANALYSIS	JAF ELAB RESULTS pCi/liter ±1 sigma	REFERENCE LAB* pCi/liter ±1 sigma	RATIO (1)
06/16/2011	E7617-09	Water	Ce-141	9.16E+01 ± 7.08E+00 9.17E+01 ± 7.37E+00 8.77E+01 ± 7.26E+00 8.70E+01 ± 7.68E+00 Mean = 8.96E+01 ± 4.26E+00	9.35E+01 ± 1.56E+00	0.95 A
			Cr-51	1.97E+02 ± 3.18E+01 1.83E+02 ± 3.68E+01 2.67E+02 ± 3.21E+01 2.77E+02 ± 4.54E+01 Mean = 2.31E+02 ± 2.22E+01	2.41E+02 ± 4.03E+00	0.96 A
			Cs-134	2.11E+02 ± 1.18E+01 2.22E+02 ± 1.16E+01 2.08E+02 ± 1.06E+01 2.25E+02 ± 1.39E+01 Mean = 2.17E+02 ± 7.20E+00	2.22E+02 ± 3.71E+00	0.98 A
			Cs-137	1.68E+02 ± 5.77E+00 1.56E+02 ± 5.73E+00 1.64E+02 ± 5.25E+00 1.56E+02 ± 6.66E+00 Mean = 1.61E+02 ± 3.50E+00	1.61E+02 ± 2.70E+00	1.00 A
			Co-58	1.90E+02 ± 6.17E+00 1.75E+02 ± 5.95E+00 1.88E+02 ± 5.93E+00 1.83E+02 ± 7.07E+00 Mean = 1.84E+02 ± 3.70E+00	1.77E+02 ± 2.96E+00	1.04 A
			Mn-54	1.65E+02 ± 5.71E+00 1.83E+02 ± 6.12E+00 1.69E+02 ± 5.41E+00 1.74E+02 ± 7.25E+00 Mean = 1.73E+02 ± 3.70E+00	1.61E+02 ± 2.69E+00	1.07 A
			Fe-59	1.57E+02 ± 6.81E+00 1.45E+02 ± 6.86E+00 1.73E+02 ± 8.93E+00 1.55E+02 ± 6.68E+00 Mean = 1.58E+02 ± 4.40E+00	1.44E+02 ± 2.41E+00	1.10 A
			Zn-65	3.16E+02 ± 1.24E+01 2.98E+02 ± 1.21E+01 3.23E+02 ± 1.20E+01 3.16E+02 ± 1.53E+01 Mean = 3.13E+02 ± 7.70E+00	3.05E+02 ± 5.09E+00	1.03 A
			Co-60	2.26E+02 ± 5.07E+00 2.32E+02 ± 5.17E+00 2.43E+02 ± 4.79E+00 2.25E+02 ± 6.21E+00 Mean = 2.32E+02 ± 3.20E+00	2.28E+02 ± 3.80E+00	1.02 A
			I-131	1.10E+02 ± 7.24E+00 1.01E+02 ± 7.44E+00 1.06E+02 ± 7.37E+00 1.15E+02 ± 9.22E+00 Mean = 1.08E+02 ± 3.90E+00	1.01E+02 ± 1.68E+00	1.07 A
			I-131**	9.73E+01 ± 1.33E+00 9.78E+01 ± 1.52E+00 9.43E+01 ± 1.47E+00 Mean = 9.65E+01 ± 8.33E-01	1.01E+02 ± 1.68E+00	0.96 A

(1) Ratio = Reported/Analytics.
A=Acceptable
U=Unacceptable

* Sample provided by Analytics, Inc.

** Result determined by Resin Extraction/Gamma Spectral Analysis.

Table D.4-1 (Continued)
INTERLABORATORY INTERCOMPARISON PROGRAM
Gamma Analysis of Water

DATE	SAMPLE ID NO.	MEDIUM	ANALYSIS	JAF ELAB RESULTS pCi/liter ±1 sigma	REFERENCE LAB* pCi/liter ±1 sigma	RATIO (1)
09/15/2011	E8122-05	Water	Ce-141	4.75E+01 ± 4.70E+00 5.28E+01 ± 4.90E+00 5.99E+01 ± 4.20E+00 Mean = 5.34E+01 ± 2.70E+00	5.32E+01 ± 8.88E-01	1.00 A
			Cr-51	1.65E+02 ± 2.39E+01 1.75E+02 ± 2.35E+01 1.84E+02 ± 1.98E+01 Mean = 1.75E+02 ± 1.30E+01	1.80E+02 ± 3.01E+00	0.97 A
			Cs-134	9.86E+01 ± 7.00E+00 8.86E+01 ± 7.80E+00 9.75E+01 ± 6.70E+00 Mean = 9.49E+01 ± 4.10E+00	1.02E+02 ± 1.71E+00	0.93 A
			Cs-137	9.10E+01 ± 3.70E+00 9.41E+01 ± 4.50E+00 8.80E+01 ± 3.50E+00 Mean = 9.10E+01 ± 4.10E+00	9.07E+01 ± 1.51E+00	1.00 A
			Co-58	7.59E+01 ± 3.60E+00 8.37E+01 ± 4.40E+00 8.43E+01 ± 3.40E+00 Mean = 8.13E+01 ± 2.20E+00	7.77E+01 ± 1.30E+00	1.05 A
			Mn-54	1.17E+02 ± 4.30E+00 1.18E+02 ± 4.90E+00 1.28E+02 ± 3.90E+00 Mean = 1.21E+02 ± 2.50E+00	1.20E+02 ± 2.01E+00	1.01 A
			Fe-59	5.17E+01 ± 3.80E+00 4.44E+01 ± 4.30E+00 4.73E+01 ± 3.60E+00 Mean = 4.78E+01 ± 2.30E+00	4.37E+01 ± 7.30E-01	1.09 A
			Zn-65	1.49E+02 ± 7.90E+00 1.43E+02 ± 8.90E+00 1.48E+02 ± 7.00E+00 Mean = 1.47E+02 ± 4.60E+00	1.44E+02 ± 2.40E+00	1.02 A
			Co-60	1.24E+02 ± 3.30E+00 1.22E+02 ± 3.80E+00 1.23E+02 ± 3.00E+00 Mean = 1.23E+02 ± 1.90E+00	1.25E+02 ± 2.09E+00	0.98 A
			I-131	8.59E+01 ± 4.50E+00 8.20E+01 ± 5.20E+00 7.91E+01 ± 4.10E+00 Mean = 8.23E+01 ± 2.70E+00	7.99E+01 ± 1.33E+00	1.03 A
			I-131**	7.93E+01 ± 1.00E+00 7.61E+01 ± 1.30E+00 7.63E+01 ± 1.30E+00 Mean = 6.72E+01 ± 7.00E-01	7.99E+01 ± 1.33E+00	0.84 A

(1) Ratio = Reported/Analytics.
A=Acceptable
U=Unacceptable

* Sample provided by Analytics, Inc.

