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From: ncunningham@goodwinprocter.com
Sent: Friday, September 23, 2011 10:33 PM
To: Turk, Sherwin; Stuyvenberg, Andrew
Subject: Documents sent to NMFS.REMP 2010

Dear Messrs. Turk and Stuyvenberg:

I attach a zip file with the documents from Elise Zoli and BJ Trach that did not go through by email earlier.

Please do not hesitate to let me know if you have any issues opening these documents.

Nancy Cunnigham, Senior Litigation Paralegal, Goodwin Procter

File(s) will be available for download until **13 October 2011**:

File: REMP 2010.zip, 10,366.37 KB

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Patric W Conroy
Director, Nuclear Safety Assurance

NL-11-038

May 16, 2011

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

SUBJECT: 2010 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, 2010 to December 31, 2010.

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. Reid Tagliamonte, Radiation Protection Manager at 914-734-5790.

Sincerely,

Patric W. Conroy

PWC/mb

cc: next page

4SME20
IE25
NRR

Enclosure: 1. Annual Radiological Environmental Operating Report

cc: Mr. William Dean, Regional Administrator, NRC Region 1
Mr. John Boska, 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
Mr. Paul Eddy, New York State Department of Public Service
Mr. Timothy Rice, Bureau of Hazardous Waste & Radiation Mgmt, NYSDEC

ENCLOSURE 1 TO NL-11-038

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, 2010

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SECTION I

EXECUTIVE SUMMARY

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 1166 samples were obtained out of a planned load of 1178 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

designated as "boundary wells" and were sampled as groundwater samples for tritium and strontium-90 analyses and also gamma spectroscopy analysis. These wells (MW-40 and MW-51) were designated as REMP sample stations 104 and 105. In 2010, an offsite well to replace these two wells was established as sample station 106 at the Lafarge plant south of, and adjacent to, Indian Point. Once it was established, further sampling for REMP purposes at MW-40 and MW-51 was suspended. For 2010, only the sampling at the Lafarge plant was conducted – in accordance with the current applicable ODCM revision.

A 2006 change was made to the existing fish and invertebrate samples and shoreline sediment samples. The locations and frequency remained the same; however, strontium-90 was added, as also now is Ni-63, to the required analyses. These additions were observed for the sampling and analyses conducted in 2010. These changes were captured in the ODCM. Groundwater sample results for 2010 are summarized in Table B-20.

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, Indian Point operations in 2010 did not result in exposure to the public greater than environmental background levels.

SECTION 2

INTRODUCTION

2.0 INTRODUCTION

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 has been retired as a generating facility. Units 1, 2, and 3 are owned and operated by Entergy Nuclear.

2.2 Program Background

Environmental monitoring and surveillance have been conducted at Indian Point since 1958, which was 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. Thus, as used in this report, background levels consist of those resulting from both natural and anthropogenic sources of environmental radioactivity. Accumulation of this background data permits the detection and assessment of environmental activity attributable to plant operations.

2.3 Program Objectives

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

1. To enable the identification and quantification of changes in the radioactivity of the area, and

2. To measure radionuclide concentrations in the environment attributable to operations of the Indian Point site.

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 another program objective. Verifying projected concentrations through the REMP is difficult since the environmental concentrations resulting from plant releases are consistently too small to be detected. Plant related radionuclides were detected in 2010; however, residual radioactivity from atmospheric weapons tests and naturally occurring radioactivity were the predominant sources of radioactivity in the samples collected. Analysis of the 2010 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. Assistance in the collection of fish and invertebrate samples was provided by a contracted environmental vendor - Normandeau Associates, Inc.

3.2 Sample Analysis

The analysis of Indian Point environmental samples is performed by the James A. Fitzpatrick Nuclear Power Plant (JAFNPP) Environmental Laboratory in Fulton, New York. The JAFNPP lab at Fulton currently analyzes nearly all samples, except for groundwater samples and some tritium, nickel and strontium analyses on other media. These samples were analyzed at other New York State Department of Health Environmental Laboratory Approval Program (ELAP) certified laboratories.

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 gamma spectroscopy analysis, 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 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 gamma spectroscopy 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 Roseton, 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 Roseton, 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, 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 for tritium. They are also analyzed by gamma spectroscopy.

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

Based on recent site hydrology evaluations and the addition of a number of groundwater sampling wells, two monitoring wells were installed in 2006 and designated as REMP sample stations 104 (MW-40) and 105 (MW-51). These wells have sample points at six different elevations which were specifically designed to be representative of groundwater moving towards the site boundary. In 2010, an offsite well at the Lafarge plant (106) was established to replace MW-40 and MW-51. This groundwater sample location is shown in Figure A-3.

Groundwater samples at location 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. Previous locations were visited and verified by dispatching Nuclear Environmental Technicians to the various locations.

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.

Note: An aerial survey was not conducted of the 5-mile area this year.

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):

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

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 $\pm$ 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.

$$L_c = k_a s_0 (1+T_b/T_s)^{0.5}$$

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

In accordance with program policy, recounts of positive samples are 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 are performed to verify the positive results. The recounts are not performed on; air samples with positive results from gross beta analysis, since the results are always positive due to natural background radioactive material in the air, or tritium in water samples, since an outside contractor provides these activities. 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 14). 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 2009. The 2010 average values are included in these historic tables for purposes of comparison.

SECTION 4

RESULTS AND DISCUSSION

4.0 RESULTS AND DISCUSSION

The 2010 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.

Hudson River Water
Shoreline Soil
Fish and Invertebrates
Aquatic Vegetation
Bottom Sediment
Airborne Particulates and Radioiodine
Precipitation
Drinking Water
Terrestrial Broad Leaf Vegetation
Direct Gamma Radiation
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 2010 and assessed the significance of the findings.

A summary of the results of the 2010 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 2010 consists of those resulting from past weapons testing in the earth's atmosphere. Such 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, although diminishing with time (e.g., through radioactive decay and natural dispersion processes), remains detectable.

In 2010, the detected radionuclide that may be attributable to past atmospheric weapons testing consisted of Cs-137 in some media. The levels detected were consistent with the historical levels of radionuclides resulting from weapons tests as measured in previous years.

The final group of radionuclides detected through the 2010 REMP comprises those that may be attributable to current plant operations. During 2010 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 produced in and released from fission reactors and were introduced into the environment from the accident at Chernobyl in 1986. 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.

A sample of aquatic vegetation at Lents Cove showed Cs-137 activity greater than the critical level but less that the lower limit of detection. It is being reported positive, due to its relation to the critical level, but not significant. A sample at Cold Spring (distant location) showed detectable, but not

significant, Cs-137 activity. The level is the same as that found at Lents Cove.

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.

Strontium-90 (Sr-90) may also be present in the environment from atmospheric testing debris. Due to a desire to improve the sensitivity of Sr-90 in environmental samples, a new analytical technique was pursued, at the end of 2009, for application in 2010.

2009 fish/invertebrate sample results for Sr-90 were inconclusive. As noted in the 2009 AREOR, the results for Sr-90 in all fish and invertebrate samples were under review and not reliable. It was noted that when the certified results were available, they would be submitted as an addendum.

However, as detailed below, no certifiable results were able to be obtained from the 2009 samples. In a letter dated June 29, 2010, the laboratory identified that due to the extremely low detection level requested, interferences such as radon progeny rendered the 2009 data invalid. Close observation of the analytical method used in 2009 identified the need to improve the technique, to better screen out these contaminants, or proceed in another way. A new technique was adopted at the end of 2009's evaluation, for application in 2010.

An attempt was made to re-analyze 2009 fish/invertebrate samples for Sr-90 using the new method, but the media had been consumed in the earlier tests and no further analyses were possible. 2010 samples were analyzed with the new method, with much improved sensitivity and reliability. No Strontium-90 was identified in samples from 2010.

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 2010 in aquatic 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 2010 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 AREVA NP via the JAF Laboratory. In 2010, 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 2000 through 2008. The 2010 means are also presented in Table B-4. Table B-5 presents the 2010 TLD data for the inner ring and outer ring of TLDs.

The 2010 mean value for the direct radiation sample points was 14.0 mR per standard quarter – which represents no change from 2009. At those locations where the 2010 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 14.0 mR per standard quarter and also average for the outer ring was 14.3 mR per standard quarter. The control location average for 2010 was 13.0 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 2010 averages are consistent with the historical data. The 2010 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 2010 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 gamma spectroscopy analyses 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 0.013 pCi/m^3 and the average for the control location was 0.013 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. Gamma spectroscopy analyses 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 2010 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). 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 2010.

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.

Only H-3 was found. 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 2010 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 2010. Cs-137 was detected at the Verplanck location in both samples from that location, for a total of two positive values out of eight samples from indicator locations. Cs-137 was detected at the control location (Manitou Inlet) in one of two samples (63 pCi/kg). The average concentration for the indicator locations that had positive indication of Cs-137 was 154 pCi/kg (dry) with a maximum concentration of 174 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 control locations, 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 2010 samples are presented in Table B-14. Analyses of broad leaf vegetation samples revealed only one instance of Cs-137 at 31 pCi/kg (wet) value.

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 and not at all in the last five years. The 2010 single detection is comparable to the highest average positive detection of the last ten years.

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 2010. There were no plant related radionuclides detected as a result of the GSA.

Strontium-90 was added to the analyte list in 2007. Ni-63 was added with an ODCM revision in 2010. No Ni-63, Sr-90 or any other activity aside from naturally-occurring ones was found in any of these samples in 2010. An improved analytical method for Strontium-90 in fish/invertebrates was applied in 2010, improving the sensitivity, and reducing analytical error. This improved analytical technique gave us the required sensitivity and reliable results.

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 2010.

The laboratory reported positive Cs-137 (17.6 pCi/kg) at Lents Cove. This is an amount between the Critical Level and the LLD. Activity-free samples would, about 5% of the time, show a positive result due to normal background statistical fluctuations. In the historical record, a 17

pCi/kg result was reported for a 2005 aquatic vegetation sample and also one for 2009 at the same location. A comparable detection at the Cold Spring control location showed 16.8 pCi/kg – a quite similar result.

There are about five samples per year, varying from 3 to 10, going back to 2005. No I-131 was 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 2010. Cs-137 was detected at 5 of 6 indicator station samples and not at all at two control station 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 418 pCi/kg and 1330 pCi/kg on samples taken three months apart (average = 874 pCi/kg.). There is nothing in release data and in monitoring well data that corresponds to this difference. The results are very comparable to the 2009 results – thus corroborating the 2009 results. The average of all indicator detections is 553 pCi/kg (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 430 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 2010. Other than naturally occurring radionuclides, no radionuclides were detected in precipitation samples.

A review of historical data over the last 10 years indicates tritium had been detected in both indicator and control precipitation samples in 2000; however, there have been no instances of positive values since that time.

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 2010. 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 2010 is contained in Table B-2. Data resulting from analysis of the groundwater samples for gamma emitters, tritium analysis, and Sr-90 are given in Table B-20.

No REMP nuclides other than naturally occurring ones were found in 2010.

4.13 Land Use Census

A census was performed in the vicinity of Indian Point in 2010. 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 2010 census were generally same as the 2007 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 2010 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 2010 REMP reveal that operations at the station did not result in an adverse impact on the environment.

The 2010 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 effects are very low and are significantly less than those from natural background and other anthropogenic sources.

SECTION 5

REFERENCES

5.0 REFERENCES

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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 2010 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

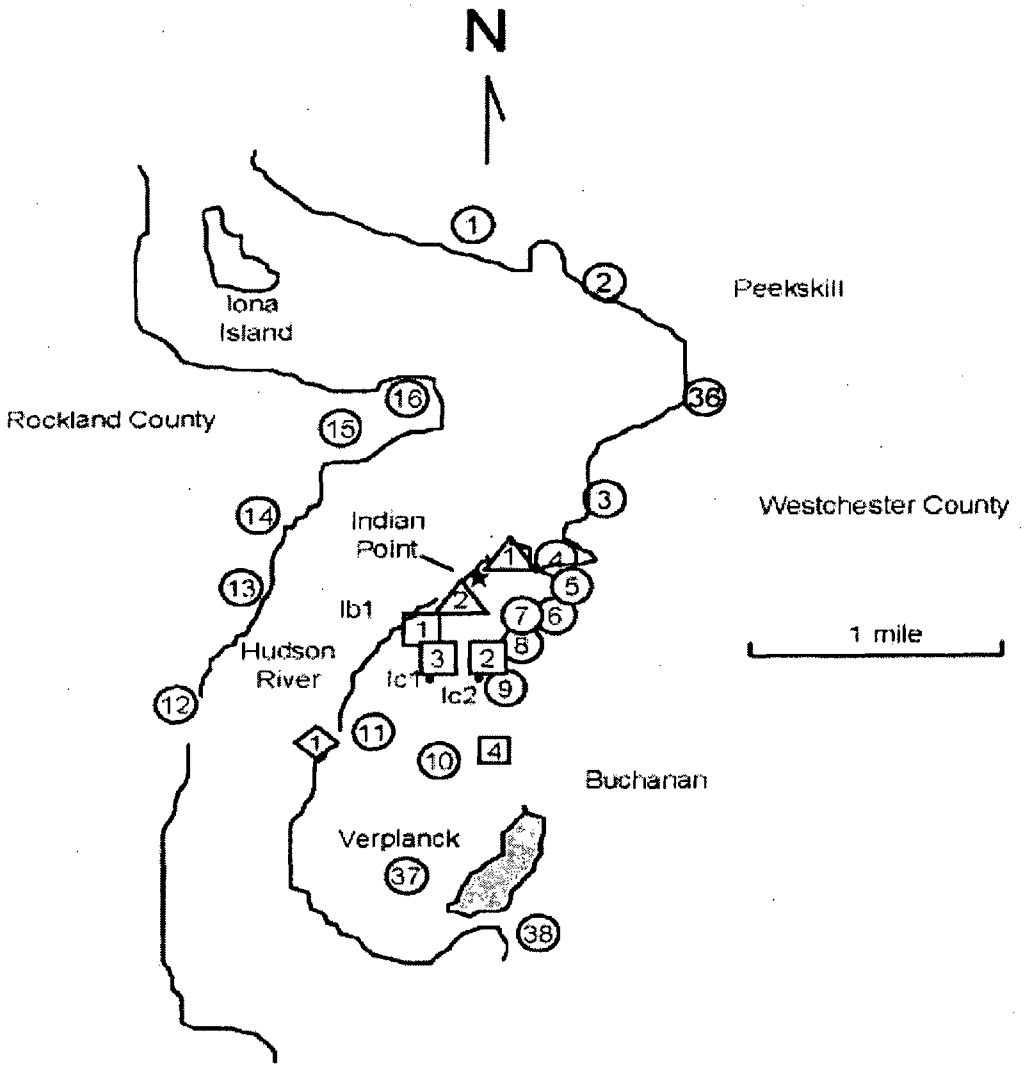
TABLE A-1
INDIAN POINT REMP SAMPLING STATION LOCATIONS

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

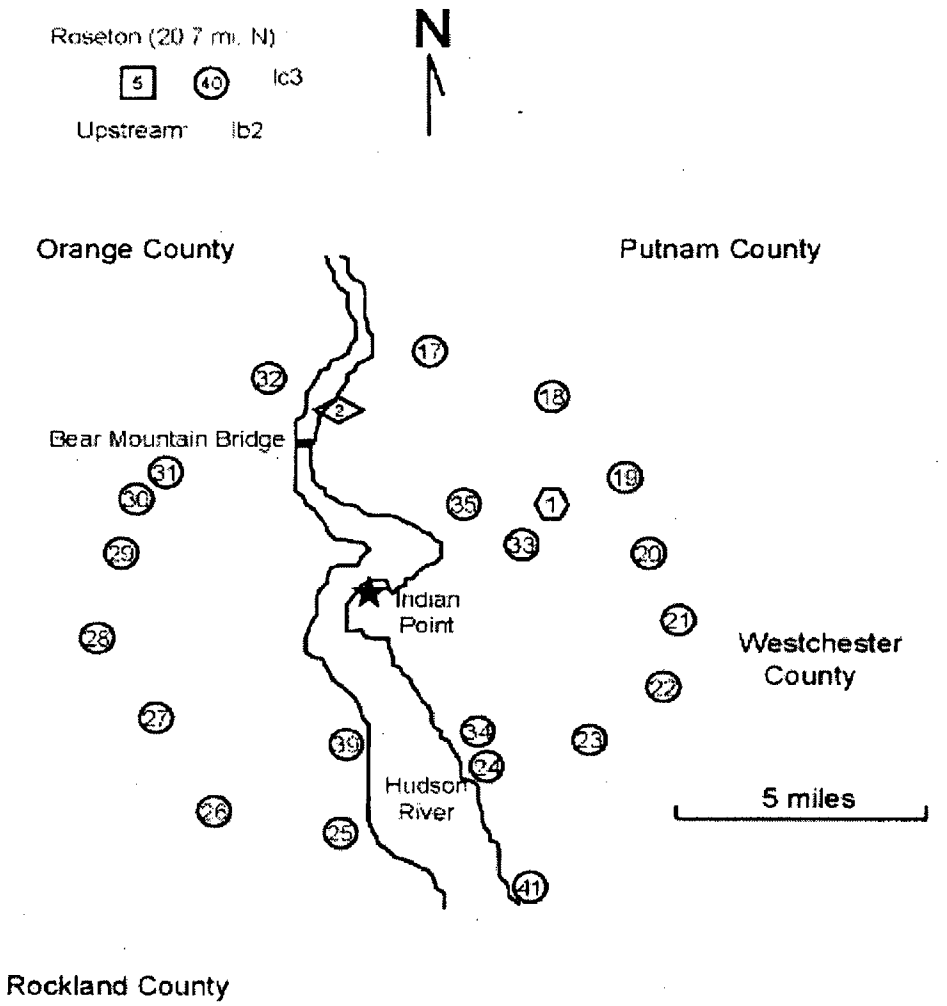


Key:

- △ - Waterborne: Surface (HR) Wa#
- ○ - Direct Radiation Sample Location DR#
- □ - Airborne Particulate and Radioiodine A#
- Ic# - Broadleaf Vegetation
- ◇ - HR Shoreline Soil Wc#
- Ib1 - Fish and Invertebrates (where available downstream)

FIGURE A-2

SAMPLING LOCATIONS
Greater than Two Miles from Indian Point

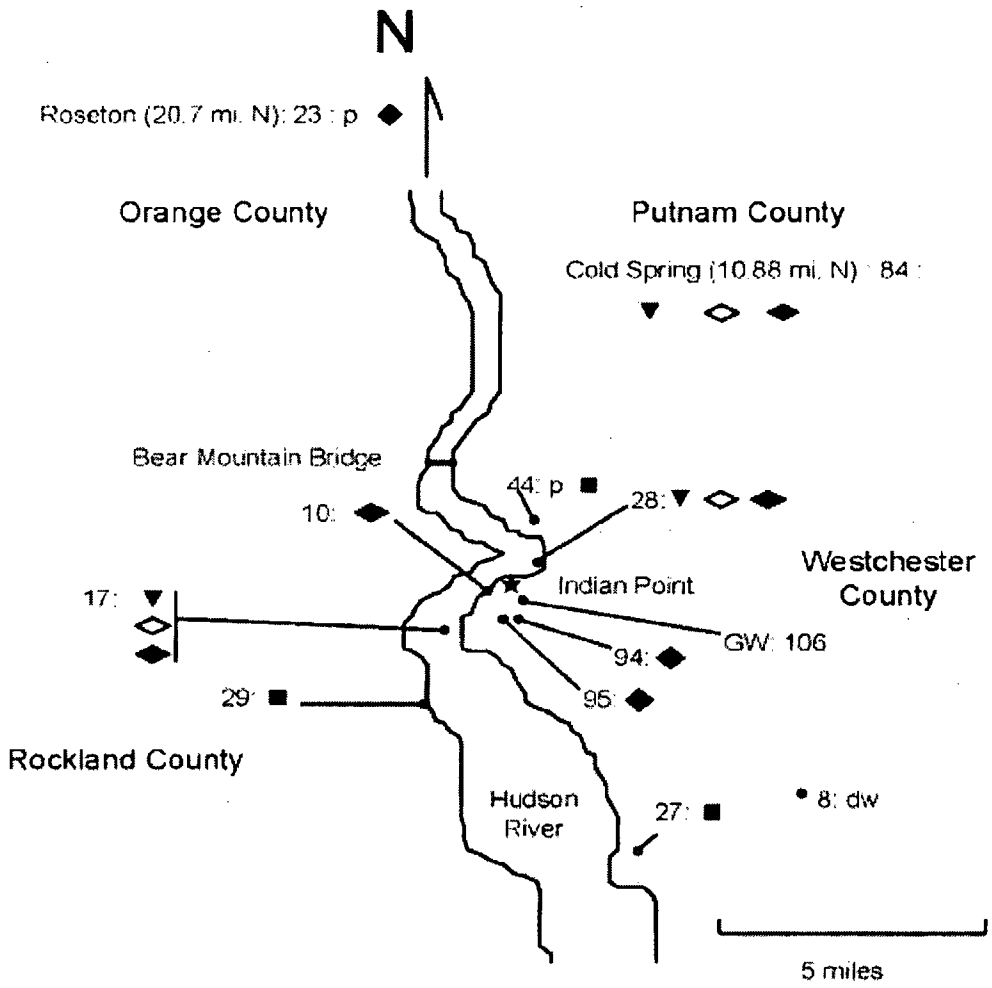


Key:

- ○ - Direct Radiation Sample Location DR#
- □ - Airborne Sampling Location A#
- ◇ - Hudson River Shoreline Soil Wc#
- Ic3 - Broadleaf Vegetation
- ⬡ - 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 2010 Annual Radiological Environmental Monitoring Program Summary

The results of the 2010 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 2010. 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 I-131, 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 2010, environmental sampling was performed for 12 unique media types addressed in the ODCM and for direct radiation. A total of 1166 samples of 1178 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 air samples, B-1b for TLDs and B-1c for other environmental media.

B.4 Analytical Deviations

There were no analytical deviations in 2010.

Note: in 2009, twenty-three suspect analyses for Sr-90 in fish resulted in incomplete results for this radionuclide. The vendor's method for analyzing the fish for Sr-90 was inadequate for the required sensitivity. Accordingly, the vendor

and the method of analysis were changed for 2010. All analyses for Sr-90 in 2010 fish were successfully performed and the required sensitivity was met.

B.5 Special Reports

No special reports were required under the REMP.

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	32	1	97%	See Table B-1c
DRINKING WATER	32	0	100%	N/A
SHORELINE SOIL	10	0	100%	N/A
BROAD LEAF VEGETATION	58	0	100%	N/A
FISH & INVERTEBRATES	24	0	100%	N/A
AQUATIC VEGETATION	5	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	1178	12	99.0%	

TOTAL NUMBER OF SAMPLES COLLECTED = 1166

* Samples not collected or unable to be analyzed.

TABLES B-1a / B-1b / B-1c

TABLE B-1a
2010 Air Sampling Deviations

STATION	WEEK	PROBLEM / ACTIONS TO PREVENT RECURRENCE
Grassy Point	2	Lost 145 hours from power interruption
Grassy Point	12	Lost 74 hours from power interruption
Grassy Point	26	Lost 65 hours from power interruption
Grassy Point	33	Lost 161 hours run time from power interruption
Grassy Point	43	Lost 158 hours; sample pump required replacement
Algonquin	11	Lost 141 hours due to sample pump failure
Algonquin	12,13,14	Lost weeks continuously from security fence modifications line cutting
Algonquin	34	Lost most of week from security fence modifications line cutting
NYU Tower	9	Lost 122 hours from GFCI trip
Training Building	49	Filter media found mis-aligned when retrieved (bypassed)
Roseton	9	Lost 74 hours from trees falling on power lines
Roseton	13	Lost 95 hours; GFCI found tripped
Roseton	29	Lost 40 hours on integrator; sample was running at week's end

Note: eight of thirteen could be analyzed; five could not be analyzed

TABLE B-1b
2010 TLD Deviations

STATION	QUARTER	PROBLEM / ACTIONS TO PREVENT RECURRENCE
Lent's Cove	3rd	TLD was removed from holder; raise installation height

TABLE B-1c
2010 Other Media Deviations

STATION	SAMPLE SCHEDULE	PROBLEM / ACTIONS TO PREVENT RECURRENCE
Hudson River Discharge	Week 47	Surface Water; sample pump found de-energized, grab sample taken and pump re-energized

TABLE B-2
ODCM ANNUAL SUMMARY - 2010

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 163	N/A	*14.1 (159/160) / 10.3 - 21.1*	Palisades Parkway (Lake Welch Exit) 4.96 Mi (WSW) at 310° DR28 19.8 *(4/4) / 17.3 - 21.1*	*13.0 (4/4) / 11.8 - 13.7*	0
AIR PARTICULATES AND RADIOIODINE (pCi/m^3) B-6, B-7, B-8	GB (411)	0.01	*0.013 (359/364) / 0.001 - 0.032*	#29 Grassy Point 3.37 Mi (SSW) at 196° 0.013 (52/52) / 0.002-0.032	*0.013 (52/52) / 0.002-0.027*	0
	I-131 (411)	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)	<Lc	<Lc	428 (2/4) <Lc 455	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 - 2010

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 (10)					
	Cs-134	150	<Lc	<Lc	<Lc	0
	Cs-137	180	*154 (2/8) / <L_c - 173*	#17 Off Verplanck 1.5 Mi (SSW) at 202.5° *154 (2/2) / 134 - 173*	*#50 Manitou Inlet 63 (1/4) / <L_c - 63*	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 - 2010

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 (58)					
	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	*31(1/37) / <L_c - 31*	*#95 Meteorological Tower 0.46 Mi (SSW) at 208° 31(1/16) / <L_c - 31*	<Lc	0
FISH AND INVERTEBRATES (pCi/kg - wet) B-15	GSA (24)					
	Mn-54	130	<Lc	<Lc	<Lc	0
	Co-58	130	<Lc	<Lc	<Lc	0
	Fe-59	260	<Lc	<Lc	<Lc	0
	Ni-63 (24)	100	<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
	Sr-90 (24)	5	<Lc	<Lc	<Lc	0
AQUATIC VEGETATION (pCi/kg - WET) B-16	GSA(5)					
	Co-60	NONE	<Lc	<Lc	<Lc	0
	I-131	NONE	<Lc	<Lc	<Lc	0
	Cs-134	NONE	<Lc	<Lc	<Lc	0
	Cs-137	NONE	17.6 *(1/4) / <L_c - 17.6*	#28 Lents Cove 0 .45 Mi (ENE) at 069° *17.6 (1/2) / <L_c - 17.6*	#84 Cold Spring 10.88 Mi (N) at 356° 16.8 *(1/2) / <L_c - 16.8*	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 - 2010

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	*553 (5/6) / <Lc - 1330*	#10 Discharge Canal 0.3 Mi WSW *874 (2/2) / 418 - 1330*	<Lc	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

2010 DIRECT RADIATION, QUARTERLY DATA
(mR per STANDARD QUARTER)

Station ID	Sector	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Mean	Yearly
DR-01	N	13.54 ± 0.44	15.57 ± 0.63	15.80 ± 0.76	15.94 ± 1.16	15.2	60.9
DR-02	NNE	13.73 ± 0.70	14.15 ± 0.66	16.08 ± 0.47	14.63 ± 1.00	14.6	58.6
DR-03	NE	11.14 ± 0.50	11.70 ± 0.40	13.12 ± 0.66	11.80 ± 0.95	11.9	47.8
DR-04	ENE	12.50 ± 0.46	13.62 ± 0.57	0.00 * 0.00	13.48 ± 1.19	13.2	52.8
DR-05	ENE	13.32 ± 0.47	14.03 ± 0.57	15.29 ± 0.56	13.62 ± 1.07	14.1	56.3
DR-06	ESE	13.57 ± 0.48	13.95 ± 0.66	15.71 ± 0.75	14.35 ± 1.07	14.4	57.6
DR-07	SE	14.96 ± 0.54	15.79 ± 0.76	17.26 ± 0.75	16.19 ± 1.30	16.1	64.2
DR-08	SSE	11.14 ± 0.31	11.69 ± 0.50	12.55 ± 0.72	11.19 ± 1.17	11.6	46.6
DR-09	S	12.33 ± 0.45	12.48 ± 0.50	13.72 ± 0.66	13.13 ± 0.97	12.9	51.7
DR-10	SSW	13.22 ± 0.51	14.88 ± 0.47	15.38 ± 0.52	14.09 ± 1.07	14.4	57.6
DR-11	SW	10.34 ± 0.51	10.69 ± 0.50	12.06 ± 0.62	10.46 ± 1.07	10.9	43.6
DR-12	WSW	14.52 ± 0.74	15.69 ± 0.59	15.46 ± 0.72	16.22 ± 1.49	15.5	61.9
DR-13	WSW	18.38 ± 0.64	17.44 ± 0.68	17.18 ± 0.80	17.62 ± 1.26	17.7	70.6
DR-14	WNW	11.88 ± 0.66	14.27 ± 0.73	13.60 ± 0.57	14.39 ± 1.24	13.5	54.1
DR-15	NW	11.97 ± 0.56	13.92 ± 0.76	14.11 ± 0.78	14.05 ± 1.13	13.5	54.1
DR-16	NNW	13.38 ± 0.68	15.08 ± 0.48	14.91 ± 0.61	14.98 ± 1.28	14.6	58.4
DR-17	N	13.23 ± 0.40	15.94 ± 0.81	14.77 ± 0.54	15.30 ± 1.07	14.8	59.2
DR-18	NNE	14.04 ± 0.59	14.71 ± 0.68	15.78 ± 0.51	14.56 ± 0.99	14.8	59.1
DR-19	NE	13.89 ± 0.42	15.20 ± 0.66	16.55 ± 0.48	14.51 ± 1.16	15.0	60.2
DR-20	ENE	12.28 ± 0.39	13.23 ± 0.48	14.46 ± 0.57	13.07 ± 1.11	13.3	53.0
DR-21	E	13.15 ± 0.60	14.33 ± 0.59	15.62 ± 0.88	14.15 ± 1.07	14.3	57.3
DR-22	ESE	10.36 ± 0.48	11.22 ± 0.41	12.57 ± 0.76	11.00 ± 0.82	11.3	45.2
DR-23	SE	12.73 ± 0.49	14.04 ± 0.64	15.44 ± 0.76	13.61 ± 1.00	14.0	55.8
DR-24	SSE	13.69 ± 0.63	14.65 ± 0.64	15.48 ± 0.63	13.96 ± 1.00	14.4	57.8
DR-25	S	11.25 ± 0.45	12.59 ± 0.75	12.16 ± 0.42	12.29 ± 0.96	12.1	48.3
DR-26	SSW	12.91 ± 0.37	14.84 ± 0.67	13.86 ± 0.84	14.73 ± 1.24	14.1	56.3
DR-27	SW	12.25 ± 0.54	14.10 ± 0.67	13.40 ± 0.59	14.36 ± 1.15	13.5	54.1
DR-28	NW	17.26 ± 0.63	20.42 ± 0.73	20.31 ± 0.71	21.07 ± 1.64	19.8	79.1
DR-29	W	12.28 ± 0.72	14.69 ± 0.73	14.54 ± 0.50	14.96 ± 1.12	14.1	56.5
DR-30	SNS	12.64 ± 0.44	15.68 ± 0.72	14.38 ± 0.76	14.20 ± 1.31	14.2	56.9
DR-31	WSW	14.93 ± 0.56	16.72 ± 0.58	16.86 ± 0.52	16.89 ± 1.38	16.4	65.4
DR-32	NNW	11.61 ± 0.71	13.20 ± 0.53	12.94 ± 0.51	13.48 ± 1.03	12.8	51.2
DR-33	NE	12.99 ± 0.41	12.81 ± 0.48	14.94 ± 1.05	13.23 ± 1.05	13.5	54.0
DR-34	SE	11.86 ± 0.43	12.64 ± 0.56	13.77 ± 0.51	12.17 ± 1.15	12.6	50.4
DR-35	NNE	12.56 ± 0.57	13.11 ± 0.59	14.25 ± 0.69	12.24 ± 0.94	13.0	52.2
DR-36	NE	14.99 ± 0.65	14.48 ± 0.52	15.65 ± 0.57	14.53 ± 1.41	14.9	59.7
DR-37	SSW	13.41 ± 0.61	14.33 ± 0.90	15.38 ± 0.69	13.86 ± 0.96	14.2	57.0
DR-38	S	11.43 ± 0.47	12.83 ± 1.10	13.55 ± 0.51	11.50 ± 0.89	12.3	49.3
DR-39	SSW	14.05 ± 0.53	15.63 ± 0.64	15.75 ± 0.67	16.26 ± 1.17	15.4	61.7
DR-40**	N	13.30 ± 0.42	13.72 ± 0.55	11.78 ± 0.70	13.13 ± 1.19	13.0	51.9
DR-41	SSE	12.12 ± 0.56	13.05 ± 0.61	13.95 ± 0.69	12.32 ± 1.03	12.9	51.4
AVERAGE		13.0	14.2	14.5	14.1	14.0	56.2

* Data not available

** Control Location

TABLE B-4

DIRECT RADIATION, 2000 THROUGH 2010 DATA
(mR per Standard Quarter Basis)

Station ID	Mean (2000-2009)	Standard Deviation (2000-2009)	Minimum Value (2000-2009)	Maximum Value (2000-2009)	2010 Mean
DR-01	62.4	2.8	58.4	68.0	60.9
DR-02	58.6	2.9	53.6	64.8	58.6
DR-03	47.7	1.8	44.0	50.0	47.8
DR-04	54.2	3.5	46.8	58.8	52.8
DR-05	54.2	2.3	48.4	56.8	56.3
DR-06	54.1	3.2	46.4	57.6	57.6
DR-07	63.8	3.6	55.6	68.8	64.2
DR-08	51.1	2.8	47.2	56.4	46.6
DR-09	53.3	2.8	47.2	58.0	51.7
DR-10	56.9	2.2	53.2	60.0	57.6
DR-11	44.4	2.0	40.8	47.2	43.6
DR-12	66.5	4.2	60.8	76.0	61.9
DR-13	76.1	4.0	68.0	82.0	70.6
DR-14	53.2	1.9	50.0	56.0	54.1
DR-15	52.9	3.1	46.4	57.6	54.1
DR-16	58.6	2.1	55.2	61.6	58.4
DR-17	59.8	3.2	56.4	66.8	59.2
DR-18	56.6	2.2	52.4	58.8	59.1
DR-19	59.4	2.3	55.2	61.6	60.2
DR-20	53.5	3.1	47.6	58.8	53.0
DR-21	54.6	2.3	50.0	57.6	57.3
DR-22	45.6	2.8	40.4	50.8	45.2
DR-23	55.5	2.6	49.6	58.8	55.8
DR-24	56.8	3.0	49.2	60.0	57.8
DR-25	49.4	2.2	44.8	52.8	48.3
DR-26	55.2	2.4	50.4	58.8	56.3
DR-27	54.2	3.2	46.8	59.2	54.1
DR-28	69.0	9.0	57.2	78.8	79.1
DR-29	61.8	7.1	54.8	73.6	56.5
DR-30	60.8	4.9	52.4	68.0	56.9
DR-31	69.2	4.8	62.0	78.4	65.4
DR-32	52.2	3.0	46.0	57.2	51.2
DR-33	48.1	9.4	34.0	55.2	54.0
DR-34	52.4	4.6	43.2	60.8	50.4
DR-35	55.2	3.4	48.8	60.8	52.2
DR-36	59.7	3.6	52.4	65.6	59.7
DR-37	54.5	2.9	48.8	58.8	57.0
DR-38	52.3	3.3	48.0	58.4	49.3
DR-39	61.2	3.4	55.2	66.0	61.7
DR-40**	63.7	6.4	54.8	75.2	51.9
DR-41	51.4	3.2	44.4	55.2	51.4
Average	56.4		50.4	61.8	56.2

** Control Location

TABLE B-5

2010 DIRECT RADIATION
INNER AND OUTER RINGS
(mR per Standard Quarter Basis)

Inner Ring ID	Outer Ring ID	Sector	Inner Ring Annual Average	Outer Ring Annual Average
DR-01	DR-17	N	60.9	59.2
DR-02	DR-18	NNE	58.6	59.1
DR-03	DR-19	NE	47.8	60.2
DR-04	DR-20	ENE	52.8	53.0
DR-05	DR-21	E	56.3	57.3
DR-06	DR-22	ESE	57.6	45.2
DR-07	DR-23	SE	64.2	55.8
DR-08	DR-24	SSE	46.6	57.8
DR-09	DR-25	S	51.7	48.3
DR-10	DR-26	SSW	57.6	56.3
DR-11	DR-27	SW	43.6	54.1
DR-12	DR-28	WSW	61.9	79.1
DR-13	DR-29	W	70.6	56.5
DR-14	DR-30	WNW	54.1	56.9
DR-15	DR-31	NW	54.1	65.4
DR-16	DR-32	NNW	58.4	51.2
Average			56.0	57.2

TABLE B-6

IPEC

ENVIRONMENTAL AIRBORNE PARTICULATE SAMPLES - 2010

GROSS BETA ACTIVITY pCi/ m^3 ± 1 Sigma

SAMPLE STATION #

Week Number	Week End Date	4	5	94	95	23**	27	29	44
1	1/4/2010	0.008 ± 0.001	0.013 ± 0.001	0.011 ± 0.001	0.011 ± 0.001	0.013 ± 0.001	0.011 ± 0.001	0.014 ± 0.001	0.015 ± 0.001
2	1/12/2010	0.007 ± 0.001	0.005 ± 0.001	0.005 ± 0.001	0.006 ± 0.001	0.006 ± 0.001	0.007 ± 0.001	0.005 ± 0.001	0.004 ± 0.001
3	1/19/2010	0.018 ± 0.001	0.023 ± 0.002	0.018 ± 0.001	0.015 ± 0.001	0.017 ± 0.001	0.018 ± 0.001	0.017 ± 0.001	0.017 ± 0.001
4	1/26/2010	0.012 ± 0.001	0.014 ± 0.001	0.012 ± 0.001	0.013 ± 0.001	0.014 ± 0.001	0.014 ± 0.001	0.014 ± 0.001	0.014 ± 0.001
5	2/2/2010	0.014 ± 0.001	0.015 ± 0.001	0.016 ± 0.001	0.011 ± 0.001	0.014 ± 0.001	0.014 ± 0.001	0.006 ± 0.003	0.013 ± 0.001
6	2/9/2010	0.013 ± 0.001	0.013 ± 0.001	0.013 ± 0.001	0.013 ± 0.001	0.013 ± 0.001	0.015 ± 0.001	0.012 ± 0.001	0.011 ± 0.001
7	2/16/2010	0.011 ± 0.001	0.008 ± 0.001	0.008 ± 0.001	0.009 ± 0.001	0.009 ± 0.001	0.009 ± 0.001	0.008 ± 0.001	0.009 ± 0.001
8	2/23/2010	0.005 ± 0.001	0.004 ± 0.001	0.004 ± 0.001	0.005 ± 0.001	0.003 ± 0.001	0.004 ± 0.001	0.006 ± 0.001	0.006 ± 0.001
9	3/2/2010	0.002 ± 0.001	-0.001 ± 0.001	0.001 ± 0.001	0.003 ± 0.001	0.000 ± 0.001	0.002 ± 0.001	0.002 ± 0.000	0.002 ± 0.001
10	3/8/2010	0.013 ± 0.001	0.013 ± 0.001	0.017 ± 0.001	0.012 ± 0.001	0.014 ± 0.001	0.012 ± 0.001	0.012 ± 0.001	0.010 ± 0.001
11	3/15/2010	0.023 ± 0.005	0.014 ± 0.001	0.016 ± 0.001	0.016 ± 0.001	0.014 ± 0.001	0.016 ± 0.001	0.016 ± 0.001	0.016 ± 0.001
12	3/23/2010	no data	0.016 ± 0.001	0.019 ± 0.001	0.016 ± 0.001	0.014 ± 0.001	0.018 ± 0.001	0.012 ± 0.001	0.017 ± 0.001
13	3/30/2010	no data	0.011 ± 0.001	0.012 ± 0.001	0.013 ± 0.001	0.008 ± 0.002	0.012 ± 0.001	0.014 ± 0.001	0.015 ± 0.001
14	4/5/2010	no data	0.004 ± 0.001	0.004 ± 0.001	0.004 ± 0.001	0.004 ± 0.001	0.004 ± 0.001	0.004 ± 0.001	0.004 ± 0.001
15	4/12/2010	0.010 ± 0.002	0.014 ± 0.001	0.017 ± 0.001	0.015 ± 0.001	0.016 ± 0.001	0.013 ± 0.001	0.012 ± 0.001	0.015 ± 0.001
16	4/20/2010	0.010 ± 0.001	0.009 ± 0.001	0.010 ± 0.001	0.011 ± 0.001	0.015 ± 0.001	0.009 ± 0.001	0.010 ± 0.001	0.010 ± 0.001
17	4/26/2010	0.010 ± 0.001	0.013 ± 0.001	0.011 ± 0.001	0.013 ± 0.001	0.015 ± 0.001	0.011 ± 0.001	0.011 ± 0.001	0.015 ± 0.001
18	5/4/2010	0.012 ± 0.001	0.012 ± 0.001	0.014 ± 0.001	0.014 ± 0.001	0.015 ± 0.001	0.012 ± 0.001	0.013 ± 0.001	0.014 ± 0.001
19	5/11/2010	0.008 ± 0.001	0.010 ± 0.001	0.008 ± 0.001	0.009 ± 0.001	0.011 ± 0.001	0.010 ± 0.001	0.009 ± 0.001	0.011 ± 0.001
20	5/17/2010	0.010 ± 0.001	0.009 ± 0.001	0.009 ± 0.001	0.010 ± 0.001	0.009 ± 0.001	0.010 ± 0.001	0.010 ± 0.001	0.009 ± 0.001
21	5/24/2010	0.008 ± 0.001	0.010 ± 0.001	0.012 ± 0.001	0.010 ± 0.001	0.010 ± 0.001	0.010 ± 0.001	0.009 ± 0.001	0.010 ± 0.001
22	6/1/2010	0.011 ± 0.001	0.009 ± 0.001	0.013 ± 0.001	0.012 ± 0.001	0.014 ± 0.001	0.011 ± 0.001	0.012 ± 0.001	0.010 ± 0.001
23	6/7/2010	0.011 ± 0.001	0.010 ± 0.001	0.011 ± 0.001	0.011 ± 0.001	0.013 ± 0.001	0.010 ± 0.001	0.013 ± 0.001	0.012 ± 0.001
24	6/14/2010	0.007 ± 0.001	0.009 ± 0.001	0.008 ± 0.001	0.006 ± 0.001	0.005 ± 0.001	0.008 ± 0.001	0.008 ± 0.001	0.007 ± 0.001
25	6/21/2010	0.010 ± 0.001	0.011 ± 0.001	0.011 ± 0.001	0.012 ± 0.001	0.012 ± 0.001	0.010 ± 0.001	0.012 ± 0.001	0.010 ± 0.001
26	6/28/2010	0.012 ± 0.001	0.012 ± 0.001	0.015 ± 0.001	0.013 ± 0.001	0.012 ± 0.001	0.013 ± 0.001	0.016 ± 0.001	0.012 ± 0.001

** Control sample location

TABLE B-6 (Continued)
IPEC
ENVIRONMENTAL AIRBORNE PARTICULATE SAMPLES - 2010
GROSS BETA ACTIVITY pCi/ m^3 ± 1 Sigma

SAMPLE STATION #

Week Number	Week End Date	4	5	94	95	23**	27	29	44
27	7/6/2010	0.015 ± 0.001	0.015 ± 0.001	0.013 ± 0.001	0.013 ± 0.001	0.013 ± 0.001	0.011 ± 0.001	0.014 ± 0.001	0.015 ± 0.001
28	7/12/2010	0.020 ± 0.002	0.019 ± 0.002	0.022 ± 0.002	0.018 ± 0.001	0.021 ± 0.002	0.020 ± 0.002	0.018 ± 0.001	0.019 ± 0.002
29	7/19/2010	0.016 ± 0.001	0.015 ± 0.001	0.014 ± 0.001	0.015 ± 0.001	0.014 ± 0.002	0.012 ± 0.001	0.014 ± 0.001	0.015 ± 0.001
30	7/26/2010	0.016 ± 0.001	0.016 ± 0.001	0.015 ± 0.001	0.015 ± 0.001	0.014 ± 0.001	0.015 ± 0.001	0.018 ± 0.001	0.013 ± 0.001
31	8/2/2010	0.015 ± 0.001	0.013 ± 0.001	0.015 ± 0.001	0.013 ± 0.001	0.014 ± 0.001	0.015 ± 0.001	0.014 ± 0.001	0.015 ± 0.001
32	8/9/2010	0.018 ± 0.001	0.015 ± 0.001	0.017 ± 0.001	0.018 ± 0.001	0.018 ± 0.001	0.017 ± 0.001	0.019 ± 0.001	0.016 ± 0.001
33	8/16/2010	0.026 ± 0.003	0.021 ± 0.002	0.016 ± 0.001	0.015 ± 0.001	0.014 ± 0.001	0.015 ± 0.001	0.032 ± 0.015	0.018 ± 0.001
34	8/23/2010	no data	0.019 ± 0.001	0.017 ± 0.001	0.020 ± 0.001	0.018 ± 0.001	0.017 ± 0.001	0.019 ± 0.001	0.015 ± 0.001
35	8/30/2010	0.008 ± 0.001	0.005 ± 0.001	0.009 ± 0.001	0.009 ± 0.001	0.009 ± 0.001	0.007 ± 0.001	0.009 ± 0.001	0.008 ± 0.001
36	9/7/2010	0.026 ± 0.002	0.029 ± 0.002	0.027 ± 0.002	0.028 ± 0.001	0.032 ± 0.002	0.029 ± 0.002	0.025 ± 0.001	0.027 ± 0.002
37	9/13/2010	0.010 ± 0.001	0.010 ± 0.001	0.011 ± 0.001	0.010 ± 0.001	0.009 ± 0.001	0.006 ± 0.001	0.011 ± 0.001	0.008 ± 0.001
38	9/20/2010	0.009 ± 0.001	0.011 ± 0.001	0.012 ± 0.001	0.011 ± 0.001	0.013 ± 0.001	0.009 ± 0.001	0.012 ± 0.001	0.009 ± 0.001
39	9/27/2010	0.017 ± 0.001	0.018 ± 0.001	0.021 ± 0.001	0.020 ± 0.001	0.020 ± 0.001	0.019 ± 0.001	0.017 ± 0.001	0.016 ± 0.001
40	10/4/2010	0.005 ± 0.001	0.005 ± 0.001	0.005 ± 0.001	0.005 ± 0.001	0.004 ± 0.001	0.006 ± 0.001	0.005 ± 0.001	0.005 ± 0.001
41	10/12/2010	0.010 ± 0.001	0.011 ± 0.001	0.010 ± 0.001	0.011 ± 0.001	0.012 ± 0.001	0.012 ± 0.001	0.012 ± 0.001	0.011 ± 0.001
42	10/18/2010	0.007 ± 0.001	0.007 ± 0.001	0.006 ± 0.001	0.007 ± 0.001	0.006 ± 0.001	0.008 ± 0.001	0.009 ± 0.001	0.005 ± 0.001
43	10/25/2010	0.015 ± 0.001	0.015 ± 0.001	0.011 ± 0.001	0.014 ± 0.001	0.013 ± 0.001	0.012 ± 0.001	0.016 ± 0.009	0.014 ± 0.001
44	11/1/2010	0.007 ± 0.001	0.011 ± 0.001	0.008 ± 0.001	0.009 ± 0.001	0.009 ± 0.001	0.008 ± 0.001	0.011 ± 0.001	0.012 ± 0.001
45	11/8/2010	0.005 ± 0.001	0.005 ± 0.001	0.004 ± 0.001	0.005 ± 0.001	0.003 ± 0.001	0.005 ± 0.001	0.005 ± 0.001	0.005 ± 0.001
46	11/15/2010	0.013 ± 0.001	0.012 ± 0.001	0.013 ± 0.001	0.013 ± 0.001	0.012 ± 0.001	0.014 ± 0.001	0.014 ± 0.001	0.013 ± 0.001
47	11/22/2010	0.017 ± 0.001	0.013 ± 0.001	0.015 ± 0.001	0.018 ± 0.001	0.014 ± 0.001	0.015 ± 0.001	0.017 ± 0.001	0.015 ± 0.001
48	11/29/2010	0.021 ± 0.001	0.018 ± 0.001	0.016 ± 0.001	0.019 ± 0.001	0.019 ± 0.001	0.019 ± 0.001	0.021 ± 0.001	0.018 ± 0.001
49	12/6/2010	0.009 ± 0.001	0.010 ± 0.001	no data	0.010 ± 0.001	0.006 ± 0.001	0.008 ± 0.001	0.008 ± 0.001	0.009 ± 0.001
50	12/13/2010	0.007 ± 0.001	0.009 ± 0.001	0.009 ± 0.001	0.010 ± 0.001	0.007 ± 0.001	0.008 ± 0.001	0.009 ± 0.001	0.009 ± 0.001
51	12/20/2010	0.013 ± 0.001	0.014 ± 0.001	0.012 ± 0.001	0.016 ± 0.001	0.013 ± 0.001	0.013 ± 0.001	0.014 ± 0.001	0.011 ± 0.001
52	12/27/2010	0.004 ± 0.001	0.006 ± 0.001	0.006 ± 0.001	0.004 ± 0.001	0.005 ± 0.001	0.006 ± 0.001	0.006 ± 0.001	0.007 ± 0.001