** Result determined by Resin Extraction/Gamma Spectral Analysis.

Table D.4-1 (Continued)
INTERLABORATORY INTERCOMPARISON PROGRAM
Gamma Analysis of Water

DATE	SAMPLE ID NO.	MEDIUM	ANALYSIS	JAF ELAB RESULTS pCi/liter ± 1 sigma	REFERENCE LAB* pCi/liter ± 1 sigma	RATIO (1)
12/08/2011	E8183-09	Water	Cr-51	5.01E+02 ± 4.08E+01 6.12E+02 ± 3.81E+01 5.66E+02 ± 3.61E+01 5.89E+02 ± 3.49E+01 5.46E+02 ± 3.77E+01 Mean = 5.63E+02 ± 2.55E+01	5.66E+02 ± 9.45E+00	0.99 A
			Cs-134	1.59E+02 ± 1.34E+01 1.68E+02 ± 1.17E+01 1.70E+02 ± 9.30E+00 1.78E+02 ± 1.08E+01 1.74E+02 ± 1.07E+01 Mean = 1.70E+02 ± 7.60E+00	1.71E+02 ± 2.86E+00	0.99 A
			Cs-137	2.16E+02 ± 7.50E+00 2.13E+02 ± 6.70E+00 2.09E+02 ± 5.70E+00 2.12E+02 ± 6.00E+00 2.28E+02 ± 6.50E+00 Mean = 2.16E+02 ± 4.40E+00	2.10E+02 ± 3.50E+00	1.03 A
			Co-58	2.29E+02 ± 7.80E+00 2.36E+02 ± 7.00E+00 2.24E+02 ± 5.70E+00 2.21E+02 ± 6.30E+00 2.37E+02 ± 6.50E+00 Mean = 2.29E+02 ± 4.50E+00	2.21E+02 ± 3.69E+00	1.04 A
			Mn-54	2.49E+02 ± 8.10E+00 2.64E+02 ± 7.20E+00 2.69E+02 ± 6.20E+00 2.61E+02 ± 6.60E+00 2.62E+02 ± 6.90E+00 Mean = 2.61E+02 ± 4.80E+00	2.41E+02 ± 4.02E+00	1.08 A
			Fe-59	2.14E+02 ± 8.50E+00 2.03E+02 ± 7.73E+01 2.03E+02 ± 6.40E+00 2.04E+02 ± 7.00E+00 1.88E+02 ± 7.30E+00 Mean = 2.02E+02 ± 4.90E+00	1.83E+02 ± 3.06E+00	1.11 A
			Zn-65	3.20E+02 ± 1.44E+01 3.11E+02 ± 1.27E+01 3.30E+02 ± 1.03E+01 3.06E+02 ± 1.13E+01 3.07E+02 ± 1.22E+01 Mean = 3.15E+02 ± 8.30E+00	2.91E+02 ± 4.87E+00	1.08 A
			Co-60	2.86E+02 ± 6.50E+00 2.87E+02 ± 5.70E+00 2.82E+02 ± 4.80E+00 2.88E+02 ± 5.20E+00 2.87E+02 ± 5.50E+00 Mean = 2.86E+02 ± 3.80E+00	2.70E+02 ± 4.51E+00	1.06 A
			I-131	9.25E+01 ± 5.50E+00 1.00E+02 ± 5.30E+00 9.96E+01 ± 5.50E+00 8.49E+01 ± 5.40E+00 8.66E+01 ± 5.60E+00 Mean = 9.27E+01 ± 3.60E+00	8.87E+01 ± 1.48E+00	1.05 A
			I-131**	1.07E+02 ± 1.90E+00 1.16E+02 ± 2.10E+00 1.08E+02 ± 2.80E+00 1.11E+02 ± 2.50E+00 Mean = 1.11E+02 ± 1.30E+00	8.87E+01 ± 1.48E+00	1.25 A

(1) Ratio = Reported/Analytics. A=Acceptable U=Unacceptable

* Sample provided by Analytics, Inc.

** Result determined by Resin Extraction/Gamma Spectral Analysis.

D.5 References

D.5.1 Radioactivity and Radiochemistry, The Counting Room: Special Edition, 1994 Caretaker Publications, Atlanta, Georgia.

D.5.2 Data Reduction and Error Analysis for the Physical Sciences, Bevington P.R., McGraw Hill, New York (1969).

D.6 TELEDYNE BROWN ENGINEERING ENVIRONMENTAL SERVICES INTERCOMPARISON PROGRAM

ANALYTICS ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM
TELEDYNE BROWN ENGINEERING ENVIRONMENTAL SERVICES

Month/Year	Identification Number	Matrix	Nuclide	Units	Reported Value (a)	Known Value (b)	Ratio (c) TBE/Analytics	
March 2011	11-MaW24	Water	Am-241	Bq/L	0.418	0.529	0.370 - 0.688	W
			Ba-133	pCi/L	73.3	75.3	63.0 - 82.8	A
	E7463-396	AP	Co-57	Bq/L	0.139		(1)	A
			Co-58	pCi/L	121	113	1.07	A
			Co-60	pCi/L	186	172	1.08	A
			Cr-51	pCi	243	215	1.13	A
			Cs-134	pCi/L	130	130	1.00	A
			Cs-137	pCi/L	74.6	77.0	69.3 - 87.4	A
	E7464-396	Water	Fe-55	pCi/L	2090	1940	1.08	A
			Fe-59	pCi/L	201	175	1.15	A
			Gr-A	pCi/L	64.1	50.1	26.1 - 62.9	N (1)
			Gr-B	pCi/L	51.8	49.8	33.8 - 56.9	A
			H-3	pCi/L	10057	10200	8870 - 11200	A
	E7461-396	Milk	I-131	pCi/L	92.9	96.9	0.96	A
			K-40	Bq/kg	569	540	378 - 702	A
			Mn-54	pCi/L	289	266	1.09	A
			Ni-63	Bq/L	17.8	18.6	13.0 - 24.2	A
			Pu-238	Bq/sample	0.095	0.096	0.067 - 0.125	A
			Pu-239/240	Bq/L	0.715	0.809	0.566 - 1.052	A
March 2011	E7460-396	Milk	Sr-89	pCi/L	98.8	97.4	1.01	A
			Sr-90	pCi/L	42.5	42.5	31.3 - 48.8	A
			Tc-99	Bq/kg	-3.79		(1)	A
			U-234/233	Bq/L	1.57	1.50	1.05 - 1.95	A
			U-238	Bq/sample	0.165	0.185	0.130 - 0.241	A
			U-Nat	pCi/L	38.5	39.8	32.2 - 44.4	A
			Zn-65	pCi/L	287	261	1.10	A
			Ce-141	pCi/L	68.1	79.9	0.85	A

(1) Calculation did not allow for Y-90 ingrowth on the Sr-89 mount. NCR 09-14

(a) Teledyne Brown Engineering reported result.