** Control sample location

TABLE B-7
CONCENTRATIONS OF GAMMA EMITTERS IN QUARTERLY COMPOSITES
OF SITE AIR PARTICULATE SAMPLES - 2010
Results in Units of 10E-3 pCi/ m³ ± 1 Sigma

SAMPLE LOCATIONS - 1ST QTR 2010

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	121.7 +/- 15.9	139.8 +/- 13.5	98.7 +/- 11.8	98.9 +/- 11.0	114.8 +/- 13.0	110.4 +/- 14.1	131.1 +/- 12.0	121.7 +/- 13.3
Cs-134	< 1.3	< 0.9	< 0.5	< 0.6	< 1.0	< 1.2	< 0.8	< 0.8
Cs-137	< 0.7	< 0.4	< 0.6	< 0.3	< 0.2	< 0.6	< 0.2	< 0.6
Zr-95	< 1.2	< 1.4	< 0.7	< 0.9	< 2.1	< 2.9	< 0.6	< 1.2
Nb-95	< 1.8	< 1.4	< 0.9	< 0.8	< 0.7	< 1.5	< 1.1	< 1.1
Co-58	< 1.7	< 0.8	< 0.6	< 0.5	< 0.7	< 1.5	< 0.7	< 0.4
Mn-54	< 0.8	< 0.4	< 0.6	< 0.6	< 0.8	< 0.9	< 0.2	< 0.7
Zn-65	< 2.0	< 1.2	< 1.2	< 1.1	< 1.3	< 2.8	< 1.5	< 0.9
Co-60	< 0.6	< 0.7	< 0.9	< 0.4	< 0.7	< 0.5	< 0.5	< 0.4
K-40	< 8.5	< 4.2	< 4.6	< 5.4	44.6 +/- 9.5	57.6 +/- 11.2	< 3.3	< 4.9

** Control Sample Location

SAMPLE LOCATIONS - 2ND QTR 2010

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	111.0 +/- 14.7	131.2 +/- 14.2	149.2 +/- 15.6	145.8 +/- 15.5	163.4 +/- 14.4	119.9 +/- 13.8	122.5 +/- 11.4	103.7 +/- 12.6
Cs-134	< 1.1	< 0.7	< 1.0	< 0.8	< 0.5	< 0.9	< 0.5	< 0.7
Cs-137	< 0.4	< 0.6	< 0.7	< 0.7	< 0.4	< 0.6	< 0.2	< 0.5
Zr-95	< 2.9	< 1.2	< 1.2	< 2.3	< 2.3	< 1.5	< 1.1	< 1.2
Nb-95	< 1.7	< 1.2	< 1.2	< 2.1	< 1.6	< 1.2	< 1.0	< 1.4
Co-58	< 0.8	< 0.7	< 1.0	< 0.8	< 0.6	< 0.8	< 0.3	< 0.5
Mn-54	< 0.8	< 0.3	< 0.5	< 0.5	< 0.6	< 0.6	< 0.5	< 0.4
Zn-65	< 1.0	< 1.4	< 2.6	< 1.9	< 1.8	< 1.0	< 1.4	< 1.7
Co-60	< 0.7	< 0.6	< 0.6	< 1.1	< 0.8	< 0.7	< 0.4	< 0.8
K-40	< 5.8	< 5.6	< 6.4	< 7.3	50.6 +/- 9.6	< 3.9	< 5.7	< 5.2

** Control Sample Location

TABLE B-7 (Continued)
CONCENTRATIONS OF GAMMA EMITTERS IN QUARTERLY COMPOSITES
OF SITE AIR PARTICULATE SAMPLES - 2010
Results in Units of 10E-3 pCi/ m^3 ± 1 Sigma

SAMPLE LOCATIONS - 3RD QTR 2010

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	116.1 +/- 15.4	132.1 +/- 14.0	145.1 +/- 14.1	135.4 +/- 13.0	106.2 +/- 12.7	136.1 +/- 15.0	123.4 +/- 13.8	145.1 +/- 15.0
Cs-134	< 0.6	< 0.8	< 0.6	< 0.6	< 0.6	< 1.0	< 0.8	< 0.8
Cs-137	< 0.7	< 0.8	< 0.3	< 0.2	< 0.4	< 0.5	< 0.6	< 0.9
Zr-95	< 2.3	< 2.3	< 1.0	< 0.7	< 0.7	< 2.2	< 1.5	< 1.7
Nb-95	< 2.6	< 1.3	< 1.0	< 0.5	< 1.1	< 1.2	< 1.5	< 1.6
Co-58	< 1.7	< 1.0	< 0.5	< 0.4	< 0.4	< 1.0	< 0.7	< 1.1
Mn-54	< 0.4	< 0.7	< 0.4	< 0.6	< 0.3	< 0.7	< 0.7	< 0.8
Zn-65	< 2.6	< 2.2	< 1.4	< 1.6	< 1.2	< 1.1	< 2.3	< 2.0
Co-60	< 0.6	< 0.9	< 0.4	< 0.5	< 0.5	< 0.9	< 0.6	< 0.5
K-40	< 9.0	41.1 +/- 10.4	< 6.4	< 6.9	< 4.6	< 12.8	51.0 +/- 9.8	33.7 +/- 9.3

** Control Sample Location

SAMPLE LOCATIONS - 4TH QTR 2010

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	78.2 +/- 10.4	106.6 +/- 12.0	72.7 +/- 11.4	61.1 +/- 11.1	93.2 +/- 10.7	50.4 +/- 9.0	82.3 +/- 9.9	94.2 +/- 12.0
Cs-134	< 0.3	< 0.4	< 0.8	< 0.9	< 0.5	< 0.5	< 0.9	< 1.0
Cs-137	< 0.3	< 0.5	< 0.6	< 0.7	< 0.6	< 0.3	< 0.3	< 0.7
Zr-95	< 1.1	< 1.5	< 1.5	< 0.7	< 0.8	< 1.1	< 1.6	< 2.6
Nb-95	< 0.9	< 1.4	< 1.8	< 1.1	< 0.9	< 1.1	< 1.3	< 0.7
Co-58	< 0.4	< 0.8	< 1.1	< 0.7	< 0.8	< 0.4	< 0.5	< 1.0
Mn-54	< 0.7	< 0.7	< 0.6	< 0.6	< 0.6	< 0.3	< 0.4	< 0.6
Zn-65	< 1.0	< 1.4	< 2.3	< 1.2	< 0.7	< 0.9	< 2.0	< 1.1
Co-60	< 0.5	< 0.8	< 0.7	< 0.4	< 0.4	< 0.4	< 0.7	< 1.0
K-40	< 5.3	< 5.8	48.9 +/- 9.8	< 6.6	< 4.1	< 4.8	< 8.5	68.8 +/- 12.7

** Control Sample Location

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
1	01/04/10	< 0.023	< 0.037	< 0.033	< 0.020	< 0.015	< 0.031	< 0.019	< 0.029
2	01/12/10	< 0.018	< 0.017	< 0.025	< 0.018	< 0.017	< 0.015	< 0.014	< 0.020
3	01/19/10	< 0.022	< 0.018	< 0.025	< 0.018	< 0.024	< 0.020	< 0.021	< 0.020
4	01/26/10	< 0.017	< 0.015	< 0.017	< 0.015	< 0.019	< 0.017	< 0.027	< 0.025
5	02/02/10	< 0.020	< 0.016	< 0.021	< 0.020	< 0.021	< 0.020	< 0.065	< 0.031
6	02/09/10	< 0.021	< 0.017	< 0.021	< 0.017	< 0.023	< 0.018	< 0.014	< 0.012
7	02/16/10	< 0.015	< 0.017	< 0.018	< 0.019	< 0.028	< 0.015	< 0.022	< 0.026
8	02/23/10	< 0.021	< 0.018	< 0.020	< 0.014	< 0.026	< 0.017	< 0.031	< 0.037
9	03/02/10	< 0.026	< 0.061	< 0.023	< 0.015	< 0.035	< 0.028	< 0.017	< 0.021
10	03/08/10	< 0.028	< 0.033	< 0.019	< 0.018	< 0.022	< 0.020	< 0.023	< 0.028
11	03/15/10	< 0.062	< 0.022	< 0.029	< 0.028	< 0.034	< 0.020	< 0.016	< 0.016
12	03/23/10	no data	< 0.030	< 0.017	< 0.025	< 0.026	< 0.017	< 0.056	< 0.034
13	03/30/10	no data	< 0.023	< 0.020	< 0.021	< 0.057	< 0.019	< 0.030	< 0.038
14	04/05/10	no data	< 0.026	< 0.027	< 0.025	< 0.035	< 0.024	< 0.021	< 0.021
15	04/12/10	< 0.049	< 0.027	< 0.013	< 0.031	< 0.028	< 0.021	< 0.015	< 0.023
16	04/20/10	< 0.036	< 0.020	< 0.017	< 0.030	< 0.034	< 0.014	< 0.028	< 0.034
17	04/26/10	< 0.032	< 0.024	< 0.024	< 0.022	< 0.022	< 0.027	< 0.046	< 0.023
18	05/04/10	< 0.039	< 0.020	< 0.022	< 0.025	< 0.027	< 0.032	< 0.022	< 0.035
19	05/11/10	< 0.029	< 0.033	< 0.036	< 0.025	< 0.027	< 0.034	< 0.025	< 0.041
20	05/17/10	< 0.016	< 0.005	< 0.037	< 0.015	< 0.020	< 0.028	< 0.019	< 0.036
21	05/24/10	< 0.018	< 0.019	< 0.025	< 0.023	< 0.021	< 0.016	< 0.016	< 0.017
22	06/01/10	< 0.016	< 0.015	< 0.021	< 0.015	< 0.021	< 0.027	< 0.022	< 0.023
23	06/07/10	< 0.013	< 0.020	< 0.033	< 0.030	< 0.029	< 0.022	< 0.010	< 0.028
24	06/14/10	< 0.035	< 0.028	< 0.033	< 0.035	< 0.027	< 0.020	< 0.025	< 0.022
25	06/21/10	< 0.024	< 0.021	< 0.024	< 0.027	< 0.029	< 0.018	< 0.014	< 0.025
26	06/28/10	< 0.022	< 0.032	< 0.018	< 0.020	< 0.026	< 0.021	< 0.020	< 0.034

** Control sample location

TABLE B-8 (continued)
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	08/30/10	no data	< 0.019	< 0.027	< 0.021	< 0.021	< 0.026	< 0.018	< 0.025
35	09/07/10	< 0.019	< 0.016	< 0.031	< 0.023	< 0.025	< 0.013	< 0.014	< 0.018
36	09/13/10	< 0.034	< 0.019	< 0.024	< 0.030	< 0.018	< 0.031	< 0.024	< 0.032
37	09/20/10	< 0.026	< 0.025	< 0.025	< 0.031	< 0.024	< 0.017	< 0.017	< 0.022
38	09/27/10	< 0.025	< 0.018	< 0.026	< 0.019	< 0.023	< 0.020	< 0.016	< 0.019
39	10/04/10	< 0.026	< 0.025	< 0.021	< 0.017	< 0.029	< 0.024	< 0.018	< 0.029
40	10/12/10	< 0.020	< 0.017	< 0.018	< 0.018	< 0.025	< 0.017	< 0.023	< 0.021
41	10/18/10	< 0.032	< 0.020	< 0.027	< 0.025	< 0.026	< 0.017	< 0.014	< 0.030
42	10/25/10	< 0.019	< 0.021	< 0.024	< 0.020	< 0.022	< 0.019	< 0.047	< 0.020
43	11/01/10	< 0.022	< 0.015	< 0.023	< 0.018	< 0.024	< 0.014	< 0.011	< 0.019
44	11/08/10	< 0.024	< 0.021	< 0.025	< 0.021	< 0.021	< 0.020	< 0.010	< 0.035
45	11/15/10	< 0.026	< 0.017	< 0.028	< 0.018	< 0.020	< 0.013	< 0.014	< 0.034
46	11/22/10	< 0.022	< 0.022	< 0.015	< 0.024	< 0.021	< 0.013	< 0.015	< 0.025
47	11/29/10	< 0.021	< 0.029	< 0.017	< 0.019	< 0.014	< 0.023	< 0.016	< 0.027
48	12/06/10	< 0.020	< 0.016		< 0.018	< 0.022	< 0.013	< 0.018	< 0.018
49	12/13/10	< 0.004	< 0.018	no data	< 0.021	< 0.017	< 0.024	< 0.016	< 0.021
50	12/20/10	< 0.037	< 0.036	< 0.026	< 0.032	< 0.033	< 0.022	< 0.024	< 0.031
51	12/27/10	< 0.034	< 0.027	< 0.025	< 0.022	< 0.028	< 0.025	< 0.020	< 0.024
52	01/04/11	< 0.019	< 0.019	< 0.023	< 0.021	< 0.016	< 0.023	< 0.013	< 0.015

** Control sample location

TABLE B-9
CONCENTRATIONS OF GAMMA EMITTERS IN SURFACE WATER SAMPLES – 2010
Results in Units of pCi/liter ± 1 Sigma
#9 PLANT INLET (HUDSON RIVER INTAKE)

Date	1/29/2010	2/26/2010	3/26/2010	4/30/2010	5/24/2010	6/28/2010
NUCLIDE						
I-131	< 5.80	< 4.56	< 3.82	< 6.68	< 2.93	< 3.94
Cs-134	< 0.80	< 0.83	< 0.58	< 0.77	< 0.71	< 0.64
Cs-137	< 1.12	< 1.07	< 0.84	< 1.13	< 0.94	< 0.90
Zr-95	< 2.41	< 2.27	< 1.66	< 2.19	< 1.63	< 1.72
Nb-95	< 1.81	< 1.55	< 1.08	< 1.49	< 1.05	< 1.34
Co-58	< 1.43	< 1.11	< 0.99	< 1.13	< 1.06	< 0.95
Mn-54	< 1.20	< 1.01	< 0.84	< 1.14	< 0.95	< 0.93
Fe-59	< 4.10	< 3.27	< 2.28	< 3.49	< 2.12	< 2.77
Zn-65	< 1.83	< 2.84	< 1.82	< 2.62	< 1.10	< 1.14
Co-60	< 1.15	< 1.16	< 0.82	< 1.09	< 0.90	< 0.91
K-40	162.6 +/- 13.72	108.9 +/- 11.45	43.73 +/- 6.81	87.79 +/- 10.97	55.59 +/- 8.21	45.7 +/- 9.05
Ba/La-140	< 4.54	< 2.98	< 2.45	< 2.70	< 1.90	< 2.44
Date	7/26/2010	8/30/2010	9/27/2010	10/25/2010	11/29/2010	12/28/2010
NUCLIDE						
I-131	< 4.04	< 3.30	< 3.16	< 2.30	< 3.27	< 3.73
Cs-134	< 0.98	< 0.76	< 0.66	< 1.04	< 0.61	< 0.58
Cs-137	< 1.44	< 0.99	< 0.89	< 0.67	< 0.78	< 0.77
Zr-95	< 2.38	< 1.88	< 1.63	< 1.29	< 1.73	< 1.65
Nb-95	< 1.66	< 1.28	< 1.19	< 0.79	< 1.18	< 1.03
Co-58	< 1.36	< 1.06	< 1.07	< 0.74	< 0.96	< 0.81
Mn-54	< 1.04	< 1.11	< 0.93	< 0.56	< 0.83	< 0.76
Fe-59	< 3.74	< 2.98	< 2.57	< 1.40	< 2.75	< 2.64
Zn-65	< 1.88	< 1.34	< 1.12	< 1.44	< 1.84	< 1.77
Co-60	< 1.09	< 1.05	< 0.90	< 0.63	< 0.85	< 0.77
K-40	94.11 +/- 13.49	140.1 +/- 11.59	55.9 +/- 9.08	129.8 +/- 9.35	42.85 +/- 7.30	91.62 +/- 7.89
Ba/La-140	< 2.64	< 2.67	< 2.12	< 1.38	< 2.19	< 2.66

TABLE B-9 (Continued)
CONCENTRATIONS OF GAMMA EMITTERS IN SURFACE WATER SAMPLES – 2010
Results in Units of pCi/liter ± 1 Sigma
#10 DISCHARGE CANAL (MIXING ZONE)

Date	1/29/2010	2/26/2010	3/26/2010	4/30/2010	5/24/2010	6/28/2010
NUCLIDE						
I-131	< 6.69	< 3.32	< 5.09	< 5.34	< 2.81	< 4.20
Cs-134	< 0.86	< 0.61	< 0.78	< 0.43	< 0.85	< 0.85
Cs-137	< 1.26	< 0.84	< 1.13	< 0.64	< 1.08	< 1.08
Zr-95	< 2.70	< 1.60	< 2.52	< 1.24	< 1.91	< 2.00
Nb-95	< 1.79	< 1.06	< 1.73	< 1.03	< 1.34	< 1.62
Co-58	< 1.43	< 0.83	< 1.38	< 0.83	< 1.08	< 1.25
Mn-54	< 1.26	< 0.87	< 1.20	< 0.70	< 1.19	< 0.99
Fe-59	< 4.35	< 2.50	< 3.68	< 2.14	< 3.05	< 3.43
Zn-65	< 1.86	< 2.06	< 1.47	< 0.80	< 2.75	< 2.51
Co-60	< 1.33	< 0.82	< 1.23	< 0.57	< 1.08	< 1.03
K-40	428 +/- 19.21	114.5 +/- 9.04	426.8 +/- 16.64	52.42 +/- 5.76	83.39 +/- 10.91	118.5 +/- 12.39
Ba/La-140	< 3.70	< 2.73	< 3.19	< 2.81	< 2.49	< 3.21
Date	7/26/2010	8/30/2010	9/27/2010	10/25/2010	11/29/2010	12/28/2010
NUCLIDE						
I-131	< 4.23	< 4.10	< 3.19	< 3.20	< 3.26	< 4.21
Cs-134	< 1.14	< 0.73	< 1.26	< 1.33	< 0.72	< 0.64
Cs-137	< 1.40	< 1.12	< 1.11	< 1.01	< 1.00	< 0.84
Zr-95	< 2.87	< 2.20	< 2.13	< 2.28	< 1.91	< 1.74
Nb-95	< 1.50	< 1.56	< 1.41	< 1.39	< 1.27	< 1.25
Co-58	< 1.71	< 1.19	< 1.12	< 1.15	< 1.05	< 1.01
Mn-54	< 1.73	< 1.24	< 1.08	< 1.10	< 1.07	< 0.81
Fe-59	< 3.95	< 2.88	< 3.22	< 3.11	< 2.82	< 2.63
Zn-65	< 1.87	< 2.80	< 1.40	< 2.59	< 1.34	< 1.55
Co-60	< 1.54	< 0.94	< 1.15	< 1.10	< 1.03	< 0.91
K-40	123.2 +/- 17.13	81.7 +/- 12.01	135.9 +/- 13.16	83.54 +/- 11.62	88.77 +/- 10.54	48.64 +/- 7.77
Ba/La-140	< 3.90	< 3.28	< 2.07	< 2.76	< 2.46	< 3.03

TABLE B-10
CONCENTRATIONS OF TRITIUM IN SURFACE WATER SAMPLES – 2010

(QUARTERLY COMPOSITE SAMPLES)

Results in Units of pCi/l ± 1 Sigma

STATION CODE	PERIOD	DATE		TRITIUM
PLANT INTAKE (HUDSON RIVER) (09, INLET) **	First Quarter	12/31/09	03/26/10	455
	Second Quarter	03/26/10	06/28/10	401
	Third Quarter	06/28/10	09/27/10	<409
	Fourth Quarter	09/27/10	12/28/10	<408
DISCHARGE CANAL (10, MIXING ZONE)	First Quarter	12/31/09	03/26/10	<403
	Second Quarter	03/26/10	06/28/10	<397
	Third Quarter	06/28/10	09/27/10	<409
	Fourth Quarter	09/27/10	12/28/10	<408

** Control Sample location

TABLE B-11
CONCENTRATIONS OF GAMMA EMITTERS IN DRINKING WATER SAMPLES – 2010
Results in Units of pCi/liter ± 1 Sigma
CAMP FIELD RESERVOIR

Date	1/12/2010	2/8/2010	3/15/2010	4/20/2010	5/11/2010	6/7/2010
NUCLIDE						
I-131	< 2.75	< 2.38	< 3.54	< 3.71	< 3.00	< 4.10
Cs-134	< 1.31	< 1.50	< 2.20	< 3.14	< 2.99	< 2.17
Cs-137	< 1.45	< 2.14	< 2.48	< 1.35	< 2.61	< 2.99
Zr-95	< 2.94	< 2.28	< 4.93	< 3.93	< 3.94	< 5.93
Nb-95	< 1.75	< 1.79	< 3.90	< 3.04	< 2.51	< 3.78
Co-58	< 1.48	< 1.79	< 2.71	< 2.49	< 2.31	< 3.05
Mn-54	< 1.75	< 1.62	< 2.59	< 2.60	< 1.88	< 3.45
Fe-59	< 4.02	< 4.20	< 5.93	< 5.26	< 5.87	< 6.54
Zn-65	< 3.72	< 4.36	< 7.54	< 5.04	< 3.94	< 9.06
Co-60	< 2.01	< 1.72	< 3.72	< 1.90	< 1.90	< 3.52
K-40	45.93 +/- 15.03	< 13.63	166.4 +/- 35.94	< 24.79	< 17.54	432.9 +/- 50.30
Ba/La-140	< 2.52	< 2.90	< 4.75	< 3.74	< 1.92	< 4.44
Date	7/12/2010	8/9/2010	9/20/2010	10/18/2010	11/15/2010	12/13/2010
NUCLIDE						
I-131	< 3.72	< 2.39	< 2.68	< 2.26	< 2.48	< 3.23
Cs-134	< 1.65	< 1.38	< 1.39	< 1.47	< 1.82	< 2.00
Cs-137	< 4.02	< 1.88	< 2.02	< 2.11	< 2.68	< 2.61
Zr-95	< 4.47	< 2.55	< 3.12	< 2.86	< 2.94	< 4.40
Nb-95	< 3.08	< 1.98	< 1.91	< 2.01	< 2.00	< 2.59
Co-58	< 2.88	< 1.95	< 1.81	< 1.62	< 2.06	< 2.49
Mn-54	< 3.26	< 1.66	< 1.43	< 1.79	< 2.43	< 2.40
Fe-59	< 7.90	< 5.15	< 5.08	< 3.63	< 6.33	< 4.44
Zn-65	< 10.42	< 1.85	< 4.69	< 2.16	< 6.79	< 6.83
Co-60	< 3.35	< 2.32	< 1.72	< 1.80	< 2.37	< 3.01
K-40	109.7 +/- 26.57	< 19.27	< 16.29	< 20.60	81.54 +/- 21.56	< 22.62
Ba/La-140	< 5.25	< 1.78	< 2.77	< 2.40	< 2.66	< 2.36

TABLE B-11 (Continued)
CONCENTRATIONS OF GAMMA EMITTERS IN DRINKING WATER SAMPLES – 2010
Results in Units of pCi/liter ± 1 Sigma
NEW CROTON RESERVOIR

Date	1/12/2010	2/8/2010	3/15/2010	4/20/2010	5/11/2010	6/7/2010
NUCLIDE						
I-131	< 2.17	< 2.79	< 4.22	< 4.40	< 1.88	< 2.90
Cs-134	< 2.25	< 1.67	< 1.92	< 1.63	< 2.97	< 1.50
Cs-137	< 2.43	< 2.63	< 3.11	< 2.83	< 2.27	< 2.27
Zr-95	< 4.16	< 2.61	< 5.70	< 4.10	< 3.24	< 3.79
Nb-95	< 2.24	< 2.10	< 2.99	< 2.15	< 2.10	< 2.41
Co-58	< 2.00	< 2.10	< 3.12	< 3.14	< 2.16	< 2.66
Mn-54	< 2.11	< 2.33	< 2.53	< 2.37	< 1.86	< 2.23
Fe-59	< 4.60	< 5.53	< 10.07	< 7.25	< 4.86	< 6.25
Zn-65	< 3.92	< 5.23	< 7.40	< 3.22	< 4.13	< 3.05
Co-60	< 1.74	< 2.46	< 2.93	< 2.74	< 1.97	< 2.50
K-40	113.7 +/- 21.38	72.45 +/- 22.25	337.5 +/- 42.70	125.4 +/- 24.80	< 26.28	412.4 +/- 35.16
Ba/La-140	< 2.66	< 3.38	< 3.30	< 4.03	< 2.98	< 2.78
Date	**7/12/2010**	**8/9/2010**	**9/20/2010**	**10/18/2010**	**11/15/2010**	**12/13/2010**
NUCLIDE						
I-131	< 3.09	< 2.29	< 2.19	< 2.43	< 3.26	< 2.52
Cs-134	< 2.00	< 1.54	< 2.89	< 2.07	< 1.57	< 1.57
Cs-137	< 2.52	< 2.32	< 2.09	< 2.43	< 2.94	< 2.09
Zr-95	< 3.25	< 3.24	< 2.97	< 4.30	< 3.77	< 3.93
Nb-95	< 2.72	< 1.79	< 2.46	< 2.36	< 2.59	< 2.05
Co-58	< 2.01	< 2.20	< 1.67	< 1.66	< 2.30	< 2.06
Mn-54	< 1.89	< 2.28	< 1.86	< 1.99	< 2.31	< 2.11
Fe-59	< 8.10	< 5.54	< 5.40	< 6.13	< 7.35	< 5.95
Zn-65	< 5.59	< 6.27	< 4.14	< 6.53	< 7.48	< 6.13
Co-60	< 2.13	< 2.08	< 2.18	< 1.74	< 2.13	< 2.55
K-40	< 24.80	69.5 +/- 19.33	118.6 +/- 23.32	93.1 +/- 21.05	< 28.62	106.7 +/- 23.43
Ba/La-140	< 4.03	< 2.97	< 3.29	< 1.87	< 4.29	< 2.67

TABLE B-12
CONCENTRATIONS OF TRITIUM IN DRINKING WATER SAMPLES – 2010
(QUARTERLY COMPOSITE SAMPLES)

Results in Units of pCi/l ± 1 Sigma

STATION CODE	PERIOD	DATE		TRITIUM
CAMP FIELD RESERVOIR	First Quarter	12/15/09	03/15/10	< 420
	Second Quarter	03/15/10	06/07/10	< 406
	Third Quarter	06/07/10	09/20/10	< 410
	Fourth Quarter	09/20/10	12/13/10	< 421
NEW CROTON RESERVOIR	First Quarter	12/15/09	03/15/10	< 420
	Second Quarter	03/15/10	06/07/10	< 406
	Third Quarter	06/07/10	09/20/10	< 410
	Fourth Quarter	09/20/10	12/13/10	< 409

TABLE B-13
CONCENTRATIONS OF RADIONUCLIDES IN SHORELINE SOIL SAMPLES – 2010
Results in Units of pCi/kg ± 1 Sigma

Sample Location / Date		COLD SPRING SHORELINE 6/2/2010	LENTS COVE SHORELINE 6/2/2010	MANITOU SHORELINE 6/2/2010	VERPLANCK SHORELINE 6/3/2010	WHITE BEACH SHORELINE 6/3/2010
Client ID		ISS842210	ISS282210	ISS502210	ISS172210	ISS532210
Radionuclide	Req. CL (pCi)					
Be-7		< 328.2	< 399.9	< 475.2	< 245.8	< 222.7
I-131		< 132.3	< 192.7	< 201.0	< 115.5	< 97.7
Cs-134	**75**	< 32.2	< 47.1	< 55.8	< 34.7	< 15.3
Cs-137	**90**	< 27.1	< 41.7	62.7 +/- 39.0	173.2 +/- 28.5	< 20.4
Zr-95		< 56.5	< 68.8	< 106.1	< 65.8	< 58.1
Nb-95		< 52.9	< 70.8	< 78.1	< 43.2	< 36.2
Co-58		< 42.0	< 52.4	< 51.0	< 32.0	< 26.0
Mn-54		< 31.7	< 39.0	< 44.9	< 34.4	< 22.1
Zn-65		< 53.0	< 60.0	< 59.0	< 100.3	< 80.4
Fe-59		< 117.0	< 116.7	< 149.6	< 99.9	< 56.0
Co-60		< 41.5	< 31.6	< 56.1	< 27.5	< 25.0
Ba/La-140		< 70.7	< 114.0	< 107.6	< 46.6	< 32.1
Ru-103		< 43.9	< 52.1	< 61.2	< 34.6	< 31.0
Ru-106		< 332.8	< 410.4	< 539.9	< 319.1	< 255.0
Ce-141		< 73.7	< 98.0	< 94.8	< 60.7	< 46.6
Ce-144		< 226.6	< 314.6	< 276.2	< 176.0	< 129.3
AcTh-228		869.4 +/- 129.2	1554.0 +/- 164.4	913.8 +/- 188.1	787.5 +/- 116.1	< 81.5
Ra-226		1706.0 +/- 674.7	3861.0 +/- 911.3	2149.0 +/- 682.2	1028.0 +/- 555.6	< 446.2
K-40		37710.0 +/- 1156.0	16870.0 +/- 884.1	20910.0 +/- 1178.0	16410.0 +/- 842.1	9909.0 +/- 646.5
Sr-90	**3000**	< 179	< 199	< 192	< 175	< 148

TABLE B-13 (Continued)
CONCENTRATIONS OF RADIONUCLIDES IN SHORELINE SOIL SAMPLES – 2010
Results in Units of pCi/kg ± 1 Sigma

Sample Location Date		COLD SPRING SHORELINE 9/13/2010	LENTS COVE SHORELINE 9/13/2010	MANITOU SHORELINE 9/13/2010	VERPLANCK SHORELINE 9/14/2010	WHITE BEACH SHORELINE 9/14/2010
Client ID		ISS843710	ISS283710	ISS503710	ISS173710	ISS533710
Radionuclide	Req. CL (pCi)					
Be-7		< 287.9	< 302.2	< 291.9	< 214.8	< 227.1
I-131		< 55.9	< 56.9	< 87.6	< 43.1	< 53.9
Cs-134	**75**	< 39.7	< 41.9	< 37.6	< 18.1	< 18.8
Cs-137	**90**	< 30.8	< 34.8	< 54.9	133.7 +/- 22.5	< 27.3
Zr-95		< 61.1	< 68.3	< 94.4	< 34.6	< 40.4
Nb-95		< 43.5	< 43.6	< 74.9	< 30.1	< 29.5
Co-58		< 29.3	< 34.4	< 45.6	< 14.6	< 24.1
Mn-54		< 29.0	< 34.1	< 56.7	< 21.1	< 29.8
Zn-65		< 91.7	< 54.4	< 62.9	< 83.3	< 83.8
Fe-59		< 104.8	< 95.6	< 99.4	< 68.3	< 95.7
Co-60		< 34.6	< 45.3	< 42.6	< 22.4	< 29.5
Ba/La-140		< 42.1	< 66.7	< 77.8	< 30.7	< 55.3
Ru-103		< 32.5	< 35.1	< 44.3	< 23.6	< 21.5
Ru-106		< 248.3	< 325.4	< 448.3	< 242.9	< 255.4
Ce-141		< 54.3	< 56.6	< 84.8	< 44.0	< 37.5
Ce-144		< 203.0	< 220.9	< 360.7	< 184.4	< 156.2
AcTh-228		1034.0 +/- 124.1	1455.0 +/- 152.8	1607.0 +/- 223.2	412.2 +/- 88.7	< 100.9
Ra-226		1625.0 +/- 681.4	4792.0 +/- 681.4	4422.0 +/- 1021.0	1810.0 +/- 442.0	< 556.8
K-40		34640.0 +/- 1043.0	15500.0 +/- 858.6	13760.0 +/- 1091.0	15530.0 +/- 683.3	13490.0 +/- 774.2
Sr-90	**3000**	< 30	< 35	< 37	< 36	< 37

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
Client ID		IBV951710S1	IBV951710S2
Radionuclide	Req. CL (pCi)	RAGWEED	MULLEIN
Be-7		774.9 +/- 71.0	1813.0 +/- 116.7
I-131	50	< 9.01	< 10.25
Cs-134	50	< 6.17	< 8.07
Cs-137	50	< 8.22	< 10.51
Zr-95		< 10.44	< 14.52
Nb-95		< 7.68	< 10.69
Co-58		< 7.23	< 7.49
Mn-54		< 6.82	< 9.16
Zn-65		< 19.13	< 25.70
Fe-59		< 18.73	< 29.61
Co-60		< 7.02	< 10.67
Ba/La-140		< 6.11	< 10.03
Ru-103		< 6.33	< 10.35
Ru-106		< 76.47	< 117.80
Ce-141		< 9.63	< 13.11
Ce-144		< 40.17	< 48.79
AcTh-228		< 23.75	< 27.19
Ra-226		< 151.80	< 180.00
K-40		4522.0 +/- 191.1	3846.0 +/- 226.2

TABLE B-14 (Continued)

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
Client ID		IBV952410S1	IBV952410S2
Radionuclide	Req. CL (pCi)	RAGWEED	MULLEIN
Be-7		749.6 +/- 75.2	531.1 +/- 69.5
I-131	50	< 9.27	< 9.07
Cs-134	50	< 12.71	< 5.81
Cs-137	50	< 8.42	< 7.09
Zr-95		< 15.10	< 12.15
Nb-95		< 8.55	< 8.29
Co-58		< 7.81	< 7.93
Mn-54		< 7.95	< 8.63
Zn-65		< 25.63	< 20.05
Fe-59		< 26.13	< 20.29
Co-60		< 8.69	< 8.59
Ba/La-140		< 6.58	< 8.51
Ru-103		< 6.70	< 6.78
Ru-106		< 87.83	< 90.44
Ce-141		< 10.40	< 10.34
Ce-144		< 37.62	< 47.73
AcTh-228		< 33.66	< 31.39
Ra-226		< 142.20	447.8 +/- 119.2
K-40		7903.0 +/- 286.2	4656.0 +/- 206.9

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 7/19/2010	MET TOWER 7/19/2010	MET TOWER 7/19/2010	MET TOWER 8/16/2010	MET TOWER 8/16/2010	MET TOWER 8/16/2010
Client ID		IBV952910S1	IBV952910S2	IBV952910S3	IBV953310S1	IBV953310S2	IBV953310S3
Radionuclide	Req. CL (pCi)	RAGWEED	MULLEIN	COTTON WOOD	RAGWEED	COMMON	WILD RYE
Be-7		1323.0 +/- 112.0	493.4 +/- 83.4	1049.0 +/- 136.6	1970.0 +/- 174.2	1968.0 +/- 121.8	572.5 +/- 93.0
I-131	50	< 13.15	< 11.35	< 15.66	< 20.48	< 11.96	< 13.32
Cs-134	50	< 9.21	< 11.84	< 18.83	< 26.89	< 8.23	< 9.02
Cs-137	50	< 12.91	< 11.15	< 14.01	< 18.88	< 11.58	31.2 +/- 5.9
Zr-95		< 19.06	< 21.03	< 28.79	< 26.31	< 17.34	< 16.68
Nb-95		< 10.62	< 11.56	< 17.65	< 14.80	< 10.16	< 12.57
Co-58		< 10.42	< 10.00	< 17.80	< 19.79	< 9.09	< 12.00
Mn-54		< 12.46	< 11.12	< 14.06	< 18.15	< 9.44	< 11.10
Zn-65		< 32.54	< 37.17	< 53.68	< 52.58	< 28.16	< 31.31
Fe-59		< 24.79	< 33.58	< 51.73	< 49.48	< 27.86	< 30.89
Co-60		< 11.11	< 14.04	< 15.21	< 20.97	< 9.98	< 10.52
Ba/La-140		< 16.37	< 9.82	< 16.56	< 22.48	< 11.04	< 12.25
Ru-103		< 10.29	< 9.95	< 14.16	< 16.03	< 8.13	< 10.05
Ru-106		< 126.60	< 120.90	< 143.70	< 161.70	< 99.92	< 101.30
Ce-141		< 14.74	< 16.24	< 19.81	< 20.47	< 13.94	< 14.49
Ce-144		< 67.73	< 59.23	< 88.52	< 82.06	< 60.00	< 67.76
AcTh-228		56.4 +/- 34.5	< 44.08	< 52.32	< 72.87	< 38.06	< 46.45
Ra-226		805.2 +/- 188.3	317.4 +/- 124.2	< 269.30	508.8 +/- 236.7	459.6 +/- 165.3	< 219.20
K-40		6733.0 +/- 312.3	6621.0 +/- 331.2	4044.0 +/- 324.2	9322.0 +/- 461.4	3999.0 +/- 231.7	10290.0 +/- 357.0

TABLE B-14 (Continued)
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 9/13/2010	MET TOWER 9/13/2010	MET TOWER 9/13/2010	MET TOWER 10/12/2010	MET TOWER 10/12/2010	MET TOWER 10/12/2010
Client ID		IBV953710S1	IBV953710S2	IBV953710S3	IBV954110S1	IBV954110S2	IBV954110S3
Radionuclide	Req. CL (pCi)	MULLEIN	GRAPE LEAVES	RAGWEED	RAGWEED	MULLEIN	COTTON WOOD
Be-7		934.9 +/- 99.8	392.0 +/- 77.7	2363.0 +/- 132.9	3436.0 +/- 206.2	2322.0 +/- 172.7	7546.0 +/- 276.4
I-131	**50**	< 14.18	< 10.64	< 14.26	< 24.80	< 25.54	< 20.72
Cs-134	**50**	< 8.02	< 11.89	< 7.41	< 12.67	< 15.03	< 24.52
Cs-137	**50**	< 9.89	< 8.75	< 9.10	< 21.47	< 19.82	< 20.24
Zr-95		< 14.31	< 18.03	< 16.88	< 37.35	< 30.99	< 40.38
Nb-95		< 10.37	< 10.57	< 9.90	< 16.95	< 20.62	< 20.01
Co-58		< 10.53	< 9.33	< 11.25	< 20.82	< 19.26	< 19.14
Mn-54		< 11.37	< 8.48	< 11.17	< 15.19	< 19.02	< 20.62
Zn-65		< 30.54	< 25.63	< 27.64	< 55.25	< 27.35	< 23.76
Fe-59		< 34.83	< 25.51	< 32.58	< 57.31	< 55.58	< 59.07
Co-60		< 12.32	< 12.68	< 11.83	< 27.38	< 21.36	< 21.57
Ba/La-140		< 10.43	< 12.98	< 10.52	< 27.31	< 25.06	< 18.69
Ru-103		< 9.25	< 9.58	< 10.12	< 19.60	< 20.05	< 20.26
Ru-106		< 113.30	< 104.10	< 111.80	< 202.00	< 195.80	< 183.80
Ce-141		< 14.37	< 11.97	< 14.56	< 23.83	< 25.37	< 29.22
Ce-144		< 69.64	< 51.77	< 58.73	< 97.88	< 98.52	< 107.10
AcTh-228		< 39.73	< 31.63	< 40.33	< 79.14	< 78.52	< 68.08
Ra-226		363.2 +/- 170.1	357.0 +/- 141.5	< 225.60	< 340.60	< 365.20	1337.0 +/- 344.0
K-40		8036.0 +/- 316.8	3956.0 +/- 253.5	6852.0 +/- 295.6	10390.0 +/- 514.7	10670.0 +/- 456.8	7828.0 +/- 399.4

TABLE B-14 (Continued)
CONCENTRATIONS OF GAMMA EMITTERS IN BROADLEAF VEGETATION SAMPLES – 2010
Results in Units of pCi/kg ± 1 Sigma
#94 IPEC Training Center

Sample Location Date		TRAINING BLDG 4/26/2010	TRAINING BLDG 4/26/2010	TRAINING BLDG 4/26/2010	TRAINING BLDG 5/17/2010	TRAINING BLDG 5/17/2010	TRAINING BLDG 5/17/2010
Client ID		IBV941710S1	IBV941710S2	IBV941710S3	IBV942010S1	IBV942010S2	IBV942010S3
Radionuclide	Req. CL (pCi)	RAGWEED	MULLEIN	MUSTARD	RAGWEED	EWICK	ALLROOT
Be-7		851.1 +/- 77.9	834.9 +/- 83.9	201.4 +/- 90.1	612.4 +/- 89.6	< 94.83	338.8 +/- 65.1
I-131	**50**	< 9.42	< 9.92	< 15.50	< 12.36	< 11.67	< 9.60
Cs-134	**50**	< 10.77	< 11.87	< 11.20	< 15.97	< 9.35	< 12.56
Cs-137	**50**	< 7.80	< 8.77	< 14.75	< 12.22	< 11.84	< 7.88
Zr-95		< 14.57	< 16.88	< 23.42	< 23.67	< 18.96	< 15.66
Nb-95		< 8.07	< 8.25	< 13.70	< 12.41	< 11.00	< 12.47
Co-58		< 7.39	< 9.24	< 12.28	< 10.17	< 9.43	< 10.69
Mn-54		< 8.01	< 10.18	< 14.88	< 12.39	< 9.79	< 11.86
Zn-65		< 22.98	< 26.61	< 38.93	< 28.62	< 25.51	< 23.06
Fe-59		< 24.38	< 26.43	< 36.04	< 43.86	< 31.05	< 31.97
Co-60		< 6.91	< 9.56	< 14.30	< 17.41	< 12.11	< 9.15
Ba/La-140		< 8.55	< 10.26	< 18.53	< 13.91	< 13.79	< 10.41
Ru-103		< 8.73	< 8.93	< 10.12	< 10.87	< 10.53	< 8.26
Ru-106		< 80.20	< 95.65	< 122.50	< 133.20	< 124.50	< 75.11
Ce-141		< 11.88	< 12.21	< 15.87	< 13.97	< 14.50	< 12.64
Ce-144		< 45.81	< 53.19	< 60.78	< 56.35	< 51.92	< 47.70
AcTh-228		< 28.14	< 33.64	112.0 +/- 38.9	< 44.17	< 37.75	< 39.00
Ra-226		< 151.70	< 172.20	< 241.20	< 204.00	< 199.10	< 168.90
K-40		5573.0 +/- 241.8	4136.0 +/- 237.7	6262.0 +/- 339.5	9766.0 +/- 383.0	4768.0 +/- 279.4	5890.0 +/- 296.9

** Control Sample Location

TABLE B-14 (Continued)
CONCENTRATIONS OF GAMMA EMITTERS IN BROADLEAF VEGETATION SAMPLES – 2010
Results in Units of pCi/kg ± 1 Sigma
#94 IPEC Training Center

Sample Location Date		TRAINING BLDG 6/14/2010	TRAINING BLDG 6/14/2010	TRAINING BLDG 6/14/2010
Client ID		IBV942410S1	IBV942410S2	IBV942410S3
Radionuclide	Req. CL (pCi)	RAGWEED	GRAPE L.	VRG CREE
Be-7		1021.0 +/- 110.0	686.8 +/- 70.9	1008.0 +/- 92.0
I-131	**50**	< 12.34	< 9.54	< 8.31
Cs-134	**50**	< 18.90	< 6.52	< 12.59
Cs-137	**50**	< 13.73	< 9.61	< 10.67
Zr-95		< 19.24	< 14.36	< 17.20
Nb-95		< 12.76	< 7.41	< 10.22
Co-58		< 13.46	< 7.89	< 8.99
Mn-54		< 15.60	< 8.00	< 11.76
Zn-65		< 42.15	< 25.10	< 26.54
Fe-59		< 45.12	< 26.07	< 29.09
Co-60		< 17.92	< 7.62	< 9.14
Ba/La-140		< 14.48	< 8.41	< 11.09
Ru-103		< 12.25	< 7.70	< 8.66
Ru-106		< 119.90	< 89.56	< 95.92
Ce-141		< 15.23	< 11.59	< 12.39
Ce-144		< 70.44	< 55.23	< 50.06
AcTh-228		< 59.06	< 35.63	< 29.15
Ra-226		< 213.10	261.6 +/- 138.0	409.5 +/- 132.2
K-40		8866.0 +/- 438.3	3239.0 +/- 185.4	3086.0 +/- 207.3

** Control Sample Location

TABLE B-14 (Continued)
CONCENTRATIONS OF GAMMA EMITTERS IN BROADLEAF VEGETATION SAMPLES – 2010
Results in Units of pCi/kg ± 1 Sigma
#94 IPEC Training Center