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

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

ANALYTICS ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM
TELEDYNE BROWN ENGINEERING ENVIRONMENTAL SERVICES

Month/Year	Identification Number	Matrix	Nuclide	Units	Reported Value (a)	Known Value (b)	Ratio (c) TBE/Analytics	Evaluation (d)
March 2011	E7460-396	Milk	Sr-89	pCi/L	98.8	97.4	1.01	A
			Sr-90	pCi/L	15.2	15.8	0.96	A
	E7461-396	Milk	I-131	pCi/L	92.9	96.9	0.96	A
			Ce-141	pCi/L	NA			
			Cr-51	pCi/L	398	298	1.34	N (1)
			Cs-134	pCi/L	130	130	1.00	A
			Cs-137	pCi/L	232	205	1.13	A
			Co-58	pCi/L	121	113	1.07	A
			Mn-54	pCi/L	289	266	1.09	A
			Fe-59	pCi/L	201	175	1.15	A
			Zn-65	pCi/L	287	261	1.10	A
			Co-60	pCi/L	186	172	1.08	A
	E7463-396	AP	Ce-141	pCi	NA			
			Cr-51	pCi	243	215	1.13	A
			Cs-134	pCi	85.0	94.2	0.90	A
			Cs-137	pCi	168	148	1.14	A
			Co-58	pCi	89.2	81.8	1.09	A
			Mn-54	pCi	171	192	0.89	A
			Fe-59	pCi	129	126	1.02	A
			Zn-65	pCi	159	189	0.84	A
			Co-60	pCi	132	124	1.06	A
	E7462-396	Charcoal	I-131	pCi	96.5	96.3	1.00	A
	E7464-396	Water	Fe-55	pCi/L	2090	1940	1.08	A
June 2011	E7851-396	Milk	Sr-89	pCi/L	96.7	103	0.94	A
			Sr-90	pCi/L	13.8	15.6	0.88	A
	E7852-396	Milk	I-131	pCi/L	110	103.0	1.07	A
			Ce-141	pCi/L	68.1	79.9	0.85	A
			Cr-51	pCi/L	186	206	0.90	A
			Cs-134	pCi/L	164	190	0.86	A
			Cs-137	pCi/L	140	138	1.01	A
			Co-58	pCi/L	141	152	0.93	A
			Mn-54	pCi/L	136	138	0.99	A
			Fe-59	pCi/L	128	123	1.04	A
			Zn-65	pCi/L	263	261	1.01	A
			Co-60	pCi/L	189	195	0.97	A
	E7854-396	AP	Ce-141	pCi	49.9	42.9	1.16	A
			Cr-51	pCi	95.6	110	0.87	A
			Cs-134	pCi	104	102	1.02	A
			Cs-137	pCi	83.8	74.0	1.13	A
			Co-58	pCi	90.7	81.3	1.12	A
			Mn-54	pCi	74.5	73.9	1.01	A
			Fe-59	pCi	62.0	66.1	0.94	A
			Zn-65	pCi	140	140	1.00	A
			Co-60	pCi	119	104	1.14	A
	E7853-396	Charcoal	I-131	pCi	76.2	86.1	0.89	A

ANALYTICS ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM
TELEDYNE BROWN ENGINEERING ENVIRONMENTAL SERVICES

Month/Year	Identification Number	Matrix	Nuclide	Units	Reported Value (a)	Known Value (b)	Ratio (c) TBE/Analytics	Evaluation (d)
June 2011	E7855-396	Water	Fe-55	pCi/L	1770	1970	0.90	A
September 2011	E8070-396	Milk	Sr-89	pCi/L	102	90.8	1.12	A
			Sr-90	pCi/L	13.2	14.7	0.90	A
	E8071-396	Milk	I-131	pCi/L	74.2	89.2	0.83	A
			Ce-141	pCi/L	66.9	66.7	1.00	A
			Cr-51	pCi/L	249	226	1.10	A
			Cs-134	pCi/L	116	128	0.91	A
			Cs-137	pCi/L	106	114	0.93	A
			Co-58	pCi/L	95.4	97.5	0.98	A
			Mn-54	pCi/L	147	151	0.97	A
			Fe-59	pCi/L	53.1	54.8	0.97	A
			Zn-65	pCi/L	175	180	0.97	A
			Co-60	pCi/L	150	157	0.96	A
	E8073-396	AP	Ce-141	pCi	66.6	67.5	0.99	A
			Cr-51	pCi	263	229	1.15	A
			Cs-134	pCi	139	130	1.07	A
			Cs-137	pCi	110	115	0.96	A
			Co-58	pCi	108	98.6	1.10	A
			Mn-54	pCi	152	153	0.99	A
			Fe-59	pCi	57.5	55.5	1.04	A
			Zn-65	pCi	190	183	1.04	A
			Co-60	pCi	156	159	0.98	A
	E8072-396	Charcoal	I-131	pCi	77.6	80.6	0.96	A
September 2011	E8074-396	Water	Fe-55	pCi/L	1710	1790	0.96	A
December, 2011	E8230-396	Milk	Sr-89	pCi/L	93.3	93.1	1.00	A
			Sr-90	pCi/L	12.7	15.4	0.82	A
	E8231-396	Milk	I-131	pCi/L	82.5	90.2	0.91	A
			Ce-141	pCi/L	not provided by Analytics for this study			
			Cr-51	pCi/L	465	566	0.82	A
			Cs-134	pCi/L	142	171	0.83	A
			Cs-137	pCi/L	185	210	0.88	A
			Co-58	pCi/L	177	221	0.80	A
			Mn-54	pCi/L	208	241	0.86	A
			Fe-59	pCi/L	164	183	0.90	A
			Zn-65	pCi/L	259	291	0.89	A
			Co-60	pCi/L	224	270	0.83	A
December, 2011	E8233-396	AP	Ce-141	pCi	not provided by Analytics for this study			
			Cr-51	pCi	344	368	0.93	A
			Cs-134	pCi	105	111	0.95	A
			Cs-137	pCi	129	137	0.94	A
			Co-58	pCi	145	144	1.01	A
			Mn-54	pCi	137	157	0.87	A
			Fe-59	pCi	119	119	1.00	A
			Zn-65	pCi	145	190	0.76	W
			Co-60	pCi	168	176	0.95	A

ANALYTICS ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM
TELEDYNE BROWN ENGINEERING ENVIRONMENTAL SERVICES

Month/Year	Identification Number	Matrix	Nuclide	Units	Reported Value (a)	Known Value (b)	Ratio (c) TBE/Analytics	Evaluation (d)
December 2011	E8232-396	Charcoal	I-131	pCi	100	89.5	1.12	A

(1) Sample appears to be biased high. Corrective Action evaluated after the 2nd Quarter Analytics PE sample; no action required. NCR 11-13

(a) Teledyne Brown Engineering reported result.

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

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

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

DOE's MIXED ANALYTE PERFORMANCE EVALUATION PROGRAM (MAPEP)
TELEDYNE BROWN ENGINEERING ENVIRONMENTAL SERVICES

Month/Year	Identification Number	Media	Nuclide	Units	Reported Value (a)	Known Value (b)	Acceptance Range	Evaluation (c)
March 2011	11-MaW24	Water	Am-241	Bq/L	0.418	0.529	0.370 - 0.688	W
			Cs-134	Bq/L	19.1	21.5	15.1 - 28.0	A
			Cs-137	Bq/L	29.0	29.4	20.6 - 38.2	A
			Co-57	Bq/L	0.139		(1)	A
			Co-60	Bq/L	23.9	24.6	17.2 - 32.0	A
			H-3	Bq/L	265	243	170 - 316	A
			Mn-54	Bq/L	31.8	31.6	22.1 - 41.1	A
			Ni-63	Bq/L	17.8	18.6	13.0 - 24.2	A
			Pu-238	Bq/L	0.92	1.064	0.745 - 1.383	A
			Pu-239/240	Bq/L	0.715	0.809	0.566 - 1.052	A
			K-40	Bq/L	94.8	91	64 - 118	A
			Sr-90	Bq/L	9.64	8.72	6.10 - 11.34	A
			Tc-99	Bq/L	8.09	8.99	6.29 - 11.69	A
			U-234/233	Bq/L	1.57	1.50	1.05 - 1.95	A
			U-238	Bq/L	1.57	1.54	1.08 - 2.00	A
			Zn-65	Bq/L	-0.142		(1)	A
	11-GrW24	Water	Gr-A	Bq/L	0.767	1.136	0.341 - 1.931	A
			Gr-B	Bq/L	3.43	2.96	1.48 - 4.44	A
	11-MaS24	Soil	Am-241	Bq/kg	50.3	61.1	42.8 - 79.4	A
			Cs-134	Bq/kg	612	680	476 - 884	A
			Cs-137	Bq/kg	772	758	531 - 985	A
			Co-57	Bq/kg	910	927	649 - 1205	A
			Co-60	Bq/kg	500	482	337 - 627	A
			Mn-54	Bq/kg	0.607		(1)	A
			Ni-63	Bq/kg	511	582	407 - 757	A
			Pu-238	Bq/kg	0.375	0.48	(4)	A
			Pu-239/240	Bq/kg	NR	98.0	68.6 - 127.4	N (2)
			K-40	Bq/kg	569	540	378 - 702	A
			Sr-90	Bq/kg	NR	160	112 - 208	N (3)
			Tc-99	Bq/kg	-3.79		(1)	A
			U-234/233	Bq/kg	148	176	123 - 229	A
			U-238	Bq/kg	134	184	129 - 239	W
			Zn-65	Bq/kg	1497	1359	951 - 1767	A
	11-RdF24	AP	Am-241	Bq/sample	0.0067		(1)	A
			Cs-134	Bq/sample	3.26	3.49	2.44 - 4.54	A
			Cs-137	Bq/sample	2.36	2.28	1.60 - 2.96	A
			Co-57	Bq/sample	3.30	3.33	2.33 - 4.33	A
			Co-60	Bq/sample	0.0765		(1)	A
			Mn-54	Bq/sample	2.84	2.64	1.85 - 3.43	A
			Pu-238	Bq/sample	0.095	0.096	0.067 - 0.125	A
			Pu-239/240	Bq/sample	0.0687	0.0765	0.0536 - 0.0995	A
			Sr-90	Bq/sample	NR	1.36	0.95 - 1.77	N (3)
			U-234/233	Bq/sample	0.163	0.178	0.125 - 0.231	A
			U-238	Bq/sample	0.165	0.185	0.130 - 0.241	A
			Zn-65	Bq/sample	3.30	3.18	2.23 - 4.13	A
	11-GrF24	AP	Gr-A	Bq/sample	0.101	0.659	0.198 - 1.120	N (5)
			Gr-B	Bq/sample	1.23	1.323	0.662 - 1.985	A

DOE's MIXED ANALYTE PERFORMANCE EVALUATION PROGRAM (MAPEP)
TELEDYNE BROWN ENGINEERING ENVIRONMENTAL SERVICES

Month/Year	Identification Number	Media	Nuclide	Units	Reported Value (a)	Known Value (b)	Acceptance Range	Evaluation (c)
March 2011	11-RdV24	Vegetation	Cs-134	Bq/sample	4.97	5.50	3.85 - 7.15	A
			Cs-137	Bq/sample	0.0356		(1)	A
			Co-57	Bq/sample	10.8	9.94	6.96 - 12.92	A
			Co-60	Bq/sample	4.89	4.91	3.44 - 6.38	A
			Mn-54	Bq/sample	6.42	6.40	4.48 - 8.32	A
			Sr-90	Bq/sample	NR	2.46	1.72 - 3.20	N (3)
			Zn-65	Bq/sample	3.07	2.99	2.09 - 3.89	A
September 2011	11-MaW25	Water	Am-241	Bq/L	2.64	3.18	2.23 - 4.13	A
			Cs-134	Bq/L	16.0	19.1	13.4 - 24.8	A
			Cs-137	Bq/L	0.0043		(1)	A
			Co-57	Bq/L	33.1	36.6	25.6 - 47.6	A
			Co-60	Bq/L	26.9	29.3	20.5 - 38.1	A
			H-3	Bq/L	1011	1014	710 - 1318	A
			Mn-54	Bq/L	23.2	25.0	17.5 - 32.5	A
			Ni-63	Bq/L	0.581		(1)	A
			Pu-238	Bq/L	0.0264	0.016	(4)	A
			Pu-239/240	Bq/L	1.74	2.40	1.68 - 3.12	W
			K-40	Bq/L	147	156	109 - 203	A
			Sr-90	Bq/L	15.8	14.2	9.9 - 18.5	A
			Tc-99	Bq/L	-1.00		(1)	A
			U-234/233	Bq/L	2.53	2.78	1.95 - 3.61	A
			U-238	Bq/L	2.60	2.89	2.02 - 3.76	A
			Zn-65	Bq/L	27.3	28.5	20.0 - 37.1	A
	11-GrW25	Water	Gr-A	Bq/L	0.894	0.866	0.260 - 1.472	A
			Gr-B	Bq/L	5.87	4.81	2.41 - 7.22	A
	11-MaS25	Soil	Am-241	Bq/kg	0.270	0.259	(4)	A
			Cs-134	Bq/kg	-0.213		(1)	A
			Cs-137	Bq/kg	1110	979	685 - 1273	A
			Co-57	Bq/kg	1290	1180	826 - 1534	A
			Co-60	Bq/kg	731	644	451 - 837	A
			Mn-54	Bq/kg	987	848	594 - 1102	A
			Ni-63	Bq/kg	10.08		(1)	A
			Pu-238	Bq/kg	93.1	93.6	65.5 - 121.7	A
			Pu-239/240	Bq/kg	74.6	77.4	54.2 - 100.6	A
			K-40	Bq/kg	753	625	438 - 813	W
			Sr-90	Bq/kg	276	320	224 - 416	A
			Tc-99	Bq/kg	133	182	127 - 237	W
			U-234/233	Bq/kg	275	263	184 - 342	A
			U-238	Bq/kg	281	274	192 - 356	A
			Zn-65	Bq/kg	1870	1560	1092 - 2028	A

DOE's MIXED ANALYTE PERFORMANCE EVALUATION PROGRAM (MAPEP)
TELEDYNE BROWN ENGINEERING ENVIRONMENTAL SERVICES

Month/Year	Identification Number	Media	Nuclide	Units	Reported Value (a)	Known Value (b)	Acceptance Range	Evaluation (c)
September 2011	11-RdF25	AP	Am-241	Bq/sample	0.124	0.147	0.103 - 0.191	A
			Cs-134	Bq/sample	-0.043		(1)	A
			Cs-137	Bq/sample	3.09	2.60	1.82 - 3.38	A
			Co-57	Bq/sample	5.36	5.09	3.56 - 6.62	A
			Co-60	Bq/sample	3.41	3.20	2.24 - 4.16	A
			Mn-54	Bq/sample	0.067		(1)	A
			Pu-238	Bq/sample	0.138	0.1183	0.0828 - 0.1538	A
			Pu-239/240	Bq/sample	0.135	0.135	0.095 - 0.176	A
			Sr-90	Bq/sample	1.84	1.67	1.17 - 2.17	A
			U-234/233	Bq/sample	0.153	0.162	0.113 - 0.211	A
			U-238	Bq/sample	0.164	0.168	0.118 - 0.218	A
			Zn-65	Bq/sample	5.17	4.11	2.88 - 5.34	W
	11-GrF25	AP	Gr-A	Bq/sample	0.0058		(1)	A
			Gr-B	Bq/sample	-0.01		(1)	A
	11-RdV25	Vegetation	Cs-134	Bq/sample	0.0081		(1)	A
			Cs-137	Bq/sample	4.94	4.71	3.30 - 6.12	A
			Co-57	Bq/sample	0.0639		(1)	A
			Co-60	Bq/sample	3.36	3.38	2.37 - 4.39	A
			Mn-54	Bq/sample	5.89	5.71	4.00 - 7.42	A
			Sr-90	Bq/sample	1.31	1.26	0.88 - 1.64	A
			Zn-65	Bq/sample	6.54	6.39	4.47 - 8.31	A

(1) False positive test.