Sample Location Date		TRAINING BLDG 7/19/2010	TRAINING BLDG 7/19/2010	TRAINING BLDG 7/19/2010	TRAINING BLDG 8/16/2010	TRAINING BLDG 8/16/2010	TRAINING BLDG 8/16/2010
Client ID		IBV942910S1	IBV942910S2	IBV942910S3	IBV943310S1	IBV943310S2	IBV943310S3
Radionuclide	Req. CL (pCi)	CATALPA	GRAPE LEAVES	RAGWEED	RAGWEED	GRAPE	CATALP
Be-7		743.6 +/- 122.8	334.7 +/- 95.9	1567.0 +/- 112.7	2221.0 +/- 135.0	755.5 +/- 105.5	1008.0 +/- 76.2
I-131	50	< 18.34	< 15.76	< 11.52	< 11.87	< 15.60	< 8.37
Cs-134	50	< 10.37	< 11.10	< 7.88	< 13.88	< 13.81	< 5.36
Cs-137	50	< 13.74	< 15.12	< 14.02	< 10.34	< 11.28	< 7.56
Zr-95		< 27.86	< 25.97	< 19.25	< 18.26	< 21.32	< 11.49
Nb-95		< 14.70	< 16.99	< 13.93	< 9.88	< 14.24	< 7.92
Co-58		< 15.87	< 16.65	< 13.64	< 10.29	< 12.31	< 6.29
Mn-54		< 15.23	< 15.03	< 12.86	< 11.06	< 14.72	< 8.14
Zn-65		< 47.25	< 37.43	< 35.57	< 31.51	< 19.08	< 22.61
Fe-59		< 43.14	< 42.72	< 38.76	< 29.19	< 39.73	< 13.82
Co-60		< 20.35	< 15.55	< 11.35	< 12.71	< 16.00	< 7.16
Ba/La-140		< 18.82	< 23.66	< 13.07	< 14.21	< 11.32	< 6.32
Ru-103		< 16.10	< 15.18	< 13.00	< 9.71	< 11.92	< 7.92
Ru-106		< 189.10	< 160.20	< 155.10	< 97.57	< 121.70	< 82.13
Ce-141		< 19.00	< 20.27	< 15.98	< 14.08	< 15.57	< 8.89
Ce-144		< 81.63	< 76.63	< 64.26	< 53.39	< 63.49	< 34.45
AcTh-228		< 59.12	< 67.11	< 48.89	< 48.54	< 53.17	< 28.01
Ra-226		460.8 +/- 282.2	416.0 +/- 246.7	624.0 +/- 183.5	< 205.50	< 219.60	320.1 +/- 134.4
K-40		4305.0 +/- 325.6	5403.0 +/- 364.5	9087.0 +/- 350.7	7614.0 +/- 340.3	4962.0 +/- 291.2	2342.0 +/- 154.5

TABLE B-14 (Continued)
CONCENTRATIONS OF GAMMA EMITTERS IN BROADLEAF VEGETATION SAMPLES – 2010
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		9/13/2010	9/13/2010	9/13/2010	10/12/2010	10/12/2010	10/13/2010
Client ID		IBV943710S1	IBV943710S2	IBV943710S3	IBV944110S1	IBV944110S2	IBV944110S3
Radionuclide	Req. CL (pCi)	CATALPA	GRAPE LE	RAGWEED	RAGWEED	COTTON W	CATALPA
Be-7		1886.0 +/- 141.4	1234.0 +/- 140.0	2466.0 +/- 146.0	9988.0 +/- 384.3	4265.0 +/- 228.9	2432.0 +/- 138.4
I-131	**50**	< 13.37	< 18.59	< 11.53	< 26.82	< 20.41	< 13.06
Cs-134	**50**	< 9.32	< 10.67	< 14.41	< 18.03	< 15.77	< 10.03
Cs-137	**50**	< 9.83	< 17.62	< 12.23	< 27.67	< 16.03	< 13.72
Zr-95		< 22.69	< 23.89	< 20.21	< 38.66	< 28.09	< 22.06
Nb-95		< 15.08	< 14.46	< 11.38	< 25.74	< 22.04	< 9.26
Co-58		< 11.33	< 17.20	< 7.86	< 24.29	< 21.33	< 13.05
Mn-54		< 11.27	< 15.69	< 13.50	< 24.83	< 21.36	< 9.12
Zn-65		< 17.21	< 53.39	< 32.14	< 83.11	< 29.60	< 18.31
Fe-59		< 32.62	< 53.42	< 35.89	< 82.67	< 32.84	< 28.42
Co-60		< 11.26	< 20.04	< 11.56	< 34.42	< 22.26	< 12.53
Ba/La-140		< 19.94	< 18.42	< 14.07	< 39.45	< 23.71	< 17.26
Ru-103		< 9.54	< 17.51	< 12.54	< 24.55	< 18.19	< 10.54
Ru-106		< 111.00	< 171.20	< 123.90	< 288.80	< 133.10	< 145.30
Ce-141		< 18.37	< 18.49	< 14.88	< 30.42	< 25.80	< 16.69
Ce-144		< 67.67	< 79.60	< 61.63	< 134.50	< 102.70	< 76.33
AcTh-228		< 41.88	< 60.85	< 47.25	< 88.66	< 65.86	< 40.39
Ra-226		< 225.60	395.3 +/- 204.5	647.3 +/- 207.4	1146.0 +/- 434.9	595.1 +/- 303.8	424.2 +/- 210.6
K-40		2230.0 +/- 227.6	5314.0 +/- 357.2	7125.0 +/- 348.1	8569.0 +/- 554.0	3571.0 +/- 323.2	1582.0 +/- 167.7

TABLE B-14 (Continued)
CONCENTRATIONS OF GAMMA EMITTERS IN BROADLEAF VEGETATION SAMPLES – 2010
Results in Units of pCi/kg ± 1 Sigma
#23 Roseton **

Sample Location Date		ROSETON 4/26/2010	ROSETON 4/26/2010	ROSETON 4/26/2010	ROSETON 5/17/2010	ROSETON 5/17/2010	ROSETON 5/17/2010
Client ID		IBV231710S1	IBV231710S2	IBV231710S3	IBV232010S1	IBV232010S2	IBV232010S3
Radionuclide	Req. CL (pCi)	RAGWEED	MULLEIN	PENNY WORT	RAGWEED	MULLEIN	BURDOCK
Be-7		591.6 +/- 57.3	1010.0 +/- 109.5	790.6 +/- 97.7	740.9 +/- 84.5	914.5 +/- 127.8	1087.0 +/- 105.1
I-131	**50**	< 7.98	< 11.51	< 14.14	< 12.42	< 20.08	< 13.86
Cs-134	**50**	< 4.41	< 7.80	< 14.76	< 6.15	< 11.70	< 7.98
Cs-137	**50**	< 5.94	< 11.55	< 14.09	< 10.17	< 16.12	< 11.91
Zr-95		< 11.50	< 21.37	< 21.44	< 13.93	< 29.18	< 18.23
Nb-95		< 6.94	< 12.44	< 13.12	< 8.25	< 20.10	< 12.39
Co-58		< 6.82	< 11.85	< 11.01	< 9.73	< 15.85	< 9.94
Mn-54		< 7.11	< 10.22	< 11.72	< 7.83	< 14.62	< 10.95
Zn-65		< 20.99	< 33.02	< 29.62	< 12.25	< 48.01	< 16.63
Fe-59		< 16.55	< 29.10	< 30.74	< 28.16	< 42.17	< 25.77
Co-60		< 7.16	< 14.81	< 12.41	< 10.99	< 16.20	< 11.32
Ba/La-140		< 8.63	< 12.53	< 14.83	< 9.06	< 15.82	< 11.64
Ru-103		< 7.64	< 9.36	< 11.31	< 8.99	< 16.36	< 8.76
Ru-106		< 70.54	< 122.40	< 141.20	< 94.10	< 148.50	< 93.93
Ce-141		< 9.95	< 12.87	< 16.53	< 12.80	< 21.01	< 12.99
Ce-144		< 38.79	< 64.68	< 61.12	< 60.56	< 78.89	< 59.80
AcTh-228		< 24.69	< 47.22	71.1 +/- 35.1	94.1 +/- 31.4	< 57.78	< 35.75
Ra-226		< 136.90	527.9 +/- 163.3	260.7 +/- 164.2	< 194.60	< 284.40	480.6 +/- 166.2
K-40		5550.0 +/- 192.4	3933.0 +/- 271.5	6080.0 +/- 287.8	6687.0 +/- 269.6	6525.0 +/- 381.5	6467.0 +/- 275.7

** Control Sample Location

TABLE B-14 (Continued)
CONCENTRATIONS OF GAMMA EMITTERS
IN BROADLEAF VEGETATION SAMPLES - 2010
Results in Units of pCi/kg ± 1 Sigma
#23 Roseton **

Sample Location Date		ROSETON 6/14/2010	ROSETON 6/14/2010	ROSETON 6/14/2010
Client ID		IBV232410S1	IBV232410S2	IBV232410S3
Radionuclide	Req. CL (pCi)	RAGWEED	MULLEIN	BURDOCK
Be-7		501.6 +/- 116.4	876.6 +/- 103.3	309.5 +/- 90.8
I-131	**50**	< 18.76	< 11.03	< 15.81
Cs-134	**50**	< 16.73	< 15.21	< 15.33
Cs-137	**50**	< 14.87	< 11.67	< 12.78
Zr-95		< 34.71	< 20.05	< 22.65
Nb-95		< 18.60	< 12.74	< 12.58
Co-58		< 15.07	< 12.10	< 11.42
Mn-54		< 15.04	< 10.35	< 10.86
Zn-65		< 44.74	< 34.24	< 38.79
Fe-59		< 48.57	< 28.81	< 33.18
Co-60		< 18.02	< 12.87	< 14.08
Ba/La-140		< 16.80	< 8.75	< 21.54
Ru-103		< 13.18	< 9.48	< 11.60
Ru-106		< 151.70	< 112.30	< 120.50
Ce-141		< 19.52	< 14.75	< 15.99
Ce-144		< 78.45	< 61.65	< 66.83
AcTh-228		< 54.71	< 44.12	< 50.65
Ra-226		< 284.30	< 201.90	< 232.60
K-40		1000.0 +/- 457.4	5206.0 +/- 307.9	6280.0 +/- 333.1

TABLE B-14 (Continued)
CONCENTRATIONS OF GAMMA EMITTERS IN BROADLEAF VEGETATION SAMPLES – 2010
Results in Units of pCi/kg ± 1 Sigma
#23 Roseton **

Sample Location Date		ROSETON 7/19/2010	ROSETON 7/19/2010	ROSETON 7/19/2010	ROSETON 8/16/2010	ROSETON 8/16/2010	ROSETON 8/16/2010
Client ID		IBV232910S1	IBV232910S2	IBV232910S3	IBV233310S1	IBV233310S2	IBV233310S3
Radionuclide	Req. CL (pCi)	BURDOCK	RAGWEED	MILKWEED	RAGWEED	COMMON MULLEIN	CATALPA
Be-7		1513.0 +/- 116.8	1147.0 +/- 117.4	899.9 +/- 113.4	1847.0 +/- 120.8	3557.0 +/- 168.9	976.8 +/- 70.5
I-131	**50**	< 11.45	< 16.98	< 17.35	< 12.92	< 13.91	< 7.98
Cs-134	**50**	< 16.97	< 15.91	< 18.79	< 9.75	< 9.00	< 5.56
Cs-137	**50**	< 9.69	< 12.79	< 14.45	< 10.88	< 10.18	< 6.35
Zr-95		< 17.47	< 20.14	< 23.27	< 16.89	< 14.51	< 10.57
Nb-95		< 9.01	< 11.92	< 13.87	< 10.48	< 11.53	< 6.97
Co-58		< 8.53	< 12.20	< 14.61	< 10.11	< 11.20	< 5.65
Mn-54		< 11.04	< 13.51	< 15.39	< 12.31	< 10.86	< 6.60
Zn-65		< 29.65	< 32.85	< 39.00	< 37.42	< 37.87	< 8.60
Fe-59		< 27.89	< 33.91	< 44.43	< 32.18	< 34.44	< 15.80
Co-60		< 13.56	< 14.39	< 20.80	< 10.30	< 12.49	< 7.10
Ba/La-140		< 14.85	< 16.07	< 25.15	< 10.13	< 14.06	< 8.93
Ru-103		< 11.30	< 11.11	< 12.56	< 10.70	< 10.07	< 5.63
Ru-106		< 115.60	< 153.70	< 137.50	< 131.20	< 97.61	< 67.17
Ce-141		< 13.27	< 14.93	< 15.84	< 14.42	< 16.68	< 9.00
Ce-144		< 56.16	< 59.90	< 68.04	< 59.75	< 64.62	< 38.47
AcTh-228		< 48.04	< 34.24	< 55.42	< 43.67	123.9 +/- 35.1	< 23.69
Ra-226		584.1 +/- 155.4	384.5 +/- 160.5	< 258.10	< 198.20	498.5 +/- 195.7	222.9 +/- 121.3
K-40		8504.0 +/- 348.5	7042.0 +/- 373.5	5212.0 +/- 324.7	8066.0 +/- 343.8	4257.0 +/- 269.9	1929.0 +/- 124.4

** Control Sample Location

TABLE B-14 (Continued)
CONCENTRATIONS OF GAMMA EMITTERS IN BROADLEAF VEGETATION SAMPLES – 2010
Results in Units of pCi/kg ± 1 Sigma
#23 Roseton **

Sample Location Date		ROSETON 7/19/2010	ROSETON 7/19/2010	ROSETON 7/19/2010	ROSETON 8/16/2010	ROSETON 8/16/2010	ROSETON 8/16/2010
Client ID		IBV232910S1	IBV232910S2	IBV232910S3	IBV233310S1	IBV233310S2	IBV233310S3
Radionuclide	Req. CL (pCi)	BURDOCK	RAGWEED	MILKWEED	RAGWEED	COMMON MULLEIN	CATALPA
Be-7		1513.0 +/- 116.8	1147.0 +/- 117.4	899.9 +/- 113.4	1847.0 +/- 120.8	3557.0 +/- 168.9	976.8 +/- 70.5
I-131	50	< 11.45	< 16.98	< 17.35	< 12.92	< 13.91	< 7.98
Cs-134	50	< 16.97	< 15.91	< 18.79	< 9.75	< 9.00	< 5.56
Cs-137	50	< 9.69	< 12.79	< 14.45	< 10.88	< 10.18	< 6.35
Zr-95		< 17.47	< 20.14	< 23.27	< 16.89	< 14.51	< 10.57
Nb-95		< 9.01	< 11.92	< 13.87	< 10.48	< 11.53	< 6.97
Co-58		< 8.53	< 12.20	< 14.61	< 10.11	< 11.20	< 5.65
Mn-54		< 11.04	< 13.51	< 15.39	< 12.31	< 10.86	< 6.60
Zn-65		< 29.65	< 32.85	< 39.00	< 37.42	< 37.87	< 8.60
Fe-59		< 27.89	< 33.91	< 44.43	< 32.18	< 34.44	< 15.80
Co-60		< 13.56	< 14.39	< 20.80	< 10.30	< 12.49	< 7.10
Ba/La-140		< 14.85	< 16.07	< 25.15	< 10.13	< 14.06	< 8.93
Ru-103		< 11.30	< 11.11	< 12.56	< 10.70	< 10.07	< 5.63
Ru-106		< 115.60	< 153.70	< 137.50	< 131.20	< 97.61	< 67.17
Ce-141		< 13.27	< 14.93	< 15.84	< 14.42	< 16.68	< 9.00
Ce-144		< 56.16	< 59.90	< 68.04	< 59.75	< 64.62	< 38.47
AcTh-228		< 48.04	< 34.24	< 55.42	< 43.67	123.9 +/- 35.1	< 23.69
Ra-226		584.1 +/- 155.4	384.5 +/- 160.5	< 258.10	< 198.20	498.5 +/- 195.7	222.9 +/- 121.3
K-40		8504.0 +/- 348.5	7042.0 +/- 373.5	5212.0 +/- 324.7	8066.0 +/- 343.8	4257.0 +/- 269.9	1929.0 +/- 124.4

** Control Sample Location

TABLE B-14 (Continued)
CONCENTRATIONS OF GAMMA EMITTERS IN BROADLEAF VEGETATION SAMPLES – 2010
Results in Units of pCi/kg ± 1 Sigma
#23 Roseton **

Sample Location Date		ROSETON 9/13/2010	ROSETON 9/13/2010	ROSETON 9/13/2010	ROSETON 10/12/2010	ROSETON 10/12/2010	ROSETON 10/12/2010
Client ID		IBV233710S1	IBV233710S2	IBV233710S3	IBV234110S1	IBV234110S2	IBV234110S3
Radionuclide	Req. CL (pCi)	BITTERSWEET	RAGWEED	GRAPE LEAVES	RAGWEED	COMMON MULLEI	PORCELAIN BERRY
Be-7		969.4 +/- 126.9	1529.0 +/- 136.7	575.7 +/- 108.1	5955.0 +/- 243.7	1444.0 +/- 145.0	1166.0 +/- 163.2
I-131	**50**	< 16.70	< 16.40	< 16.69	< 20.29	< 16.10	< 19.73
Cs-134	**50**	< 11.05	< 18.04	< 17.08	< 13.64	< 18.60	< 27.24
Cs-137	**50**	< 15.68	< 11.76	< 15.58	< 18.30	< 15.84	< 24.33
Zr-95		< 28.15	< 21.04	< 24.24	< 27.95	< 29.32	< 33.08
Nb-95		< 15.92	< 14.62	< 14.15	< 17.51	< 17.33	< 21.80
Co-58		< 13.15	< 13.71	< 15.69	< 14.22	< 18.20	< 19.42
Mn-54		< 14.55	< 13.22	< 13.03	< 15.74	< 13.81	< 15.48
Zn-65		< 23.69	< 44.22	< 19.32	< 22.66	< 38.52	< 28.77
Fe-59		< 43.51	< 50.31	< 34.37	< 50.89	< 44.47	< 51.27
Co-60		< 13.44	< 18.11	< 14.50	< 16.53	< 14.25	< 16.61
Ba/La-140		< 20.83	< 10.83	< 14.76	< 20.27	< 21.59	< 25.70
Ru-103		< 15.92	< 11.71	< 14.45	< 15.37	< 16.50	< 17.24
Ru-106		< 147.00	< 138.60	< 157.00	< 166.20	< 140.10	< 233.20
Ce-141		< 20.37	< 15.22	< 27.14	< 21.71	< 20.52	< 23.05
Ce-144		< 77.62	< 74.63	< 113.70	< 115.10	< 82.59	< 10.00
AcTh-228		< 56.18	< 39.62	117.4 +/- 38.5	125.0 +/- 47.7	89.6 +/- 45.4	< 68.43
Ra-226		< 306.70	416.7 +/- 230.2	767.7 +/- 298.1	< 260.40	703.6 +/- 281.7	636.1 +/- 284.4
K-40		5269.0 +/- 336.0	7287.0 +/- 414.4	6116.0 +/- 303.7	8757.0 +/- 412.4	8261.0 +/- 367.1	4078.0 +/- 359.5

** Control Sample Location

TABLE B-15
CONCENTRATIONS OF RADIONUCLIDES IN FISH SAMPLES – 2010
Results in Units of pCi/kg ± 1 Sigma
#25 Downstream (Hudson River)

Sample Location Date		VOP FISH 5/14/2010	VOP FISH 5/14/2010	VOP FISH 5/14/2010	VOP FISH 5/21/2010	VOP FISH 5/21/2010	VOP FISH 6/15/2010
Client ID		IFH252710S3	IFH252710S5	IFH252710S6	IFH252710S1	IFH252710S4	IFH252710S2
Radionuclide	Req. CL (pCi)	CATFISH	WHITE PERCH	STRIPED BASS	BLUE CRAB	AMERICAN EEL	SUNFISH
Be-7		< 239.7	< 218.2	< 211.2	< 260.1	< 289.5	< 233.3
I-131		< 2923.0	< 2631.0	< 2479.0	< 1693.0	< 2004.0	< 223.3
Cs-134	65	< 12.6	< 15.8	< 15.5	< 11.4	< 22.3	< 10.4
Cs-137	75	< 18.2	< 13.9	< 18.2	< 18.0	< 18.9	< 18.7
Zr-95		< 45.6	< 55.2	< 41.1	< 49.9	< 62.6	< 39.0
Nb-95		< 58.1	< 38.5	< 45.2	< 45.2	< 67.7	< 27.5
Co-58	65	< 31.2	< 23.0	< 25.3	< 26.4	< 28.2	< 26.4
Mn-54	65	< 19.1	< 18.7	< 18.9	< 16.2	< 24.5	< 19.0
Zn-65	130	< 45.8	< 38.0	< 49.4	< 48.2	< 59.5	< 62.4
Fe-59	130	< 105.2	< 110.8	< 99.5	< 92.3	< 94.9	< 77.6
Co-60	65	< 13.9	< 15.3	< 17.5	< 15.4	< 16.4	< 19.4
Ba/La-140		< 659.7	< 559.3	< 384.1	< 302.6	< 437.9	< 106.0
Ru-103		< 49.4	< 32.4	< 42.8	< 39.3	< 41.9	< 29.7
Ru-106		< 214.6	< 189.4	< 198.3	< 211.5	< 232.2	< 213.9
Ce-141		< 73.6	< 63.9	< 60.4	< 58.2	< 77.2	< 40.6
Ce-144		< 111.3	< 90.6	< 77.9	< 109.9	< 105.9	< 101.0
AcTh-228		< 69.9	< 51.0	< 52.0	< 64.0	< 70.0	< 65.9
Ra-226		< 363.2	399.9 +/- 200.6	315.3 +/- 191.4	667.9 +/- 263.0	< 358.2	846.3 +/- 270.8
K-40		2980.0 +/- 271.0	2884.0 +/- 287.3	4036.0 +/- 295.5	2713.0 +/- 245.7	5352.0 +/- 397.7	5541.0 +/- 355.4
Ni-63	100	< 62.0	< 64.0	< 55.0	< 74.0	< 64.0	< 62.0
Sr-90	5	< 2.8	< 2.7	< 3.8	< 4.7	< 2.9	< 3.3

TABLE B-15 (Continued)

CONCENTRATIONS OF RADIONUCLIDES IN FISH SAMPLES – 2010
Results in Units of pCi/kg ± 1 Sigma
#25 Downstream (Hudson River)

Sample Location Date		VOP FISH 8/6/2010	VOP FISH 8/13/2010	VOP FISH 8/13/2010	VOP FISH 8/13/2010	VOP FISH 8/28/2010	VOP FISH 9/9/2010
Client ID		IFH254410S1	IFH254410S3	IFH254410S4	IFH254410S5	IFH254410S6	IFH254410S2
Radionuclide	Req. CL (pCi)	BLUE CRAB	CAT FISH	AMERICAN EEL	WHITE PERCH	STRIPED BASS	SUN FISH
Be-7		< 211.5	< 179.0	< 142.6	< 229.9	< 204.5	< 249.8
I-131		< 25560.0	< 15800.0	< 16100.0	< 26680.0	< 7573.0	< 5913.0
Cs-134	65	< 5.2	< 9.6	< 9.5	< 6.6	< 10.6	< 11.3
Cs-137	75	< 6.9	< 9.0	< 7.4	< 8.8	< 10.4	< 11.8
Zr-95		< 31.5	< 31.2	< 35.7	< 39.6	< 38.3	< 45.0
Nb-95		< 41.1	< 40.4	< 46.1	< 52.6	< 46.5	< 51.9
Co-58	65	< 16.3	< 16.0	< 16.1	< 20.3	< 18.8	< 24.4
Mn-54	65	< 8.6	< 10.1	< 8.5	< 11.7	< 10.6	< 13.6
Zn-65	130	< 20.4	< 25.1	< 23.2	< 27.3	< 27.6	< 18.6
Fe-59	130	< 74.2	< 80.3	< 75.5	< 99.9	< 76.6	< 85.9
Co-60	65	< 6.9	< 7.6	< 8.3	< 8.6	< 9.7	< 10.4
Ba/La-140		< 1148.0	< 1076.0	< 834.4	< 1661.0	< 663.9	< 716.5
Ru-103		< 34.4	< 36.7	< 32.5	< 42.3	< 39.1	< 43.8
Ru-106		< 98.9	< 106.9	< 89.4	< 131.1	< 111.7	< 131.2
Ce-141		< 65.4	< 61.3	< 60.6	< 85.2	< 66.2	< 81.3
Ce-144		< 50.7	< 48.1	< 46.7	< 71.8	< 62.3	< 77.2
AcTh-228		112.7 +/- 22.1	58.7 +/- 21.7	< 29.1	127.2 +/- 28.7	114.5 +/- 29.4	123.3 +/- 31.0
Ra-226		603.7 +/- 114.5	< +/- 121.9	329.6 +/- 106.3	757.5 +/- 158.2	996.8 +/- 153.5	1289.0 +/- 192.7
K-40		2718.0 +/- 113.6	4157.0 +/- 153.1	2806.0 +/- 141.1	3607.0 +/- 164.1	7455.0 +/- 197.0	6753.0 +/- 223.8
Ni-63	100	< 67.0	< 48.0	< 47.0	< 52.0	< 48.0	< 54.0
Sr-90	5	< 2.9	< 2.4	< 2.9	< 4.3	< 3.2	< 3.3

TABLE B-15 (Continued)
CONCENTRATIONS OF RADIONUCLIDES IN FISH SAMPLES – 2010
Results in Units of pCi/kg ± 1 Sigma
#23 Roseton (Control)

Sample Location Date		ROSETON FISH 5/13/2010	ROSETON FISH 5/13/2010	ROSETON FISH 5/13/2010	ROSETON FISH 5/14/2010	ROSETON FISH 6/1/2010	ROSETON FISH 6/14/2010
Client ID		IFH232710S1	IFH232710S3	IFH232710S4	IFH232710S2	IFH232710S5	IFH232710S6
Radionuclide	Req. CL (pCi)	CATFISH	STRIPED BASS	WHITE PERCH	AMERICAN EEL	SUNFISH	BLUE CRAB
Be-7		< 245.3	< 314.1	< 244.4	< 267.6	< 318.2	< 174.7
I-131		< 2716.0	< 3284.0	< 2613.0	< 2652.0	< 1034.0	< 179.5
Cs-134	**65**	< 17.7	< 20.2	< 12.8	< 17.9	< 25.2	< 11.2
Cs-137	**75**	< 16.4	< 20.2	< 14.0	< 15.9	< 25.7	< 16.5
Zr-95		< 59.1	< 65.7	< 52.0	< 50.9	< 70.8	< 33.1
Nb-95		< 61.6	< 60.4	< 59.0	< 49.1	< 55.1	< 25.2
Co-58	**65**	< 28.2	< 33.2	< 28.6	< 28.2	< 30.0	< 15.0
Mn-54	**65**	< 11.9	< 20.9	< 19.2	< 14.8	< 24.6	< 14.8
Zn-65	**130**	< 55.0	< 50.0	< 50.5	< 37.8	< 75.4	< 37.1
Fe-59	**130**	< 114.4	< 116.8	< 96.9	< 106.3	< 77.4	< 52.2
Co-60	**65**	< 17.7	< 19.7	< 16.0	< 23.3	< 23.1	< 10.4
Ba/La-140		< 599.0	< 530.0	< 545.9	< 512.5	< 300.6	< 92.1
Ru-103		< 48.1	< 52.6	< 45.3	< 40.9	< 61.5	< 21.7
Ru-106		< 181.9	< 215.6	< 193.4	< 210.3	< 213.4	< 162.2
Ce-141		< 82.5	< 91.3	< 71.8	< 74.1	< 69.8	< 34.5
Ce-144		< 106.5	< 116.7	< 89.1	< 99.0	< 118.4	< 88.7
AcTh-228		< 65.2	130.1 +/- 54.6	< 70.6	< 61.6	141.8 +/- 71.0	< 49.7
Ra-226		597.5 +/- 261.4	1447.0 +/- 303.2	< 289.3	454.3 +/- 198.0	615.7 +/- 298.7	579.2 +/- 252.0
K-40		5204.0 +/- 316.4	8134.0 +/- 384.3	3457.0 +/- 298.8	3120.0 +/- 280.7	6528.0 +/- 475.4	3289.0 +/- 258.8
Ni-63	**100**	< 64.0	< 63.0	< 68.0	< 64.0	< 64.0	< 76.0
Sr-90	**5**	< 3.2	< 3.0	< 4.8	< 2.2	< 3.9	< 4.9

TABLE B-15 (Continued)
CONCENTRATIONS OF RADIONUCLIDES IN FISH SAMPLES – 2010
Results in Units of pCi/kg ± 1 Sigma
#23 Roseton (Control)

Sample Location Date		ROSETON FISH 8/4/2010	ROSETON FISH 8/4/2010	ROSETON FISH 8/4/2010	ROSETON FISH 9/1/2010	ROSETON FISH 9/9/2010	ROSETON FISH 9/9/2010
Client ID		IFH234410S2	IFH234410S3	IFH234410S6	IFH234410S1	IFH234410S4	IFH234410S5
Radionuclide	Req. CL (pCi)	AMERICAN EEL	STRIPED BASS	BLUE CRAB	CAT FISH	WHITE PERCH	SUNFISH
Be-7		< 229.6	< 234.5	< 284.7	< 174.6	< 190.0	< 259.3
I-131		< 32260.0	< 29160.0	< 35420.0	< 3152.0	< 4895.0	< 6483.0
Cs-134	**65**	< 6.0	< 6.4	< 11.7	< 11.2	< 11.6	< 14.8
Cs-137	**75**	< 9.4	< 7.9	< 11.0	< 9.4	< 8.9	< 13.6
Zr-95		< 40.7	< 40.3	< 47.5	< 38.6	< 32.0	< 51.0
Nb-95		< 50.6	< 48.9	< 65.6	< 46.6	< 42.3	< 55.5
Co-58	**65**	< 19.2	< 18.3	< 26.9	< 19.1	< 20.3	< 26.4
Mn-54	**65**	< 9.5	< 10.9	< 12.2	< 10.2	< 12.7	< 16.2
Zn-65	**130**	< 24.2	< 29.5	< 16.2	< 28.0	< 31.3	< 41.6
Fe-59	**130**	< 79.1	< 89.2	< 114.6	< 88.5	< 88.5	< 115.6
Co-60	**65**	< 8.7	< 8.9	< 12.0	< 11.1	< 12.4	< 15.9
Ba/La-140		< 1289.0	< 1675.0	< 1765.0	< 369.7	< 826.9	< 868.1
Ru-103		< 42.5	< 39.0	< 55.3	< 26.4	< 31.4	< 44.4
Ru-106		< 118.8	< 107.3	< 129.2	< 120.3	< 111.9	< 168.4
Ce-141		< 78.6	< 73.5	< 107.2	< 56.0	< 63.9	< 70.2
Ce-144		< 63.8	< 49.7	< 73.4	< 69.5	< 63.8	< 68.7
AcTh-228		95.6 +/- 28.1	< 31.7	140.2 +/- 32.9	< 34.6	57.2 +/- 33.1	79.0 +/- 35.3
Ra-226		1079.0 +/- 147.2	436.4 +/- 127.1	814.5 +/- 166.4	493.7 +/- 185.8	753.9 +/- 170.1	757.1 +/- 169.8
K-40		2820.0 +/- 138.2	4161.0 +/- 168.2	5860.0 +/- 198.8	2774.0 +/- 199.7	3345.0 +/- 200.3	5338.0 +/- 244.6
Ni-63	**100**	< 55.0	< 47.0	< 72.0	< 48.0	< 53.0	< 51.0
Sr-90	**5**	< 2.8	< 2.6	< 2.9	< 2.9	< 3.1	< 4.9

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
Client ID		IAV842610	IAV843710	IAV282610	IAV283710	IAV172210
Radionuclide	Req. CL (pCi)	MYRO	MYRO	MYRO	MYRO	MYRO
Be-7		118.8 +/- 35.0	< 50.2	90.3 +/- 37.9	< 53.5	445.0 +/- 69.2
I-131	**30**	< 8.7	< 9.1	< 9.8	< 10.4	< 16.6
Cs-134	**30**	< 6.0	< 7.4	< 3.7	< 7.6	< 5.1
Cs-137	**40**	16.8 +/- 3.1	< 6.5	17.6 * +/- 3.4	< 5.1	< 7.6
Zr-95		< 10.4	< 8.8	< 8.2	< 10.1	< 14.6
Nb-95		< 6.1	< 6.6	< 6.0	< 6.9	< 9.0
Co-58		< 5.7	< 6.8	< 5.0	< 6.4	< 10.3
Mn-54		< 4.6	< 5.8	< 5.4	< 6.5	< 9.8
Zn-65		< 11.2	< 16.9	< 13.0	< 9.5	< 30.9
Fe-59		< 14.4	< 16.1	< 14.4	< 13.7	< 35.7
Co-60		< 5.3	< 5.9	< 4.8	< 4.9	< 12.3
Ba/La-140		< 7.3	< 9.2	< 7.6	< 11.5	< 17.1
Ru-103		< 5.2	< 6.1	< 4.8	< 6.1	< 8.5
Ru-106		< 40.5	< 53.3	< 60.2	< 61.5	< 87.6
Ce-141		< 8.0	< 9.7	< 8.6	< 8.4	< 12.4
Ce-144		< 31.5	< 33.0	< 38.2	< 32.8	< 49.0
AcTh-228		131.6 +/- 19.0	109.8 +/- 19.9	250.5 +/- 22.0	180.0 +/- 22.2	134.7 +/- 29.4
Ra-226		273.3 +/- 67.0	239.7 +/- 87.1	575.9 +/- 96.6	315.6 +/- 84.4	363.8 +/- 146.3
K-40		4573.0 +/- 145.9	1728.0 +/- 126.1	3162.0 +/- 126.7	1555.0 +/- 108.3	4782.0 +/- 238.9

* greater than critical level, but less than LLD

TABLE B-17
CONCENTRATIONS OF GAMMA EMITTERS IN BOTTOM SEDIMENT SAMPLES – 2010
Results in Units of pCi/kg ± 1 Sigma

Sample Location Date		COLD SPRING 6/2/2010	COLD SPRING 9/13/2010	LENTS COVE 6/2/2010	LENTS COVE 9/13/2010	VERPLANCK 6/3/2010	VERPLANCK 9/14/2010
Client ID		IBS842210	IBS843710	IBS282210	IBS283710	IBS172210	IBS173710
Radionuclide	Req. CL (pCi)						
Be-7		< 299.5	< 321.1	< 373.1	< 706.9	< 345.6	< 469.0
I-131		< 87.2	< 64.1	< 79.5	< 157.3	< 98.6	< 117.2
Cs-134	75	< 34.2	< 48.5	< 40.9	< 53.8	< 39.5	< 37.1
Cs-137	90	< 36.7	< 43.9	338.3 +/- 54.6	< 70.3	327.4 +/- 51.1	349.6 +/- 67.1
Zr-95		< 75.9	< 87.1	< 65.7	< 122.6	< 82.2	< 109.6
Nb-95		< 47.2	< 55.3	< 56.3	< 79.7	< 65.8	< 73.9
Co-58		< 53.2	< 47.1	< 41.9	< 59.5	< 40.4	< 58.6
Mn-54		< 39.7	< 42.1	< 48.1	< 70.6	< 40.0	< 83.7
Zn-65		< 86.0	< 70.2	< 155.2	< 203.4	< 149.1	< 231.9
Fe-59		< 142.6	< 129.8	< 134.7	< 185.8	< 117.6	< 216.9
Co-60		< 37.7	< 40.4	< 52.1	< 101.8	< 54.3	< 68.1
Ba/La-140		< 51.3	< 57.2	< 68.4	< 169.6	< 56.4	< 122.8
Ru-103		< 45.9	< 35.0	< 46.9	< 67.2	< 53.0	< 70.6
Ru-106		< 417.1	< 409.4	< 497.6	< 539.8	< 471.6	< 773.5
Ce-141		< 71.6	< 73.2	< 75.6	< 115.0	< 80.0	< 89.3
Ce-144		< 277.1	< 271.1	< 253.9	< 368.4	< 307.5	< 388.1
AcTh-228		934.7 +/- 167.5	969.5 +/- 159.7	1373.0 +/- 198.1	1587.0 +/- 296.2	1298.0 +/- 178.4	781.1 +/- 239.5
Ra-226		1539.0 +/- 604.7	2974.0 +/- 721.7	2829.0 +/- 843.8	2429.0 +/- 1117.0	1650.0 +/- 621.9	2772.0 +/- 1055.0
K-40		36350.0 +/- 1527.0	35920.0 +/- 1361.0	20700.0 +/- 1333.0	27570.0 +/- 1825.0	22930.0 +/- 1212.0	26100.0 +/- 1654.0

CONCENTRATIONS OF GAMMA EMITTERS IN BOTTOM SEDIMENT SAMPLES – 2010

Results in Units of pCi/kg ± 1 Sigma

Sample Location Date		DISCHARGE CANAL 6/3/2010	DISCHARGE CANAL 9/14/2010
Client ID		IBS102210	IBS103710
Radionuclide	Req. CL (pCi)		
Be-7		< 276.0	< 510.6
I-131		< 56.6	< 95.8
Cs-134	75	< 24.9	< 41.3
Cs-137	90	417.6 +/- 39.7	1330.0 +/- 62.8
Zr-95		< 43.4	< 77.8
Nb-95		< 34.4	< 68.0
Co-58		< 27.1	< 55.9
Mn-54		< 30.9	< 56.3
Zn-65		< 88.5	< 75.2
Fe-59		< 96.0	< 123.8
Co-60		< 31.2	< 51.6
Ba/La-140		< 51.2	< 85.7
Ru-103		< 31.6	< 54.3
Ru-106		< 251.9	< 437.1
Ce-141		< 49.2	< 93.8
Ce-144		< 184.8	< 386.5
AcTh-228		386.0 +/- 102.3	1274.0 +/- 210.5
Ra-226		1120.0 +/- 524.1	5143.0 +/- 1068.0
K-40		17640.0 +/- 846.9	23370.0 +/- 1295.0

TABLE B-18
CONCENTRATIONS OF RADIONUCLIDES IN RAINWATER SAMPLES – 2010
Results in Units of pCi/L ± 1 Sigma

Sample Location Date		PEEKSKILL RAINWATER 3/29/2010	PEEKSKILL RAINWATER 6/28/2010	PEEKSKILL RAINWATER 9/27/2010	PEEKSKILL RAINWATER 12/28/2010
Client ID Radionuclide	Req. CL (pCi)	IRF44Q110	IRF44Q210	IRF443Q10	IRF44Q410
H-3		< 403.0	< 397.0	< 409.0	< 408.0
Be-7		< 36.6	< 27.4	< 36.5	< 35.3
I-131		< 27.3	< 19.5	< 19.3	< 34.8
Cs-134	7.5	< 1.6	< 1.5	< 2.7	< 2.7
Cs-137	9	< 2.2	< 2.2	< 2.5	< 2.4
Zr-95		< 7.6	< 5.3	< 6.8	< 7.9
Nb-95		< 4.8	< 4.8	< 5.0	< 5.9
Co-58		< 3.3	< 3.3	< 2.9	< 4.3
Mn-54		< 2.5	< 2.2	< 2.2	< 2.8
Zn-65		< 7.5	< 6.1	< 6.4	< 6.7
Fe-59		< 7.2	< 11.6	< 13.7	< 10.9
Co-60	7.5	< 1.8	< 1.8	< 2.6	< 2.2
Ba/La-140		< 9.4	< 13.9	< 14.3	< 18.1
Ru-103		< 4.9	< 4.8	< 4.7	< 5.6
Ru-106		< 27.3	< 25.7	< 22.9	< 25.1
Ce-141		< 9.8	< 8.0	< 9.3	< 10.7
Ce-144		< 21.6	< 15.6	< 18.8	< 19.0
AcTh-228		< 9.3	< 7.5	24.2 +/- 7.3	< 7.7
Ra-226		< 54.7	< 50.6	< 56.9	< 59.7
K-40		86.2 +/- 20.9	82.3 +/- 20.8	407.2 +/- 36.0	407.9 +/- 37.1

TABLE B-18 (Continued)
CONCENTRATIONS OF RADIONUCLIDES IN RAINWATER SAMPLES – 2010
Results in Units of pCi/L ± 1 Sigma

Sample Location Date		ROSETON RAINWATER 3/29/2010	ROSETON RAINWATER 6/29/2010	ROSETON RAINWATER 9/27/2010	ROSETON RAINWATER 12/28/2010
Client ID Radionuclide	Req. CL (pCi)	IRF23Q110	IRF23Q210	IRF233Q10	IRF23Q410
H-3		< 403.0	< 397.0	< 409.0	< 408.0
Be-7		< 33.0	45.6 +/- 23.2	< 42.7	< 47.8
I-131		< 20.4	< 17.6	< 33.7	< 35.2
Cs-134	7.5	< 1.7	< 1.4	< 3.9	< 4.0
Cs-137	9	< 2.2	< 1.8	< 3.4	< 3.6
Zr-95		< 7.0	< 4.8	< 8.6	< 7.2
Nb-95		< 5.1	< 4.0	< 7.8	< 5.0
Co-58		< 4.6	< 2.6	< 4.3	< 4.9
Mn-54		< 2.7	< 1.9	< 3.4	< 3.5
Zn-65		< 6.3	< 4.9	< 10.2	< 11.8
Fe-59		< 14.6	< 6.8	< 18.9	< 20.2
Co-60	7.5	< 2.6	< 1.7	< 2.8	< 3.0
Ba/La-140		< 20.1	< 10.3	< 23.9	< 29.3
Ru-103		< 5.1	< 3.3	< 6.2	< 6.6
Ru-106		< 25.3	< 24.0	< 36.1	< 36.8
Ce-141		< 10.1	< 6.9	< 12.5	< 12.3
Ce-144		< 22.3	< 16.1	< 24.3	< 24.1
AcTh-228		< 11.4	9.7 +/- 4.3	< 15.2	< 10.5
Ra-226		< 56.1	64.0 +/- 34.2	< 69.6	141.9 +/- 60.2
K-40		< 24.8	< 19.3	476.1 +/- 47.5	350.9 +/- 44.7

Control Location

TABLE B-19
CONCENTRATIONS OF GAMMA EMITTERS IN SOIL SAMPLES – 2010
Results in Units of pCi/kg ± 1 Sigma

Sample Location Date		ROSETON 9/27/2010	MET TOWER 9/27/2010	TRAINING BLDG 9/27/2010
Client ID		ISO233910	ISO953910	ISO943910
Radionuclide	Req. CL (pCi)			
Be-7		< 263.5	< 357.5	< 278.0
I-131		< 42.6	< 48.2	< 37.6
Cs-134	75	< 34.8	< 28.0	< 23.4
Cs-137	90	< 44.5	< 45.9	< 40.1
Zr-95		< 64.8	< 69.1	< 61.9
Nb-95		< 46.3	< 52.7	< 34.4
Co-58		< 39.4	< 47.6	< 39.0
Mn-54		< 45.5	< 53.5	< 34.5
Zn-65		< 115.6	< 139.5	< 100.8
Fe-59		< 103.6	< 165.4	< 110.8
Co-60		< 44.4	< 57.0	< 41.1
Ba/La-140		< 37.2	< 65.4	< 48.8
Ru-103		< 32.1	< 36.7	< 29.6
Ru-106		< 378.0	< 493.8	< 361.1
Ce-141		< 57.5	< 55.6	< 49.3
Ce-144		< 266.9	< 236.8	< 194.6
AcTh-228		1073.0 +/- 175.9	573.8 +/- 169.2	594.7 +/- 123.5
Ra-226		2249.0 +/- 691.0	2284.0 +/- 657.7	2296.0 +/- 662.6
K-40		21180.0 +/- 1198.0	26370.0 +/- 1328.0	17820.0 +/- 989.7

Roseton: Control Location

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-001-013 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		< 6.1	< 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 B-21
LAND USE CENSUS - RESIDENCE and MILCH ANIMAL RESULTS
2010

The 2010 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 nor were listed in the New York Agricultural Statistic Service. There are no animals producing milk for human consumption within five miles of Indian Point.

TABLE B-22
LAND USE CENSUS
2010

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	122 Lower South St. 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 in graphical form to facilitate the comparison of 2010 data with historical values. Although other samples were taken and analyzed, values were only tabulated and plotted where positive indications were present.

Averaging only 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
2000-2010

Average Quarterly Dose (mR/Quarter)			
Year	**Inner Ring**	**Outer Ring**	**Control Location**
2000	14.0	15.0	16.0
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**
Historical Average 2000-2009	14.3	14.3	16.2

FIGURE C-1

DIRECT RADIATION, ANNUAL SUMMARY
2000 to 2010

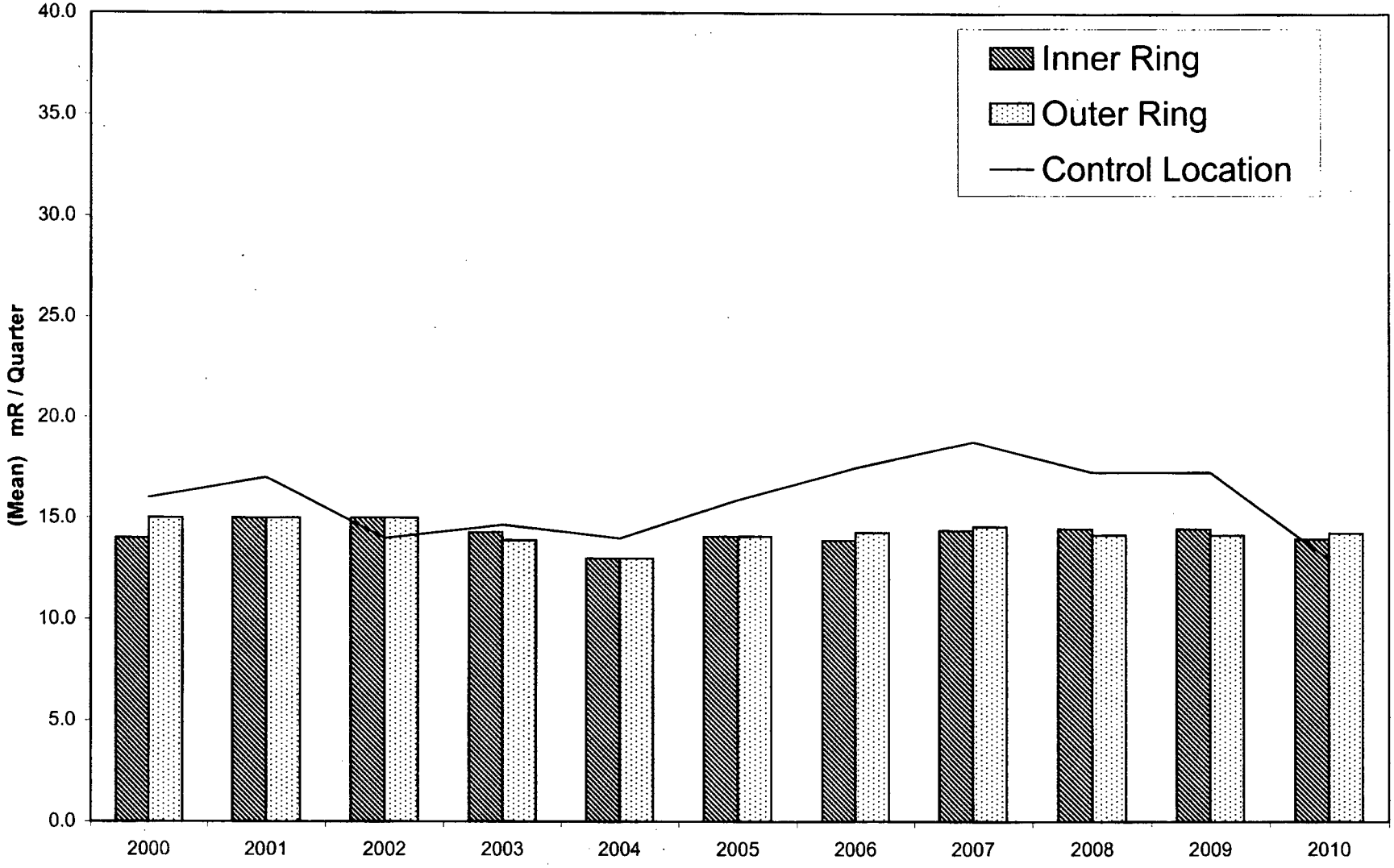


TABLE C-2

RADIONUCLIDES IN AIR
2000 to 2010
(pCi/m^3)

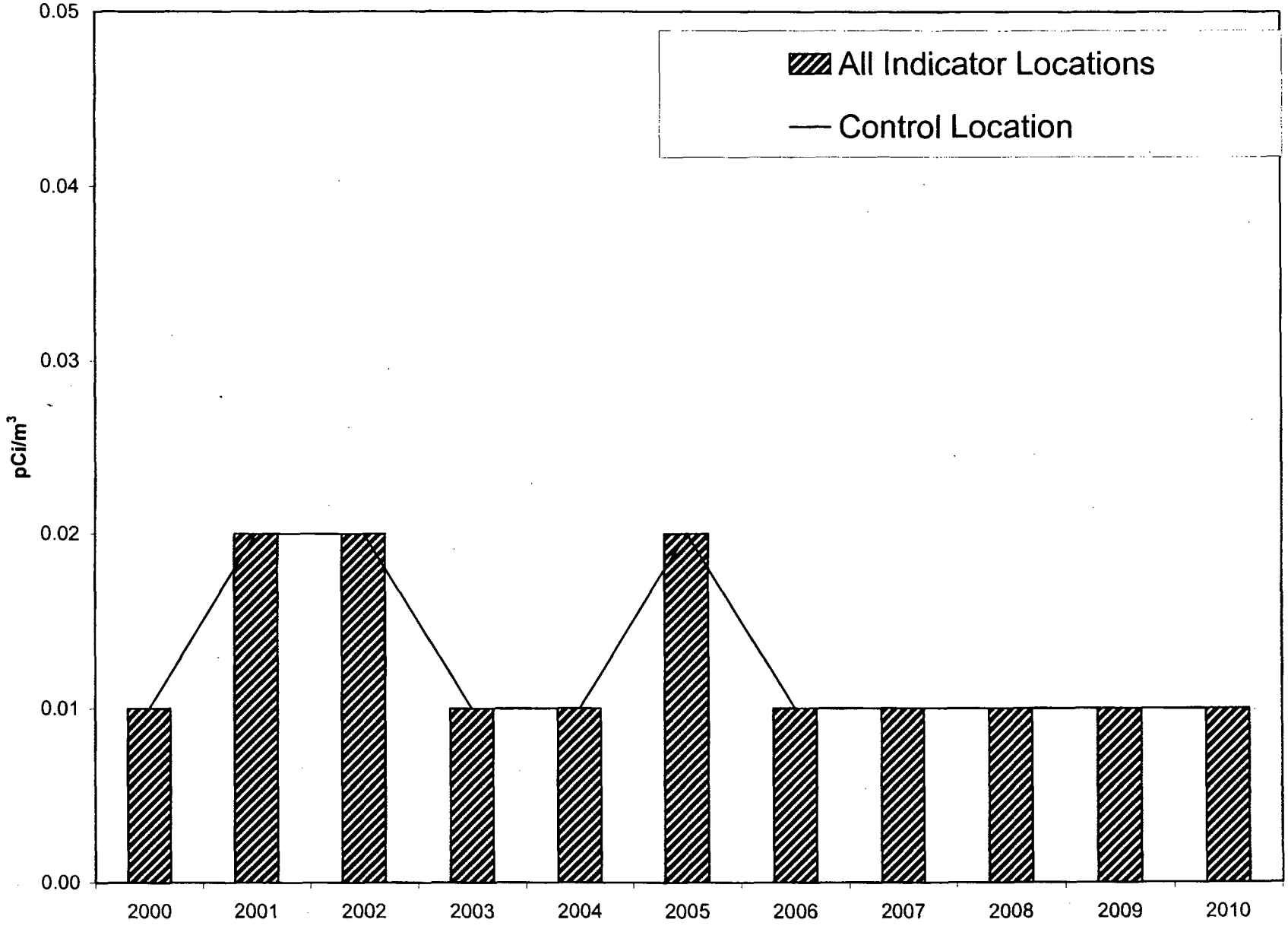
Year	Gross Beta		Cs-137	
	All Indicator Locations	Control Location	All Indicator Locations	Control Location
2000	0.01	0.01	$< L_c$	$< L_c$
2001	0.02	0.02	$< L_c$	$< L_c$
2002	0.02	0.02	$< L_c$	$< L_c$
2003	0.01	0.01	$< L_c$	$< L_c$
2004	0.01	0.01	$< L_c$	$< L_c$
2005	0.02	0.02	$< L_c$	$< L_c$
2006	0.01	0.01	$< L_c$	$< L_c$
2007	0.01	0.01	$< L_c$	$< L_c$
2008	0.01	0.01	$< L_c$	$< L_c$
2009	0.01	0.01	$< L_c$	$< L_c$
2010	**0.01**	**0.01**	**$< L_c$**	**$< L_c$**
Historical Average 2000-2009	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
2000 to 2010



* 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
2000 to 2010
(pCi/L)

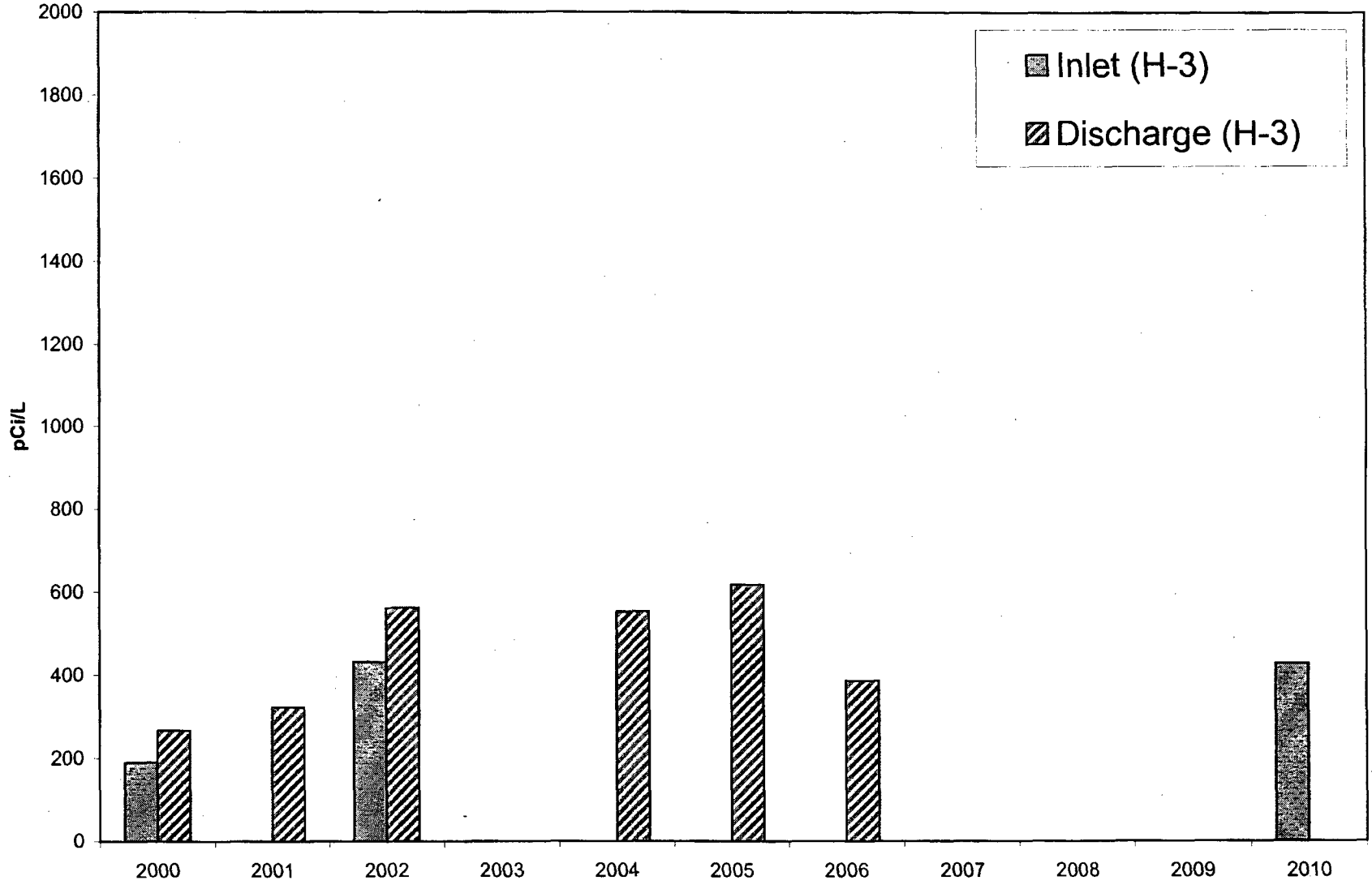
	Tritium (H-3)		Cs-137	
Year	**Inlet**	**Discharge**	**Inlet**	**Discharge**
2000	190	267	< L_c	< L_c
2001	< Lc	323	< L_c	< L_c
2002	432	562	< L_c	< L_c
2003	< Lc	< Lc	< L_c	< L_c
2004	< Lc	553	< L_c	< L_c
2005	< Lc	618	< L_c	< L_c
2006	< Lc	386	< L_c	< L_c
2007	< Lc	< Lc	< L_c	< L_c
2008	< Lc	< Lc	< L_c	< L_c
2009	< Lc	< Lc	< L_c	< L_c
2010	**428**	**< L_c**	**< L_c**	**< L_c**
Historical Average 2000-2009	311	452	< 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
2000 to 2010



Tritium ODCM required LLD = 3000 pCi/L

TABLE C-4

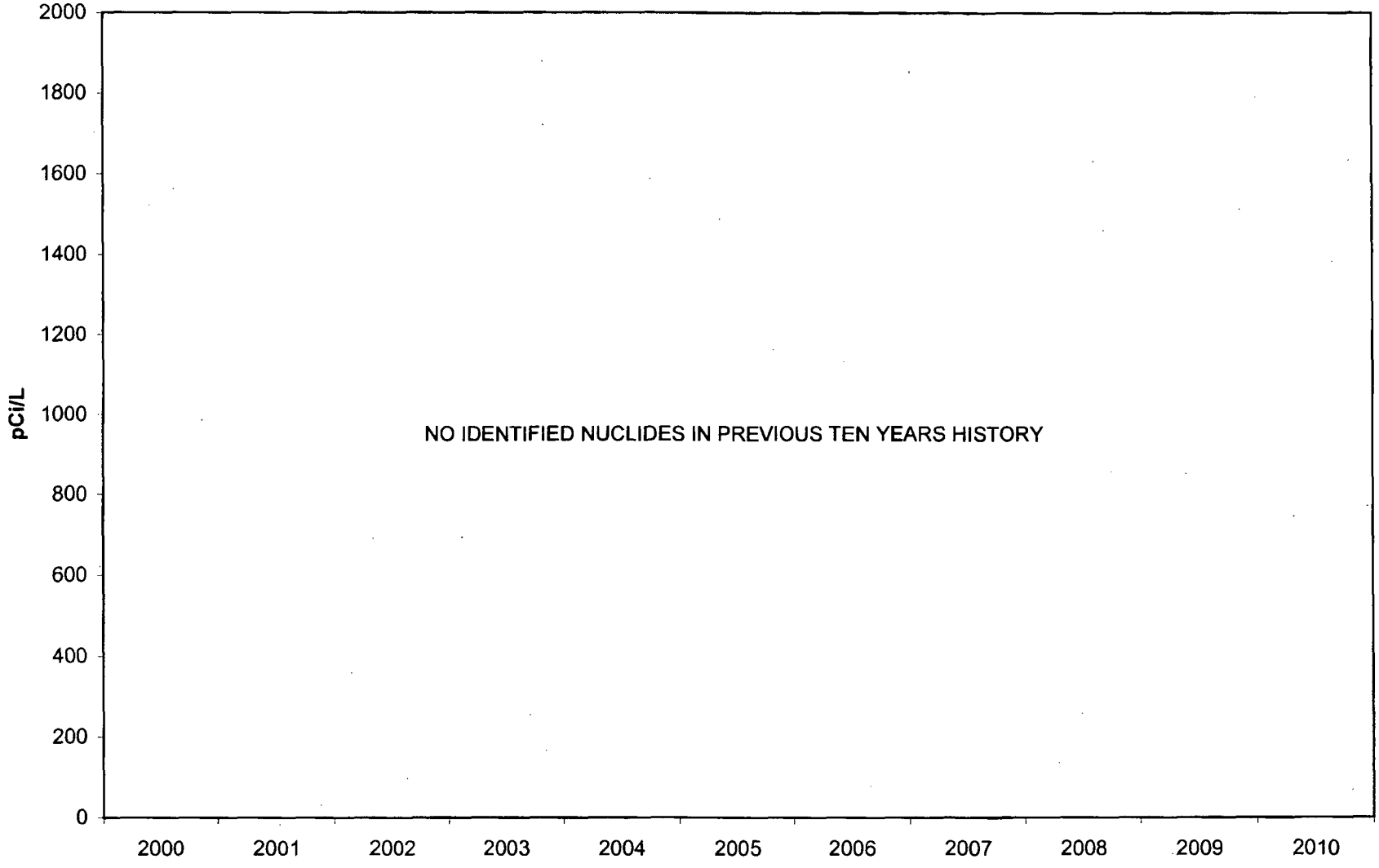
RADIONUCLIDES IN DRINKING WATER
2000 to 2010
(pCi/L)

Year	Tritium (H-3)	Cs-137
2000	$< L_c$	$< L_c$
2001	$< L_c$	$< L_c$
2002	$< L_c$	$< L_c$
2003	$< L_c$	$< L_c$
2004	$< L_c$	$< L_c$
2005	$< L_c$	$< L_c$
2006	$< L_c$	$< L_c$
2007	$< L_c$	$< L_c$
2008	$< L_c$	$< L_c$
2009	$< L_c$	$< L_c$
2010	**$< L_c$**	**$< L_c$**
Historical Average 2000-2009	$< L_c$	$< L_c$

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
2000 to 2010



Tritium ODCM required LLD = 2000 pCi/L

TABLE C-5

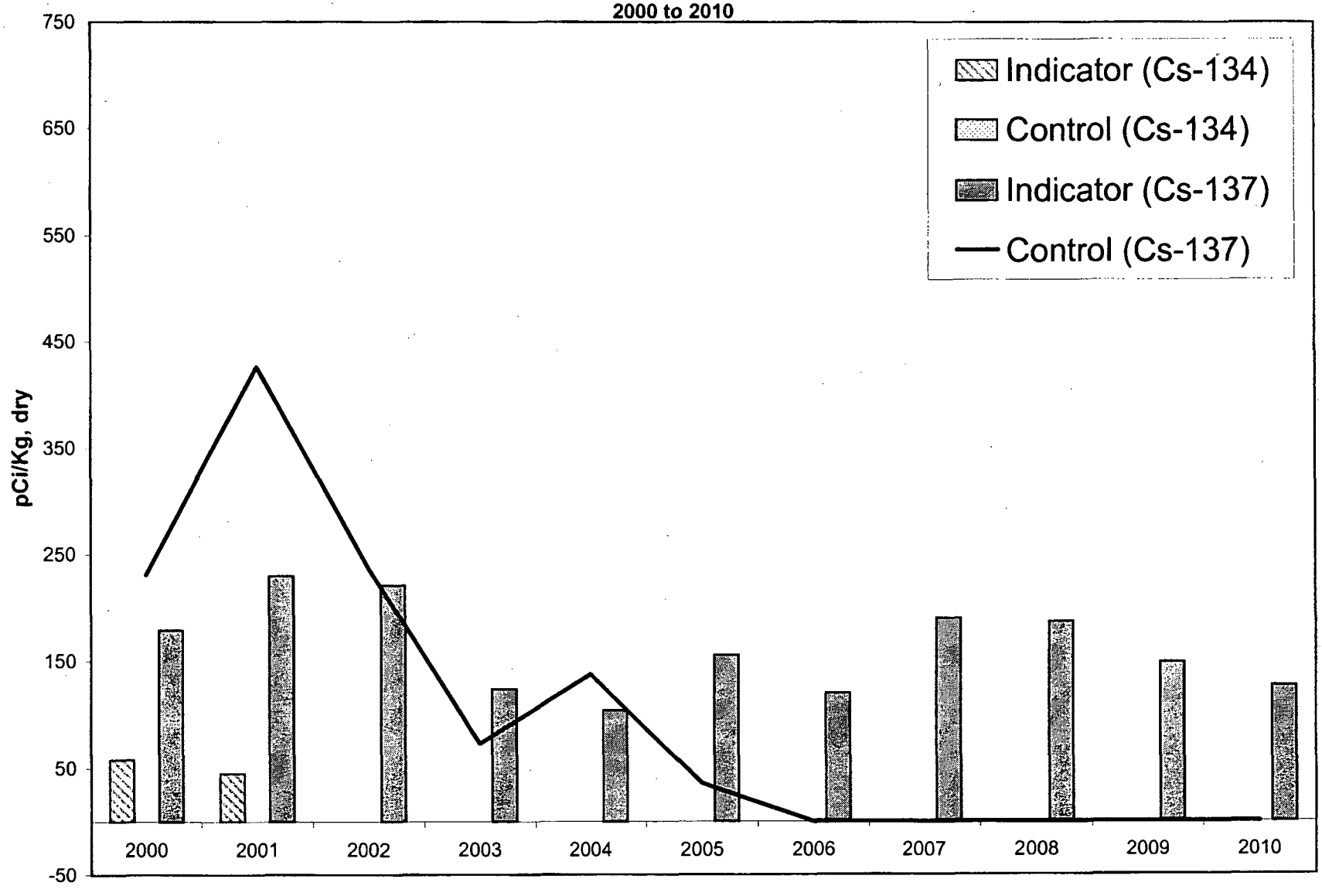
RADIONUCLIDES IN SHORELINE SOIL
2000 to 2010
(pCi/Kg, dry)

	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	**$< L_c$**	**$< L_c$**	**127**	**$< L_c$**
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

TABLE C-6

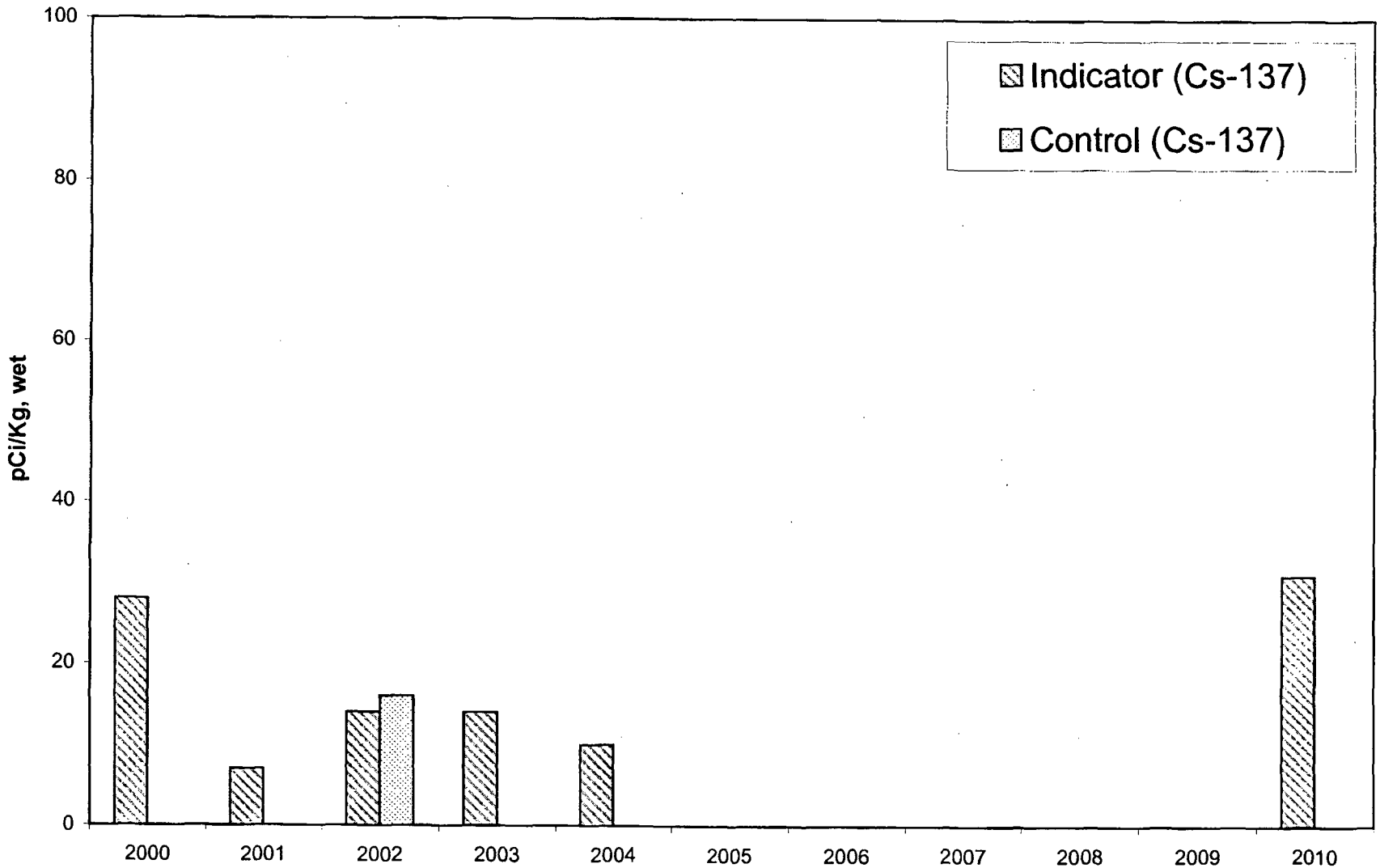
BROAD LEAF VEGETATION - Cs-137
2000 to 2010
(pCi/Kg, wet)

	Cs-137	
Year	**Indicator**	**Control**
2000	28	$< L_c$
2001	7	$< L_c$
2002	14	16
2003	14	$< L_c$
2004	10	$< L_c$
2005	$< L_c$	$< L_c$
2006	$< L_c$	$< L_c$
2007	$< L_c$	$< L_c$
2008	$< L_c$	$< L_c$
2009	$< L_c$	$< L_c$
2010	**31**	**$< L_c$**
Historical Average 2000-2009	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
2000 to 2010



ODCM required LLD = 80 pCi/Kg, wet

TABLE C-7

FISH AND INVERTEBRATES - Cs-137
2000 to 2010
(pCi/Kg, dry)

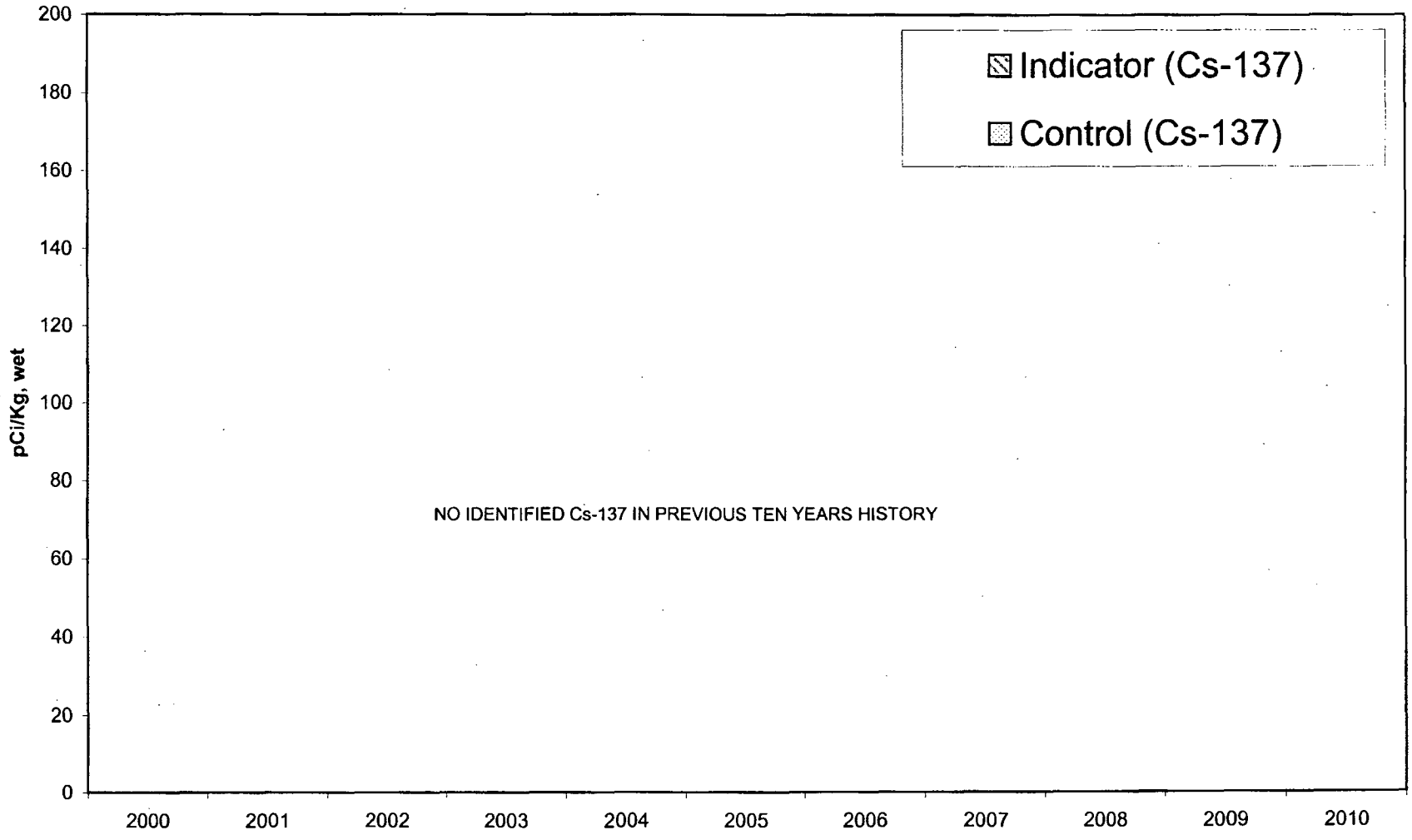
	Cs-137	
Year	**Indicator**	**Control**
2000	$< L_c$	$< L_c$
2001	$< L_c$	$< L_c$
2002	$< L_c$	$< L_c$
2003	$< L_c$	$< L_c$
2004	$< L_c$	$< L_c$
2005	$< L_c$	$< L_c$
2006	$< L_c$	$< L_c$
2007	$< L_c$	$< L_c$
2008	$< L_c$	$< L_c$
2009	$< L_c$	$< L_c$
2010	$< L_c$	$< L_c$
Historical Average 2000-2009	$< L_c$	$< L_c$

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
2000 to 2010



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

APPENDIX D

INTERLABORATORY COMPARISON PROGRAM

D.1 PROGRAM DESCRIPTION

The Offsite Dose Calculation Manual (ODCM), Part 1, Section 5.3 requires that the licensee participate in an Interlaboratory Comparison Program. The Interlaboratory Comparison Program shall include 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 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 Table D1: PROGRAM SCHEDULE

SAMPLE MEDIA	LABORATORY ANALYSIS	SAMPLE PROVIDER ECKERT & ZIEGLER 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.

$$\text{The error resolution} = \frac{\text{Reference Result}}{\text{Reference Results Error (1 sigma)}}$$

Using the appropriate row under the Error Resolution column in Table 8.3.1 below, 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 D2

ERROR RESOLUTION	RATIO OF AGREEMENT
< 4	No Comparison
4 to 7	0.5 to 2.0
8 to 15	0.6 to 1.66
16 to 50	0.75 to 1.33
51 to 200	0.8 to 1.25
>200	0.85 to 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 Table 8-1.

D.4.1 ECKERT & ZIEGLER ANALYTICS QA SAMPLES RESULTS

Thirty-four QA blind spike samples were analyzed as part of Analytics 2010 Interlaboratory Comparison Program. The following sample media were evaluated as part of the comparison program.

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

The JAF Environmental Laboratory performed 129 individual analyses on the 34 QA samples. Of the 129 analyses performed, 129 were in agreement using the NRC acceptance criteria for a 100% agreement ratio.

There were no nonconformities in the 2010 program.

D.4.2 NUMERICAL RESULTS TABLES

TABLE D3
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)
06/17/2010	E7090-05	Filter	GROSS BETA	8.61E+01 ± 2.30E+00 8.15E+01 ± 2.24E+00 8.63E+01 ± 2.30E+00 Mean = 8.46E+01 ± 1.31E+00	8.04E+01 ± 1.34E+00	1.05 A
06/17/2010	E7097-09	Filter	GROSS BETA	5.99E+01 ± 1.92E+00 5.89E+01 ± 1.91E+00 5.98E+01 ± 1.92E+00 Mean = 5.95E+01 ± 1.11E+00	5.39E+01 ± 9.01E-01	1.10 A
12/09/2010	E7354-05	Filter	GROSS BETA	9.69E+01 ± 1.39E+00 9.46E+01 ± 1.38E+00 9.39E+01 ± 1.37E+00 Mean = 9.51E+01 ± 7.98E-01	8.92E+01 ± 1.49E+00	1.07 A

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

TABLE D3 (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)	
3/18/2010	E7020-05	Water	H-3		3.48E+03	±	1.53E+02	3.41E+03	±	5.70E+01	1.03	A
					3.57E+03	±	1.53E+02					
					3.53E+03	±	1.53E+02					
				Mean =	3.53E+03	±	8.83E+01					
06/17/2010	E7089-05	Water	H-3		1.14E+03	±	1.33E+02	9.58E+02	±	1.60E+01	1.13	A
					1.13E+03	±	1.32E+02					
					1.04E+03	±	1.32E+02					
					1.00E+03	±	1.29E+02					
					1.07E+03	±	1.30E+02					
					1.13E+03	±	1.30E+02					
				Mean =	1.09E+03	±	5.35E+01					
9/16/2010	E7187-05	Water	H-3		8.82E+02	±	1.31E+02	8.96E+02	±	1.50E+01	1.01	A
					8.54E+02	±	1.31E+02					
					9.74E+02	±	1.32E+02					
				Mean =	9.03E+02	±	7.58E+01					
12/9/2010	E7329-09	Water	H-3		1.00E+04	±	2.04E+02	9.96E+03	±	1.66E+02	1.00	A
					1.00E+04	±	2.04E+02					
					9.91E+03	±	2.04E+02					
				Mean =	9.98E+03	±	1.18E+02					
12/9/2010	E7330-09	Water	H-3		9.78E+03	±	2.03E+02	9.96E+03	±	1.66E+02	0.99	A
					9.83E+03	±	2.03E+02					
					1.01E+04	±	2.05E+02					
				Mean =	9.90E+03	±	1.18E+02					

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

TABLE D3 (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)
03/18/2010	E7023-05	Water	GROSS BETA	2.58E+02 ± 2.50E+00 2.57E+02 ± 2.50E+00 2.54E+02 ± 2.50E+00 Mean = 2.56E+02 ± 1.44E+00	2.60E+02 ± 4.35E+00	0.98 A
06/17/2010	E7095-05	Water	GROSS BETA	1.78E+02 ± 2.10E+00 1.78E+02 ± 2.10E+00 1.79E+02 ± 2.10E+00 Mean = 1.78E+02 ± 1.21E+00	1.88E+02 ± 3.14E+00	0.95 A
09/16/2010	E7192-05	Water	GROSS BETA	2.30E+02 ± 2.40E+00 2.28E+02 ± 2.40E+00 2.26E+02 ± 2.40E+00 2.25E+02 ± 2.40E+00 Mean = 2.27E+02 ± 1.20E+00	2.18E+02 ± 3.64E+00	1.04 A

(1) Ratio = Reported/Analytics.

* Sample provided by Analytics, Inc.

A=Acceptable

U=Unacceptable

TABLE D3 (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)	
3/18/2010	E6993-09	Air	I-131		8.62E+01	±	2.23E+00	8.52E+01	±	1.42E+00	0.99	A
					8.27E+01	±	2.88E+00					
					8.10E+01	±	1.81E+00					
					8.90E+01	±	3.65E+00					
				Mean =	8.47E+01	±	1.37E+00					
06/17/2010	E7093-05	Air	I-131		7.94E+01	±	1.45E+00	7.98E+01	±	1.33E+00	0.99	A
					7.64E+01	±	2.98E+00					
					8.08E+01	±	3.07E+00					
				Mean =	7.89E+01	±	1.51E+00					
9/16/2010	E7191-05	Air	I-131		6.01E+01	±	1.25E+00	6.00E+01	±	1.00E+00	1.03	A
					6.39E+01	±	2.24E+00					
					6.06E+01	±	2.00E+00					
				Mean =	6.15E+01	±	1.08E+00					
9/16/2010	E7183-09	Air	I-131		6.09E+01	±	2.23E+00	5.97E+01	±	9.97E-01	1.03	A
					6.19E+01	±	2.83E+00					
					6.08E+01	±	2.98E+00					
				Mean =	6.12E+01	±	1.56E+00					

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

TABLE D3 (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)	
3/18/2010	E7021-05	Water	Ce-141		2.73E+02	±	7.49E+00	2.63E+02	±	4.40E+00	1.04	A
					2.71E+02	±	3.53E+00					
					2.75E+02	±	7.24E+00					
				Mean =	2.73E+02	±	3.67E+00					
			Cr-51		3.42E+02	±	2.97E+01	3.64E+02	±	6.08E+00	1.03	A
					3.84E+02	±	1.29E+01					
					3.98E+02	±	2.76E+01					
				Mean =	3.75E+02	±	1.42E+01					
			Cs-134		2.03E+02	±	5.40E+00	1.79E+02	±	2.99E+00	1.09	A
					1.91E+02	±	5.85E+00					
					1.91E+02	±	3.29E+00					
				Mean =	1.95E+02	±	2.87E+00					
			Cs-137		1.64E+02	±	5.04E+00	1.59E+02	±	2.66E+00	1.01	A
					1.56E+02	±	5.67E+00					
					1.60E+02	±	2.90E+00					
				Mean =	1.60E+02	±	2.71E+00					
			Co-58		1.47E+02	±	4.50E+00	1.44E+02	±	2.40E+00	1.03	A
					1.46E+02	±	5.39E+00					
					1.51E+02	±	2.73E+00					
				Mean =	1.48E+02	±	2.51E+00					
			Mn-54		2.24E+02	±	5.62E+00	2.09E+02	±	3.49E+00	1.07	A
					2.24E+02	±	6.45E+00					
					2.22E+02	±	3.37E+00					
				Mean =	2.23E+02	±	3.07E+00					
			Fe-59		1.48E+02	±	5.43E+00	1.38E+02	±	2.31E+00	1.09	A
					1.54E+02	±	6.52E+00					
					1.52E+02	±	3.26E+00					
				Mean =	1.51E+02	±	3.03E+00					
			Zn-65		2.92E+02	±	1.02E+01	2.56E+02	±	4.27E+00	1.09	A
					2.66E+02	±	1.14E+01					
					2.77E+02	±	5.88E+00					
				Mean =	2.79E+02	±	5.45E+00					
			Co-60		1.85E+02	±	3.89E+00	1.85E+02	±	3.08E+00	1.03	A
					1.91E+02	±	4.64E+00					
					1.92E+02	±	2.41E+00					
				Mean =	1.90E+02	±	2.17E+00					
			I-131**		7.11E+01	±	7.18E-01	7.22E+01	±	1.21E+00	1.02	A
					7.53E+01	±	1.91E+00					
					7.43E+01	±	1.79E+00					
				Mean =	7.36E+01	±	9.05E-01					

(1) Ratio = Reported/Analytics.
* Sample provided by Analytics, Inc.
** Result determined by Resin Extraction/Gamma Spectral Analysis.
A=Acceptable
U=Unacceptable

TABLE D3 (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)	
6/17/2010	E7096-09	Water	Ce-141		1.70E+02	±	3.17E+00	1.61E+02	±	2.68E+00	1.07	A
					1.74E+02	±	2.83E+00					
					1.74E+02	±	5.76E+00					
				Mean =	1.73E+02	±	2.39E+00					
			Cr-51		5.26E+02	±	1.51E+01	4.94E+02	±	8.25E+00	0.99	A
					5.12E+02	±	1.62E+01					
					4.31E+02	±	2.96E+01					
				Mean =	4.90E+02	±	1.23E+01					
			Cs-134		2.01E+02	±	2.33E+00	1.83E+02	±	3.06E+00	1.08	A
					1.92E+02	±	2.77E+00					
					2.02E+02	±	5.04E+00					
				Mean =	1.98E+02	±	2.07E+00					
			Cs-137		2.26E+02	±	2.44E+00	2.18E+02	±	3.65E+00	1.04	A
					2.22E+02	±	2.74E+00					
					2.30E+02	±	5.25E+00					
				Mean =	2.26E+02	±	2.13E+00					
			Co-58		1.57E+02	±	2.11E+00	1.47E+02	±	2.46E+00	1.07	A
					1.55E+02	±	2.49E+00					
					1.61E+02	±	4.68E+00					
				Mean =	1.58E+02	±	1.90E+00					
			Mn-54		2.71E+02	±	2.63E+00	2.46E+02	±	4.11E+00	1.10	A
					2.74E+02	±	3.01E+00					
					2.67E+02	±	5.56E+00					
				Mean =	2.71E+02	±	2.28E+00					
			Fe-59		1.89E+02	±	2.77E+00	1.73E+02	±	2.89E+00	1.08	A
					1.91E+02	±	3.27E+00					
					1.80E+02	±	5.96E+00					
				Mean =	1.87E+02	±	2.45E+00					
			Zn-65		3.29E+02	±	4.42E+00	3.00E+02	±	5.00E+00	1.11	A
					3.34E+02	±	5.42E+00					
					3.38E+02	±	1.01E+01					
				Mean =	3.34E+02	±	4.10E+00					
			Co-60		2.99E+02	±	2.06E+00	2.86E+02	±	4.78E+00	1.05	A
					2.99E+02	±	2.44E+00					
					3.00E+02	±	4.55E+00					
				Mean =	2.99E+02	±	1.85E+00					
			I-131**		8.15E+01	±	2.25E+00	7.89E+01	±	1.32E+00	1.03	A
					8.24E+01	±	2.76E+00					
					7.94E+01	±	4.13E+00					
				Mean =	8.11E+01	±	1.36E+00					

(1) Ratio = Reported/Analytics.
* Sample provided by Analytics, Inc.
** Result determined by Resin Extraction/Gamma Spectral Analysis.
A=Acceptable
U=Unacceptable

TABLE D3 (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)	
9/16/2010	E7188-05	Water	Ce-141	1.77E+02	±	5.28E+00	1.65E+02	±	2.76E+00	1.09	A
				1.80E+02	±	5.73E+00					
				1.81E+02	±	3.26E+00					
				Mean = 1.79E+02	±	2.82E+00					
			Cr-51	3.44E+02	±	2.19E+01	2.97E+02	±	4.95E+00	1.06	A
				3.07E+02	±	2.85E+01					
				2.96E+02	±	1.48E+01					
				Mean = 3.16E+02	±	1.30E+01					
			Cs-134	1.22E+02	±	3.92E+00	1.18E+02	±	1.97E+00	1.05	A
				1.23E+02	±	5.49E+00					
				1.27E+02	±	2.77E+00					
				Mean = 1.24E+02	±	2.43E+00					
			Cs-137	1.26E+02	±	3.82E+00	1.20E+02	±	2.00E+00	1.05	A
				1.28E+02	±	5.01E+00					
				1.25E+02	±	2.61E+00					
				Mean = 1.26E+02	±	2.27E+00					
			Co-58	1.03E+02	±	3.43E+00	9.35E+01	±	1.56E+00	1.09	A
				1.02E+02	±	4.76E+00					
				1.02E+02	±	2.29E+00					
				Mean = 1.02E+02	±	2.10E+00					
			Mn-54	1.75E+02	±	4.26E+00	1.52E+02	±	2.53E+00	1.11	A
				1.70E+02	±	5.72E+00					
				1.62E+02	±	2.88E+00					
				Mean = 1.69E+02	±	2.56E+00					
			Fe-59	1.36E+02	±	4.41E+00	1.16E+02	±	1.93E+00	1.13	A
				1.31E+02	±	6.05E+00					
				1.25E+02	±	3.16E+00					
				Mean = 1.31E+02	±	2.71E+00					
			Zn-65	2.98E+02	±	8.60E+00	2.59E+02	±	4.32E+00	1.11	A
				2.99E+02	±	1.18E+01					
				2.69E+02	±	5.86E+00					
				Mean = 2.89E+02	±	5.24E+00					
			Co-60	2.31E+02	±	3.65E+00	2.17E+02	±	3.62E+00	1.06	A
				2.29E+02	±	4.92E+00					
				2.28E+02	±	2.54E+00					
				Mean = 2.29E+02	±	2.21E+00					
			I-131**	6.90E+01	±	1.37E+00	6.44E+01	±	1.08E+00	1.03	A
				6.42E+01	±	1.45E+00					
				6.61E+01	±	9.53E-01					
				Mean = 6.64E+01	±	7.37E-01					

(1) Ratio = Reported/Analytics.

* Sample provided by Analytics, Inc.

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

A=Acceptable

U=Unacceptable

TABLE D3 (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)	
12/9/2010	E7331-09	Water	Cr-51	4.91E+02	±	2.87E+01	4.55E+02	±	7.59E+00	1.10	A
				5.43E+02	±	3.76E+01					
				5.16E+02	±	2.87E+01					
				4.58E+02	±	1.97E+01					
				Mean = 5.02E+02	±	1.47E+01					
			Cs-134	1.69E+02	±	5.25E+00	1.57E+02	±	2.62E+00	1.07	A
				1.67E+02	±	6.23E+00					
				1.65E+02	±	4.60E+00					
				1.74E+02	±	3.22E+00					
				Mean = 1.69E+02	±	2.47E+00					
			Cs-137	1.75E+02	±	4.94E+00	1.86E+02	±	3.10E+00	0.97	A
				1.72E+02	±	5.94E+00					
				1.92E+02	±	4.68E+00					
				1.80E+02	±	3.30E+00					
				Mean = 1.80E+02	±	2.40E+00					
			Co-58	1.00E+02	±	4.24E+00	9.00E+01	±	1.50E+00	1.06	A
				9.84E+01	±	4.80E+00					
				8.82E+01	±	3.81E+00					
				9.50E+01	±	2.65E+00					
				Mean = 9.54E+01	±	1.98E+00					
			Mn-54	1.27E+02	±	4.46E+00	1.19E+02	±	1.99E+00	1.09	A
				1.28E+02	±	5.50E+00					
				1.35E+02	±	4.23E+00					
				1.29E+02	±	3.09E+00					
				Mean = 1.30E+02	±	2.20E+00					
			Fe-59	1.45E+02	±	5.91E+00	1.31E+02	±	2.18E+00	1.16	A
				1.52E+02	±	7.49E+00					
				1.63E+02	±	5.62E+00					
				1.48E+02	±	3.96E+00					
				Mean = 1.52E+02	±	2.94E+00					
			Zn-65	1.84E+02	±	8.71E+00	1.74E+02	±	2.90E+00	1.08	A
				1.98E+02	±	1.17E+01					
				1.78E+02	±	8.42E+00					
				1.94E+02	±	5.99E+00					
				Mean = 1.89E+02	±	4.47E+00					
			Co-60	3.10E+02	±	4.96E+00	3.00E+02	±	5.01E+00	1.04	A
				3.17E+02	±	6.06E+00					
				3.09E+02	±	4.57E+00					
				3.11E+02	±	3.28E+00					
				Mean = 3.12E+02	±	2.41E+00					
			I-131**	1.02E+02	±	4.19E+00	1.00E+02	±	1.67E+00	1.01	A
				1.02E+02	±	3.81E+00					
				9.89E+01	±	3.51E+00					
				Mean = 1.01E+02	±	2.22E+00					

(1) Ratio = Reported/Analytics.

* Sample provided by Analytics, Inc.