(2) Evaluated as failed, with a note of false negative due to reporting only one of the plutonium isotopes. NCR 11-11

(3) Evaluated as failed due to not reporting a previously reported analyte. NCR 11-11

(4) Sensitivity evaluation

(5) The filter for Gross Alpha was counted on the wrong side. Recounted on the correct side resulted in acceptable results. NCR 11-11

(a) Teledyne Brown Engineering reported result.

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

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

ERA ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM
TELEDYNE BROWN ENGINEERING ENVIRONMENTAL SERVICES

Month/Year	Identification Number	Media	Nuclide	Units	Reported Value (a)	Known Value (b)	Control Limits	Evaluation (c)
May 2011	RAD-85	Water	Sr-89	pCi/L	59.8	63.2	51.1 - 71.2	A
			Sr-90	pCi/L	42.5	42.5	31.3 - 48.8	A
			Ba-133	pCi/L	73.3	75.3	63.0 - 82.8	A
			Cs-134	pCi/L	64.9	72.9	59.5 - 80.2	A
			Cs-137	pCi/L	74.6	77.0	69.3 - 87.4	A
			Co-60	pCi/L	87.8	88.8	79.9 - 100	A
			Zn-65	pCi/L	103	98.9	89.0 - 118	A
			Gr-A	pCi/L	64.1	50.1	26.1 - 62.9	N (1)
			Gr-B	pCi/L	51.8	49.8	33.8 - 56.9	A
			I-131	pCi/L	27.4	27.5	22.9 - 32.3	A
			U-Nat	pCi/L	38.5	39.8	32.2 - 44.4	A
			H-3	pCi/L	10057	10200	8870 - 11200	A
	MRAD-14	Filter	Gr-A	pCi/filter	79.7	74.3	38.5 - 112	A
November 2011	RAD-87	Water	Sr-89	pCi/L	81.0	69.7	56.9 - 77.9	N (2)
			Sr-90	pCi/L	35.5	41.4	30.2 - 47.2	A
			Ba-133	pCi/L	90.7	96.9	81.8 - 106	A
			Cs-134	pCi/L	36.6	33.4	26.3 - 36.7	A
			Cs-137	pCi/L	44.7	44.3	39.4 - 51.7	A
			Co-60	pCi/L	118.7	119	107 - 133	A
			Zn-65	pCi/L	80.2	76.8	68.9 - 92.5	A
			Gr-A	pCi/L	34.2	53.2	27.8 - 66.6	A
			Gr-B	pCi/L	39.3	45.9	30.9 - 53.1	A
			I-131	pCi/L	22.9	27.5	22.9 - 32.3	A
			U-Nat	pCi/L	46.8	48.6	39.4 - 54.0	A
			H-3	pCi/L	15733	17400	15200 - 19100	A
	MRAD-15	Filter	Gr-A	pCi/filter	44.6	58.4	30.3 - 87.8	A

(1) The solids on the planchet exceeded 100 mg, which was beyond the range of the efficiency curve. NCR 11-08

(2) Sr-89 TBE to known ratio of 1.16 fell within acceptable range of ± 20%. No action required. NCR 11-16

(a) Teledyne Brown Engineering reported result.

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

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

D.7 Environmental TLD Quality Assurance

Environmental dosimetry services for the reporting period of January – December, 2011 were provided by the Environmental Dosimetry Company (EDC), Sterling, Massachusetts. The TLD systems at the Environmental Dosimetry Company (EDC) are calibrated and operated to ensure consistent and accurate evaluation of TLDs. The quality of the dosimetric results reported to EDC clients is ensured by in-house performance testing and independent performance testing by EDC clients.

The purpose of the dosimetry quality assurance program is to provide performance documentation of the routine processing of EDC dosimeters. Performance testing provides a statistical measure of the bias and precision of dosimetry processing against a reliable standard, which in turn points out any trends or performance changes. Dosimetry quality control tests are performed on EDC Panasonic 814 Environmental dosimeters. These tests include: (1) the in-house testing program conducted by the EDC QA Officer and (2) independent test perform by EDC clients.

Excluded from this report are instrumentation checks. Although instrumentation checks represent an important aspect of the quality assurance program, they are not included as process checks in this report. Instrumentation checks represent between 5-10% of the TLDs processed.

Table D.7-1 provides a summary of individual dosimeter results evaluated against the EDC internal acceptance criteria for high-energy photons (Cs-137) only. The internal acceptance (tolerance) criteria for the Panasonic Environmental dosimeters are: ± 15% for bias and ± 12.8% for precision. During this period, 100% (72/72) of the individual dosimeters, evaluated against these criteria met the tolerance limits for accuracy and 100% (72/72) met the criterion for precision.

Table D.7-2 provides the Bias + Standard deviation results for each group (N=6) of dosimeters evaluated against the internal tolerance criteria. Overall, 100% (12/12) of the dosimeter sets evaluated against the internal tolerance performance criteria met these criteria.

Table D.7-3 presents the independent blind spike results for irradiated dosimeters provided by client utilities during this annual period. All results passed the performance acceptance criterion.

TABLE D.7-1

PERCENTAGE OF INDIVIDUAL DOSIMETERS THAT PASSED EDC INTERNAL CRITERIA JANUARY – DECEMBER 2011[1], [2]

Dosimeter Type	Number Tested	% Passed Bias Criteria	% Passed Precision Criteria
Panasonic Environmental	72	100	100

[1]This table summarizes results of tests conducted by EDC.
[2]Environmental dosimeter results are free in air.

TABLE D.7-2

MEAN DOSIMETER ANALYSES (N=6)
JANUARY – DECEMBER 2011[1], [2]

Process Date	Mean Bias %	Standard Deviation %	Tolerance Limit +/-15%
04/22/2011	3.0	1.9	Pass
05/02/2011	8.0	1.4	Pass
05/18/2011	0.2	1.4	Pass
07/21/2011	6.2	0.6	Pass
08/05/2011	5.4	0.6	Pass
08/16/2011	7.0	1.1	Pass
10/14/2011	-1.6	1.7	Pass
11/07/2011	0.4	0.8	Pass
01/19/2012	-1.0	1.3	Pass
01/22/2012	-3.1	1.8	Pass
01/29/2012	4.9	1.2	Pass
02/09/2012	-1.6	1.5	Pass

[1] This table summarizes results of tests conducted by EDC for TLDs issued in 2011.
[2] Environmental dosimeter results are free in air.