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

A=Acceptable

U=Unacceptable

TABLE D3 (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)	
3/18/2010	E6994-09	MILK	Ce-141	2.68E+02 ± 5.38E+00	2.61E+02 ± 4.36E+00	1.04	A
				2.57E+02 ± 5.37E+00			
				2.68E+02 ± 1.13E+01			
				2.89E+02 ± 1.22E+01			
				Mean = 2.70E+02 ± 4.58E+00			
			Cr-51	3.55E+02 ± 2.53E+01	3.61E+02 ± 6.03E+00	0.93	A
				3.72E+02 ± 2.34E+01			
				3.55E+02 ± 5.27E+01			
				2.65E+02 ± 5.45E+01			
				Mean = 3.37E+02 ± 2.08E+01			
			Cs-134	1.79E+02 ± 3.95E+00	1.78E+02 ± 2.97E+00	1.00	A
				1.79E+02 ± 4.62E+00			
				1.88E+02 ± 9.01E+00			
				1.68E+02 ± 9.01E+00			
				Mean = 1.78E+02 ± 3.53E+00			
			Cs-137	1.60E+02 ± 3.88E+00	1.58E+02 ± 2.64E+00	1.02	A
				1.51E+02 ± 3.78E+00			
				1.64E+02 ± 8.33E+00			
				1.68E+02 ± 8.03E+00			
				Mean = 1.61E+02 ± 3.19E+00			
			Co-58	1.44E+02 ± 4.03E+00	1.43E+02 ± 2.38E+00	1.00	A
				1.39E+02 ± 3.85E+00			
				1.47E+02 ± 8.42E+00			
				1.43E+02 ± 7.40E+00			
				Mean = 1.43E+02 ± 3.13E+00			
			Mn-54	2.15E+02 ± 4.39E+00	2.07E+02 ± 3.46E+00	1.04	A
				2.22E+02 ± 4.68E+00			
				2.24E+02 ± 9.49E+00			
				2.01E+02 ± 8.96E+00			
				Mean = 2.15E+02 ± 3.64E+00			
			Fe-59	1.58E+02 ± 5.27E+00	1.37E+02 ± 2.29E+00	1.08	A
				1.44E+02 ± 5.27E+00			
				1.66E+02 ± 1.03E+01			
				1.25E+02 ± 9.91E+00			
				Mean = 1.48E+02 ± 4.03E+00			
			Zn-65	2.67E+02 ± 8.17E+00	2.54E+02 ± 4.24E+00	1.05	A
				2.75E+02 ± 8.77E+00			
				2.56E+02 ± 1.73E+01			
				2.70E+02 ± 1.75E+01			
				Mean = 2.67E+02 ± 6.84E+00			
			Co-60	1.79E+02 ± 3.25E+00	1.83E+02 ± 3.06E+00	0.99	A
				1.83E+02 ± 3.41E+00			
				1.81E+02 ± 6.73E+00			
				1.82E+02 ± 6.34E+00			
				Mean = 1.81E+02 ± 2.59E+00			
			I-131**	6.62E+01 ± 7.99E+00	7.40E+01 ± 1.24E+00	0.95	A
				7.40E+01 ± 4.47E+00			
				6.96E+01 ± 1.09E+01			
				Mean = 6.99E+01 ± 3.56E+00			

(1) Ratio = Reported/Analytics.
* Sample provided by Analytics, Inc.
** Result determined by Resin Extraction/Gamma Spectral Analysis.
A=Acceptable
U=Unacceptable

TABLE D3 (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)	
06/17/2010	E7091-05	MILK	Ce-141	1.25E+02	±	6.24E+00	1.10E+02	±	1.84E+00	1.08	A
				1.12E+02	±	3.98E+00					
				1.20E+02	±	3.14E+00					
				Mean = 1.19E+02	±	2.68E+00					
			Cr-51	3.59E+02	±	2.85E+01	3.39E+02	±	5.66E+00	1.03	A
				3.27E+02	±	2.01E+01					
				3.62E+02	±	1.54E+01					
				Mean = 3.49E+02	±	1.27E+01					
			Cs-134	1.42E+02	±	4.64E+00	1.26E+02	±	2.10E+00	1.07	A
				1.31E+02	±	3.44E+00					
				1.32E+02	±	2.43E+00					
				Mean = 1.35E+02	±	2.09E+00					
			Cs-137	1.49E+02	±	4.82E+00	1.50E+02	±	2.51E+00	1.00	A
				1.51E+02	±	3.23E+00					
				1.48E+02	±	2.48E+00					
				Mean = 1.49E+02	±	2.10E+00					
			Co-58	1.16E+02	±	4.40E+00	1.01E+02	±	1.69E+00	1.09	A
				1.06E+02	±	3.02E+00					
				1.09E+02	±	2.34E+00					
				Mean = 1.10E+02	±	1.94E+00					
			Mn-54	1.87E+02	±	5.30E+00	1.69E+02	±	2.82E+00	1.09	A
				1.84E+02	±	3.59E+00					
				1.82E+02	±	2.67E+00					
				Mean = 1.84E+02	±	2.31E+00					
			Fe-59	1.34E+02	±	5.61E+00	1.19E+02	±	1.98E+00	1.10	A
				1.24E+02	±	4.10E+00					
				1.34E+02	±	3.04E+00					
				Mean = 1.31E+02	±	2.53E+00					
			Zn-65	2.37E+02	±	8.94E+00	2.06E+02	±	3.44E+00	1.10	A
				2.17E+02	±	6.80E+00					
				2.25E+02	±	4.84E+00					
				Mean = 2.26E+02	±	4.08E+00					
			Co-60	1.97E+02	±	4.13E+00	1.97E+02	±	3.28E+00	1.02	A
				2.05E+02	±	2.91E+00					
				2.00E+02	±	2.21E+00					
				Mean = 2.01E+02	±	1.84E+00					
			I-131	9.92E+01	±	5.23E+00	9.69E+01	±	1.62E+00	0.92	A
				9.79E+01	±	3.75E+00					
				9.89E+01	±	2.61E+00					
			I-131**	7.87E+01	±	2.26E+00					
				8.03E+01	±	2.25E+00					
				7.97E+01	±	2.65E+00					
				Mean = 8.91E+01	±	1.35E+00					

(1) Ratio = Reported/Analytics.

* Sample provided by Analytics, Inc.

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

A=Acceptable

U=Unacceptable

TABLE D3 (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)	
9/16/2010	E7190-05	MILK	Ce-141	1.35E+02	±	4.99E+00	1.30E+02	±	2.17E+00	1.05	A
				1.40E+02	±	6.52E+00					
				1.34E+02	±	2.58E+00					
				1.35E+02	±	5.26E+00					
				Mean = 1.36E+02	±	2.52E+00					
			Cr-51	2.49E+02	±	2.21E+01	2.34E+02	±	3.90E+00	0.99	A
				2.27E+02	±	2.71E+01					
				2.33E+02	±	1.05E+01					
				2.16E+02	±	2.56E+01					
				Mean = 2.31E+02	±	1.11E+01					
			Cs-134	9.92E+01	±	4.27E+00	9.30E+01	±	1.55E+00	1.03	A
				8.97E+01	±	4.93E+00					
				9.70E+01	±	1.86E+00					
				9.80E+01	±	4.44E+00					
				Mean = 9.60E+01	±	2.03E+00					
			Cs-137	9.91E+01	±	3.97E+00	9.45E+01	±	1.58E+00	1.01	A
				9.37E+01	±	4.70E+00					
				9.49E+01	±	1.85E+00					
				9.23E+01	±	4.43E+00					
				Mean = 9.50E+01	±	1.95E+00					
			Co-58	8.06E+01	±	3.62E+00	7.37E+01	±	1.23E+00	1.03	A
				7.76E+01	±	4.54E+00					
				7.55E+01	±	1.63E+00					
				7.04E+01	±	4.30E+00					
				Mean = 7.60E+01	±	1.85E+00					
			Mn-54	1.22E+02	±	4.15E+00	1.19E+02	±	1.99E+00	1.03	A
				1.18E+02	±	5.14E+00					
				1.28E+02	±	2.02E+00					
				1.24E+02	±	5.06E+00					
				Mean = 1.23E+02	±	2.14E+00					
			Fe-59	9.75E+01	±	4.86E+00	9.11E+01	±	1.52E+00	1.14	A
				1.14E+02	±	6.59E+00					
				1.03E+02	±	2.32E+00					
				1.01E+02	±	5.87E+00					
				Mean = 1.04E+02	±	2.58E+00					
			Zn-65	2.16E+02	±	8.69E+00	2.04E+02	±	3.40E+00	1.01	A
				1.79E+02	±	1.13E+01					
				2.20E+02	±	3.99E+00					
				2.12E+02	±	1.05E+01					
				Mean = 2.07E+02	±	4.54E+00					
			Co-60	1.79E+02	±	3.90E+00	1.71E+02	±	2.85E+00	1.03	A
				1.82E+02	±	4.79E+00					
				1.73E+02	±	1.78E+00					
				1.70E+02	±	4.43E+00					
				Mean = 1.76E+02	±	1.95E+00					
			I-131**	8.62E+01	±	1.61E+00	9.41E+01	±	1.57E+00	0.91	A
				8.50E+01	±	1.23E+00					
				8.61E+01	±	1.67E+00					
				Mean = 8.58E+01	±	8.75E-01					

(1) Ratio = Reported/Analytics.
* Sample provided by Analytics, Inc.
** Result determined by Resin Extraction/Gamma Spectral Analysis.
A=Acceptable
U=Unacceptable

TABLE D3 (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)	
3/18/2010	E7022-05	FILTER	Ce-141	2.08E+02	±	3.64E+00	2.04E+02	±	3.40E+00	1.05	A
				2.18E+02	±	3.88E+00					
				2.14E+02	±	4.19E+00					
				Mean = 2.13E+02	±	2.26E+00					
			Cr-51	2.97E+02	±	1.61E+01	2.81E+02	±	4.70E+00	1.02	A
				2.57E+02	±	1.62E+01					
				3.07E+02	±	1.80E+01					
				Mean = 2.87E+02	±	9.69E+00					
			Cs-134	1.55E+02	±	4.98E+00	1.38E+02	±	2.31E+00	1.09	A
				1.50E+02	±	5.13E+00					
				1.48E+02	±	5.24E+00					
				Mean = 1.51E+02	±	2.95E+00					
			Cs-137	1.25E+02	±	3.96E+00	1.23E+02	±	2.05E+00	1.02	A
				1.32E+02	±	4.21E+00					
				1.21E+02	±	4.14E+00					
				Mean = 1.26E+02	±	2.37E+00					
			Co-58	1.16E+02	±	3.89E+00	1.11E+02	±	1.86E+00	1.05	A
				1.17E+02	±	4.01E+00					
				1.18E+02	±	3.93E+00					
				Mean = 1.17E+02	±	2.28E+00					
			Mn-54	1.76E+02	±	4.64E+00	1.62E+02	±	2.70E+00	1.10	A
				1.84E+02	±	5.17E+00					
				1.77E+02	±	4.98E+00					
				Mean = 1.79E+02	±	2.85E+00					
			Fe-59	1.22E+02	±	4.88E+00	1.07E+02	±	1.78E+00	1.12	A
				1.16E+02	±	5.13E+00					
				1.23E+02	±	5.25E+00					
				Mean = 1.20E+02	±	2.94E+00					
			Zn-65	2.31E+02	±	8.72E+00	1.98E+02	±	3.30E+00	1.12	A
				2.28E+02	±	9.46E+00					
				2.05E+02	±	8.99E+00					
				Mean = 2.21E+02	±	5.23E+00					
			Co-60	1.36E+02	±	3.50E+00	1.43E+02	±	2.38E+00	0.97	A
				1.37E+02	±	3.73E+00					
				1.43E+02	±	3.59E+00					
				Mean = 1.39E+02	±	2.08E+00					

(1) Ratio = Reported/Analytics.

* Sample provided by Analytics, Inc.

A=Acceptable

U=Unacceptable

TABLE D3 (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)	
9/16/2010	E7189-05	FILTER	Ce-141	1.28E+02	±	2.65E+00	1.26E+02	±	2.10E+00	1.02	A
				1.30E+02	±	2.67E+00					
				1.26E+02	±	1.38E+00					
				Mean = 1.28E+02	±	1.34E+00					
			Cr-51	2.28E+02	±	1.35E+01	2.26E+02	±	3.77E+00	1.01	A
				2.28E+02	±	1.38E+01					
				2.31E+02	±	6.90E+00					
				Mean = 2.29E+02	±	6.83E+00					
			Cs-134	1.02E+02	±	3.84E+00	8.98E+01	±	1.50E+00	1.10	A
				9.09E+01	±	3.81E+00					
				1.04E+02	±	1.68E+00					
				Mean = 9.90E+01	±	1.89E+00					
			Cs-137	8.80E+01	±	3.28E+00	9.13E+01	±	1.52E+00	0.98	A
				8.79E+01	±	3.17E+00					
				9.29E+01	±	1.47E+00					
				Mean = 8.96E+01	±	1.60E+00					
			Co-58	7.25E+01	±	2.96E+00	7.12E+01	±	1.19E+00	1.03	A
				7.27E+01	±	2.96E+00					
				7.51E+01	±	1.38E+00					
				Mean = 7.34E+01	±	1.47E+00					
			Mn-54	1.24E+02	±	3.84E+00	1.15E+02	±	1.93E+00	1.09	A
				1.25E+02	±	3.94E+00					
				1.26E+02	±	1.76E+00					
				Mean = 1.25E+02	±	1.93E+00					
			Fe-59	1.02E+02	±	4.39E+00	8.81E+01	±	1.47E+00	1.17	A
				1.05E+02	±	4.56E+00					
				1.02E+02	±	1.92E+00					
				Mean = 1.03E+02	±	2.20E+00					
			Zn-65	2.24E+02	±	8.24E+00	1.97E+02	±	3.29E+00	1.14	A
				2.22E+02	±	8.46E+00					
				2.27E+02	±	3.58E+00					
				Mean = 2.24E+02	±	4.11E+00					
			Co-60	1.70E+02	±	3.58E+00	1.65E+02	±	2.75E+00	1.02	A
				1.63E+02	±	3.54E+00					
				1.70E+02	±	1.56E+00					
				Mean = 1.68E+02	±	1.76E+00					

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

TABLE D3 (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)	
6/17/2010	E7092-05	SOIL	Ce-141	2.89E-01	±	1.03E-02	2.51E-01	±	4.19E-03	1.05	A
				2.47E-01	±	1.73E-02					
				2.33E-01	±	2.38E-02					
				2.87E-01	±	1.09E-02					
				Mean = 2.64E-01	±	8.26E-03					
			Cr-51	8.52E-01	±	5.18E-02	7.71E-01	±	1.29E-02	1.13	A
				8.56E-01	±	9.65E-02					
				9.16E-01	±	5.34E-02					
				Mean = 8.75E-01	±	4.06E-02					
			Cs-134	3.19E-01	±	7.72E-03	2.86E-01	±	4.78E-03	1.15	A
				3.23E-01	±	1.48E-02					
				3.45E-01	±	2.16E-02					
				3.29E-01	±	8.49E-03					
				Mean = 3.29E-01	±	7.15E-03					
			Cs-137	4.44E-01	±	8.48E-03	4.32E-01	±	7.21E-03	1.05	A
				4.63E-01	±	1.71E-02					
				4.52E-01	±	2.36E-02					
				4.52E-01	±	9.04E-03					
				Mean = 4.53E-01	±	7.92E-03					
			Co-58	2.54E-01	±	6.62E-03	2.30E-01	±	3.84E-03	1.08	A
				2.62E-01	±	1.44E-02					
				2.36E-01	±	2.06E-02					
				2.37E-01	±	7.68E-04					
				Mean = 2.47E-01	±	6.50E-03					
			Mn-54	4.17E-01	±	8.49E-03	3.85E-01	±	6.43E-03	1.07	A
				3.97E-01	±	1.66E-02					
				4.15E-01	±	2.33E-02					
				4.21E-01	±	8.54E-03					
				Mean = 4.13E-01	±	7.76E-03					
			Fe-59	3.01E-01	±	9.44E-03	2.70E-01	±	4.51E-03	1.09	A
				3.01E-01	±	1.97E-02					
				2.71E-01	±	2.89E-02					
				3.03E-01	±	1.02E-02					
				Mean = 2.94E-01	±	9.41E-03					
			Zn-65	5.12E-01	±	1.43E-02	4.68E-01	±	7.82E-03	1.09	A
				4.94E-01	±	2.83E-02					
				5.36E-01	±	4.23E-02					
				5.07E-01	±	1.48E-02					
				Mean = 5.12E-01	±	1.37E-02					
			Co-60	4.74E-01	±	6.60E-03	4.47E-01	±	7.46E-03	1.05	A
				4.56E-01	±	1.36E-02					
				4.78E-01	±	1.93E-02					
				4.68E-01	±	6.79E-03					
				Mean = 4.69E-01	±	6.36E-03					

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

TABLE D3 (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)	
6/20/2010	E7094-05	VEG	Ce-141		2.06E-01	±	9.86E-03	2.21E-01	±	3.69E-03	0.94	A
					2.03E-01	±	1.14E-02					
					2.15E-01	±	6.10E-03					
				Mean =	2.08E-01	±	5.42E-03					
			Cr-51		5.72E-01	±	4.94E-02	6.80E-01	±	1.14E-02	0.88	A
					6.32E-01	±	6.34E-02					
					6.00E-01	±	3.30E-02					
				Mean =	6.01E-01	±	2.90E-02					
			Cs-134		2.68E-01	±	9.60E-03	2.52E-01	±	4.21E-03	1.08	A
					2.66E-01	±	1.36E-02					
					2.81E-01	±	7.29E-03					
				Mean =	2.72E-01	±	6.06E-03					
			Cs-137		2.83E-01	±	9.37E-03	3.01E-01	±	5.03E-03	0.95	A
					2.91E-01	±	1.23E-02					
					2.84E-01	±	6.37E-03					
				Mean =	2.86E-01	±	5.57E-03					
			Co-58		2.02E-01	±	8.49E-03	2.03E-01	±	3.39E-03	0.99	A
					2.09E-01	±	1.11E-02					
					1.89E-01	±	5.44E-03					
				Mean =	2.00E-01	±	5.00E-03					
			Mn-54		3.49E-01	±	1.04E-02	3.39E-01	±	5.66E-03	1.00	A
					3.36E-01	±	1.35E-02					
					3.34E-01	±	7.03E-03					
				Mean =	3.40E-01	±	6.14E-03					
			Fe-59		2.33E-01	±	1.17E-02	2.38E-01	±	3.97E-03	0.98	A
					2.25E-01	±	1.50E-02					
					2.39E-01	±	7.96E-03					
				Mean =	2.32E-01	±	6.87E-03					
			Zn-65		4.18E-01	±	1.89E-02	4.12E-01	±	6.88E-03	1.02	A
					4.27E-01	±	2.48E-02					
					4.16E-01	±	1.35E-02					
				Mean =	4.20E-01	±	1.13E-02					
			Co-60		3.77E-01	±	8.39E-03	3.94E-01	±	6.58E-03	0.97	A
					3.82E-01	±	1.12E-02					
					3.84E-01	±	5.81E-03					
				Mean =	3.81E-01	±	5.05E-03					

(1) Ratio = Reported/Analytics.

* Sample provided by Analytics, Inc.

A=Acceptable

U=Unacceptable

TABLE D3 (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)	
9/16/2010	E7184-09	VEG	Ce-141		4.78E-01	±	1.16E-02	4.79E-01	±	8.00E-03	1.05	A
					5.20E-01	±	2.06E-02					
					5.09E-01	±	1.92E-02					
					5.00E-01	±	1.45E-02					
				Mean =	5.02E-01	±	8.43E-03					
			Cr-51		8.81E-01	±	5.64E-02	8.59E-01	±	1.43E-02	1.08	A
					9.73E-01	±	1.07E-01					
					9.45E-01	±	1.01E-01					
					9.13E-01	±	6.68E-02					
				Mean =	9.28E-01	±	4.28E-02					
			Cs-134		3.98E-01	±	1.16E-02	3.42E-01	±	5.71E-03	1.13	A
					3.54E-01	±	2.20E-02					
					3.88E-01	±	2.19E-02					
					4.08E-01	±	1.40E-02					
				Mean =	3.87E-01	±	8.99E-03					
			Cs-137		3.61E-01	±	1.05E-02	3.47E-01	±	5.79E-03	1.01	A
					3.42E-01	±	1.85E-02					
					3.41E-01	±	1.83E-02					
					3.57E-01	±	1.30E-02					
				Mean =	3.50E-01	±	7.73E-03					
			Co-58		3.03E-01	±	1.01E-02	2.71E-01	±	4.53E-03	1.03	A
					2.48E-01	±	1.75E-02					
					2.63E-01	±	1.83E-02					
					3.07E-01	±	1.22E-02					
				Mean =	2.80E-01	±	7.47E-03					
			Mn-54		5.04E-01	±	1.23E-02	4.39E-01	±	7.33E-03	1.10	A
					4.83E-01	±	2.12E-02					
					4.79E-01	±	2.12E-02					
					4.68E-01	±	1.42E-02					
				Mean =	4.84E-01	±	8.85E-03					
			Fe-59		3.87E-01	±	1.39E-02	3.35E-01	±	5.59E-03	1.18	A
					4.28E-01	±	2.64E-02					
					3.99E-01	±	2.48E-02					
					3.66E-01	±	1.65E-02					
				Mean =	3.95E-01	±	1.05E-02					
			Zn-65		8.15E-01	±	2.57E-02	7.49E-01	±	1.25E-02	1.06	A
					8.02E-01	±	4.46E-02					
					7.65E-01	±	4.48E-02					
					7.82E-01	±	3.00E-02					
				Mean =	7.91E-01	±	1.86E-02					
			Co-60		6.60E-01	±	1.11E-02	6.28E-01	±	1.05E-02	1.06	A
					6.69E-01	±	1.95E-02					
					6.87E-01	±	1.94E-02					
					6.39E-01	±	1.25E-02					
				Mean =	6.64E-01	±	8.05E-03					

(1) Ratio = Reported/Analytics.

* Sample provided by Analytics, Inc.

A=Acceptable

U=Unacceptable

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GEL | Laboratories LLC

2010 ANNUAL QUALITY ASSURANCE REPORT

FOR THE

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM (REMP)

JANUARY 2010 – DECEMBER 2010

GEL LABORATORIES, LLC
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2010 ANNUAL QUALITY ASSURANCE REPORT

FOR THE

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM (REMP)

JANUARY 2010 – DECEMBER 2010

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Date

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2010 ANNUAL QUALITY ASSURANCE REPORT FOR THE RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM (REMP)

1. Introduction

GEL Laboratories, LLC (GEL) is a privately owned environmental laboratory dedicated to providing personalized client services of the highest quality. GEL was established as an analytical testing laboratory in 1981. Now a full service lab, our analytical divisions use state of the art equipment and methods to provide a comprehensive array of organic, inorganic, and radiochemical analyses to meet the needs of our clients.

At GEL, quality is emphasized at every level of personnel throughout the company. Management's ongoing commitment to good professional practice and to the quality of our testing services to our customers is demonstrated by their dedication of personnel and resources to develop, implement, assess, and improve our technical and management operations.

The purpose of GEL's quality assurance program is to establish policies, procedures, and processes to meet or exceed the expectations of our clients. To achieve this, all personnel that support these services to our clients are introduced to the program and policies during their initial orientation, and annually thereafter during company-wide training sessions.

GEL's primary goals are to ensure that all measurement data generated are scientifically and legally defensible, of known and acceptable quality per the data quality objectives (DQOs), and thoroughly documented to provide sound support for environmental decisions. In addition, GEL continues to ensure compliance with all contractual requirements, environmental standards, and regulations established by local, state and federal authorities.

GEL administers the QA program in accordance with the Quality Assurance Plan, GL-QS-B-001. Our Quality Systems include all quality assurance (QA) policies and quality control (QC) procedures necessary to plan, implement, and assess the work we perform. GEL's QA Program establishes a quality management system (QMS) that governs all of the activities of our organization.

This report entails the quality assurance program for the proficiency testing and environmental monitoring aspects of GEL for 2010. GEL's QA Program is designed to monitor the quality of analytical processing associated with environmental, radiobioassay, effluent (10 CFR Part 50), and waste (10 CFR Part 61) sample analysis.

This report covers the category of Radiological Environmental Monitoring Program (REMP) and includes:

- Intra-laboratory QC results analyzed during 2010.
- Inter-laboratory QC results analyzed during 2010 where known values were available.

2. Quality Assurance Programs for Inter-laboratory, Intra-laboratory and Third Party Cross-Check

In addition to internal and client audits, our laboratory participates in annual performance evaluation studies conducted by independent providers. We routinely participate in the following types of performance audits:

- Proficiency testing and other inter-laboratory comparisons.
- Performance requirements necessary to retain Certifications
- Evaluation of recoveries of certified reference and in-house secondary reference materials using statistical process control data.
- Evaluation of relative percent difference between measurements through SPC data.

We also participate in a number of proficiency testing programs for federal and state agencies and as required by contracts. It is our policy that no proficiency evaluation samples be analyzed in any special manner. Our annual performance evaluation participation generally includes a combination of studies that support the following:

- US Environmental Protection Agency Discharge Monitoring Report, Quality Assurance Program (DMR-QA). Annual national program sponsored by EPA for laboratories engaged in the analysis of samples associated with the NPDES monitoring program. Participation is mandatory for all holders of NPDES permits. The permit holder must analyze for all of the parameters listed on the discharge permit. Parameters include general chemistry, metals, BOD/COD, oil and grease, ammonia, nitrates, etc.

- Department of Energy Mixed Analyte Performance Evaluation Program (MAPEP). A semiannual program developed by DOE in support of DOE contractors performing waste analyses. Participation is required for all laboratories that perform environmental analytical measurements in support of environmental management activities. This program includes radioactive isotopes in water, soil, vegetation and air filters.

- ERA's MRAD-Multimedia Radiochemistry Proficiency test program. This program is for labs seeking certification for radionuclides in wastewater and solid waste. The program is conducted in strict compliance with USEPA National Standards for Water Proficiency study.

- ERA's InterLaB RadCheM Proficiency Testing Program for radiological analyses. This program completes the process of replacing the USEPA EMSL-LV Nuclear Radiation Assessment Division program discontinued in 1998. Laboratories seeking certification for radionuclide analysis in drinking water also use the study. This program is conducted in strict compliance with the USEPA National Standards for Water Proficiency Testing Studies. This program encompasses Uranium by EPA method 200.8 (for drinking water certification in Florida/Primary NELAP), gamma

emitters, Gross Alpha/Beta, Iodine-131, naturally occurring radioactive isotopes, Strontium-89/90, and Tritium.

- ERA's Water Pollution (WP) biannual program for waste methodologies includes parameters for both organic and inorganic analytes.
- ERA's Water Supply (WS) biannual program for drinking water methodologies includes parameters for organic and inorganic analytes.
- New York State Department of Health Environmental Laboratory Approval Program Proficiency Testing Program for Potable Water (PW)
- Environmental Cross-Check Program administered by Eckert & Ziegler Analytics, Inc. This program encompasses radionuclides in water, soil, milk, naturally occurring radioactive isotopes in soil and air filters.

GEL procures single-blind performance evaluation samples from Eckert & Ziegler Analytics to verify the analysis of sample matrices processed at GEL. Samples are received on a quarterly basis. GEL's Third-Party Cross-Check Program provides environmental matrices encountered in a typical nuclear utility REMP. The Third-Party Cross-Check Program is intended to meet or exceed the inter-laboratory comparison program requirements discussed in NRC Regulatory Guide 4.15, revision 1. Once performance evaluation samples have been prepared in accordance with the instructions provided by the PT provider, samples are managed and analyzed in the same manner as environmental samples from GEL's clients.

3. Quality Assurance Program for Internal and External Audits

During each annual reporting period, at least one internal assessment is conducted in accordance with the pre-established schedule from Standard Operating Procedure for the Conduct of Quality Audits, GL-QS-E001. The annual internal audit plan is reviewed for adequacy and includes the scheduled frequency and scope of quality control actions necessary to GEL's QA program. Internal audits are conducted at least annually in accordance with a schedule approved by the Quality Systems Director. Supplier audits are contingent upon the categorization of the supplier, and may or may not be conducted prior to the use of a supplier or subcontractor. Type I suppliers and subcontractors, regardless of how they were initially qualified, are re-evaluated at least once every three years.

In addition, prospective customers audit GEL during pre-contract audits. GEL hosts several external audits each year for both our clients and other programs. These programs include environmental monitoring, waste characterization, and radiobioassay. The following list of programs may audit GEL at least annually or up to every three years depending on the program.

- NELAC, National Environmental Laboratory Accreditation Program
- DOECAP, U.S. Department of Energy Consolidated Audit Program
- DOELAP, U.S. Department of Energy Laboratory Accreditation Program
- DOE QSAS, U.S. Department of Energy, Quality Systems for Analytical Services
- ISO/IEC 17025

- A2LA, American Association for Laboratory Accreditation
- DOD ELAP, US Department of Defense Environmental Accreditation Program
- NUPIC, Nuclear Procurement Issues Committee
- South Carolina Department of Heath and Environmental Control (SC DHEC)

The annual radiochemistry laboratory internal audit (10-RAD-001) was conducted in March 2010. Four findings, one observation, and two recommendations resulted from this assessment. Each finding was closed and appropriate laboratory staff addressed each observation and recommendation. The internal audit closed in June 2010.

4. Performance Evaluation Acceptance Criteria for Environmental Sample Analysis

GEL utilized an acceptance protocol based upon two performance models. For those inter-laboratory programs that already have established performance criteria for bias (i.e., MAPEP, and ERA/ELAP), GEL will utilize the criteria for the specific program. For intra-laboratory or third party quality control programs that do not have a specific acceptance criteria (i.e. the Eckert-Ziegler Analytics Environmental Cross-check Program), results will be evaluated in accordance with GEL's internal acceptance criteria.

5. Performance Evaluation Samples

Performance Evaluation (PE) results and internal quality control sample results are evaluated in accordance with GEL acceptance criteria. The first criterion concerns bias, which is defined as the deviation of any one result from the known value. The second criterion concerns precision, which deals with the ability of the measurement to be replicated by comparison of an individual result with the mean of all results for a given sample set.

At GEL, we also evaluate our analytical performance on a regular basis through statistical process control acceptance criteria. Where feasible, this criterion is applied to both measures of precision and accuracy and is specific to sample matrix. We establish environmental process control limits at least annually.

For Radiochemistry analysis, quality control evaluation is based on static limits rather than those that are statistically derived. Our current process control limits are maintained in GEL's AlphaLIMS. We also measure precision with matrix duplicates and/or matrix spike duplicates. The upper and lower control limits (UCL and LCL respectively) for precision are plus or minus three times the standard deviation from the mean of a series of relative percent differences. The static precision criteria for radiochemical analyses are 0 - 20%, for activity levels exceeding the contract required detection limit (CRDL).

6. Quality Control Program for Environmental Sample Analysis

GEL's internal QA Program is designed to include QC functions such as instrumentation calibration checks (to insure proper instrument response), blank samples, instrumentation backgrounds, duplicates, as well as overall staff qualification analyses and statistical process controls. Both quality control and qualification analyses samples are used to be as similar as the matrix type of those samples submitted for analysis by the various laboratory clients. These performance test samples (or performance evaluation samples) are either

actual sample submitted in duplicate in order to evaluate the precision of laboratory measurements, or fortified blank samples, which have been given a known quantity of a radioisotope that is in the interest to GEL's clients.

Accuracy (or Bias) is measured through laboratory control samples and/or matrix spikes, as well as surrogates and internal standards. The UCLs and LCLs for accuracy are plus or minus three times the standard deviation from the mean of a series of recoveries. The static limit for radiochemical analyses is 75 - 125%. Specific instructions for out-of-control situations are provided in the applicable analytical SOP.

GEL's Laboratory Control Standard (LCS) is an aliquot of reagent water or other blank matrix to which known quantities of the method analytes are added in the laboratory. The LCS is analyzed exactly like a sample, and its purpose is to determine whether the methodology is in control, and whether the laboratory is capable of making accurate and precise measurements. Some methods may refer to these samples as Laboratory Fortified Blanks (LFB). The requirement for recovery is between 75 and 125% for radiological analyses excluding drinking water matrix.

$$\text{Bias (\%)} = \frac{\text{(observed concentration)}}{\text{(known concentration)}} * 100\ \%$$

Precision is a data quality indicator of the agreement between measurements of the same property, obtained under similar conditions, and how well they conform to themselves. Precision is usually expressed as standard deviation, variance or range in either absolute or relative (percentage) terms.

GEL's laboratory duplicate (DUP or LCSD) is an aliquot of a sample taken from the same container and processed in the same manner under identical laboratory conditions. The aliquot is analyzed independently from the parent sample and the results are compared to measure precision and accuracy.

If a sample duplicate is analyzed, it will be reported as Relative Percent Difference (RPD). The RPD must be 20 percent or less, if both samples are greater than 5 times the MDC. If both results are less than 5 times MDC, then the RPD must be equal to or less than 100%. If one result is above the MDC and the other is below the MDC, then the RPD can be calculated using the MDC for the result of the one below the MDC. The RPD must be 100% or less. In the situation where both results are above the MDC but one result is greater than 5 times the MDC and the other is less than 5 times the MDC, the RPD must be less than or equal to 20%. If both results are below MDC, then the limits on % RPD are not applicable.

$$\text{Difference (\%)} = \frac{\text{(high duplicate result – low duplicate result)}}{\text{(average of results)}} * 100\ \%$$

7. Summary of Data Results

During 2010, forty-three radioisotopes associated with six matrix types were analyzed under GEL's Performance Evaluation program in participation with ERA, MAPEP, NYSDOH ELAP and Eckert & Ziegler Analytics. Matrix types were representative of client analyses performed during 2010. The list below contains the type of matrix evaluated by GEL.

- Air Filter
- Cartridge
- Water
- Milk
- Soil
- Vegetation

Graphs are provided in Figures 1-8 of this report to allow for the evaluation of trends or biases. These graphs include radioisotopes Cobalt-60, Cesium-137, Tritium, Strontium-90, Gross Alpha, Gross Beta, and Iodine-131. A summary of GEL's quality control for radiological analyses by isotopic analysis and matrix are represented in Table 8. Each LCS and DUP represents a batch of samples for each isotopic analysis. This summary contains the number of reportable quality control results for our clients.

8. Summary of Participation in the Eckert & Ziegler Analytics Environmental Cross-Check Program

During 2010, Eckert & Ziegler Analytics provided samples for 106 individual environmental analyses. Of the 106 analyses, 99% (105 out of 106) of all results fell within the PT provider's acceptance criteria. The only analytical failure occurred with the analysis of Iron-59 in milk. For the corrective action associated with the Iron-59 failure, refer to CARR110209-542 (Table 9).

9. Summary of Participation in the MAPEP Monitoring Program

During 2010, one set of MAPEP samples (MAPEP 22) was analyzed by the laboratory. Of the 66 analyses, 80% (53 out of 66) of all results fell within the PT provider's acceptance criteria. Thirteen analytical failures occurred: Plutonium-238 in water, Uranium-235 in filter, Uranium-238 in filter, Uranium-Total in filter, Americium-241 in filter, Cesium-134 in filter, Cesium-137 in filter, Cobalt-60 in filter, Manganese-54 in filter, Plutonium-239/240 in filter, Uranium-244/243 in filter, Uranium-238 in filter, and Uranium-238 in vegetation.

For the corrective action associated MAPEP 22, refer to CARR100617-496 (Table 9). The ICP-MS analysis of Uranium-235 and Uranium-238 failure was attributed to the use of the less vigorous digestion method (EPA Method 3050B). After contacting RESL, GEL discovered that they had used a more rigorous total dissolution process. The failure for Plutonium-238 was attributed to a data reviewer's error and lack of attention to detail to the region of interest that was not included in the data result. Approximately 400 additional counts should have been included. For the remaining isotopic failures, the error was attributed to analyst error and failure to follow the instructions from the PT provider.

10. Summary of Participation in the ERA MRaD PT Program

During 2010, the ERA MRad program provided samples (MRAD-12 and MRAD-13) for 175 individual environmental analyses. Of the 175 analyses, 96% (169 out of 176) of all results fell within the PT provider's acceptance criteria. Six analytical failures occurred: Uranium-234 in soil, Uranium-238 in soil, Uranium-238 in vegetation, Plutonium-238 in water, Uranium-238 in water, and Bismuth-212 in soil.

For the corrective actions associated with MRAD 12 and MRAD-13, refer to corrective actions CARR100617-497 and CARR101210-527, respectively (Table 9). For MRAD-12, the ICP-MS analysis of Uranium-235 and Uranium-238 failure was attributed to the use of the less vigorous digestion method (EPA Method 3050B). After contacting RESL, GEL discovered that they had used a more rigorous total dissolution process. For Uranium-238 in vegetation, air and water, the failure was attributed to method sensitivity by gamma spectroscopy. Future PT analysis will be performed using a more sensitive method.

For MRAD-13, the failure for Bismuth-212 was attributed to a reporting error. The actual result (1660 pCi/kg) was within the acceptance range. The failure of Iron-55 was attributed to matrix interference. An additional recount with a smaller aliquot and fresh reagent rinses removed the interferant.

11. Summary of Participation in the ERA PT Program

During 2010, the ERA program provided samples (RAD-80 and RAD-82) for 53 individual environmental analyses. Of the 53 analyses, 77% (41 out of 53) of all results fell within the PT provider's acceptance criteria. Twelve analytical failures occurred: Strontium-89 in water, Strontium-90 in water, Barium-133 in water, Cesium-134 in water, Cesium-137 in water, Cobalt-60 in water, Zinc-65 in water, Uranium (Natural) in water, Uranium (Nat) Mass in water, Strontium-90 in water, Cesium-134 in water, and Zinc-65 in water.

For the corrective actions associated with RAD-80 and RAD-82, refer to corrective actions CARR100318-487 and CARR100907-512, respectively (Table 9). For RAD-80, the Gross Alpha failure was attributed to a concentrated iron carrier. The Strontium-89 and Strontium-90 failures were attributed to the associated weights of the carriers utilized during the preparation and analysis.

For RAD-82, failures of the Gamma Emitters and the Naturals (Uranium) were attributed to analyst error and failure to follow the instructions from the PT provider. The failure of Strontium-89 and Strontium-90 was attributed to analyst error while diluting the sample.

12. Summary of Participation in the New York ELAP PT Program

During 2010, the NYSDOH ELAP PT program provided 30 individual tests for radiological analysis. Of the 30 analyses, 83% (25 out of 30) of the results were within the PT provider's acceptance criteria. Five analytical failures occurred: Cesium-134 in water, Iodine-131 in water (two), Strontium-89 in water, and Radium-226 in water.

For the corrective actions associated with NY-337, refer to corrective action CARR101203-525 (Table 9). For Cesium-134, Iodine-131, Strontium-89 and Strontium-90, and Radium-226, the failures could not be determined. The laboratory continues to monitor results of internal quality control samples.

In addition, GEL (Lab ID# E87156, Lab Code# SC00012) maintained primary NELAP accreditation from the Florida Department of Health for the following methods in potable water and non-potable water. The radiological analytes and methods are listed below.

- Gross Alpha: EPA 900.0, EPA 1984 00-02

- Gross Beta: EPA 900.0
- Iodine-131: DOE 4.5.2.3, EPA 901.1, EPA 902.0
- Photon Emitters: DOE 4.5.2.3, EPA 901.1
- Radioactive Cesium: DOE 4.5.2.3, EPA 901.1
- Tritium: EPA 906.0
- Radium-226: EPA 903.1, EPA 1984 Ra-04
- Radium-228: EPA 904.0, EPA 1976 PP.24
- Radon: SM 20 7500 Rn, DOE 1990 Sr-02
- Strontium-89: EPA 905.0
- Strontium-90: EPA 905.0
- Uranium (Activity): DOE 1990 U-02, ASTM D5174-97, 02

13. Quality Control Program for REMP Analyses

GEL's internal (intra-laboratory) quality control program evaluated 1590 individual analyses for bias and 1591 analyses for precision for standard REMP matrix and radionuclides. Of the 959 internal quality control analyses evaluated for bias, 100% met laboratory acceptance criteria. In addition, 100% of the 1591 results for precision were found to be acceptable. The results are summarized in Table 8.

GEL performs low-level analysis specifically for Tritium in water. A chart of low activity H-3 spike performance is provided in Figure 8. All 2010 analyses were within the acceptance criteria.

14. Corrective Action Request and Report (CARR)

There are two categories of corrective action at GEL. One is corrective action implemented at the analytical and data review level in accordance with the analytical SOP. The other is formal corrective action documented by the Quality Systems Team in accordance with GL-QS-E-002. A formal corrective action is initiated when a nonconformance reoccurs or is so significant that permanent elimination or prevention of the problem is required.

GEL includes quality requirements in most analytical standard operating procedures to ensure that data are reported only if the quality control criteria are met or the quality control measures that did not meet the acceptance criteria are documented. A formal corrective action is implemented according to GL-QS-E-002 for Conducting Corrective/Preventive Action and Identifying Opportunities for Improvement. Recording and documentation is performed following guidelines stated in GL-QS-E-012 for Client NCR Database Operation.

Any employee at GEL can identify and report a nonconformance and request that corrective action be taken. Any GEL employee can participate on a corrective action team as requested by the QS team or Group Leaders. The steps for conducting corrective action are detailed in GL-QS-E-002. In the event that correctness or validity of the laboratory's test results in doubt, the laboratory will take corrective action. If investigations show that the results have been impacted, affected clients will be informed of the issue in writing within five (5) calendar days of the discovery.

Table 9 provides the status of CARRs for radiological performance testing during 2010.

15. References

1. GEL Quality Assurance Plan, GL-QS-B-001
2. GEL Standard Operating Procedure for the Conduct of Quality Audits, GL-QS-E-001
3. GEL Standard Operating Procedure for Conducting Corrective/Preventive Action and Identifying Opportunities for Improvement, GL-QS-E-002
4. GEL Standard Operating Procedure for AlphaLIMS Documentation of Nonconformance Reporting and Dispositioning and Control of Nonconforming Items, GL-QS-E-004
5. GEL Standard Operating Procedure for Handling Proficiency Evaluation Samples, GL-QS-E-013
6. GEL Standard Operating Procedure for Quality Assurance Measurement Calculations and Processes, GL-QS-E-014
7. 40 CFR Part 136 Guidelines Establishing Test Procedures for the Analysis of Pollutants
8. ISO/IEC 17025-2005, General Requirements for the Competence of Testing and Calibration Laboratories
9. ANSI/ASQC E4-1994, Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology Programs, American National Standard
10. 2003 NELAC Standard, National Environmental Laboratory Accreditation Program
11. MARLAP, Multi-Agency Radiological Laboratory Analytical Protocols
12. 10 CFR Part 21, Reporting of Defects and Noncompliance
13. 10 CFR Part 50 Appendix B, Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants
14. 10 CFR Part 61, Licensing Requirements for Land Disposal and Radioactive Waste
15. NRC REG Guide 4.15 and NRC REG Guide 4.8

TABLE 1
2010 RADIOLOGICAL PROFICIENCY TESTING RESULTS AND ACCEPTANCE CRITERIA

Sample Number	Quarter / Year	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
RAD - 80	1st / 2010	Water	pCi/L	Barium-133	73.5	72.9	61.0 - 80.2	Acceptable
RAD - 80	1st / 2010	Water	pCi/L	Cesium-134	69.2	63.4	51.5 - 69.7	Acceptable
RAD - 80	1st / 2010	Water	pCi/L	Cesium-137	118.0	120	108 - 134	Acceptable
RAD - 80	1st / 2010	Water	pCi/L	Cobalt-60	87.7	90	81 - 101	Acceptable
RAD - 80	1st / 2010	Water	pCi/L	Gross Alpha	51.3	42.5	22.0 - 53.9	Acceptable
RAD - 80	1st / 2010	Water	pCi/L	Gross Beta	52.0	54.2	37.0 - 61.1	Acceptable
RAD - 80	1st / 2010	Water	pCi/L	Iodine-131	30.5	28.2	23.5 - 33.1	Acceptable
RAD - 80	1st / 2010	Water	pCi/L	Radium-226	16.9	17.8	13.2 - 20.3	Acceptable
RAD - 80	1st / 2010	Water	pCi/L	Radium-228	20.4	18.2	12.3 - 21.8	Acceptable
RAD - 80	1st / 2010	Water	pCi/L	Strontium-89	37.9	53.3	42.3 - 60.9	Not Acceptable
RAD - 80	1st / 2010	Water	pCi/L	Strontium-90	52.3	42.2	31.1 - 48.4	Not Acceptable
RAD - 80	1st / 2010	Water	pCi/L	Tritium	19200	18700	16400-20600	Acceptable
RAD - 80	1st / 2010	Water	pCi/L	Uranium (Nat)	49.0	50.2	40.7 - 55.8	Acceptable
RAD - 80	1st / 2010	Water	ug/L	Uranium (Nat) Mass	67.3	73.2	59.4 - 81.4	Acceptable
RAD - 80	1st / 2010	Water	pCi/L	Zinc-65	213.0	210	189 - 246	Acceptable
E6922-278	2nd / 2010	Cartridge	pCi	Iodine-131	9.02E+01	9.39E+01	0.96	Acceptable
E6924-278	2nd / 2010	Milk	pCi/L	Iodine-131	8.25E+01	8.73E+01	0.95	Acceptable
E6925-278	2nd / 2010	Water	pCi/L	Iodine-131	1.00E+02	9.61E+01	1.04	Acceptable
E6924-278	2nd / 2010	Milk	pCi/L	Iron-59	1.88E+02	1.78E+02	1.06	Acceptable
E6925-278	2nd / 2010	Water	pCi/L	Iron-59	1.94E+02	1.79E+02	1.08	Acceptable
E6924-278	2nd / 2010	Milk	pCi/L	Manganese-54	1.83E+02	1.78E+02	1.03	Acceptable
E6925-278	2nd / 2010	Water	pCi/L	Manganese-54	1.90E+02	1.79E+02	1.06	Acceptable
E6923-278	2nd / 2010	Milk	pCi/L	Strontium-89	9.73E+01	1.31E+02	0.75	Acceptable
E6923-278	2nd / 2010	Milk	pCi/L	Strontium-90	1.38E+01	1.79E+01	0.77	Acceptable
E6924-278	2nd / 2010	Milk	pCi/L	Zinc-65	3.68E+02	3.45E+02	1.07	Acceptable
E6925-278	2nd / 2010	Water	pCi/L	Zinc-65	3.72E+02	3.48E+02	1.07	Acceptable
E6924-278	2nd / 2010	Milk	pCi/L	Cerium-141	2.01E+02	2.02E+02	0.99	Acceptable
E6925-278	2nd / 2010	Water	pCi/L	Cerium-141	2.04E+02	2.04E+02	1.00	Acceptable
E6924-278	2nd / 2010	Milk	pCi/L	Cesium-134	2.41E+02	2.53E+02	0.95	Acceptable
E6925-278	2nd / 2010	Water	pCi/L	Cesium-134	2.56E+02	2.55E+02	1.00	Acceptable
E6924-278	2nd / 2010	Milk	pCi/L	Cesium-137	1.71E+02	1.79E+02	0.96	Acceptable
E6925-278	2nd / 2010	Water	pCi/L	Cesium-137	1.81E+02	1.81E+02	1.00	Acceptable
E6924-278	2nd / 2010	Milk	pCi/L	Cobalt-58	2.03E+02	2.11E+02	0.96	Acceptable
E6925-278	2nd / 2010	Water	pCi/L	Cobalt-58	2.19E+02	2.13E+02	1.03	Acceptable

Sample Number	Quarter / Year	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
E6924-278	2nd / 2010	Milk	pCi/L	Cobalt-60	2.47E+02	2.56E+02	0.97	Acceptable
E6925-278	2nd / 2010	Water	pCi/L	Cobalt-60	2.67E+02	2.58E+02	1.03	Acceptable
E6924-278	2nd / 2010	Milk	pCi/L	Cr-51	5.54E+02	5.48E+02	1.01	Acceptable
E6925-278	2nd / 2010	Water	pCi/L	Cr-51	5.78E+02	5.54E+02	1.04	Acceptable
E7054-278	2nd / 2010	Milk	pCi/L	Cerium-141	2.61E+02	2.61E+02	1.00	Acceptable
E7055-278	2nd / 2010	Water	pCi/L	Cerium-141	2.78E+02	2.63E+02	1.06	Acceptable
E7054-278	2nd / 2010	Milk	pCi/L	Cesium-134	1.76E+02	1.78E+02	0.99	Acceptable
E7055-278	2nd / 2010	Water	pCi/L	Cesium-134	1.85E+02	1.79E+02	1.03	Acceptable
E7054-278	2nd / 2010	Milk	pCi/L	Cesium-137	1.61E+02	1.58E+02	1.02	Acceptable
E7055-278	2nd / 2010	Water	pCi/L	Cesium-137	1.71E+02	1.59E+02	1.07	Acceptable
E7054-278	2nd / 2010	Milk	pCi/L	Cobalt-58	1.45E+02	1.43E+02	1.02	Acceptable
E7055-278	2nd / 2010	Water	pCi/L	Cobalt-58	1.51E+02	1.44E+02	1.05	Acceptable
E7054-278	2nd / 2010	Milk	pCi/L	Cobalt-60	1.90E+02	1.83E+02	1.04	Acceptable
E7055-278	2nd / 2010	Water	pCi/L	Cobalt-60	1.94E+02	1.85E+02	1.05	Acceptable
E7054-278	2nd / 2010	Milk	pCi/L	Cr-51	3.81E+02	3.61E+02	1.05	Acceptable
E7055-278	2nd / 2010	Water	pCi/L	Cr-51	3.86E+02	3.64E+02	1.06	Acceptable
E7052-278	2nd / 2010	Cartridge	pCi	Iodine-131	8.58E+01	8.54E+01	1.00	Acceptable
E7054-278	2nd / 2010	Milk	pCi/L	Iodine-131	6.91E+01	7.40E+01	0.93	Acceptable
E7055-278	2nd / 2010	Water	pCi/L	Iodine-131	8.12E+01	7.22E+01	1.12	Acceptable
E7054-278	2nd / 2010	Milk	pCi/L	Iron-59	1.60E+02	1.37E+02	1.17	Acceptable
E7055-278	2nd / 2010	Water	pCi/L	Iron-59	1.60E+02	1.38E+02	1.16	Acceptable
E7054-278	2nd / 2010	Milk	pCi/L	Manganese-54	2.10E+02	2.07E+02	1.01	Acceptable
E7055-278	2nd / 2010	Water	pCi/L	Manganese-54	2.30E+02	2.09E+02	1.1	Acceptable
E7053-278	2nd / 2010	Milk	pCi/L	Strontium-89	7.91E+01	9.28E+01	0.85	Acceptable
E7053-278	2nd / 2010	Milk	pCi/L	Strontium-90	1.12E+01	1.27E+01	0.88	Acceptable
E7054-278	2nd / 2010	Milk	pCi/L	Zinc-65	2.71E+02	2.54E+02	1.07	Acceptable
E7055-278	2nd / 2010	Water	pCi/L	Zinc-65	2.97E+02	2.56E+02	1.16	Acceptable
NY-332 3262	2nd / 2010	Water	pCi/L	Barium-133	27.8	25.6	20.6 - 30.5	Acceptable
NY-332 3262	2nd / 2010	Water	pCi/L	Cesium-134	14.8	14.0	10.7 - 17.3	Acceptable
NY-332 3262	2nd / 2010	Water	pCi/L	Cesium-137	124	123	112 - 134	Acceptable
NY-332 3262	2nd / 2010	Water	pCi/L	Cobalt-60	98.3	99.5	90.3 - 109	Acceptable
NY-332 3263	2nd / 2010	Water	pCi/L	Gross Alpha	33.0	26.8	15.0 - 38.6	Acceptable
NY-332 3263	2nd / 2010	Water	pCi/L	Gross Beta	64.6	54.0	41.3 - 66.7	Acceptable
NY-332 3264	2nd / 2010	Water	pCi/L	Iodine-131	23.4	26.4	21.9 - 31.0	Acceptable
NY-332 3264	2nd / 2010	Water	pCi/L	Iodine-131	26.8	26.4	21.9 - 31.0	Acceptable
NY-332 3265	2nd / 2010	Water	pCi/L	Radium-226	12.1	13.2	10.4 - 16.0	Acceptable
NY-332 3265	2nd / 2010	Water	pCi/L	Radium-228	9.90	8.91	6.08 - 11.7	Acceptable

Sample Number	Quarter / Year	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
NY-332 3261	2nd / 2010	Water	pCi/L	Strontium-89	46.7	41.9	33.4 - 50.4	Acceptable
NY-332 3261	2nd / 2010	Water	pCi/L	Strontium-90	33.9	34.8	27.1 - 42.5	Acceptable
NY-332 3266	2nd / 2010	Water	pCi/L	Tritium	9610	9490	8390 - 10600	Acceptable
NY-332 3265	2nd / 2010	Water	pCi/L	Uranium (activity)	48.81	44.7	37.9 - 51.4	Acceptable
NY-332 3262	2nd / 2010	Water	pCi/L	Zinc-65	146	139	121 - 156	Acceptable
MRAD-12	2nd / 2010	Soil	pCi/kg	Actinium-228	1570	1850	1190 - 2600	Acceptable
MRAD-12	2nd / 2010	Soil	pCi/kg	Americium-241	1130	1500	896 - 1930	Acceptable
MRAD-12	2nd / 2010	Soil	pCi/kg	Americium-241	1120	1500	896 - 1930	Acceptable
MRAD-12	2nd / 2010	Vegetation	pCi/kg	Americium-241	2410	3140	1790 - 4310	Acceptable
MRAD-12	2nd / 2010	Vegetation	pCi/kg	Americium-241	3600	3140	1790 - 4310	Acceptable
MRAD-12	2nd / 2010	Air Filter	pCi/Filter	Americium-241	52.7	60.0	35.1 - 82.3	Acceptable
MRAD-12	2nd / 2010	Air Filter	pCi/Filter	Americium-241	76	60	35.1 - 82.3	Acceptable
MRAD-12	2nd / 2010	Water	pCi/L	Americium-241	79.1	95.6	65.5 - 129	Acceptable
MRAD-12	2nd / 2010	Water	pCi/L	Americium-241	123	95.6	65.5 - 129	Acceptable
MRAD-12	2nd / 2010	Soil	pCi/kg	Bismuth-212	1430	1640	430 - 2450	Acceptable
MRAD-12	2nd / 2010	Soil	pCi/kg	Bismuth-214	1080	1410	865 - 2030	Acceptable
MRAD-12	2nd / 2010	Soil	pCi/kg	Cesium-134	3040	3110	2000 - 3740	Acceptable
MRAD-12	2nd / 2010	Vegetation	pCi/kg	Cesium-134	1750	1670	956 - 2310	Acceptable
MRAD-12	2nd / 2010	Air Filter	pCi/Filter	Cesium-134	504	436	284 - 540	Acceptable
MRAD-12	2nd / 2010	Water	pCi/L	Cesium-134	454	417	308 - 479	Acceptable
MRAD-12	2nd / 2010	Soil	pCi/kg	Cesium-137	4330	4440	3400 - 5770	Acceptable
MRAD-12	2nd / 2010	Vegetation	pCi/kg	Cesium-137	1550	1470	1080 - 2040	Acceptable
MRAD-12	2nd / 2010	Air Filter	pCi/Filter	Cesium-137	785	701	527 - 921	Acceptable
MRAD-12	2nd / 2010	Water	pCi/L	Cesium-137	693	654	556 - 783	Acceptable
MRAD-12	2nd / 2010	Soil	pCi/kg	Cobalt-60	2120	2140	1560 - 2870	Acceptable
MRAD-12	2nd / 2010	Vegetation	pCi/kg	Cobalt-60	2100	1970	1330 - 2830	Acceptable
MRAD-12	2nd / 2010	Air Filter	pCi/Filter	Cobalt-60	591	523	405 - 653	Acceptable
MRAD-12	2nd / 2010	Water	pCi/L	Cobalt-60	813	727	633 - 859	Acceptable
MRAD-12	2nd / 2010	Vegetation	pCi/kg	Curium-244	429	528	260 - 822	Acceptable
MRAD-12	2nd / 2010	Air Filter	pCi/Filter	Gross Alpha	68.2	79.6	41.3 - 120	Acceptable
MRAD-12	2nd / 2010	Air Filter	pCi/Filter	Gross Beta	72	70.4	43.4 - 103	Acceptable
MRAD-12	2nd / 2010	Air Filter	pCi/Filter	Iron-55	375	359	158 - 559	Acceptable
MRAD-12	2nd / 2010	Soil	pCi/kg	Lead-212	1540	1520	980 - 2140	Acceptable
MRAD-12	2nd / 2010	Soil	pCi/kg	Lead-214	1300	1440	862 - 2140	Acceptable
MRAD-12	2nd / 2010	Soil	pCi/kg	Manganese-54	< 22.9	0	----	Acceptable
MRAD-12	2nd / 2010	Vegetation	pCi/kg	Manganese-54	< 9.6	0.00	----	Acceptable

Sample Number	Quarter / Year	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
MRAD-12	2nd / 2010	Air Filter	pCi/Filter	Manganese-54	< 5.07	0.00	----	Acceptable
MRAD-12	2nd / 2010	Water	pCi/L	Manganese-54	< 7.7	0.00	----	Acceptable
MRAD-12	2nd / 2010	Soil	pCi/kg	Plutonium-238	1360	1330	761 - 1870	Acceptable
MRAD-12	2nd / 2010	Vegetation	pCi/kg	Plutonium-238	3090	3040	1640 - 4450	Acceptable
MRAD-12	2nd / 2010	Air Filter	pCi/Filter	Plutonium-238	63.9	64.1	44.0 - 84.3	Acceptable
MRAD-12	2nd / 2010	Water	pCi/L	Plutonium-238	79.5	109	82.4 - 135	Not Acceptable
MRAD-12	2nd / 2010	Soil	pCi/kg	Plutonium-239	1220	1260	860 - 1670	Acceptable
MRAD-12	2nd / 2010	Vegetation	pCi/kg	Plutonium-239	2830	2800	1740 - 3820	Acceptable
MRAD-12	2nd / 2010	Air Filter	pCi/Filter	Plutonium-239	56.6	56.7	41.1 - 73.4	Acceptable
MRAD-12	2nd / 2010	Water	pCi/L	Plutonium-239	103	105	81.2 - 130	Acceptable
MRAD-12	2nd / 2010	Soil	pCi/kg	Potassium-40	11100	10900	7900 - 14800	Acceptable
MRAD-12	2nd / 2010	Vegetation	pCi/kg	Potassium-40	40800	34900	25100 - 49400	Acceptable
MRAD-12	2nd / 2010	Soil	pCi/kg	Strontium-90	7870	8180	2960 - 13300	Acceptable
MRAD-12	2nd / 2010	Soil	pCi/kg	Strontium-90	7870	8180	2960 - 13300	Acceptable
MRAD-12	2nd / 2010	Vegetation	pCi/kg	Strontium-90	7880	9120	5100 - 12100	Acceptable
MRAD-12	2nd / 2010	Air Filter	pCi/Filter	Strontium-90	178	187	82.3 - 291	Acceptable
MRAD-12	2nd / 2010	Water	pCi/L	Strontium-90	708	719	456 - 961	Acceptable
MRAD-12	2nd / 2010	Soil	pCi/kg	Thorium-234	1600	1610	511 - 3070	Acceptable
MRAD-12	2nd / 2010	Soil	pCi/kg	Uranium-234	1230	1620	1030 - 2010	Acceptable
MRAD-12	2nd / 2010	Vegetation	pCi/kg	Uranium-234	1680	1720	1180 - 2280	Acceptable
MRAD-12	2nd / 2010	Air Filter	pCi/Filter	Uranium-234	68.8	62.1	39.1 - 92.0	Acceptable
MRAD-12	2nd / 2010	Water	pCi/L	Uranium-234	62.4	61.4	46.3 - 79.2	Acceptable
MRAD-12	2nd / 2010	Soil	pCi/kg	Uranium-234	< 1158	1620	1030 - 2010	Not Acceptable
MRAD-12	2nd / 2010	Soil	pCi/kg	Uranium-238	1600	1610	984 - 2040	Acceptable
MRAD-12	2nd / 2010	Soil	pCi/kg	Uranium-238	908	1610	984 - 2040	Not Acceptable
MRAD-12	2nd / 2010	Soil	pCi/kg	Uranium-238	1440	1610	984 - 2040	Acceptable
MRAD-12	2nd / 2010	Vegetation	pCi/kg	Uranium-238	1604	1710	1200 - 2160	Acceptable
MRAD-12	2nd / 2010	Vegetation	pCi/kg	Uranium-238	1770	1710	1200 - 2160	Acceptable
MRAD-12	2nd / 2010	Vegetation	pCi/kg	Uranium-238	< 1240	1710	1200 - 2160	Not Acceptable
MRAD-12	2nd / 2010	Air Filter	pCi/Filter	Uranium-238	61.5	61.5	39.4 - 87.3	Acceptable
MRAD-12	2nd / 2010	Air Filter	pCi/Filter	Uranium-238	69.5	61.5	39.4 - 87.3	Acceptable
MRAD-12	2nd / 2010	Air Filter	pCi/Filter	Uranium-238	< 61.2	61.5	39.4 - 87.3	Acceptable
MRAD-12	2nd / 2010	Water	pCi/L	Uranium-238	67.9	60.9	46.5 - 75.5	Acceptable
MRAD-12	2nd / 2010	Water	pCi/L	Uranium-238	66.1	60.9	46.5 - 75.5	Acceptable
MRAD-12	2nd / 2010	Water	pCi/L	Uranium-238	< 155	60.9	46.5 - 75.5	Not Acceptable
MRAD-12	2nd / 2010	Soil	pCi/kg	Uranium-Total	2789	3300	1880 - 4460	Acceptable
MRAD-12	2nd / 2010	Vegetation	pCi/kg	Uranium-Total	3536	3510	2410 - 4530	Acceptable

Sample Number	Quarter / Year	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
MRAD-12	2nd / 2010	Soil	ug/kg	Uranium-Total (mass)	2920	4820	2650 - 6060	Acceptable
MRAD-12	2nd / 2010	Vegetation	ug/kg	Uranium-Total (mass)	5270	5120	3520 - 6610	Acceptable
MRAD-12	2nd / 2010	Vegetation	pCi/kg	Uranium-Total (mass)	5290	5120	3520 - 6610	Acceptable
MRAD-12	2nd / 2010	Air Filter	ug/Filter	Uranium-Total (mass)	183	184	114 - 264	Acceptable
MRAD-12	2nd / 2010	Air Filter	ug/Filter	Uranium-Total (mass)	208	184	114 - 264	Acceptable
MRAD-12	2nd / 2010	Air Filter	ug/Filter	Uranium-Total (mass)	175	184	114 - 264	Acceptable
MRAD-12	2nd / 2010	Water	ug/L	Uranium-Total (mass)	213	182	143 - 225	Acceptable
MRAD-12	2nd / 2010	Water	ug/L	Uranium-Total (mass)	198	182	143 - 225	Acceptable
MRAD-12	2nd / 2010	Soil	pCi/kg	Zinc-65	2790	2470	1960 - 3310	Acceptable
MRAD-12	2nd / 2010	Vegetation	pCi/kg	Zinc-65	1630	1360	983 - 1860	Acceptable
MRAD-12	2nd / 2010	Air Filter	pCi/Filter	Zinc-65	462	389	269 - 539	Acceptable
MRAD-12	2nd / 2010	Water	pCi/L	Zinc-65	632	533	452 - 664	Acceptable
RAD - 82	3rd / 2010	Water	pCi/L	Barium-133	112.0	89.1	75.0 - 98.0	Not Acceptable
RAD - 82	3rd / 2010	Water	pCi/L	Cesium-134	115.0	88.3	72.4 -97.1	Not Acceptable
RAD - 82	3rd / 2010	Water	pCi/L	Cesium-137	271	210	189 - 232	Not Acceptable
RAD - 82	3rd / 2010	Water	pCi/L	Cobalt-60	98.4	72.8	65.5 - 82.5	Not Acceptable
RAD - 82	3rd / 2010	Water	pCi/L	Gross Alpha	65.5	61.1	32.0 - 75.9	Acceptable
RAD - 82	3rd / 2010	Water	pCi/L	Gross Beta	56.7	56.4	38.6 - 63.6	Acceptable
RAD - 82	3rd / 2010	Water	pCi/L	Iodine-131	32.2	28.4	23.6 - 33.3	Acceptable
RAD - 82	3rd / 2010	Water	pCi/L	Radium-226	15.9	17.1	12.7 - 19.6	Acceptable
RAD - 82	3rd / 2010	Water	pCi/L	Radium-228	18.9	16.1	10.8 - 19.4	Acceptable
RAD - 82	3rd / 2010	Water	pCi/L	Strontium-89	60.6	55.3	44.1 - 62.9	Acceptable
RAD - 82	3rd / 2010	Water	pCi/L	Strontium-90	47.1	32.8	24.0 - 38.0	Not Acceptable
RAD - 82	3rd / 2010	Water	pCi/L	Tritium	18500	19800	17300 - 21700	Acceptable
RAD - 82	3rd / 2010	Water	pCi/L	Uranium (Nat)	58.0	49.6	40.2 - 55.1	Not Acceptable
RAD - 82	3rd / 2010	Water	ug/L	Uranium (Nat) Mass	89.1	72.3	58.7 - 80.4	Not Acceptable
RAD - 82	3rd / 2010	Water	pCi/L	Zinc-65	161	110	99.0 - 131	Not Acceptable
MAPEP-10-MaS22	3rd / 2010	Soil	Bq/kg	Americium-241	0.07	0.00	----	Acceptable
MAPEP-10-RdF22	3rd / 2010	Filter	Bq/sample	Americium-241	0.2637	0.146	0.102 - 0.190	Not Acceptable
MAPEP-10-RdV22	3rd / 2010	Vegetation	Bq/sample	Americium-241	0.179	0.225	0.158 - 0.293	Acceptable
MAPEP-10-MaS22	3rd / 2010	Soil	Bq/kg	Cesium-134	744.67	733	513 - 953	Acceptable
MAPEP-10-RdF22	3rd / 2010	Filter	Bq/sample	Cesium-134	4.323	2.13	1.49 - 2.77	Not Acceptable
MAPEP-10-RdV22	3rd / 2010	Vegetation	Bq/sample	Cesium-134	3.098	4.39	3.07 - 5.71	Acceptable

Sample Number	Quarter / Year	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
MAPEP-10-MaS22	3 rd / 2010	Soil	Bq/kg	Cesium-137	831.7	779	545 - 1013	Acceptable
MAPEP-10-RdF22	3 rd / 2010	Filter	Bq/sample	Cesium-137	3.070	1.53	1.07 - 1.99	Not Acceptable
MAPEP-10-RdV22	3 rd / 2010	Vegetation	Bq/sample	Cesium-137	2.185	3.06	2.14 - 3.98	Acceptable
MAPEP-10-MaS22	3 rd / 2010	Soil	Bq/kg	Cobalt-57	536.0	522	365 - 679	Acceptable
MAPEP-10-RdV22	3 rd / 2010	Vegetation	Bq/sample	Cobalt-57	0.009	0.00	----	Acceptable
MAPEP-10-MaS22	3 rd / 2010	Soil	Bq/kg	Cobalt-60	670.3	622	435 - 809	Acceptable
MAPEP-10-RdF22	3 rd / 2010	Filter	Bq/sample	Cobalt-60	5.187	2.473	1.731 - 3.215	Not Acceptable
MAPEP-10-RdV22	3 rd / 2010	Vegetation	Bq/sample	Cobalt-60	3.076	3.27	2.29 - 4.25	Acceptable
MAPEP-10-GrF22	3 rd / 2010	Filter	Bq/sample	Gross Alpha	0.303	0.427	>0.0 - 0.854	Acceptable
MAPEP-10-GrF22	3 rd / 2010	Filter	Bq/sample	Gross Beta	1.433	1.29	0.65 - 1.94	Acceptable
MAPEP-10-MaS22	3 rd / 2010	Soil	Bq/kg	Iron-55	83.6	0.00	----	Acceptable
MAPEP-10-MaS22	3 rd / 2010	Soil	Bq/kg	Manganese-54	940.7	849	594 - 1104	Acceptable
MAPEP-10-RdF22	3 rd / 2010	Filter	Bq/sample	Manganese-54	6.483	3.02	2.11 - 3.93	Not Acceptable
MAPEP-10-RdV22	3 rd / 2010	Vegetation	Bq/sample	Manganese-54	0.004	0.00	----	Acceptable
MAPEP-10-MaS22	3 rd / 2010	Soil	Bq/kg	Nickel-63	489	477	334 - 620	Acceptable
MAPEP-10-MaS22	3 rd / 2010	Soil	Bq/kg	Plutonium-238	17.9	24	16.9 - 31.3	Acceptable
MAPEP-10-RdF22	3 rd / 2010	Filter	Bq/sample	Plutonium-238	0.010	0.0010	----	Acceptable
MAPEP-10-RdV22	3 rd / 2010	Vegetation	Bq/sample	Plutonium-238	0.149	0.160	0.112 - 0.208	Acceptable
MAPEP-10-MaS22	3 rd / 2010	Soil	Bq/kg	Plutonium-239/240	0.21	0.00	----	Acceptable
MAPEP-10-RdF22	3 rd / 2010	Filter	Bq/sample	Plutonium-239/240	0.164	0.0832	0.0582 - 0.1082	Not Acceptable
MAPEP-10-RdV22	3 rd / 2010	Vegetation	Bq/sample	Plutonium-239/240	0.0026	0.0008	----	Acceptable
MAPEP-10-MaS22	3 rd / 2010	Soil	Bq/kg	Potassium-40	638.7	559	391 - 727	Acceptable
MAPEP-10-MaS22	3 rd / 2010	Soil	Bq/kg	Strontium-90	261.0	288	202 - 374	Acceptable
MAPEP-10-RdF22	3 rd / 2010	Filter	Bq/sample	Strontium-90	-0.004	0.00	----	Acceptable
MAPEP-10-RdV22	3 rd / 2010	Vegetation	Bq/sample	Strontium-90	0.033	0.00	----	Acceptable
MAPEP-10-MaS22	3 rd / 2010	Soil	Bq/kg	Technetium-99	-3.0	0.00	----	Acceptable
MAPEP-10-MaS22	3 rd / 2010	Soil	Bq/kg	Uranium-234/233	65.27	60	42 -78	Acceptable
MAPEP-10-RdF22	3 rd / 2010	Filter	Bq/sample	Uranium-234/233	0.137	0.068	0.048 - 0.088	Not Acceptable
MAPEP-10-RdV22	3 rd / 2010	Vegetation	Bq/sample	Uranium-234/233	0.184	0.216	0.151 - 0.281	Acceptable
MAPEP-10-RdF22	3 rd / 2010	Filter	ug/sample	Uranium-235	0.0756	0.0381	0.0267 - 0.0495	Not Acceptable
MAPEP-10-RdV22	3 rd / 2010	Vegetation	ug/sample	Uranium-235	0.090	0.1250	0.0875 - 0.1625	Acceptable

Sample Number	Quarter / Year	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
MAPEP-10-MaS22	3 rd / 2010	Soil	Bq/kg	Uranium-238	70.23	64	45 - 83	Acceptable
MAPEP-10-RdF22	3 rd / 2010	Filter	ug/sample	Uranium-238	10.2	5.7	4.0 - 7.4	Not Acceptable
MAPEP-10-RdF22	3 rd / 2010	Filter	Bq/sample	Uranium-238	0.147	0.071	0.050 - 0.092	Not Acceptable
MAPEP-10-RdV22	3 rd / 2010	Vegetation	ug/sample	Uranium-238	12.5	17.9	12.5 - 23.3	Not Acceptable
MAPEP-10-RdV22	3 rd / 2010	Vegetation	Bq/sample	Uranium-238	0.184	0.223	0.156 - 0.290	Acceptable
MAPEP-10-RdF22	3 rd / 2010	Filter	ug/sample	Uranium-Total	10.2	5.7	4.0 - 7.4	Not Acceptable
MAPEP-10-RdV22	3 rd / 2010	Vegetation	ug/sample	Uranium-Total	13.9	18.0	12.6 - 23.4	Acceptable
MAPEP-10-MaS22	3 rd / 2010	Soil	Bq/kg	Zinc-65	-2.89	0.0	----	Acceptable
MAPEP-10-RdF22	3 rd / 2010	Filter	Bq/sample	Zinc-65	-0.106	0.00	----	Acceptable
MAPEP-10-RdV22	3 rd / 2010	Vegetation	Bq/sample	Zinc-65	6.844	7.10	4.97 - 9.23	Acceptable
E7119-278	3 rd / 2010	Milk	pCi/L	Cesium-134	1.37E+02	1.26E+02	1.09	Acceptable
E7119-278	3 rd / 2010	Milk	pCi/L	Cesium-137	1.68E+02	1.50E+02	1.12	Acceptable
E7119-278	3 rd / 2010	Milk	pCi/L	Cobalt-58	1.13E+02	1.01E+02	1.12	Acceptable
E7119-278	3 rd / 2010	Milk	pCi/L	Cobalt-60	2.14E+02	1.97E+02	1.09	Acceptable
E7119-278	3 rd / 2010	Milk	pCi/L	Cr-51	3.90E+02	3.39E+02	1.15	Acceptable
E7117-278	3 rd / 2010	Milk	pCi/L	Iodine-131	7.97E+01	8.02E+01	0.99	Acceptable
E7119-278	3 rd / 2010	Milk	pCi/L	Iodine-131	1.06E+02	9.69E+01	1.09	Acceptable
E7119-278	3 rd / 2010	Milk	pCi/L	Iron-59	1.55E+02	1.19E+02	1.30	Not Acceptable
E7119-278	3 rd / 2010	Milk	pCi/L	Manganese-54	1.99E+02	1.69E+02	1.18	Acceptable
E7118-278	3 rd / 2010	Milk	pCi/L	Strontium-89	7.95E+01	9.34E+01	0.85	Acceptable
E7118-278	3 rd / 2010	Milk	pCi/L	Strontium-90	1.57E+01	1.67E+01	0.94	Acceptable
E7119-278	3 rd / 2010	Milk	pCi/L	Zinc-65	2.40E+02	2.06E+02	1.17	Acceptable
090710N	3 rd / 2010	Water	pCi/L	Barium-133	86.9	92.9	78.3 - 102	Acceptable
090710N	3 rd / 2010	Water	pCi/L	Cesium-134	93.8	79.4	65.0 - 87.3	Not Acceptable
090710N	3 rd / 2010	Water	pCi/L	Cesium-137	55.5	54.6	49.1 - 62.9	Acceptable
090710N	3 rd / 2010	Water	pCi/L	Cobalt-60	120.0	117	105 - 131	Acceptable
090710N	3 rd / 2010	Water	pCi/L	Uranium (Nat)	34.9	33.8	27.3 - 37.8	Acceptable
090710N	3 rd / 2010	Water	ug/L	Uranium (Nat) Mass	48.6	49.3	39.8 - 55.1	Acceptable
090710N	3 rd / 2010	Water	pCi/L	Zinc-65	129	99.5	89.6 - 119	Not Acceptable
MAPEP-10-MaW22	3 rd / 2010	Water	Bq/L	Americium-241	1.0323	1.30	0.91 - 1.69	Acceptable
MAPEP-10-MaW22	3 rd / 2010	Water	Bq/L	Cesium-134	0.027	0.00	----	Acceptable
MAPEP-10-MaW22	3 rd / 2010	Water	Bq/L	Cesium-137	63.1	60.6	42.4 - 78.8	Acceptable
MAPEP-10-MaW22	3 rd / 2010	Water	Bq/L	Cobalt-57	29.2	28.3	19.8 - 36.8	Acceptable
MAPEP-10-MaW22	3 rd / 2010	Water	Bq/L	Cobalt-60	-0.021	0.00	----	Acceptable

Sample Number	Quarter / Year	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
MAPEP-10-GrW22	3 rd / 2010	Water	Bq/L	Gross Alpha	0.559	0.676	>0.0 - 1.352	Acceptable
MAPEP-10-GrW22	3 rd / 2010	Water	Bq/L	Gross Beta	3.110	3.09	1.55 - 4.64	Acceptable
MAPEP-10-MaW22	3 rd / 2010	Water	Bq/L	Iron-55	0.24	0.00	----	Acceptable
MAPEP-10-MaW22	3 rd / 2010	Water	Bq/L	Manganese-54	28.83	26.9	18.8 - 35.0	Acceptable
MAPEP-10-MaW22	3 rd / 2010	Water	Bq/L	Nickel-63	57.7	59.9	41.9 - 77.9	Acceptable
MAPEP-10-MaW22	3 rd / 2010	Water	Bq/L	Plutonium-238	1.213	1.93	1.35 - 2.51	Not Acceptable
MAPEP-10-MaW22	3 rd / 2010	Water	Bq/L	Plutonium-239/240	0.026	0.009	----	Acceptable
MAPEP-10-MaW22	3 rd / 2010	Water	Bq/L	Strontium-90	-0.01	0.00	----	Acceptable
MAPEP-10-MaW22	3 rd / 2010	Water	Bq/L	Technetium-99	-0.4	0.00	----	Acceptable
MAPEP-10-MaW22	3 rd / 2010	Water	Bq/L	Tritium	107	90.8	63.6 - 118.0	Acceptable
MAPEP-10-MaW22	3 rd / 2010	Water	Bq/L	Uranium-234/233	1.163	1.22	0.85 - 1.59	Acceptable
MAPEP-10-MaW22	3 rd / 2010	Water	Bq/L	Uranium-238	1.223	1.25	0.88 - 1.63	Acceptable
MAPEP-10-MaW22	3 rd / 2010	Water	Bq/L	Zinc-65	45.9	40.7	28.5 - 52.9	Acceptable
E7195-278	4th / 2010	Milk	pCi/L	Cerium-141	1.39E+02	1.30E+02	1.07	Acceptable
E7195-278	4th / 2010	Milk	pCi/L	Cesium-134	9.85E+01	9.30E+01	1.06	Acceptable
E7196-278	4th / 2010	Water	pCi/L	Cesium-134	1.22E+02	1.18E+02	1.03	Acceptable
E7195-278	4th / 2010	Milk	pCi/L	Cesium-137	9.87E+01	9.45E+01	1.04	Acceptable
E7196-278	4th / 2010	Water	pCi/L	Cesium-137	1.24E+02	1.20E+02	1.03	Acceptable
E7195-278	4th / 2010	Milk	pCi/L	Cobalt-58	7.02E+01	7.37E+01	0.95	Acceptable
E7196-278	4th / 2010	Water	pCi/L	Cobalt-58	9.63E+01	9.35E+01	1.03	Acceptable
E7195-278	4th / 2010	Milk	pCi/L	Cobalt-60	1.77E+02	1.71E+02	1.04	Acceptable
E7196-278	4th / 2010	Water	pCi/L	Cobalt-60	2.34E+02	2.17E+02	1.08	Acceptable
E7195-278	4th / 2010	Milk	pCi/L	Cr-51	2.48E+02	2.34E+02	1.06	Acceptable
E7196-278	4th / 2010	Water	pCi/L	Cr-51	3.12E+02	2.97E+02	1.05	Acceptable
E7193-278	4th / 2010	Cartridge	pCi	Iodine-131	5.97E+01	6.02E+01	0.99	Acceptable
E7195-278	4th / 2010	Milk	pCi/L	Iodine-131	1.01E+02	9.41E+02	1.07	Acceptable
E7196-278	4th / 2010	Water	pCi/L	Iodine-131	7.24E+01	6.44E+01	1.12	Acceptable
E7195-278	4th / 2010	Milk	pCi/L	Iron-59	1.02E+02	9.11E+01	1.12	Acceptable
E7196-278	4th / 2010	Water	pCi/L	Iron-59	1.42E+02	1.16E+02	1.23	Acceptable
E7195-278	4th / 2010	Milk	pCi/L	Manganese-54	1.20E+02	1.19E+02	1.01	Acceptable
E7196-278	4th / 2010	Water	pCi/L	Manganese-54	1.70E+02	1.52E+02	1.12	Acceptable
E7194-278	4th / 2010	Milk	pCi/L	Strontium-89	7.62E+01	9.28E+01	0.82	Acceptable
E7194-278	4th / 2010	Milk	pCi/L	Strontium-90	1.30E+01	1.47E+01	0.88	Acceptable
E7195-278	4th / 2010	Milk	pCi/L	Zinc-65	2.37E+02	2.04E+02	1.16	Acceptable
E7196-278	4th / 2010	Water	pCi/L	Zinc-65	2.97E+02	2.59E+02	1.15	Acceptable
NY-337 3762	4th / 2010	Water	pCi/L	Barium-133	50.5	50.9	43.3 - 59.4	Acceptable

Sample Number	Quarter / Year	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
NY-337 3762	4th / 2010	Water	pCi/L	Cesium-134	51.0	42.0	35.8 - 49.2	Not Acceptable
NY-337 3762	4th / 2010	Water	pCi/L	Cesium-137	29.3	27.3	22.4 - 32.1	Acceptable
NY-337 3762	4th / 2010	Water	pCi/L	Cobalt-60	13.6	13.2	9.72 - 16.7	Acceptable
NY-337 3763	4th / 2010	Water	pCi/L	Gross Alpha	32.8	41.6	24.3 - 58.9	Acceptable
NY-337 3763	4th / 2010	Water	pCi/L	Gross Beta	29.3	27.5	18.3 - 36.7	Acceptable
NY-337 3764	4th / 2010	Water	pCi/L	Iodine-131	13.4	18.2	14.7 - 21.7	Not Acceptable
NY-337 3764	4th / 2010	Water	pCi/L	Iodine-131	13.5	18.2	14.7 - 21.7	Not Acceptable
NY-337 3765	4th / 2010	Water	pCi/L	Radium-226	13.2	10.6	8.30 - 12.9	Not Acceptable
NY-337 3765	4th / 2010	Water	pCi/L	Radium-228	6.51	6.07	3.91 - 8.22	Acceptable
NY-337 3761	4th / 2010	Water	pCi/L	Strontium-89	47.8	61.3	51.3 - 71.4	Not Acceptable
NY-337 3761	4th / 2010	Water	pCi/L	Strontium-90	12.0	14.9	11.0 - 18.8	Acceptable
NY-337 3766	4th / 2010	Water	pCi/L	Tritium	14400	15300	13500 - 17000	Acceptable
NY-337 3765	4th / 2010	Water	pCi/L	Uranium (activity)	17.5	16.0	13.2 - 18.7	Acceptable
NY-337 3762	4th / 2010	Water	pCi/L	Zinc-65	134	122	104 - 138	Acceptable
100510N	4th / 2010	Water	pCi/L	Strontium-89	49.9	51.4	40.6 - 58.9	Acceptable
100510N	4th / 2010	Water	pCi/L	Strontium-90	35.4	41.3	30.4 - 47.5	Acceptable
RAD - 83	4th / 2010	Water	pCi/L	Strontium-90	41.5	43	31.7 - 49.3	Acceptable
112210H1	4th / 2010	Water	pCi/L	Barium-133	66.3	65.9	54.9 - 72.5	Acceptable
112210H1	4th / 2010	Water	pCi/L	Cesium-134	71.6	71.6	58.4 - 78.8	Acceptable
112210H1	4th / 2010	Water	pCi/L	Cesium-137	151	146	131 - 163	Acceptable
112210H1	4th / 2010	Water	pCi/L	Cobalt-60	90.2	84.5	76.0 - 95.3	Acceptable
112210H1	4th / 2010	Water	pCi/L	Zinc-65	207	186	167 - 219	Acceptable
112210H2	4th / 2010	Water	pCi/L	Plutonium-238	102.0	108	81.7 - 134	Acceptable
112210H2	4th / 2010	Water	pCi/L	Plutonium-239	77.6	86.3	66.8 - 107	Acceptable
MRAD-13	4th / 2010	Soil	pCi/kg	Actinium-228	1460	1830	1170 - 2580	Acceptable
MRAD-13	4th / 2010	Soil	pCi/kg	Americium-241	845	1120	669 - 1440	Acceptable
MRAD-13	4th / 2010	Soil	pCi/kg	Americium-241	928	1120	669 - 1440	Acceptable
MRAD-13	4th / 2010	Vegetation	pCi/kg	Americium-241	4000	4760	2710 - 6540	Acceptable
MRAD-13	4th / 2010	Air Filter	pCi/Filter	Americium-241	70.1	74.1	43.3 - 102	Acceptable
MRAD-13	4th / 2010	Water	pCi/L	Americium-241	164	176	120 - 238	Acceptable
MRAD-13	4th / 2010	Water	pCi/L	Americium-241	178	176	120 - 238	Acceptable
MRAD-13	4th / 2010	Soil	pCi/kg	Bismuth-212	< 538	2070	543 - 3100	Not Acceptable
MRAD-13	4th / 2010	Soil	pCi/kg	Bismuth-214	818	983	603 - 1410	Acceptable
MRAD-13	4th / 2010	Soil	pCi/kg	Cesium-134	2230	2240	1440 - 2700	Acceptable
MRAD-13	4th / 2010	Vegetation	pCi/kg	Cesium-134	1200	1040	595 - 1440	Acceptable
MRAD-13	4th / 2010	Air Filter	pCi/Filter	Cesium-134	405	388	253 - 480	Acceptable
MRAD-13	4th / 2010	Water	pCi/L	Cesium-134	495	492	363 - 565	Acceptable

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MRAD-13	4th / 2010	Soil	pCi/kg	Cesium-137	3400	3530	2700 - 4580	Acceptable
MRAD-13	4th / 2010	Vegetation	pCi/kg	Cesium-137	1420	1260	924 - 1750	Acceptable
MRAD-13	4th / 2010	Air Filter	pCi/Filter	Cesium-137	532	514	386 - 675	Acceptable
MRAD-13	4th / 2010	Water	pCi/L	Cesium-137	620	625	531 - 749	Acceptable
MRAD-13	4th / 2010	Soil	pCi/kg	Cobalt-60	4580	4780	3480 - 6420	Acceptable
MRAD-13	4th / 2010	Vegetation	pCi/kg	Cobalt-60	1130	1010	683 - 1450	Acceptable
MRAD-13	4th / 2010	Air Filter	pCi/Filter	Cobalt-60	531	479	371 - 598	Acceptable
MRAD-13	4th / 2010	Water	pCi/L	Cobalt-60	732	714	622 - 844	Acceptable
MRAD-13	4th / 2010	Air Filter	pCi/Filter	Gross Alpha	74.2	52.3	27.1 - 78.7	Acceptable
MRAD-13	4th / 2010	Water	pCi/L	Gross Alpha	145	146	64.8 - 216	Acceptable
MRAD-13	4th / 2010	Air Filter	pCi/Filter	Gross Beta	55.6	52.7	32.5 - 77.0	Acceptable
MRAD-13	4th / 2010	Water	pCi/L	Gross Beta	171	143	83.6 - 210	Acceptable
MRAD-13	4th / 2010	Air Filter	pCi/Filter	Iron-55	707	626	275 - 974	Acceptable
MRAD-13	4th / 2010	Water	pCi/L	Iron-55	1220	825	480 - 1100	Not Acceptable
MRAD-13	4th / 2010	Soil	pCi/kg	Lead-212	1550	1640	1060 - 2310	Acceptable
MRAD-13	4th / 2010	Soil	pCi/kg	Lead-214	1030	969	580 - 1440	Acceptable
MRAD-13	4th / 2010	Soil	pCi/kg	Manganese-54	< 38.0	0.00	----	Acceptable
MRAD-13	4th / 2010	Vegetation	pCi/kg	Manganese-54	< 39.8	0.00	----	Acceptable
MRAD-13	4th / 2010	Water	pCi/L	Manganese-54	< 5	0.00	----	Acceptable
MRAD-13	4th / 2010	Soil	pCi/kg	Plutonium-238	1170	1280	733 - 1800	Acceptable
MRAD-13	4th / 2010	Vegetation	pCi/kg	Plutonium-238	3740	4740	2560 - 6940	Acceptable
MRAD-13	4th / 2010	Air Filter	pCi/Filter	Plutonium-238	70.8	72.9	50.0 - 95.8	Acceptable
MRAD-13	4th / 2010	Water	pCi/L	Plutonium-238	157	162	122 - 201	Acceptable
MRAD-13	4th / 2010	Soil	pCi/kg	Plutonium-239	1070	1180	805 - 1570	Acceptable
MRAD-13	4th / 2010	Vegetation	pCi/kg	Plutonium-239	3590	4470	2770 - 6100	Acceptable
MRAD-13	4th / 2010	Air Filter	pCi/Filter	Plutonium-239	65.6	69.6	50.5 - 90.1	Acceptable
MRAD-13	4th / 2010	Water	pCi/L	Plutonium-239	136	148	114 - 183	Acceptable
MRAD-13	4th / 2010	Soil	pCi/kg	Potassium-40	10500	10700	7760 - 14500	Acceptable
MRAD-13	4th / 2010	Vegetation	pCi/kg	Potassium-40	29000	22600	16200 - 32000	Acceptable
MRAD-13	4th / 2010	Soil	pCi/kg	Strontium-90	10953	9270	3350 - 15100	Acceptable
MRAD-13	4th / 2010	Vegetation	pCi/kg	Strontium-90	9800	7810	4360 - 10400	Acceptable
MRAD-13	4th / 2010	Air Filter	pCi/Filter	Strontium-90	80.2	159	70.0 - 247	Acceptable
MRAD-13	4th / 2010	Water	pCi/L	Strontium-90	817	921	585 - 1230	Acceptable
MRAD-13	4th / 2010	Soil	pCi/kg	Thorium-234	1010	1340	425 - 2550	Acceptable
MRAD-13	4th / 2010	Water	pCi/L	Tritium	20900	21600	14100 - 31900	Acceptable
MRAD-13	4th / 2010	Soil	pCi/kg	Uranium-234	899	1360	862 - 1690	Acceptable
MRAD-13	4th / 2010	Soil	pCi/kg	Uranium-234	1190	1360	862 - 1690	Acceptable
MRAD-13	4th / 2010	Soil	pCi/kg	Uranium-234	1110	1360	862 - 1690	Acceptable

Sample Number	Quarter / Year	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
MRAD-13	4th / 2010	Vegetation	pCi/kg	Uranium-234	3600	4010	2750 - 5320	Acceptable
MRAD-13	4th / 2010	Air Filter	pCi/Filter	Uranium-234	73.5	71.8	45.2 - 106	Acceptable
MRAD-13	4th / 2010	Air Filter	pCi/Filter	Uranium-234	69.9	71.8	45.2 - 106	Acceptable
MRAD-13	4th / 2010	Water	pCi/L	Uranium-234	106	109	82.2 - 140	Acceptable
MRAD-13	4th / 2010	Water	pCi/L	Uranium-234	106	109	82.2 - 140	Acceptable
MRAD-13	4th / 2010	Water	pCi/L	Uranium-234	104	109	82.2 - 140	Acceptable
MRAD-13	4th / 2010	Soil	pCi/kg	Uranium-238	1010	1340	819 - 1700	Acceptable
MRAD-13	4th / 2010	Soil	pCi/kg	Uranium-238	1080	1340	819 - 1700	Acceptable
MRAD-13	4th / 2010	Soil	pCi/kg	Uranium-238	903	1340	819 - 1700	Acceptable
MRAD-13	4th / 2010	Soil	pCi/kg	Uranium-238	1090	1340	819 - 1700	Acceptable
MRAD-13	4th / 2010	Vegetation	pCi/kg	Uranium-238	4000	3980	2800 - 5030	Acceptable
MRAD-13	4th / 2010	Air Filter	pCi/Filter	Uranium-238	75.5	71.2	45.6 - 101	Acceptable
MRAD-13	4th / 2010	Air Filter	pCi/Filter	Uranium-238	66.8	71.2	45.6 - 101	Acceptable
MRAD-13	4th / 2010	Water	pCi/L	Uranium-238	107	108	82.5 - 134	Acceptable
MRAD-13	4th / 2010	Water	pCi/L	Uranium-238	114	108	82.5 - 134	Acceptable
MRAD-13	4th / 2010	Water	pCi/L	Uranium-238	108	108	82.5 - 134	Acceptable
MRAD-13	4th / 2010	Soil	pCi/kg	Uranium-Total	2027.4	2770	1580 - 3740	Acceptable
MRAD-13	4th / 2010	Soil	ug/kg	Uranium-Total	2093	2770	1580 - 3740	Acceptable
MRAD-13	4th / 2010	Soil	pCi/kg	Uranium-Total	2253	2770	1580 - 3740	Acceptable
MRAD-13	4th / 2010	Air Filter	pCi/Filter	Uranium-Total	149	146	74.6 - 232	Acceptable
MRAD-13	4th / 2010	Air Filter	pCi/Filter	Uranium-Total	142	146	74.6 - 232	Acceptable
MRAD-13	4th / 2010	Water	pCi/L	Uranium-Total	218	221	159 - 294	Acceptable
MRAD-13	4th / 2010	Water	pCi/L	Uranium-Total	226.8	221	159 - 294	Acceptable
MRAD-13	4th / 2010	Water	pCi/L	Uranium-Total	217	221	159 - 294	Acceptable
MRAD-13	4th / 2010	Soil	ug/kg	Uranium-Total (mass)	3240	4040	2220 - 5080	Acceptable
MRAD-13	4th / 2010	Soil	pCi/kg	Uranium-Total (mass)	2685	4040	2220 - 5080	Acceptable
MRAD-13	4th / 2010	Soil	ug/kg	Uranium-Total (mass)	3241	4040	2220 - 5080	Acceptable
MRAD-13	4th / 2010	Soil	ug/kg	Uranium-Total (mass)	2820	4040	2220 - 5080	Acceptable
MRAD-13	4th / 2010	Vegetation	ug/kg	Uranium-Total (mass)	12000	11900	8180 - 15400	Acceptable
MRAD-13	4th / 2010	Air Filter	ug/Filter	Uranium-Total (mass)	224.5	213	132 - 306	Acceptable
MRAD-13	4th / 2010	Air Filter	ug/Filter	Uranium-Total (mass)	201	213	132 - 306	Acceptable
MRAD-13	4th / 2010	Air Filter	ug/Filter	Uranium-Total (mass)	192	213	132 - 306	Acceptable
MRAD-13	4th / 2010	Water	ug/L	Uranium-Total (mass)	318	323	253 - 399	Acceptable
MRAD-13	4th / 2010	Water	ug/L	Uranium-Total (mass)	342	323	253 - 399	Acceptable
MRAD-13	4th / 2010	Water	ug/L	Uranium-Total (mass)	321	323	253 - 399	Acceptable
MRAD-13	4th / 2010	Soil	pCi/kg	Zinc-65	2420	2300	1820 - 3080	Acceptable