TABLE D.7-3
SUMMARY OF INDEPENDENT DOSIMETER TESTING
JANUARY – DECEMBER 2011[1], [2]

Issuance Period	Client	Mean Bias %	Standard Deviation %	Pass / Fail
1st Qtr.2011	Millstone	1.9	2.9	Pass
2nd Qtr.2011	Millstone	1.4	3.0	Pass
2nd Qtr.2011	Seabrook	2.0	1.8	Pass
3rd Qtr. 2011	Millstone	-2.1	2.9	Pass
4th Qtr.2011	Millstone	7.8	2.8	Pass
4th Qtr.2011	Seabrook	1.7	2.0	Pass

[1] Performance criteria are +/- 30%.
[2] Blind spike irradiations using Cs-137

APPENDIX E

ADDENDA

APPENDIX E

ADDENDA

The following pages are corrections to the 2010 AREOR.

1.0 EXECUTIVE SUMMARY

This Annual Radiological Environmental Operating Report (AREOR) contains descriptions and results of the 2010 Radiological Environmental Monitoring Program (REMP) for the Indian Point site. The Indian Point site consists of Units 1, 2 and 3. Units 1, 2 and 3 are owned and operated by Entergy Nuclear Operations, Inc. Unit 1 was retired as a generating facility in 1974 and, as such, its reactor is no longer operated.

The REMP is used to measure the direct radiation and the airborne and waterborne pathway activity in the vicinity of the Indian Point site. Direct radiation pathways include radiation from buildings and plant structures, airborne material that might be released from the plant, cosmic radiation, fallout, and the naturally occurring radioactive materials in soil, air and water. Analysis of thermoluminescent dosimeters (TLDs), used to measure direct radiation, indicated that there were no increased radiation levels attributable to plant operations.

The airborne pathway includes measurements of air, precipitation, drinking water, and broad leaf vegetation samples. The airborne pathway measurements indicated that there was no adverse radiological impact to the surrounding environment attributed to Indian Point Station operations.

The waterborne pathway consists of Hudson River water, fish and invertebrates, aquatic vegetation, bottom sediment, and shoreline sediment. Measurements of the media comprising the waterborne pathway indicated that there was no adverse radiological impact to the surrounding environment attributed to Indian Point Station operations.

This report contains a description of the REMP and the conduct of that program as required by the IPEC Offsite Dose Calculation Manual, herein referred to as ODCM. This 2010 AREOR also contains summaries and discussions of the results of the 2010 program, trend analyses, and potential impact on the environment, land use census, and inter-laboratory comparisons.

During 2010, a total of 1156 samples were obtained out of a planned load of 1168 samples. Table B-1 presents a summary of the collected sampling results.

An investigation of groundwater contamination with tritium and other radionuclides has been ongoing since 2005 and continued throughout 2010. This investigation of potential onsite sources of contamination is not the focus of this Annual Radiological Environmental Operating Report; however, in 2006, Entergy agreed to several changes in the REMP to assure that all pathways were being evaluated. Specifically, two new groundwater wells (non-drinking water) were

TABLE B-1

Summary of Sampling Deviations - 2010

MEDIA	TOTAL SCHEDULED SAMPLES	NUMBER OF DEVIATIONS*	SAMPLING EFFICIENCY %	REASON FOR DEVIATION
MEDIA				
PARTICULATES IN AIR	416	5	98.8%	See Table B-1a
CHARCOAL FILTER	416	5	98.8%	See Table B-1a
TLD	164	1	99%	See Table B-1b
HUDSON RIVER WATER	24	1	96%	See Table B-1c
DRINKING WATER	24	0	100%	N/A
SHORELINE SOIL	10	0	100%	N/A
BROAD LEAF VEGETATION	63	0	100%	N/A
FISH & INVERTEBRATES	24	0	100%	N/A
AQUATIC VEGETATION	6	0	100%	N/A
HUDSON RIVER BOTTOM SEDIMENT	8	0	100%	N/A
SOIL	3	0	100%	N/A
PRECIPITATION	8	0	100%	N/A
GROUNDWATER SAMPLES	2	0	100%	N/A
TOTALS	1168	12	99.0%	

TOTAL NUMBER OF SAMPLES COLLECTED = 1156

* Samples not collected or unable to be analyzed.

TABLE B-8

IPEC

ENVIRONMENTAL CHARCOAL CARTRIDGE SAMPLES - 2010

I-131 ACTIVITY pCi/ m^3 ± 1 Sigma

SAMPLE STATION #

Week Number	Week End Date	4	5	94	95	23**	27	29	44
27	07/06/10	< 0.027	< 0.017	< 0.025	< 0.032	< 0.030	< 0.015	< 0.025	< 0.030
28	07/12/10	< 0.044	< 0.039	< 0.033	< 0.026	< 0.032	< 0.037	< 0.025	< 0.033
29	07/19/10	< 0.029	< 0.016	< 0.020	< 0.024	< 0.037	< 0.018	< 0.017	< 0.023
30	07/26/10	< 0.021	< 0.018	< 0.029	< 0.026	< 0.021	< 0.028	< 0.017	< 0.020
31	08/02/10	< 0.016	< 0.024	< 0.034	< 0.026	< 0.023	< 0.017	< 0.010	< 0.024
32	08/09/10	< 0.013	< 0.022	< 0.027	< 0.023	< 0.016	< 0.020	< 0.015	< 0.022
33	08/16/10	< 0.045	< 0.031	< 0.020	< 0.033	< 0.039	< 0.035	< 0.244	< 0.021
34	08/23/10	no data	< 0.021	< 0.014	< 0.021	< 0.017	< 0.036	< 0.029	< 0.034
35	08/30/10	< 0.020	< 0.019	< 0.027	< 0.021	< 0.021	< 0.026	< 0.018	< 0.025
36	09/07/10	< 0.019	< 0.016	< 0.031	< 0.023	< 0.025	< 0.013	< 0.014	< 0.018
37	09/13/10	< 0.034	< 0.019	< 0.024	< 0.030	< 0.018	< 0.031	< 0.024	< 0.032
38	09/20/10	< 0.026	< 0.025	< 0.025	< 0.031	< 0.024	< 0.017	< 0.017	< 0.022
39	09/27/10	< 0.025	< 0.018	< 0.026	< 0.019	< 0.023	< 0.020	< 0.016	< 0.019
40	10/04/10	< 0.026	< 0.025	< 0.021	< 0.017	< 0.029	< 0.024	< 0.018	< 0.029
41	10/12/10	< 0.020	< 0.017	< 0.018	< 0.018	< 0.025	< 0.017	< 0.023	< 0.021
42	10/18/10	< 0.032	< 0.020	< 0.027	< 0.025	< 0.026	< 0.017	< 0.014	< 0.030
43	10/25/10	< 0.019	< 0.021	< 0.024	< 0.020	< 0.022	< 0.019	< 0.047	< 0.020
44	11/01/10	< 0.022	< 0.015	< 0.023	< 0.018	< 0.024	< 0.014	< 0.011	< 0.019
45	11/08/10	< 0.024	< 0.021	< 0.025	< 0.021	< 0.021	< 0.020	< 0.010	< 0.035
46	11/15/10	< 0.026	< 0.017	< 0.028	< 0.018	< 0.020	< 0.013	< 0.014	< 0.034
47	11/22/10	< 0.022	< 0.022	< 0.015	< 0.024	< 0.021	< 0.013	< 0.015	< 0.025
48	11/29/10	< 0.021	< 0.029	< 0.017	< 0.019	< 0.014	< 0.023	< 0.016	< 0.027
49	12/06/10	< 0.020	< 0.016	no data	< 0.018	< 0.022	< 0.013	< 0.018	< 0.018
50	12/13/10	< 0.004	< 0.018	< 0.013	< 0.021	< 0.017	< 0.024	< 0.016	< 0.021
51	12/20/10	< 0.037	< 0.036	< 0.026	< 0.032	< 0.033	< 0.022	< 0.024	< 0.031
52	12/27/10	< 0.034	< 0.027	< 0.025	< 0.022	< 0.028	< 0.025	< 0.020	< 0.024