Sample Number	Quarter / Year	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
MRAD-13	4th / 2010	Vegetation	pCi/kg	Zinc-65	1380	1210	874 - 1650	Acceptable
MRAD-13	4th / 2010	Air Filter	pCi/Filter	Zinc-65	552	465	322 - 644	Acceptable
MRAD-13	4th / 2010	Water	pCi/L	Zinc-65	557	489	414 - 610	Acceptable
122810P	4th / 2010	Water	pCi/L	Barium-133	70.9	68.9	57.5 - 75.8	Acceptable
122810P	4th / 2010	Water	pCi/L	Cesium-134	43.0	43.2	34.5 - 47.5	Acceptable
122810P	4th / 2010	Water	pCi/L	Cesium-137	122	123	111 - 138	Acceptable
122810P	4th / 2010	Water	pCi/L	Cobalt-60	58.7	53.4	48.1 - 61.3	Acceptable
122810P	4th / 2010	Water	pCi/L	Zinc-65	116	102	91.8 - 122	Acceptable

TABLE 2
2010 ECKERT & ZIEGLER ANALYTICS PERFORMANCE EVALUATION RESULTS SUMMARY

Sample Number	Quarter / Year	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
E7054-278	2nd / 2010	Milk	pCi/L	Cerium-141	2.61E+02	2.61E+02	1.00	Acceptable
E7055-278	2nd / 2010	Water	pCi/L	Cerium-141	2.78E+02	2.63E+02	1.06	Acceptable
E6924-278	2nd / 2010	Milk	pCi/L	Cerium-141	2.01E+02	2.02E+02	0.99	Acceptable
E6925-278	2nd / 2010	Water	pCi/L	Cerium-141	2.04E+02	2.04E+02	1.00	Acceptable
E6924-278	2nd / 2010	Milk	pCi/L	Cerium-141	2.01E+02	2.02E+02	0.99	Acceptable
E6925-278	2nd / 2010	Water	pCi/L	Cerium-141	2.04E+02	2.04E+02	1.00	Acceptable
E7054-278	2nd / 2010	Milk	pCi/L	Cesium-137	1.61E+02	1.58E+02	1.02	Acceptable
E7055-278	2nd / 2010	Water	pCi/L	Cesium-137	1.71E+02	1.59E+02	1.07	Acceptable
E6924-278	2nd / 2010	Milk	pCi/L	Cesium-134	2.41E+02	2.53E+02	0.95	Acceptable
E6925-278	2nd / 2010	Water	pCi/L	Cesium-134	2.56E+02	2.55E+02	1.00	Acceptable
E6924-278	2nd / 2010	Milk	pCi/L	Cesium-134	2.41E+02	2.53E+02	0.95	Acceptable
E6925-278	2nd / 2010	Water	pCi/L	Cesium-134	2.56E+02	2.55E+02	1.00	Acceptable
E7054-278	2nd / 2010	Milk	pCi/L	Cesium-134	1.76E+02	1.78E+02	0.99	Acceptable
E7055-278	2nd / 2010	Water	pCi/L	Cesium-134	1.85E+02	1.79E+02	1.03	Acceptable
E6924-278	2nd / 2010	Milk	pCi/L	Cesium-137	1.71E+02	1.79E+02	0.96	Acceptable
E6925-278	2nd / 2010	Water	pCi/L	Cesium-137	1.81E+02	1.81E+02	1.00	Acceptable
E6924-278	2nd / 2010	Milk	pCi/L	Cesium-137	1.71E+02	1.79E+02	0.96	Acceptable
E6925-278	2nd / 2010	Water	pCi/L	Cesium-137	1.81E+02	1.81E+02	1.00	Acceptable
E7054-278	2nd / 2010	Milk	pCi/L	Chromium-51	3.81E+02	3.61E+02	1.05	Acceptable
E7055-278	2nd / 2010	Water	pCi/L	Chromium-51	3.86E+02	3.64E+02	1.06	Acceptable
E6924-278	2nd / 2010	Milk	pCi/L	Chromium-51	5.54E+02	5.48E+02	1.01	Acceptable

Sample Number	Quarter / Year	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
E6924-278	2nd / 2010	Milk	pCi/L	Chromium-51	5.54E+02	5.48E+02	1.01	Acceptable
E6925-278	2nd / 2010	Water	pCi/L	Chromium-51	5.78E+02	5.54E+02	1.04	Acceptable
E7054-278	2nd / 2010	Milk	pCi/L	Cobalt-58	1.45E+02	1.43E+02	1.02	Acceptable
E7055-278	2nd / 2010	Water	pCi/L	Cobalt-58	1.51E+02	1.44E+02	1.05	Acceptable
E6924-278	2nd / 2010	Milk	pCi/L	Cobalt-58	2.03E+02	2.11E+02	0.96	Acceptable
E6925-278	2nd / 2010	Water	pCi/L	Cobalt-58	2.19E+02	2.13E+02	1.03	Acceptable
E6924-278	2nd / 2010	Milk	pCi/L	Cobalt-58	2.03E+02	2.11E+02	0.96	Acceptable
E6925-278	2nd / 2010	Water	pCi/L	Cobalt-58	2.19E+02	2.13E+02	1.03	Acceptable
E7054-278	2nd / 2010	Milk	pCi/L	Cobalt-60	1.90E+02	1.83E+02	1.04	Acceptable
E7055-278	2nd / 2010	Water	pCi/L	Cobalt-60	1.94E+02	1.85E+02	1.05	Acceptable
E6924-278	2nd / 2010	Milk	pCi/L	Cobalt-60	2.47E+02	2.56E+02	0.97	Acceptable
E6925-278	2nd / 2010	Water	pCi/L	Cobalt-60	2.67E+02	2.58E+02	1.03	Acceptable
E6924-278	2nd / 2010	Milk	pCi/L	Cobalt-60	2.47E+02	2.56E+02	0.97	Acceptable
E6925-278	2nd / 2010	Water	pCi/L	Cobalt-60	2.67E+02	2.58E+02	1.03	Acceptable
E7052-278	2nd / 2010	Cartridge	pCi	Iodine-131	8.58E+01	8.54E+01	1.00	Acceptable
E7054-278	2nd / 2010	Milk	pCi/L	Iodine-131	6.91E+01	7.40E+01	0.93	Acceptable
E7055-278	2nd / 2010	Water	pCi/L	Iodine-131	8.12E+01	7.22E+01	1.12	Acceptable
E6922-278	2nd / 2010	Cartridge	pCi	Iodine-131	9.02E+01	9.39E+01	0.96	Acceptable
E6924-278	2nd / 2010	Milk	pCi/L	Iodine-131	8.25E+01	8.73E+01	0.95	Acceptable
E6925-278	2nd / 2010	Water	pCi/L	Iodine-131	1.00E+02	9.61E+01	1.04	Acceptable
E6922-278	2nd / 2010	Cartridge	pCi	Iodine-131	9.02E+01	9.39E+01	0.96	Acceptable
E6924-278	2nd / 2010	Milk	pCi/L	Iodine-131	8.25E+01	8.73E+01	0.95	Acceptable
E6925-278	2nd / 2010	Water	pCi/L	Iodine-131	1.00E+02	9.61E+01	1.04	Acceptable
E7054-278	2nd / 2010	Milk	pCi/L	Iron-59	1.60E+02	1.37E+02	1.17	Acceptable

Sample Number	Quarter / Year	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
E6924-278	2nd / 2010	Milk	pCi/L	Iron-59	1.88E+02	1.78E+02	1.06	Acceptable
E6925-278	2nd / 2010	Water	pCi/L	Iron-59	1.94E+02	1.79E+02	1.08	Acceptable
E6924-278	2nd / 2010	Milk	pCi/L	Iron-59	1.88E+02	1.78E+02	1.06	Acceptable
E6925-278	2nd / 2010	Water	pCi/L	Iron-59	1.94E+02	1.79E+02	1.08	Acceptable
E6924-278	2nd / 2010	Milk	pCi/L	Manganese-54	1.83E+02	1.78E+02	1.03	Acceptable
E6925-278	2nd / 2010	Water	pCi/L	Manganese-54	1.90E+02	1.79E+02	1.06	Acceptable
E6924-278	2nd / 2010	Milk	pCi/L	Manganese-54	1.83E+02	1.78E+02	1.03	Acceptable
E6925-278	2nd / 2010	Water	pCi/L	Manganese-54	1.90E+02	1.79E+02	1.06	Acceptable
E7054-278	2nd / 2010	Milk	pCi/L	Manganese-54	2.10E+02	2.07E+02	1.01	Acceptable
E7055-278	2nd / 2010	Water	pCi/L	Manganese-54	2.30E+02	2.09E+02	1.1	Acceptable
E7053-278	2nd / 2010	Milk	pCi/L	Strontium-89	7.91E+01	9.28E+01	0.85	Acceptable
E6923-278	2nd / 2010	Milk	pCi/L	Strontium-89	9.73E+01	1.31E+02	0.75	Acceptable
E6923-278	2nd / 2010	Milk	pCi/L	Strontium-89	9.73E+01	1.31E+02	0.75	Acceptable
E7053-278	2nd / 2010	Milk	pCi/L	Strontium-90	1.12E+01	1.27E+01	0.88	Acceptable
E6923-278	2nd / 2010	Milk	pCi/L	Strontium-90	1.38E+01	1.79E+01	0.77	Acceptable
E6923-278	2nd / 2010	Milk	pCi/L	Strontium-90	1.38E+01	1.79E+01	0.77	Acceptable
E6924-278	2nd / 2010	Milk	pCi/L	Zinc-65	3.68E+02	3.45E+02	1.07	Acceptable
E6925-278	2nd / 2010	Water	pCi/L	Zinc-65	3.72E+02	3.48E+02	1.07	Acceptable
E6924-278	2nd / 2010	Milk	pCi/L	Zinc-65	3.68E+02	3.45E+02	1.07	Acceptable
E6925-278	2nd / 2010	Water	pCi/L	Zinc-65	3.72E+02	3.48E+02	1.07	Acceptable
E7054-278	2nd / 2010	Milk	pCi/L	Zinc-65	2.71E+02	2.54E+02	1.07	Acceptable
E7055-278	2nd / 2010	Water	pCi/L	Zinc-65	2.97E+02	2.56E+02	1.16	Acceptable
E7119-278	3rd / 2010	Milk	pCi/L	Cerium-141	1.27E+02	1.10E+02	1.15	Acceptable

Sample Number	Quarter / Year	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
E7119-278	3 rd / 2010	Milk	pCi/L	Cesium-137	1.68E+02	1.50E+02	1.12	Acceptable
E7119-278	3 rd / 2010	Milk	pCi/L	Chromium-51	3.90E+02	3.39E+02	1.15	Acceptable
E7119-278	3 rd / 2010	Milk	pCi/L	Cobalt-58	1.13E+02	1.01E+02	1.12	Acceptable
E7119-278	3 rd / 2010	Milk	pCi/L	Cobalt-60	2.14E+02	1.97E+02	1.09	Acceptable
E7117-278	3 rd / 2010	Milk	pCi/L	Iodine-131	7.97E+01	8.02E+01	0.99	Acceptable
E7119-278	3 rd / 2010	Milk	pCi/L	Iodine-131	1.06E+02	9.69E+01	1.09	Acceptable
E7119-278	3 rd / 2010	Milk	pCi/L	Iron-59	1.55E+02	1.19E+02	1.30	Not Acceptable
E7119-278	3 rd / 2010	Milk	pCi/L	Manganese-54	1.99E+02	1.69E+02	1.18	Acceptable
E7118-278	3 rd / 2010	Milk	pCi/L	Strontium-89	7.95E+01	9.34E+01	0.85	Acceptable
E7118-278	3 rd / 2010	Milk	pCi/L	Strontium-90	1.57E+01	1.67E+01	0.94	Acceptable
E7119-278	3 rd / 2010	Milk	pCi/L	Zinc-65	2.40E+02	2.06E+02	1.17	Acceptable
E7195-278	4th / 2010	Milk	pCi/L	Cerium-141	1.39E+02	1.30E+02	1.07	Acceptable
E7196-278	4th / 2010	Water	pCi/L	Cerium-141	1.74E+02	1.65E+02	1.05	Acceptable
E7195-278	4th / 2010	Milk	pCi/L	Cesium-134	9.85E+01	9.30E+01	1.06	Acceptable
E7196-278	4th / 2010	Water	pCi/L	Cesium-134	1.22E+02	1.18E+02	1.03	Acceptable
E7195-278	4th / 2010	Milk	pCi/L	Cesium-137	9.87E+01	9.45E+01	1.04	Acceptable
E7196-278	4th / 2010	Water	pCi/L	Cesium-137	1.24E+02	1.20E+02	1.03	Acceptable
E7195-278	4th / 2010	Milk	pCi/L	Chromium-51	2.48E+02	2.34E+02	1.06	Acceptable
E7196-278	4th / 2010	Water	pCi/L	Chromium-51	3.12E+02	2.97E+02	1.05	Acceptable
E7195-278	4th / 2010	Milk	pCi/L	Cobalt-58	7.02E+01	7.37E+01	0.95	Acceptable
E7196-278	4th / 2010	Water	pCi/L	Cobalt-58	9.63E+01	9.35E+01	1.03	Acceptable
E7195-278	4th / 2010	Milk	pCi/L	Cobalt-60	1.77E+02	1.71E+02	1.04	Acceptable
E7196-278	4th / 2010	Water	pCi/L	Cobalt-60	2.34E+02	2.17E+02	1.08	Acceptable
E7193-278	4th / 2010	Cartridge	pCi	Iodine-131	5.97E+01	6.02E+01	0.99	Acceptable
E7195-278	4th / 2010	Milk	pCi/L	Iodine-131	1.01E+02	9.41E+02	1.07	Acceptable
E7196-278	4th / 2010	Water	pCi/L	Iodine-131	7.24E+01	6.44E+01	1.12	Acceptable
E7195-278	4th / 2010	Milk	pCi/L	Iron-59	1.02E+02	9.11E+01	1.12	Acceptable

Sample Number	Quarter / Year	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
E7195-278	4th / 2010	Milk	pCi/L	Manganese-54	1.20E+02	1.19E+02	1.01	Acceptable
E7196-278	4th / 2010	Water	pCi/L	Manganese-54	1.70E+02	1.52E+02	1.12	Acceptable
E7194-278	4th / 2010	Milk	pCi/L	Strontium-89	7.62E+01	9.28E+01	0.82	Acceptable
E7194-278	4th / 2010	Milk	pCi/L	Strontium-90	1.30E+01	1.47E+01	0.88	Acceptable
E7195-278	4th / 2010	Milk	pCi/L	Zinc-65	2.37E+02	2.04E+02	1.16	Acceptable
E7196-278	4th / 2010	Water	pCi/L	Zinc-65	2.97E+02	2.59E+02	1.15	Acceptable

TABLE 3
2010 DEPARTMENT OF ENERGY MIXED ANALYTE PERFORMANCE EVALUATION PROGRAM (MAPEP) RESULTS SUMMARY

Sample Number	Quarter / Year	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
MAPEP-10-MaS22	3 rd / 2010	Soil	Bq/kg	Americium-241	0.07	0.00	----	Acceptable
MAPEP-10-MaS22	3 rd / 2010	Soil	Bq/kg	Cesium-134	744.67	733	513 - 953	Acceptable
MAPEP-10-MaS22	3 rd / 2010	Soil	Bq/kg	Cesium-137	831.7	779	545 - 1013	Acceptable
MAPEP-10-MaS22	3 rd / 2010	Soil	Bq/kg	Cobalt-57	536.0	522	365 - 679	Acceptable
MAPEP-10-MaS22	3 rd / 2010	Soil	Bq/kg	Cobalt-60	670.3	622	435 - 809	Acceptable
MAPEP-10-MaS22	3 rd / 2010	Soil	Bq/kg	Iron-55	83.6	0.00	----	Acceptable
MAPEP-10-MaS22	3 rd / 2010	Soil	Bq/kg	Manganese-54	940.7	849	594 - 1104	Acceptable
MAPEP-10-MaS22	3 rd / 2010	Soil	Bq/kg	Nickel-63	489	477	334 - 620	Acceptable
MAPEP-10-MaS22	3 rd / 2010	Soil	Bq/kg	Plutonium-238	17.9	24	16.9 - 31.3	Acceptable
MAPEP-10-MaS22	3 rd / 2010	Soil	Bq/kg	Plutonium-239/240	0.21	0.00	----	Acceptable
MAPEP-10-MaS22	3 rd / 2010	Soil	Bq/kg	Potassium-40	638.7	559	391 - 727	Acceptable
MAPEP-10-MaS22	3 rd / 2010	Soil	Bq/kg	Strontium-90	261.0	288	202 - 374	Acceptable
MAPEP-10-MaS22	3 rd / 2010	Soil	Bq/kg	Technetium-99	-3.0	0.00	----	Acceptable
MAPEP-10-MaS22	3 rd / 2010	Soil	Bq/kg	Uranium-234/233	65.27	60	42 -78	Acceptable
MAPEP-10-MaS22	3 rd / 2010	Soil	Bq/kg	Uranium-238	70.23	64	45 - 83	Acceptable
MAPEP-10-MaS22	3 rd / 2010	Soil	Bq/kg	Zinc-65	-2.89	0.0	----	Acceptable
MAPEP-10-MaW22	3 rd / 2010	Water	Bq/L	Americium-241	1.0323	1.30	0.91 - 1.69	Acceptable
MAPEP-10-MaW22	3 rd / 2010	Water	Bq/L	Cesium-134	0.027	0.00	----	Acceptable
MAPEP-10-MaW22	3 rd / 2010	Water	Bq/L	Cesium-137	63.1	60.6	42.4 - 78.8	Acceptable
MAPEP-10-MaW22	3 rd / 2010	Water	Bq/L	Cobalt-57	29.2	28.3	19.8 - 36.8	Acceptable
MAPEP-10-MaW22	3 rd / 2010	Water	Bq/L	Cobalt-60	-0.021	0.00	----	Acceptable
MAPEP-10-MaW22	3 rd / 2010	Water	Bq/L	Hydrogen-3	107	90.8	63.6 - 118.0	Acceptable
MAPEP-10-MaW22	3 rd / 2010	Water	Bq/L	Iron-55	0.24	0.00	----	Acceptable
MAPEP-10-MaW22	3 rd / 2010	Water	Bq/L	Manganese-54	28.83	26.9	18.8 - 35.0	Acceptable
MAPEP-10-MaW22	3 rd / 2010	Water	Bq/L	Nickel-63	57.7	59.9	41.9 - 77.9	Acceptable
MAPEP-10-MaW22	3 rd / 2010	Water	Bq/L	Plutonium-238	1.213	1.93	1.35 - 2.51	Not Acceptable
MAPEP-10-MaW22	3 rd / 2010	Water	Bq/L	Plutonium-239/240	0.026	0.009	----	Acceptable
MAPEP-10-MaW22	3 rd / 2010	Water	Bq/L	Strontium-90	-0.01	0.00	----	Acceptable
MAPEP-10-MaW22	3 rd / 2010	Water	Bq/L	Technetium-99	-0.4	0.00	----	Acceptable
MAPEP-10-MaW22	3 rd / 2010	Water	Bq/L	Uranium-234/233	1.163	1.22	0.85 - 1.59	Acceptable
MAPEP-10-MaW22	3 rd / 2010	Water	Bq/L	Uranium-238	1.223	1.25	0.88 - 1.63	Acceptable
MAPEP-10-MaW22	3 rd / 2010	Water	Bq/L	Zinc-65	45.9	40.7	28.5 - 52.9	Acceptable
MAPEP-10-GrW22	3 rd / 2010	Water	Bq/L	Gross Alpha	0.559	0.676	>0.0 - 1.352	Acceptable
MAPEP-10-GrW22	3 rd / 2010	Water	Bq/L	Gross Beta	3.110	3.09	1.55 - 4.64	Acceptable

Sample Number	Quarter / Year	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
MAPEP-10-RdF22	3 rd / 2010	Filter	ug/sample	Uranium-238	10.2	5.7	4.0 - 7.4	Not Acceptable
MAPEP-10-RdF22	3 rd / 2010	Filter	ug/sample	Uranium-Total	10.2	5.7	4.0 - 7.4	Not Acceptable
MAPEP-10-RdF22	3 rd / 2010	Filter	Bq/sample	Americium-241	0.2637	0.146	0.102 - 0.190	Not Acceptable
MAPEP-10-RdF22	3 rd / 2010	Filter	Bq/sample	Cesium-134	4.323	2.13	1.49 - 2.77	Not Acceptable
MAPEP-10-RdF22	3 rd / 2010	Filter	Bq/sample	Cesium-137	3.070	1.53	1.07 - 1.99	Not Acceptable
MAPEP-10-RdF22	3 rd / 2010	Filter	Bq/sample	Cobalt-57	0.0002	0.00	----	Acceptable
MAPEP-10-RdF22	3 rd / 2010	Filter	Bq/sample	Cobalt-60	5.187	2.473	1.731 - 3.215	Not Acceptable
MAPEP-10-RdF22	3 rd / 2010	Filter	Bq/sample	Manganese-54	6.483	3.02	2.11 - 3.93	Not Acceptable
MAPEP-10-RdF22	3 rd / 2010	Filter	Bq/sample	Plutonium-238	0.010	0.0010	----	Acceptable
MAPEP-10-RdF22	3 rd / 2010	Filter	Bq/sample	Plutonium-239/240	0.164	0.0832	0.0582 - 0.1082	Not Acceptable
MAPEP-10-RdF22	3 rd / 2010	Filter	Bq/sample	Strontium-90	-0.004	0.00	----	Acceptable
MAPEP-10-RdF22	3 rd / 2010	Filter	Bq/sample	Uranium-234/233	0.137	0.068	0.048 - 0.088	Not Acceptable
MAPEP-10-RdF22	3 rd / 2010	Filter	Bq/sample	Uranium-238	0.147	0.071	0.050 - 0.092	Not Acceptable
MAPEP-10-RdF22	3 rd / 2010	Filter	Bq/sample	Zinc-65	-0.106	0.00	----	Acceptable
MAPEP-10-GrF22	3 rd / 2010	Filter	Bq/sample	Gross Alpha	0.303	0.427	>0.0 - 0.854	Acceptable
MAPEP-10-GrF22	3 rd / 2010	Filter	Bq/sample	Gross Beta	1.433	1.29	0.65 - 1.94	Acceptable
MAPEP-10-RdV22	3 rd / 2010	Vegetation	ug/sample	Uranium-235	0.090	0.1250	0.0875 - 0.1625	Acceptable
MAPEP-10-RdV22	3 rd / 2010	Vegetation	ug/sample	Uranium-238	12.5	17.9	12.5 - 23.3	Not Acceptable
MAPEP-10-RdV22	3 rd / 2010	Vegetation	ug/sample	Uranium-Total	13.9	18.0	12.6 - 23.4	Acceptable
MAPEP-10-RdV22	3 rd / 2010	Vegetation	Bq/sample	Americium-241	0.179	0.225	0.158 - 0.293	Acceptable
MAPEP-10-RdV22	3 rd / 2010	Vegetation	Bq/sample	Cesium-134	3.098	4.39	3.07 - 5.71	Acceptable
MAPEP-10-RdV22	3 rd / 2010	Vegetation	Bq/sample	Cesium-137	2.185	3.06	2.14 - 3.98	Acceptable
MAPEP-10-RdV22	3 rd / 2010	Vegetation	Bq/sample	Cobalt-57	0.009	0.00	----	Acceptable
MAPEP-10-RdV22	3 rd / 2010	Vegetation	Bq/sample	Cobalt-60	3.076	3.27	2.29 - 4.25	Acceptable
MAPEP-10-RdV22	3 rd / 2010	Vegetation	Bq/sample	Manganese-54	0.004	0.00	----	Acceptable
MAPEP-10-RdV22	3 rd / 2010	Vegetation	Bq/sample	Plutonium-238	0.149	0.160	0.112 - 0.208	Acceptable
MAPEP-10-RdV22	3 rd / 2010	Vegetation	Bq/sample	Plutonium-239/240	0.0026	0.0008	----	Acceptable
MAPEP-10-RdV22	3 rd / 2010	Vegetation	Bq/sample	Strontium-90	0.033	0.00	----	Acceptable
MAPEP-10-RdV22	3 rd / 2010	Vegetation	Bq/sample	Uranium-234/233	0.184	0.216	0.151 - 0.281	Acceptable
MAPEP-10-RdV22	3 rd / 2010	Vegetation	Bq/sample	Uranium-238	0.184	0.223	0.156 - 0.290	Acceptable
MAPEP-10-RdV22	3 rd / 2010	Vegetation	Bq/sample	Zinc-65	6.844	7.10	4.97 - 9.23	Acceptable

TABLE 4
2010 ERA PROGRAM PERFORMANCE EVALUATION RESULTS SUMMARY

Sample Number	Quarter / Year	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
RAD - 80	1st / 2010	Water	pCi/L	Barium-133	73.5	72.9	61.0 - 80.2	Acceptable
RAD - 80	1st / 2010	Water	pCi/L	Cesium-134	69.2	63.4	51.5 - 69.7	Acceptable
RAD - 80	1st / 2010	Water	pCi/L	Cesium-137	118.0	120	108 - 134	Acceptable
RAD - 80	1st / 2010	Water	pCi/L	Cobalt-60	87.7	90	81 - 101	Acceptable
RAD - 80	1st / 2010	Water	pCi/L	Zinc-65	213.0	210	189 - 246	Acceptable
RAD - 80	1st / 2010	Water	pCi/L	Gross Alpha	51.3	42.5	22.0 - 53.9	Acceptable
RAD - 80	1st / 2010	Water	pCi/L	Gross Beta	52.0	54.2	37.0 - 61.1	Acceptable
RAD - 80	1st / 2010	Water	pCi/L	Radium-226	16.9	17.8	13.2 - 20.3	Acceptable
RAD - 80	1st / 2010	Water	pCi/L	Radium-228	20.4	18.2	12.3 - 21.8	Acceptable
RAD - 80	1st / 2010	Water	pCi/L	Uranium (Nat)	49.0	50.2	40.7 - 55.8	Acceptable
RAD - 80	1st / 2010	Water	ug/L	Uranium (Nat) Mass	67.3	73.2	59.4 - 81.4	Acceptable
RAD - 80	1st / 2010	Water	pCi/L	Tritium	19200	18700	16400-20600	Acceptable
RAD - 80	1st / 2010	Water	pCi/L	Strontium-89	37.9	53.3	42.3 - 60.9	Not Acceptable
RAD - 80	1st / 2010	Water	pCi/L	Strontium-90	52.3	42.2	31.1 - 48.4	Not Acceptable
RAD - 80	1st / 2010	Water	pCi/L	Iodine-131	30.5	28.2	23.5 - 33.1	Acceptable
RAD - 82	3rd / 2010	Water	pCi/L	Barium-133	112.0	89.1	75.0 - 98.0	Not Acceptable
RAD - 82	3rd / 2010	Water	pCi/L	Cesium-134	115.0	88.3	72.4 -97.1	Not Acceptable
RAD - 82	3rd / 2010	Water	pCi/L	Cesium-137	271	210	189 - 232	Not Acceptable
RAD - 82	3rd / 2010	Water	pCi/L	Cobalt-60	98.4	72.8	65.5 - 82.5	Not Acceptable
RAD - 82	3rd / 2010	Water	pCi/L	Zinc-65	161	110	99.0 - 131	Not Acceptable
RAD - 82	3rd / 2010	Water	pCi/L	Gross Alpha	65.5	61.1	32.0 - 75.9	Acceptable
RAD - 82	3rd / 2010	Water	pCi/L	Gross Beta	56.7	56.4	38.6 - 63.6	Acceptable
RAD - 82	3rd / 2010	Water	pCi/L	Radium-226	15.9	17.1	12.7 - 19.6	Acceptable
RAD - 82	3rd / 2010	Water	pCi/L	Radium-228	18.9	16.1	10.8 - 19.4	Acceptable
RAD - 82	3rd / 2010	Water	pCi/L	Uranium (Nat)	58.0	49.6	40.2 - 55.1	Not Acceptable
RAD - 82	3rd / 2010	Water	ug/L	Uranium (Nat) Mass	89.1	72.3	58.7 - 80.4	Not Acceptable
RAD - 82	3rd / 2010	Water	pCi/L	Tritium	18500	19800	17300 - 21700	Acceptable
RAD - 82	3rd / 2010	Water	pCi/L	Strontium-89	60.6	55.3	44.1 - 62.9	Acceptable
RAD - 82	3rd / 2010	Water	pCi/L	Strontium-90	47.1	32.8	24.0 - 38.0	Not Acceptable
RAD - 82	3rd / 2010	Water	pCi/L	Iodine-131	32.2	28.4	23.6 - 33.3	Acceptable
090710N	3rd / 2010	Water	pCi/L	Barium-133	86.9	92.9	78.3 - 102	Acceptable
090710N	3rd / 2010	Water	pCi/L	Cesium-134	93.8	79.4	65.0 - 87.3	Not Acceptable
090710N	3rd / 2010	Water	pCi/L	Cesium-137	55.5	54.6	49.1 - 62.9	Acceptable
090710N	3rd / 2010	Water	pCi/L	Cobalt-60	120.0	117	105 - 131	Acceptable
090710N	3rd / 2010	Water	pCi/L	Zinc-65	129	99.5	89.6 - 119	Not Acceptable

Sample Number	Quarter / Year	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
090710N	3rd / 2010	Water	ug/L	Uranium (Nat) Mass	48.6	49.3	39.8 - 55.1	Acceptable
RAD - 83	4th / 2010	Water	pCi/L	Strontium-89	65.3	68.5	55.8 - 76.7	Acceptable
RAD - 83	4th / 2010	Water	pCi/L	Strontium-90	41.5	43	31.7 - 49.3	Acceptable
100510N	4th / 2010	Water	pCi/L	Strontium-89	49.9	51.4	40.6 - 58.9	Acceptable
100510N	4th / 2010	Water	pCi/L	Strontium-90	35.4	41.3	30.4 - 47.5	Acceptable
112210H1	4th / 2010	Water	pCi/L	Barium-133	66.3	65.9	54.9 - 72.5	Acceptable
112210H1	4th / 2010	Water	pCi/L	Cesium-134	71.6	71.6	58.4 - 78.8	Acceptable
112210H1	4th / 2010	Water	pCi/L	Cesium-137	151	146	131 - 163	Acceptable
112210H1	4th / 2010	Water	pCi/L	Cobalt-60	90.2	84.5	76.0 - 95.3	Acceptable
112210H1	4th / 2010	Water	pCi/L	Zinc-65	207	186	167 - 219	Acceptable
112210H2	4th / 2010	Water	pCi/L	Plutonium-238	102.0	108	81.7 - 134	Acceptable
112210H2	4th / 2010	Water	pCi/L	Plutonium-239	77.6	86.3	66.8 - 107	Acceptable
122810P	4th / 2010	Water	pCi/L	Barium-133	70.9	68.9	57.5 - 75.8	Acceptable
122810P	4th / 2010	Water	pCi/L	Cesium-134	43.0	43.2	34.5 - 47.5	Acceptable
122810P	4th / 2010	Water	pCi/L	Cesium-137	122	123	111 - 138	Acceptable
122810P	4th / 2010	Water	pCi/L	Cobalt-60	58.7	53.4	48.1 - 61.3	Acceptable
122810P	4th / 2010	Water	pCi/L	Zinc-65	116	102	91.8 - 122	Acceptable

TABLE 5
2010 ERA PROGRAM (MRAD) PERFORMANCE EVALUATION RESULTS SUMMARY

Sample Number	Quarter / Year	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
MRAD-12	2nd / 2010	Soil	pCi/kg	Actinium-228	1570	1850	1190 - 2600	Acceptable
MRAD-12	2nd / 2010	Soil	pCi/kg	Americium-241	1130	1500	896 - 1930	Acceptable
MRAD-12	2nd / 2010	Soil	pCi/kg	Bismuth-212	1430	1640	430 - 2450	Acceptable
MRAD-12	2nd / 2010	Soil	pCi/kg	Bismuth-214	1080	1410	865 - 2030	Acceptable
MRAD-12	2nd / 2010	Soil	pCi/kg	Cesium-134	3040	3110	2000 - 3740	Acceptable
MRAD-12	2nd / 2010	Soil	pCi/kg	Cesium-137	4330	4440	3400 - 5770	Acceptable
MRAD-12	2nd / 2010	Soil	pCi/kg	Cobalt-60	2120	2140	1560 - 2870	Acceptable
MRAD-12	2nd / 2010	Soil	pCi/kg	Lead-212	1540	1520	980 - 2140	Acceptable
MRAD-12	2nd / 2010	Soil	pCi/kg	Lead-214	1300	1440	862 - 2140	Acceptable
MRAD-12	2nd / 2010	Soil	pCi/kg	Manganese-54	< 22.9	0	-----	Acceptable
MRAD-12	2nd / 2010	Soil	pCi/kg	Potassium-40	11100	10900	7900 - 14800	Acceptable
MRAD-12	2nd / 2010	Soil	pCi/kg	Thorium-234	1600	1610	511 - 3070	Acceptable
MRAD-12	2nd / 2010	Soil	pCi/kg	Uranium-238	1600	1610	984 - 2040	Acceptable
MRAD-12	2nd / 2010	Soil	pCi/kg	Zinc-65	2790	2470	1960 - 3310	Acceptable
MRAD-12	2nd / 2010	Soil	pCi/kg	Strontium-90	7870	8180	2960 - 13300	Acceptable
MRAD-12	2nd / 2010	Soil	pCi/kg	Uranium-234	< 1158	1620	1030 - 2010	Not Acceptable
MRAD-12	2nd / 2010	Soil	pCi/kg	Uranium-238	908	1610	984 - 2040	Not Acceptable
MRAD-12	2nd / 2010	Soil	ug/kg	Uranium-Total (mass)	2920	4820	2650 - 6060	Acceptable
MRAD-12	2nd / 2010	Soil	pCi/kg	Strontium-90	7870	8180	2960 - 13300	Acceptable
MRAD-12	2nd / 2010	Soil	pCi/kg	Americium-241	1120	1500	896 - 1930	Acceptable
MRAD-12	2nd / 2010	Soil	pCi/kg	Plutonium-238	1360	1330	761 - 1870	Acceptable
MRAD-12	2nd / 2010	Soil	pCi/kg	Plutonium-239	1220	1260	860 - 1670	Acceptable
MRAD-12	2nd / 2010	Soil	pCi/kg	Uranium-234	1230	1620	1030 - 2010	Acceptable
MRAD-12	2nd / 2010	Soil	pCi/kg	Uranium-238	1440	1610	984 - 2040	Acceptable
MRAD-12	2nd / 2010	Soil	pCi/kg	Uranium-Total	2789	3300	1880 - 4460	Acceptable
MRAD-12	2nd / 2010	Soil	ug/kg	Uranium-Total (mass)	4350	4820	2650 - 6060	Acceptable
MRAD-12	2nd / 2010	Vegetation	pCi/kg	Uranium-238	1604	1710	1200 - 2160	Acceptable
MRAD-12	2nd / 2010	Vegetation	ug/kg	Uranium-Total (mass)	5270	5120	3520 - 6610	Acceptable
MRAD-12	2nd / 2010	Vegetation	pCi/kg	Americium-241	2410	3140	1790 - 4310	Acceptable
MRAD-12	2nd / 2010	Vegetation	pCi/kg	Curium-244	429	528	260 - 822	Acceptable
MRAD-12	2nd / 2010	Vegetation	pCi/kg	Plutonium-238	3090	3040	1640 - 4450	Acceptable
MRAD-12	2nd / 2010	Vegetation	pCi/kg	Plutonium-239	2830	2800	1740 - 3820	Acceptable
MRAD-12	2nd / 2010	Vegetation	pCi/kg	Uranium-234	1680	1720	1180 - 2280	Acceptable
MRAD-12	2nd / 2010	Vegetation	pCi/kg	Uranium-238	1770	1710	1200 - 2160	Acceptable

Sample Number	Quarter / Year	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
MRAD-12	2nd / 2010	Vegetation	pCi/kg	Uranium-Total (mass)	5290	5120	3520 - 6610	Acceptable
MRAD-12	2nd / 2010	Vegetation	pCi/kg	Americium-241	3600	3140	1790 - 4310	Acceptable
MRAD-12	2nd / 2010	Vegetation	pCi/kg	Cesium-134	1750	1670	956 - 2310	Acceptable
MRAD-12	2nd / 2010	Vegetation	pCi/kg	Cesium-137	1550	1470	1080 - 2040	Acceptable
MRAD-12	2nd / 2010	Vegetation	pCi/kg	Cobalt-60	2100	1970	1330 - 2830	Acceptable
MRAD-12	2nd / 2010	Vegetation	pCi/kg	Manganese-54	< 9.6	0.00	-----	Acceptable
MRAD-12	2nd / 2010	Vegetation	pCi/kg	Potassium-40	40800	34900	25100 - 49400	Acceptable
MRAD-12	2nd / 2010	Vegetation	pCi/kg	Uranium-238	< 1240	1710	1200 - 2160	Not Acceptable
MRAD-12	2nd / 2010	Vegetation	pCi/kg	Zinc-65	1630	1360	983 - 1860	Acceptable
MRAD-12	2nd / 2010	Vegetation	pCi/kg	Strontium-90	7880	9120	5100 - 12100	Acceptable
MRAD-12	2nd / 2010	Air Filter	pCi/Filter	Uranium-238	61.5	61.5	39.4 - 87.3	Acceptable
MRAD-12	2nd / 2010	Air Filter	ug/Filter	Uranium-Total (mass)	183	184	114 - 264	Acceptable
MRAD-12	2nd / 2010	Air Filter	pCi/Filter	Americium-241	52.7	60.0	35.1 - 82.3	Acceptable
MRAD-12	2nd / 2010	Air Filter	pCi/Filter	Plutonium-238	63.9	64.1	44.0 - 84.3	Acceptable
MRAD-12	2nd / 2010	Air Filter	pCi/Filter	Plutonium-239	56.6	56.7	41.1 - 73.4	Acceptable
MRAD-12	2nd / 2010	Air Filter	pCi/Filter	Uranium-234	68.8	62.1	39.1 - 92.0	Acceptable
MRAD-12	2nd / 2010	Air Filter	pCi/Filter	Uranium-238	69.5	61.5	39.4 - 87.3	Acceptable
MRAD-12	2nd / 2010	Air Filter	pCi/Filter	Uranium-Total	141	126	64.4 - 200	Acceptable
MRAD-12	2nd / 2010	Air Filter	ug/Filter	Uranium-Total (mass)	208	184	114 - 264	Acceptable
MRAD-12	2nd / 2010	Air Filter	pCi/Filter	Americium-241	76	60	35.1 - 82.3	Acceptable
MRAD-12	2nd / 2010	Air Filter	pCi/Filter	Cesium-134	504	436	284 - 540	Acceptable
MRAD-12	2nd / 2010	Air Filter	pCi/Filter	Cesium-137	785	701	527 - 921	Acceptable
MRAD-12	2nd / 2010	Air Filter	pCi/Filter	Cobalt-60	591	523	405 - 653	Acceptable
MRAD-12	2nd / 2010	Air Filter	pCi/Filter	Manganese-54	< 5.07	0.00	-----	Acceptable
MRAD-12	2nd / 2010	Air Filter	pCi/Filter	Uranium-238	< 61.2	61.5	39.4 - 87.3	Acceptable
MRAD-12	2nd / 2010	Air Filter	pCi/Filter	Zinc-65	462	389	269 - 539	Acceptable
MRAD-12	2nd / 2010	Air Filter	pCi/Filter	Strontium-90	178	187	82.3 - 291	Acceptable
MRAD-12	2nd / 2010	Air Filter	pCi/Filter	Iron-55	375	359	158 - 559	Acceptable
MRAD-12	2nd / 2010	Air Filter	ug/Filter	Uranium-Total (mass)	175	184	114 - 264	Acceptable
MRAD-12	2nd / 2010	Air Filter	pCi/Filter	Gross Alpha	68.2	79.6	41.3 - 120	Acceptable
MRAD-12	2nd / 2010	Air Filter	pCi/Filter	Gross Beta	72	70.4	43.4 - 103	Acceptable
MRAD-12	2nd / 2010	Water	pCi/L	Uranium-238	67.9	60.9	46.5 - 75.5	Acceptable
MRAD-12	2nd / 2010	Water	ug/L	Uranium-Total (mass)	213	182	143 - 225	Acceptable
MRAD-12	2nd / 2010	Water	pCi/L	Americium-241	79.1	95.6	65.5 - 129	Acceptable
MRAD-12	2nd / 2010	Water	pCi/L	Plutonium-238	79.5	109	82.4 - 135	Not Acceptable
MRAD-12	2nd / 2010	Water	pCi/L	Plutonium-239	103	105	81.2 - 130	Acceptable
MRAD-12	2nd / 2010	Water	pCi/L	Uranium-234	62.4	61.4	46.3 - 79.2	Acceptable
MRAD-12	2nd / 2010	Water	pCi/L	Uranium-238	66.1	60.9	46.5 - 75.5	Acceptable
MRAD-12	2nd / 2010	Water	pCi/L	Uranium-Total	131.5	125	90.0 - 166	Acceptable

Sample Number	Quarter / Year	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
MRAD-12	2nd / 2010	Water	pCi/L	Americium-241	123	95.6	65.5 - 129	Acceptable
MRAD-12	2nd / 2010	Water	pCi/L	Cesium-134	454	417	308 - 479	Acceptable
MRAD-12	2nd / 2010	Water	pCi/L	Cesium-137	693	654	556 - 783	Acceptable
MRAD-12	2nd / 2010	Water	pCi/L	Cobalt-60	813	727	633 - 859	Acceptable
MRAD-12	2nd / 2010	Water	pCi/L	Manganese-54	< 7.7	0.00	----	Acceptable
MRAD-12	2nd / 2010	Water	pCi/L	Uranium-238	< 155	60.9	46.5 - 75.5	Not Acceptable
MRAD-12	2nd / 2010	Water	pCi/L	Zinc-65	632	533	452 - 664	Acceptable
MRAD-12	2nd / 2010	Water	pCi/L	Strontium-90	708	719	456 - 961	Acceptable
MRAD-13	4th / 2010	Soil	pCi/kg	Actinium-228	1460	1830	1170 - 2580	Acceptable
MRAD-13	4th / 2010	Soil	pCi/kg	Americium-241	845	1120	669 - 1440	Acceptable
MRAD-13	4th / 2010	Soil	pCi/kg	Bismuth-212	< 538	2070	543 - 3100	Not Acceptable
MRAD-13	4th / 2010	Soil	pCi/kg	Bismuth-214	818	983	603 - 1410	Acceptable
MRAD-13	4th / 2010	Soil	pCi/kg	Cesium-134	2230	2240	1440 - 2700	Acceptable
MRAD-13	4th / 2010	Soil	pCi/kg	Cesium-137	3400	3530	2700 - 4580	Acceptable
MRAD-13	4th / 2010	Soil	pCi/kg	Cobalt-60	4580	4780	3480 - 6420	Acceptable
MRAD-13	4th / 2010	Soil	pCi/kg	Lead-212	1550	1640	1060 - 2310	Acceptable
MRAD-13	4th / 2010	Soil	pCi/kg	Lead-214	1030	969	580 - 1440	Acceptable
MRAD-13	4th / 2010	Soil	pCi/kg	Manganese-54	< 38.0	0.00	-----	Acceptable
MRAD-13	4th / 2010	Soil	pCi/kg	Potassium-40	10500	10700	7760 - 14500	Acceptable
MRAD-13	4th / 2010	Soil	pCi/kg	Thorium-234	1010	1340	425 - 2550	Acceptable
MRAD-13	4th / 2010	Soil	pCi/kg	Uranium-238	1010	1340	819 - 1700	Acceptable
MRAD-13	4th / 2010	Soil	pCi/kg	Zinc-65	2420	2300	1820 - 3080	Acceptable
MRAD-13	4th / 2010	Soil	pCi/kg	Americium-241	928	1120	669 - 1440	Acceptable
MRAD-13	4th / 2010	Soil	pCi/kg	Plutonium-238	1170	1280	733 - 1800	Acceptable
MRAD-13	4th / 2010	Soil	pCi/kg	Plutonium-239	1070	1180	805 - 1570	Acceptable
MRAD-13	4th / 2010	Soil	pCi/kg	Uranium-234	899	1360	862 - 1690	Acceptable
MRAD-13	4th / 2010	Soil	pCi/kg	Uranium-238	1080	1340	819 - 1700	Acceptable
MRAD-13	4th / 2010	Soil	pCi/kg	Uranium-Total	2027.4	2770	1580 - 3740	Acceptable
MRAD-13	4th / 2010	Soil	ug/kg	Uranium-Total (mass)	3240	4040	2220 - 5080	Acceptable
MRAD-13	4th / 2010	Soil	pCi/kg	Uranium-234	1190	1360	862 - 1690	Acceptable
MRAD-13	4th / 2010	Soil	pCi/kg	Uranium-238	903	1340	819 - 1700	Acceptable
MRAD-13	4th / 2010	Soil	ug/kg	Uranium-Total	2093	2770	1580 - 3740	Acceptable
MRAD-13	4th / 2010	Soil	pCi/kg	Uranium-Total (mass)	2685	4040	2220 - 5080	Acceptable
MRAD-13	4th / 2010	Soil	pCi/kg	Uranium-234	1110	1360	862 - 1690	Acceptable
MRAD-13	4th / 2010	Soil	pCi/kg	Uranium-238	1090	1340	819 - 1700	Acceptable
MRAD-13	4th / 2010	Soil	pCi/kg	Uranium-Total	2253	2770	1580 - 3740	Acceptable
MRAD-13	4th / 2010	Soil	ug/kg	Uranium-Total (mass)	3241	4040	2220 - 5080	Acceptable
MRAD-13	4th / 2010	Soil	ug/kg	Uranium-Total (mass)	2820	4040	2220 - 5080	Acceptable
MRAD-13	4th / 2010	Soil	pCi/kg	Strontium-90	10953	9270	3350 - 15100	Acceptable