TABLE B-14
CONCENTRATIONS OF GAMMA EMITTERS IN BROADLEAF VEGETATION SAMPLES – 2010
Results in Units of pCi/kg ± 1 Sigma
#95 Meteorological Tower

Sample Location Date		MET TOWER 4/26/2010	MET TOWER 4/26/2010	MET TOWER 4/26/2010	MET TOWER 5/17/2010	MET TOWER 5/17/2010	MET TOWER 5/17/2010
Client ID		IBV951710S1	IBV951710S2	IBV951710S3	IBV952010S1	IBV952010S2	IBV952010S3
Radionuclide	Req. CL (pCi)	RAGWEED	MULLEIN	BURDOCK	RAGWEED	MULLEIN	ALLROOT
Be-7		774.9 +/- 71.0	1813.0 +/- 116.7	1316.0 +/- 118.7	831.2 +/- 69.6	649.6 +/- 66.3	562.9 +/- 72.6
I-131	**50**	< 9.01	< 10.25	< 13.11	< 10.44	< 9.02	< 10.45
Cs-134	**50**	< 6.17	< 8.07	< 14.48	< 6.32	< 6.71	< 7.29
Cs-137	**50**	< 8.22	< 10.51	< 12.49	< 7.20	< 8.87	< 8.35
Zr-95		< 10.44	< 14.52	< 18.17	< 12.78	< 14.27	< 15.45
Nb-95		< 7.68	< 10.69	< 12.66	< 8.62	< 7.64	< 10.89
Co-58		< 7.23	< 7.49	< 10.31	< 7.46	< 6.88	< 9.48
Mn-54		< 6.82	< 9.16	< 10.96	< 8.67	< 8.62	< 7.94
Zn-65		< 19.13	< 25.70	< 31.43	< 21.82	< 20.25	< 28.02
Fe-59		< 18.73	< 29.61	< 33.04	< 22.67	< 19.71	< 27.62
Co-60		< 7.02	< 10.67	< 10.67	< 9.90	< 7.56	< 9.81
Ba/La-140		< 6.11	< 10.03	< 12.37	< 7.84	< 8.77	< 8.69
Ru-103		< 6.33	< 10.35	< 13.15	< 8.40	< 6.79	< 7.12
Ru-106		< 76.47	< 117.8	< 120.7	< 85.7	< 89.20	< 108.9
Ce-141		< 9.63	< 13.11	< 13.51	< 10.98	< 9.56	< 11.14
Ce-144		< 40.17	< 48.79	< 59.36	< 48.96	< 37.66	< 49.68
AcTh-228		< 23.75	< 27.19	< 45.00	< 30.50	< 32.31	< 36.49
Ra-226		< 151.8	< 180.0	< 212.7	285.6 +/- 111.2	291.5 +/- 103.1	411.9 +/- 122.6
K-40		4522.0 +/- 191.1	3846.0 +/- 226.2	4071.0 +/- 282.4	7346.0 +/- 247.3	7108.0 +/- 262.2	7286.0 +/- 306.8

TABLE B-14

CONCENTRATIONS OF GAMMA EMITTERS IN BROADLEAF VEGETATION SAMPLES – 2010

Results in Units of pCi/kg ± 1 Sigma

#95 Meteorological Tower

Sample Location Date		MET TOWER 6/14/2010	MET TOWER 6/14/2010	MET TOWER 6/14/2010			
Client ID	Req. CL (pCi)	IBV952410S1	IBV952410S2	IBV952410S3			
Radionuclide		RAGWEED	MULLEIN	BURDOCK			
Be-7		749.6 +/- 75.2	531.1 +/- 69.5	1642.0 +/- 112.0			
I-131	**50**	< 9.27	< 9.07	< 10.75			
Cs-134	**50**	< 12.71	< 5.81	< 11.39			
Cs-137	**50**	< 8.42	< 7.09	< 11.12			
Zr-95		< 15.10	< 12.15	< 21.32			
Nb-95		< 8.55	< 8.29	< 11.56			
Co-58		< 7.81	< 7.93	< 10.47			
Mn-54		< 7.95	< 8.63	< 8.81			
Zn-65		< 25.63	< 20.05	< 28.20			
Fe-59		< 26.13	< 20.29	< 32.75			
Co-60		< 8.69	< 8.59	< 12.94			
Ba/La-140		< 6.58	< 8.51	< 15.22			
Ru-103		< 6.70	< 6.78	< 11.57			
Ru-106		< 87.83	< 90.44	< 111.9			
Ce-141		< 10.40	< 10.34	< 14.39			
Ce-144		< 37.62	< 47.73	< 64.94			
AcTh-228		< 33.66	< 31.39	< 42.00			
Ra-226		< 142.2	447.8 +/- 119.2	439.9 +/- 167.3			
K-40		7903.0 +/- 286.2	4656.0 +/- 206.9	8229.0 +/- 321.4			

TABLE B-16
CONCENTRATIONS OF GAMMA EMITTERS IN AQUATIC VEGETATION SAMPLES – 2010
Results in Units of pCi/kg ± 1 Sigma

Sample Location Date		COLD SPRING 7/1/2010	COLD SPRING 9/13/2010	LENTS COVE 7/1/2010	LENTS COVE 9/13/2010	VERPLANCK 6/3/2010	VERPLANCK 7/1/2010
Client ID		IAV842610	IAV843710	IAV282610	IAV283710	IAV172210	IAV172610
Radionuclide	Req. CL (pCi)	MYRO	MYRO	MYRO	MYRO	MYRO	MYRO
Be-7		118.8 +/- 35.0	< 50.2	90.3 +/- 37.9	< 53.5	445.0 +/- 69.2	< 52.6
I-131	**30**	< 8.7	26.2 +/- 6.0	< 9.8	< 10.4	< 16.6	< 10.6
Cs-134	**30**	< 6.0	< 7.4	< 3.7	< 7.6	< 5.1	< 6.9
Cs-137	**40**	16.8 +/- 3.1	< 6.5	17.6 +/- 3.4	< 5.1	< 7.6	< 6.5
Zr-95		< 10.4	< 8.8	< 8.2	< 10.1	< 14.6	< 10.1
Nb-95		< 6.1	< 6.6	< 6.0	< 6.9	< 9.0	< 8.0
Co-58		< 5.7	< 6.8	< 5.0	< 6.4	< 10.3	< 6.4
Mn-54		< 4.6	< 5.8	< 5.4	< 6.5	< 9.8	< 5.1
Zn-65		< 11.2	< 16.9	< 13.0	< 9.5	< 30.9	< 19.4
Fe-59		< 14.4	< 16.1	< 14.4	< 13.7	< 35.7	< 19.4
Co-60		< 5.3	< 5.9	< 4.8	< 4.9	< 12.3	< 6.0
Ba/La-140		< 7.3	< 9.2	< 7.6	< 11.5	< 17.1	< 8.0
Ru-103		< 5.2	< 6.1	< 4.8	< 6.1	< 8.5	< 7.2
Ru-106		< 40.5	< 53.3	< 60.2	< 61.5	< 87.6	< 61.9
Ce-141		< 8.0	< 9.7	< 8.6	< 8.4	< 12.4	< 8.9
Ce-144		< 31.5	< 33.0	< 38.2	< 32.8	< 49.0	< 31.0
AcTh-228		131.6 +/- 19.0	109.8 +/- 19.9	250.5 +/- 22.0	180.0 +/- 22.2	134.7 +/- 29.4	109.4 +/- 21.1
Ra-226		273.3 +/- 67.0	239.7 +/- 87.1	575.9 +/- 96.6	315.6 +/- 84.4	363.8 +/- 146.3	245.6 +/- 89.0
K-40		4573.0 +/- 145.9	1728.0 +/- 126.1	3162.0 +/- 126.7	1555.0 +/- 108.3	4782.0 +/- 238.9	2551.0 +/- 148.2

TABLE B-20

CONCENTRATIONS OF RADIONUCLIDES IN MONITORING WELL SAMPLES
Results in pCi/L ± 3 sigma

Monitoring Well **Sample Name** **Sample Date**		**MW-LAF** MW-LAF-002-013 5/11/2010	**MW-LAF** MW-LAF-002-014 11/22/2010
Radionuclide	Req. MDC		
H-3		< 163	< 121
Cs-137	**18**	< 7.6	< 6.8
Co-60		< 7.3	< 6.2
Sr-90	**1**	< 0.78	< 0.54
Ni-63		< 25.4	< 20.5

Note 1: Less than values "<" are Minimum Detectable Concentration (MDC) values.
Note 2: A sample is positive if the result is greater than or equal to the MDC.

TABLE C-5

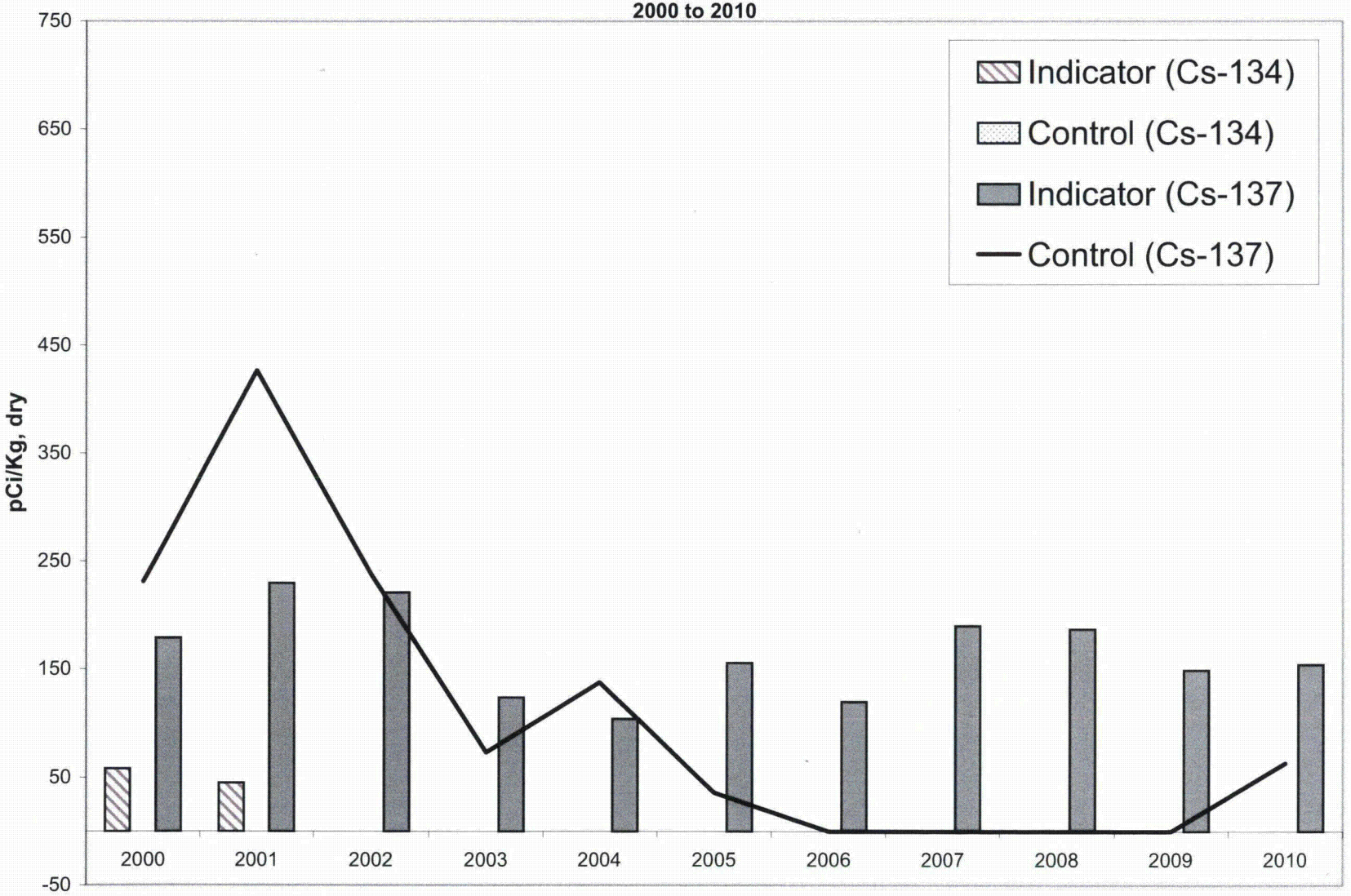
RADIONUCLIDES IN SHORELINE SOIL
2000 to 2010
(pCi/Kg, dry)

	Cs-134		Cs-137	
Year	Indicator	Control	Indicator	Control
2000	58	< L_c	179	231
2001	45	< L_c	230	427
2002	< L_c	< L_c	221	238
2003	< L_c	< L_c	124	73
2004	< L_c	< L_c	104	138
2005	< L_c	< L_c	156	36
2006	< L_c	< L_c	120	< L_c
2007	< L_c	< L_c	190	< L_c
2008	< L_c	< L_c	187	< L_c
2009	< L_c	< L_c	149	< L_c
2010	**< L_c**	**< L_c**	**154**	**63**
Historical Average 2000-2009	52	< L_c	166	191

Critical Level (L_c) is less than the RETS required LLD.

<L_c indicates no positive values above sample critical level.

FIGURE C-5
RADIONUCLIDES IN SHORELINE SOIL
2000 to 2010



Cs-134 ODCM required LLD = 150 pCi/Kg, dry
Cs-137 ODCM required LLD = 175 pCi/Kg, dry