Sample Number	Quarter / Year	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
MRAD-13	4th / 2010	Vegetation	pCi/kg	Plutonium-238	3740	4740	2560 - 6940	Acceptable
MRAD-13	4th / 2010	Vegetation	pCi/kg	Plutonium-239	3590	4470	2770 - 6100	Acceptable
MRAD-13	4th / 2010	Vegetation	pCi/kg	Uranium-234	3600	4010	2750 - 5320	Acceptable
MRAD-13	4th / 2010	Vegetation	pCi/kg	Uranium-238	4000	3980	2800 - 5030	Acceptable
MRAD-13	4th / 2010	Vegetation	pCi/kg	Uranium-Total	7834	8180	5620 - 10600	Acceptable
MRAD-13	4th / 2010	Vegetation	ug/kg	Uranium-Total (mass)	12000	11900	8180 - 15400	Acceptable
MRAD-13	4th / 2010	Vegetation	pCi/kg	Cesium-134	1200	1040	595 - 1440	Acceptable
MRAD-13	4th / 2010	Vegetation	pCi/kg	Cesium-137	1420	1260	924 - 1750	Acceptable
MRAD-13	4th / 2010	Vegetation	pCi/kg	Cobalt-60	1130	1010	683 - 1450	Acceptable
MRAD-13	4th / 2010	Vegetation	pCi/kg	Manganese-54	< 39.8	0.00	-----	Acceptable
MRAD-13	4th / 2010	Vegetation	pCi/kg	Potassium-40	29000	22600	16200 - 32000	Acceptable
MRAD-13	4th / 2010	Vegetation	pCi/kg	Zinc-65	1380	1210	874 - 1650	Acceptable
MRAD-13	4th / 2010	Vegetation	pCi/kg	Strontium-90	9800	7810	4360 - 10400	Acceptable
MRAD-13	4th / 2010	Air Filter	pCi/Filter	Uranium-234	73.5	71.8	45.2 - 106	Acceptable
MRAD-13	4th / 2010	Air Filter	pCi/Filter	Uranium-238	75.5	71.2	45.6 - 101	Acceptable
MRAD-13	4th / 2010	Air Filter	pCi/Filter	Uranium-Total	149	146	74.6 - 232	Acceptable
MRAD-13	4th / 2010	Air Filter	ug/Filter	Uranium-Total (mass)	224.5	213	132 - 306	Acceptable
MRAD-13	4th / 2010	Air Filter	pCi/Filter	Americium-241	70.1	74.1	43.3 - 102	Acceptable
MRAD-13	4th / 2010	Air Filter	pCi/Filter	Plutonium-238	70.8	72.9	50.0 - 95.8	Acceptable
MRAD-13	4th / 2010	Air Filter	pCi/Filter	Plutonium-239	65.6	69.6	50.5 - 90.1	Acceptable
MRAD-13	4th / 2010	Air Filter	pCi/Filter	Uranium-234	69.9	71.8	45.2 - 106	Acceptable
MRAD-13	4th / 2010	Air Filter	pCi/Filter	Uranium-238	66.8	71.2	45.6 - 101	Acceptable
MRAD-13	4th / 2010	Air Filter	pCi/Filter	Uranium-Total	142	146	74.6 - 232	Acceptable
MRAD-13	4th / 2010	Air Filter	ug/Filter	Uranium-Total (mass)	201	213	132 - 306	Acceptable
MRAD-13	4th / 2010	Air Filter	pCi/Filter	Cesium-134	405	388	253 - 480	Acceptable
MRAD-13	4th / 2010	Air Filter	pCi/Filter	Cesium-137	532	514	386 - 675	Acceptable
MRAD-13	4th / 2010	Air Filter	pCi/Filter	Cobalt-60	531	479	371 - 598	Acceptable
MRAD-13	4th / 2010	Air Filter	pCi/Filter	Manganese-54	< 3.58	0.00	-----	Acceptable
MRAD-13	4th / 2010	Air Filter	pCi/Filter	Zinc-65	552	465	322 - 644	Acceptable
MRAD-13	4th / 2010	Air Filter	pCi/Filter	Strontium-90	80.2	159	70.0 - 247	Acceptable
MRAD-13	4th / 2010	Air Filter	pCi/Filter	Iron-55	707	626	275 - 974	Acceptable
MRAD-13	4th / 2010	Air Filter	ug/Filter	Uranium-Total (mass)	192	213	132 - 306	Acceptable
MRAD-13	4th / 2010	Air Filter	pCi/Filter	Gross Alpha	74.2	52.3	27.1 - 78.7	Acceptable
MRAD-13	4th / 2010	Air Filter	pCi/Filter	Gross Beta	55.6	52.7	32.5 - 77.0	Acceptable
MRAD-13	4th / 2010	Water	pCi/L	Uranium-234	106	109	82.2 - 140	Acceptable
MRAD-13	4th / 2010	Water	pCi/L	Uranium-238	107	108	82.5 - 134	Acceptable
MRAD-13	4th / 2010	Water	pCi/L	Uranium-Total	218	221	159 - 294	Acceptable
MRAD-13	4th / 2010	Water	ug/L	Uranium-Total (mass)	318	323	253 - 399	Acceptable
MRAD-13	4th / 2010	Water	pCi/L	Americium-241	164	176	120 - 238	Acceptable

Sample Number	Quarter / Year	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
MRAD-13	4th / 2010	Water	pCi/L	Plutonium-239	136	148	114 - 183	Acceptable
MRAD-13	4th / 2010	Water	pCi/L	Uranium-234	106	109	82.2 - 140	Acceptable
MRAD-13	4th / 2010	Water	pCi/L	Uranium-238	114	108	82.5 - 134	Acceptable
MRAD-13	4th / 2010	Water	pCi/L	Uranium-Total	226.8	221	159 - 294	Acceptable
MRAD-13	4th / 2010	Water	ug/L	Uranium-Total (mass)	342	323	253 - 399	Acceptable
MRAD-13	4th / 2010	Water	pCi/L	Americium-241	178	176	120 - 238	Acceptable
MRAD-13	4th / 2010	Water	pCi/L	Cesium-134	495	492	363 - 565	Acceptable
MRAD-13	4th / 2010	Water	pCi/L	Cesium-137	620	625	531 - 749	Acceptable
MRAD-13	4th / 2010	Water	pCi/L	Cobalt-60	732	714	622 - 844	Acceptable
MRAD-13	4th / 2010	Water	pCi/L	Manganese-54	< 5	0.00	-----	Acceptable
MRAD-13	4th / 2010	Water	pCi/L	Zinc-65	557	489	414 - 610	Acceptable
MRAD-13	4th / 2010	Water	pCi/L	Strontium-90	817	921	585 - 1230	Acceptable
MRAD-13	4th / 2010	Water	pCi/L	Uranium-234	104	109	82.2 - 140	Acceptable
MRAD-13	4th / 2010	Water	pCi/L	Uranium-238	108	108	82.5 - 134	Acceptable
MRAD-13	4th / 2010	Water	pCi/L	Uranium-Total	217	221	159 - 294	Acceptable
MRAD-13	4th / 2010	Water	ug/L	Uranium-Total (mass)	321	323	253 - 399	Acceptable
MRAD-13	4th / 2010	Water	pCi/L	Iron-55	1220	825	480 - 1100	Acceptable
MRAD-13	4th / 2010	Water	pCi/L	Gross Alpha	145	146	64.8 - 216	Acceptable
MRAD-13	4th / 2010	Water	pCi/L	Gross Beta	171	143	83.6 - 210	Acceptable
MRAD-13	4th / 2010	Water	pCi/L	Tritium	20900	21600	14100 - 31900	Acceptable

TABLE 6
2010 NEW YORK STATE DEPARTMENT OF HEALTH ENVIRONMENTAL LABORATORY APPROVAL PROGRAM (NYSDOH ELAP) PROFICIENCY TEST RESULTS SUMMARY

Sample Number	Quarter / Year	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
NY-332 3263	2nd / 2010	Water	pCi/L	Gross Alpha	33.0	26.8	15.0 - 38.6	Acceptable
NY-332 3263	2nd / 2010	Water	pCi/L	Gross Beta	64.6	54.0	41.3 - 66.7	Acceptable
NY-332 3262	2nd / 2010	Water	pCi/L	Cesium-134	14.8	14.0	10.7 - 17.3	Acceptable
NY-332 3262	2nd / 2010	Water	pCi/L	Barium-133	27.8	25.6	20.6 - 30.5	Acceptable
NY-332 3262	2nd / 2010	Water	pCi/L	Zinc-65	146	139	121 - 156	Acceptable
NY-332 3262	2nd / 2010	Water	pCi/L	Cobalt-60	98.3	99.5	90.3 - 109	Acceptable
NY-332 3262	2nd / 2010	Water	pCi/L	Cesium-137	124	123	112 - 134	Acceptable
NY-332 3264	2nd / 2010	Water	pCi/L	Iodine-131	23.4	26.4	21.9 - 31.0	Acceptable
NY-332 3264	2nd / 2010	Water	pCi/L	Iodine-131	26.8	26.4	21.9 - 31.0	Acceptable
NY-332 3261	2nd / 2010	Water	pCi/L	Strontium-89	46.7	41.9	33.4 - 50.4	Acceptable
NY-332 3261	2nd / 2010	Water	pCi/L	Strontium-90	33.9	34.8	27.1 - 42.5	Acceptable
NY-332 3266	2nd / 2010	Water	pCi/L	Tritium	9610	9490	8390 - 10600	Acceptable
NY-332 3265	2nd / 2010	Water	pCi/L	Radium-226	12.1	13.2	10.4 - 16.0	Acceptable
NY-332 3265	2nd / 2010	Water	pCi/L	Radium-228	9.90	8.91	6.08 - 11.7	Acceptable
NY-332 3265	2nd / 2010	Water	pCi/L	Uranium (activity)	48.81	44.7	37.9 - 51.4	Acceptable
NY-337 3763	4th / 2010	Water	pCi/L	Gross Alpha	32.8	41.6	24.3 - 58.9	Acceptable
NY-337 3763	4th / 2010	Water	pCi/L	Gross Beta	29.3	27.5	18.3 - 36.7	Acceptable
NY-337 3762	4th / 2010	Water	pCi/L	Cesium-134	51.0	42.0	35.8 - 49.2	Not Acceptable
NY-337 3762	4th / 2010	Water	pCi/L	Cesium-137	29.3	27.3	22.4 - 32.1	Acceptable
NY-337 3762	4th / 2010	Water	pCi/L	Cobalt-60	13.6	13.2	9.72 - 16.7	Acceptable
NY-337 3762	4th / 2010	Water	pCi/L	Zinc-65	134	122	104 - 138	Acceptable
NY-337 3762	4th / 2010	Water	pCi/L	Barium-133	50.5	50.9	43.3 - 59.4	Acceptable
NY-337 3764	4th / 2010	Water	pCi/L	Iodine-131	13.4	18.2	14.7 - 21.7	Not Acceptable
NY-337 3764	4th / 2010	Water	pCi/L	Iodine-131	13.5	18.2	14.7 - 21.7	Not Acceptable
NY-337 3761	4th / 2010	Water	pCi/L	Strontium-89	47.8	61.3	51.3 - 71.4	Not Acceptable
NY-337 3761	4th / 2010	Water	pCi/L	Strontium-90	12.0	14.9	11.0 - 18.8	Acceptable
NY-337 3766	4th / 2010	Water	pCi/L	Tritium	14400	15300	13500 - 17000	Acceptable
NY-337 3765	4th / 2010	Water	pCi/L	Radium-226	13.2	10.6	8.30 - 12.9	Not Acceptable
NY-337 3765	4th / 2010	Water	pCi/L	Radium-228	6.51	6.07	3.91 - 8.22	Acceptable
NY-337 3765	4th / 2010	Water	pCi/L	Uranium (activity)	17.5	16.0	13.2 - 18.7	Acceptable

FIGURE 1
COBALT-60 PERFORMANCE EVALUATION RESULTS AND % BIAS

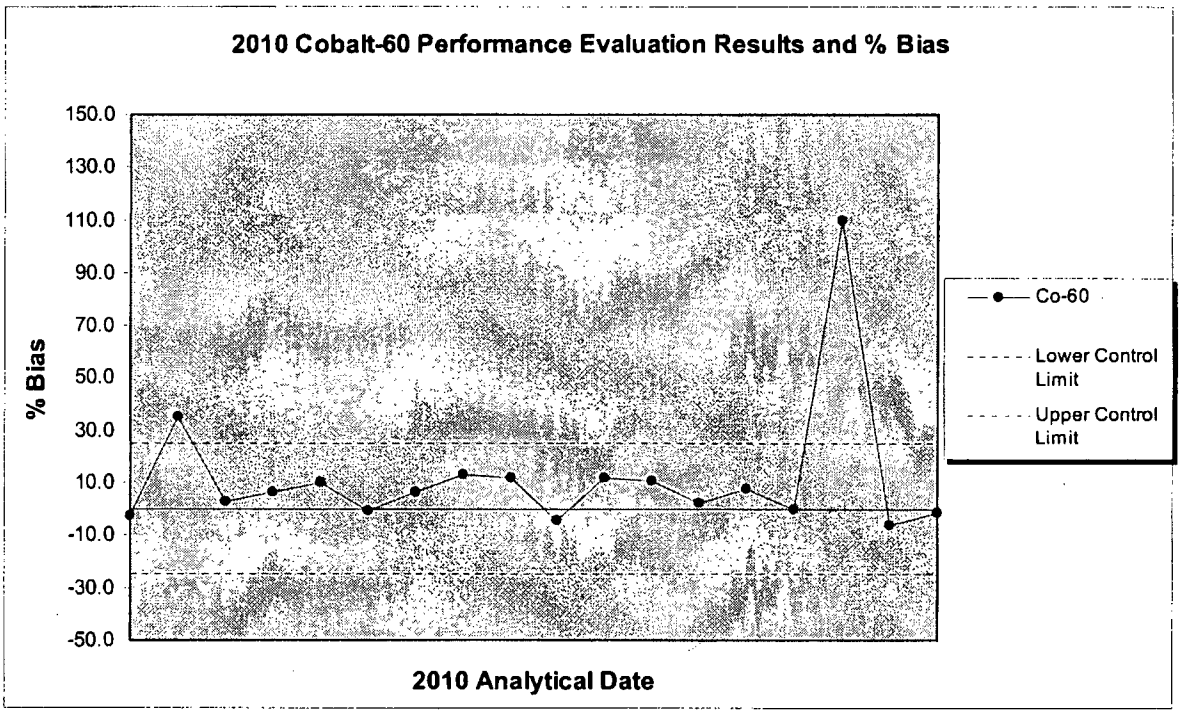

FIGURE 2
CESIUM-137 PERFORMANCE EVALUATION RESULTS AND % BIAS

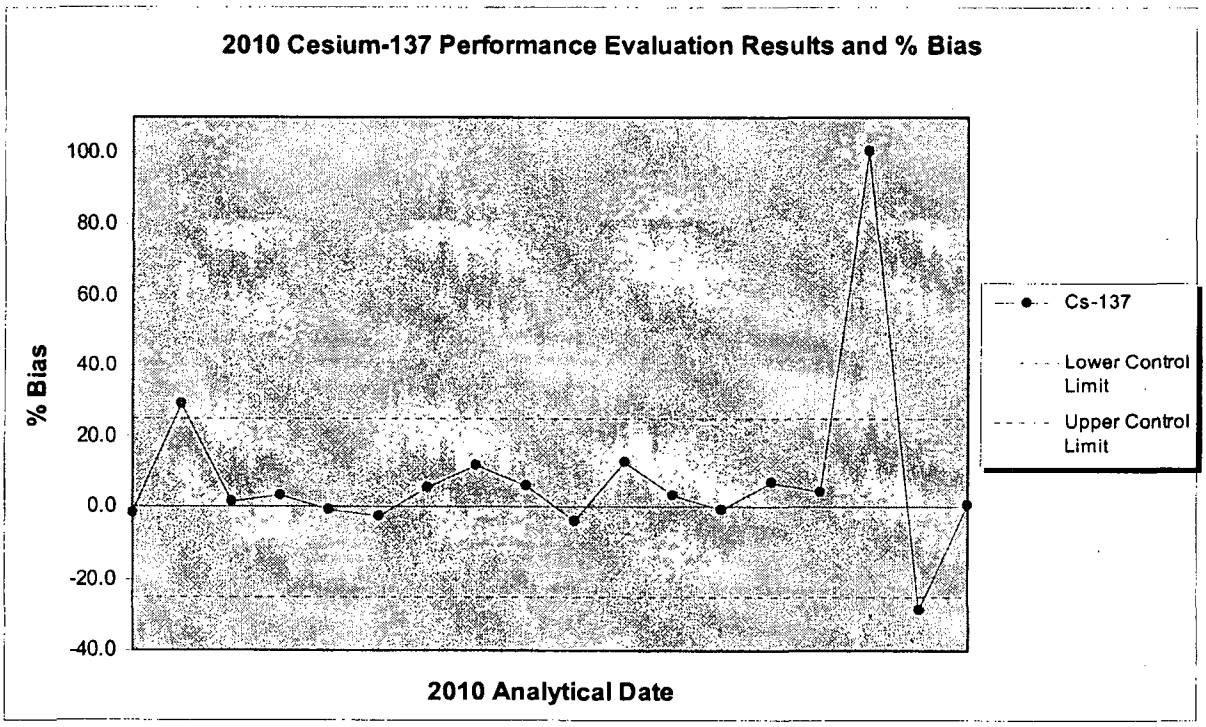

FIGURE 3
TRITIUM PERFORMANCE EVALUATION RESULTS AND % BIAS

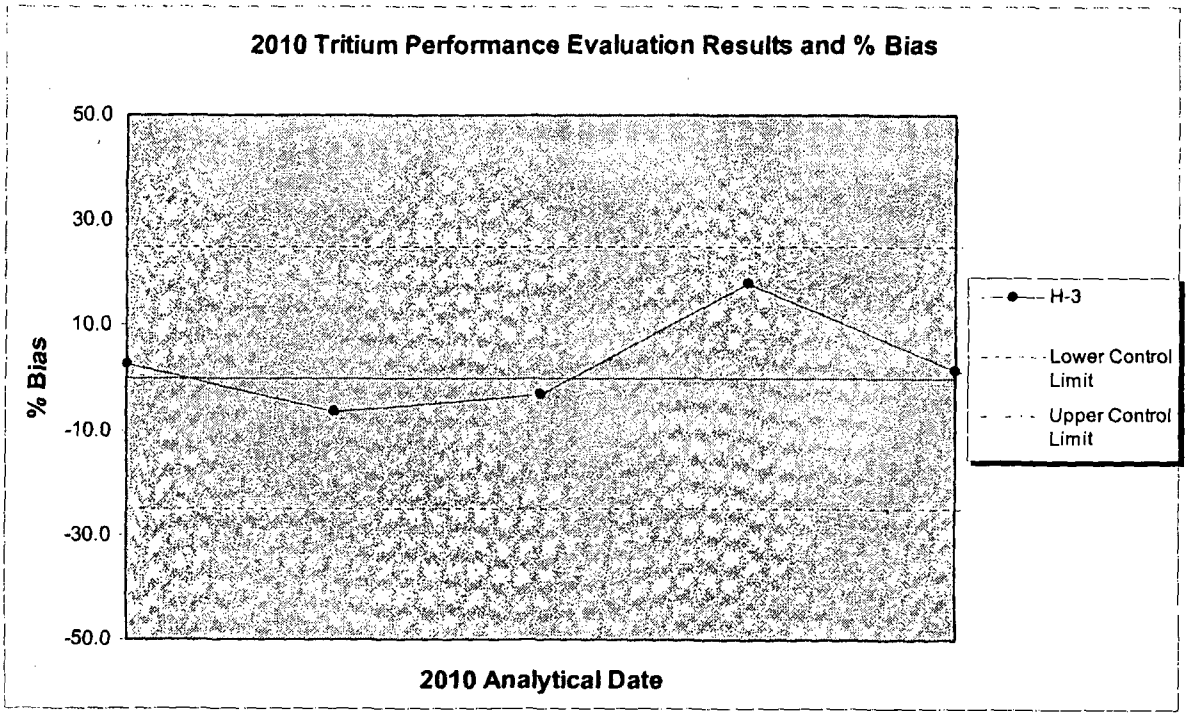

FIGURE 4
STRONTIUM-90 PERFORMANCE EVALUATION RESULTS AND % BIAS

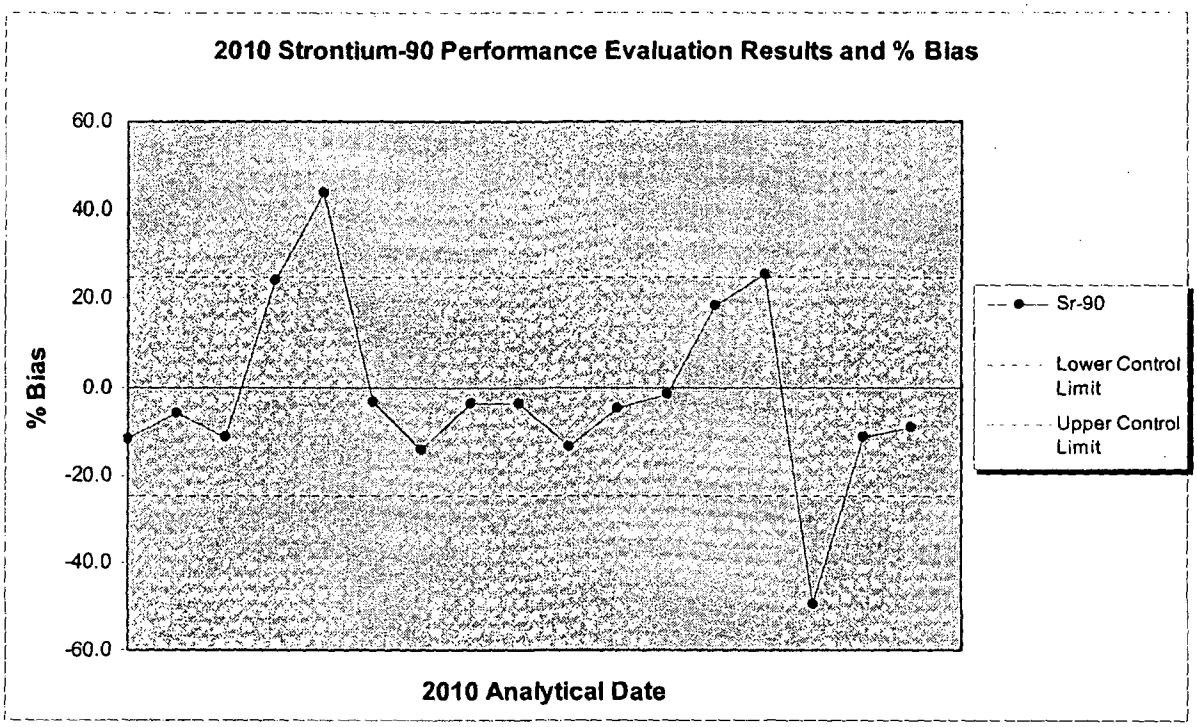

FIGURE 5
GROSS ALPHA PERFORMANCE EVALUATION RESULTS AND % BIAS

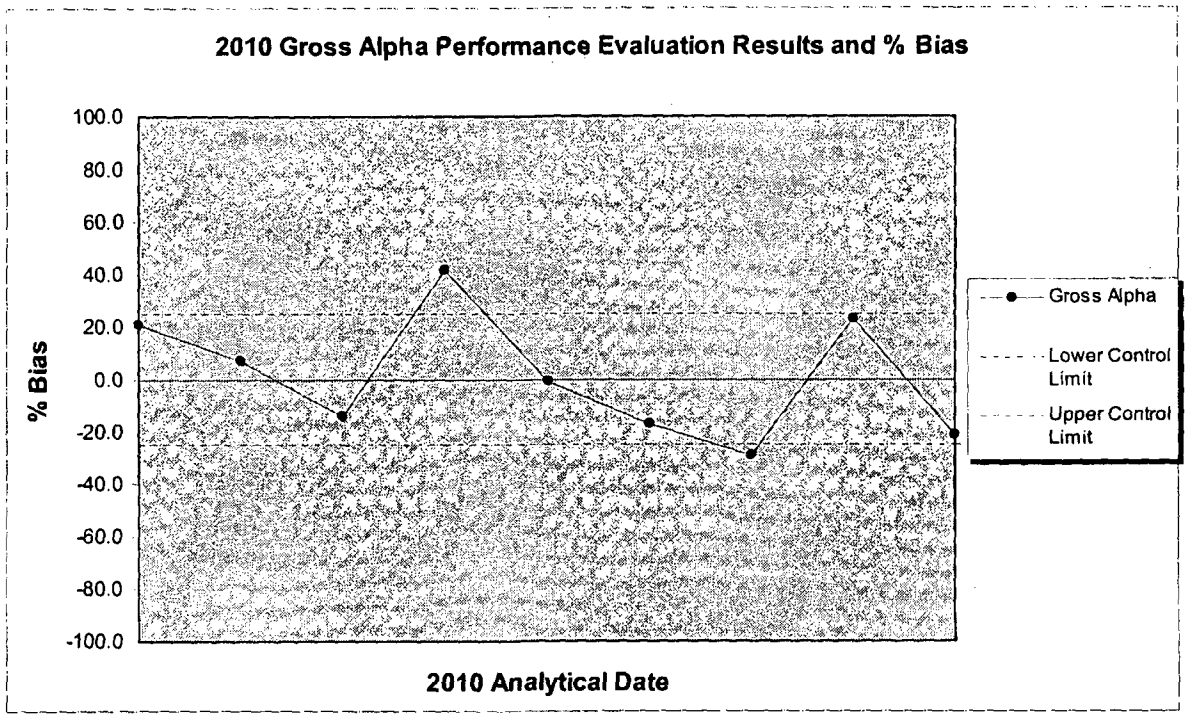

FIGURE 6
GROSS BETA PERFORMANCE EVALUATION RESULTS AND % BIAS

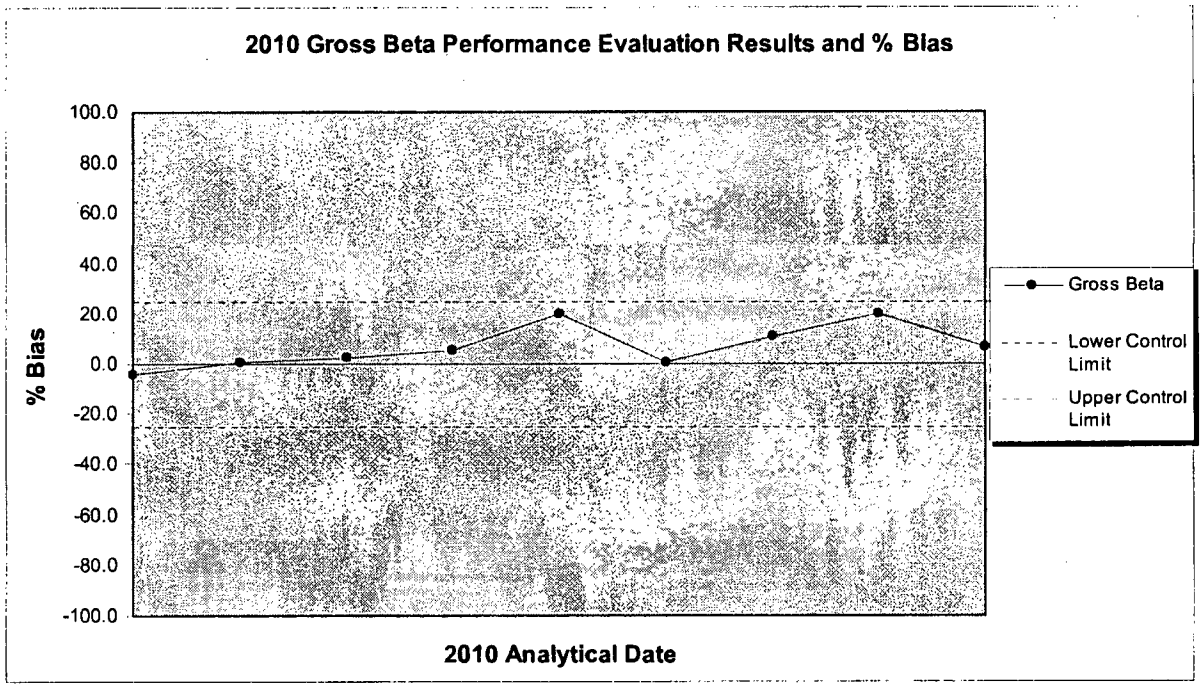

FIGURE 7
IODINE-131 PERFORMANCE EVALUATION RESULTS AND % BIAS

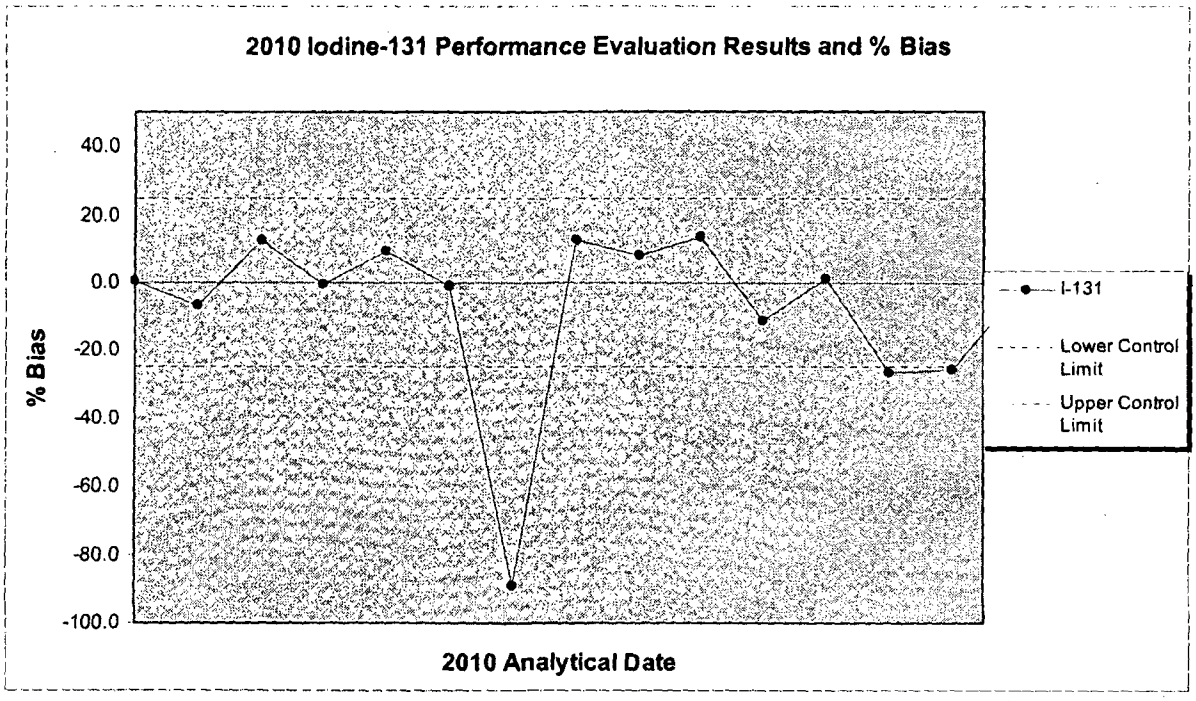

TABLE 7
GEL 2010 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM (REMP)
INTRA-LABORATORY DATA SUMMARY: BIAS AND PRECISION BY MATRIX

2010	Bias Criteria (+/- 25%) Laboratory Control Sample (LCS)		Precision Criteria (% RPD[1]) Duplicate (DUP or LCSD)	
	WITHIN CRITERIA	OUTSIDE CRITERIA	WITHIN CRITERIA	OUTSIDE CRITERIA
Air Particulate				
Gross Alpha/Beta	325	0	326	0
Americium-241	16	0	16	0
Iodine-131	247	0	249	0
Gamma	23	0	23	0
Strontium-90	15	0	15	0
Air Cartridge				
Iodine-131	11	0	11	0
Milk				
Gamma	63	0	64	0
Iodine-131	61	0	61	0
Strontium-90	33	0	34	0
Solid				
Gamma	27	0	29	0
Carbon-14	2	0	2	0
Iron-55	3	0	3	0
Nickel-63	3	0	3	0
Strontium-90	11	0	11	0
Tissue				
Gamma	38	0	36	0
Strontium-90	3	0	3	0
Vegetation				
Gamma (Including Iodine)	59	0	61	0
Strontium-90	3	0	3	0
Water				
Carbon-14	2	0	2	0
Gross Alpha/Beta	98	0	99	0
Gamma	177	0	170	0
Iodine-131	46	0	47	0
Iron-55	33	0	33	0
Nickel-63	35	0	35	0
Strontium-90	80	0	81	0
Tritium	176	0	174	0
Total:	1590	0	1591	0

Note 1: The RPD must be 20 percent or less, if both samples are greater than 5 times the MDC. If both results are less than 5 times MDC, then the RPD must be equal to or less than 100%. If one result is above the MDC and the other is below the MDC, then the RPD can be calculated using the MDC for the result of the one below the MDC. The RPD must be 100% or less. In the situation where both results are above the MDC but one result is greater than 5 times the MDC and the other is less than 5 times the MDC, the RPD must be less than or equal to 20%. If both results are below MDC, then the limits on % RPD are not applicable.

TABLE 8
GEL 2010 RADIOLOGICAL INTRA-LABORATORY DATA SUMMARY: BIAS AND PRECISION BY MATRIX

ANALYSIS	INSTRUMENT	LCS FILTER	DUP FILTER	LCS SWIPE	DUP SWIPE	LCS SOLID	DUP SOLID	LCS OIL	DUP OIL
Americium-241	Alpha Spec	2	2	47	38	485	477	13	12
Americium-243	Alpha Spec	2	2	1	0	53	50	2	2
Carbon-14	Liquid Scintillation	4	3	38	32	98	99	9	9
Gamma (long list of isotopes)	Gamma Spec	283	272	47	42	770	792	27	27
Gross Alpha/Beta	Gas Flow	111	135	20	18	20	18	42	42
Iodine-129	Gamma Spec	99	88	28	28	28	28	9	9
Iodine-131	Gamma Spec	6	4	0	0	0	0	0	0
Iron-55	Liquid Scintillation	89	8	30	24	46	48	8	8
Isotopic Plutonium	Alpha Spec and Liquid Scintillation	212	186	82	66	687	683	12	11
Isotopic Strontium	Gas Flow	165	136	41	34	365	367	1	1
Isotopic Thorium	Alpha Spec	82	59	0	0	371	372	0	0
Isotopic Uranium	Alpha Spec and ICP-MS	137	112	13	10	713	697	24	24
Lead-210	Gas Flow	44	26	0	0	33	34	0	0
Nickel-59	Gamma Spec	65	60	28	22	64	64	7	7
Nickel-63	Liquid Scintillation	95	89	39	30	75	74	8	8
Neptunium-237	Alpha Spec	67	59	32	23	107	107	10	9
Polonium-210	Alpha Spec	18	6	0	0	5	6	0	0
Promethium-137	Liquid Scintillation	8	5	0	0	12	11	0	0
Radium-226	Lucas Cell	44	31	0	0	167	175	0	0
Radium-228	Gas Flow	29	25	0	0	129	124	0	0
Technetium-99	Liquid Scintillation	87	75	32	24	142	145	12	12
Tritium	Liquid Scintillation	90	76	42	24	358	359	19	19

ANALYSIS	INSTRUMENT	LCS SLUDGE	DUP SLUDGE	LCS MISC SOLID	DUP MISC SOLID	LCS MISC LIQUID	DUP MISC LIQUID	LCS LIQUID	DUP LIQUID
Americium-241	Alpha Spec	4	4	231	220	22	19	383	335
Americium-243	Alpha Spec	1	1	21	21	5	4	12	11
Carbon-14	Liquid Scintillation	5	5	110	108	34	33	218	175
Gamma (long list of isotopes)	Gamma Spec	17	18	260	256	72	68	747	820
Gross Alpha/Beta	Gas Flow	27	27	112	109	87	80	1169	1180
Iodine-129	Gamma Spec	1	1	88	88	21	21	162	94
Iodine-131	Gamma Spec	0	0	0	0	0	0	11	14
Iron-55	Liquid Scintillation	3	3	74	72	42	43	123	103
Isotopic Plutonium	Alpha Spec or Liquid Scintillation	7	7	143	137	77	70	108	95
Isotopic Strontium	Gas Flow	13	13	61	60	80	76	16	12
Isotopic Thorium	Alpha Spec	13	13	145	132	8	8	289	359
Isotopic Uranium	Alpha Spec	24	24	102	87	39	36	640	557
Lead-210	Gas Flow	0	0	0	0	0	0	114	108
Nickel-59	Gamma Spec	0	0	68	66	9	9	76	63
Nickel-63	Liquid Scintillation	5	5	74	72	50	51	172	143
Neptunium-237	Alpha Spec	3	3	0	0	16	15	193	168
Polonium-210	Alpha Spec	0	0	1	1	0	0	3	3
Promethium-137	Liquid Scintillation	1	1	5	5	3	3	6	2
Radium-226	Lucas Cell	2	2	25	25	5	5	502	505
Radium-228	Gas Flow	0	0	27	28	1	1	432	426
Technetium-99	Liquid Scintillation	15	15	179	175	39	40	41	41
Tritium	Liquid Scintillation	9	9	125	122	8	8	898	824

TABLE 9
GEL 2010 CORRECTIVE ACTION SUMMARY

GEL CORRECTIVE ACTION IDENTIFICATION	STATUS: OPEN/ CLOSED	ISSUE	Cause and Disposition
CARR110209-542	OPEN	Eckert & Ziegler Analytics Fe-59 Failure in Milk	Monitoring in progress
CARR100617-496	CLOSED	MAPEP Series 22 PT Failures	The ICP-MS analysis of Uranium-235 and Uranium-238 failure was attributed to the use of the less vigorous digestion method (EPA Method 3050B). After contacting RESL, GEL discovered that they had used a more rigorous total dissolution process. The failure for Plutonium-238 was attributed to a data reviewer's error and lack of attention to detail to the region of interest that was not included in the data result. Approximately 400 additional counts should have been included. All analysts have been retrained on attention to detail of the ROI. For the remaining isotopic failures, the error was attributed to analyst error and failure to follow the instructions from the PT provider.
CARR100617-497	CLOSED	MRAD 12 PT Failures	The ICP-MS analysis of Uranium-235 and Uranium-238 failure was attributed to the use of the less vigorous digestion method (EPA Method 3050B). After contacting RESL, GEL discovered that they had used a more rigorous total dissolution process. For Uranium-238 in vegetation, air and water, the failure was attributed to method sensitivity by gamma spectroscopy. Future PT analysis will be performed using a more sensitive method.
CARR101210-527	CLOSED	MRAD 13 PT Failures	The failure for Bismuth-212 was attributed to a reporting error. The actual result (1660 pCi/kg) was within the acceptance range. The failure of Iron-55 was attributed to matrix interference. An additional recount with a smaller aliquot and fresh reagent rinses removed the interferant.

CARR100318-487	CLOSED	RAD-80 PT Failures	The Gross Alpha failure was attributed to a concentrated iron carrier. The Strontium-89 and Strontium-90 failures were attributed to the associated weights of the carriers utilized during the preparation and analysis.
CARR100907-512	CLOSED	RAD-82 PT Failures	Failures of the Gamma Emitters and the Naturals (Uranium) were attributed to analyst error and failure to follow the instructions from the PT provider. The failure of Strontium-89 and Strontium-90 was attributed to analyst error while diluting the sample. All analysts were retrained to the proper processes.
CARR101203-525	CLOSED	NY-337 PT Failures	For Cesium-134, Iodine-131, Strontium-89 and Strontium-90, and Radium-226, the failures could not be determined. The laboratory continues to monitor results of internal quality control samples.

TABLE 10

PERCENTAGE OF INDIVIDUAL DOSIMETERS THAT PASSED E-LAB INTERNAL CRITERIA JANUARY – DECEMBER 2010[1], [2]

Dosimeter Type	Number Tested	% Passed Bias Criteria	% Passed Precision Criteria
Panasonic Environmental	84	100	100

[1]This table summarizes results of tests conducted by E-LAB and the Third-party tester.
[2]Environmental dosimeter results are free in air.

TABLE 11

SUMMARY OF THIRD PARTY DOSIMETER TESTING JANUARY – DECEMBER 2010[1], [2]

Dosimeter Type	Exposure Period	ANSI Category	% (Bias ± SD)
Panasonic Environmental	FH 2010	II	-2.2 +/- 1.1
Panasonic Environmental	SH 2010	II	-1.5 +/- 1.4

[1]Performance criteria are the same as the internal criteria.
[2]Results are expressed as the delivered exposure for environmental TLD. ANSI HPS N13.29-1995 (Draft) Category II, High energy photons (Cs-137 or Co-60).

TABLE 12

PERCENTAGE OF MEAN DOSIMETER ANALYSES (N=6) WHICH PASSED TOLERANCE CRITERIA JANUARY – DECEMBER 2010[1], [2]

Dosimeter Type	Number of Evaluations	% Passed Tolerance Limit
Panasonic Environmental[2]	14	100

[1]This table summarizes results of tests conducted by E-LAB and the Third-party tester.
[2]Environmental dosimeter results are free in air.

Measurement of strontium-90 (^{90}Sr) and other radionuclides in edible tissues and bone/carapace of fish and blue crabs from the lower Hudson River, New York

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INTRODUCTION

In 2005, Entergy Nuclear Operations, Inc. (Entergy), the owner of the Indian Point Nuclear Power Plant located at Buchanan, NY on the Hudson River, discovered a spent fuel pool water leak to groundwater while installing a new crane to facilitate transfer of Unit 2 spent fuel to dry cask storage. This leak was determined to have generated a groundwater plume of tritium (^{3}H). During efforts to track the ^{3}H plume, ^{90}Sr was discovered in a downgradient portion of the plume and traced back to a leak in the Unit 1 spent fuel pool.

Because site groundwater flows to the Hudson River, the 2006 Radiological Environmental Monitoring Program (REMP) conducted by Entergy was modified to include ^{90}Sr as an analyte in fish samples. ^{90}Sr was detected in four of 10 samples of fish taken from the river in the vicinity of the power plant, and in three of five samples from an upstream reference location near the Roseton Generating Station in Newburgh, NY (Table 1). The tissues analyzed were composites of edible flesh from fish representing several species.

The data was reviewed by Entergy and compared with data for other facilities and historical information. Entergy concluded that the ^{90}Sr levels were low and may be indistinguishable from background levels from fallout from nuclear weapons testing in the 1950's and 1960's (Entergy 2007). The New York State Departments of Health (NYSDOH) and Environmental Conservation (NYSDEC) (the Agencies) concurred. However, the Agencies were concerned that the home ranges of several sampled species, and all striped bass, may overlap at the two sampling sites. In order to assure independence of sampling sites, the Agencies initiated this one time enhanced radiological surveillance for 2007.

The objectives of the enhanced radiological monitoring effort were to:

- gain information about the levels, impacts, and possible ^{90}Sr sources at the reference locations and the indicator station,
- determine if significant spatial differences in ^{90}Sr concentrations were present,
- to assess whether or not ^{90}Sr concentrations in the bones and flesh of fish signify heightened risk either to aquatic life in the Hudson River, and
- provide information for an independent assessment of potential public health impacts.

METHODS

Part of Entergy's REMP requirements is to conduct routine radiological surveillance using composite samples of edible tissues of fish two or more important commercial and/or recreational fish or invertebrate species. Possible target species include striped bass (*Morone saxatilis*), white perch (*Morone americana*), American eel (*Anguilla rostrata*), white catfish (*Ictalurus catus*) or channel catfish (*Ictalurus punctatus*), sunfishes including pumpkinseed (*Lepomis gibbosus*), bluegill (*L. macrochirus*) or redbreast sunfish (*L. auritus*), and blue crab (*Callinectes sapidus*). Sampling occurs in spring and fall of each year at two locations, i.e., in

the vicinity of Indian Point Nuclear Power Plant (approximately river mile 42) and the vicinity of Roseton Generating Station (the traditional reference station at approximate river mile 65). One composite sample of each species is collected at each location and is analyzed for a host of radionuclides.

Sampling is conducted by Normandeau Associates, Inc. under contract with Entergy, and samples consist of by-catch of fish or blue crabs taken as a consequence of sampling for other purposes. All samples were collected in June 2007 and were frozen (– 20º C) in a locked freezer until prepared for shipment for chemical analyses. The prepared sample mass is a minimum of 1600 g and a maximum of 2000 g. This sample mass is split three ways. The first split of 1000 g went to Entergy's contract laboratory, AREVA, Inc. The second split of 300 to 500 g went to the Nuclear Regulatory Commission for analysis at the Oak Ridge Institute for Science and Education (ORISE). The third split (300 to 500 g) was sent to the NYSDOH Wadsworth Center for Labs and Research. Collection records and chain of custody are maintained for all samples (Appendix A).

The one-time design modifications for the 2007 effort included: the addition of carp (*Cyprinus carpio*) – a benthic feeder – to the target species list; adding ^{90}Sr to the list of radionuclide analytes; analysis of fish bone or crab carapace; and sampling fish at a third location, i.e., the Catskill Region between river miles 107 and 125 (Figure 1). This upstream location assures appropriate separation of fish populations that are resident to the river, and, consequently, assures isolation of resident fish populations from the potential influence of the Indian Point Nuclear Power Plant.

Normandeau Associates, Inc. prepared the samples of edible portions of fish and blue crabs. Skinless filets were excised from each specimen, composites by species were made, and each composite was thoroughly ground and homogenized. Subsamples were developed for each laboratory. These were double packaged in food grade plastic bags, labeled, frozen, and shipped to each participating laboratory.

The remaining carcasses of the fish and blue crabs were provided to the NYSDEC's laboratory at the Hale Creek Field Station, Gloversville, NY where they were prepared for radiological analyses by the NYSDOH Wadsworth Center for Labs and Research. In addition to the required species, samples of other fish species were provided to Hale Creek including yellow perch (*Perca flavescens*), rock bass (*Ambloplites rupestris),* smallmouth bass (*Micropterus dolomieui*), largemouth bass (*Micropterus salmoides*), black crappie (*Pomoxis nigromaculatus*), and brown bullhead (*Ameiurus nebulosus*).

Preparation of bone and carapace samples was conducted in several steps. First, the samples were cleaned to remove as much muscle, skin, scales or other tissues as possible. The resulting bone samples were placed in a fume hood and air dried for 48 hours, then each sample was individually bagged, labeled and stored in a locked freezer until they were sent for further cleaning by dermestid beetles maintained by the New York State Museum at their Rensselaer Technology Park offices in Troy, NY. Each bone sample was maintained in an individual labeled sample container while undergoing dermestid cleaning. Following this process, each sample was frozen to kill the dermestids, rethawed, and the frass (dermestid larval carcasses and

fecal material) was removed from the bone. Finally, the skeletal and cranial bones (fins were excluded) were placed in food grade plastic bags, labeled and submitted to the NYSDOH Wadsworth Center for Labs and Research. Continuing chain of custody was maintained throughout the process (Appendix B).

Analysis of radionuclides were conducted by NYSDOH using two methods:

- ^{90}Sr analyses of fish bone were conducted by USEPA Method 905.0 (Krieger and Whittaker 1980b). Steps in this method include isolation of strontium, measurement of total strontium, hold the strontium for decay to allow time for the ingrowth of the yttrium-90 daughter, isolate and measure yttrium-90.

- Common indicator radionuclides (^{134}Cs, ^{137}Cs, ^{60}Co, and ^{40}K) were analyzed using USEPA Method 901.1 (Krieger and Whittaker 1980a).

Concentrations reported in Tables are the value for the sample ± the analytical standard error. For example, a value of 8 ± 2 pCi/kg would mean the best estimate concentration is 8 pCi/kg although the concentration may be as little as 6 pCi/kg or as much as 10 pCi/kg.

Statistical tests for spatial differences in concentrations employed the Kruskal-Wallis test when there were three comparisons. The Mann-Whitney test was used when there were only two comparisons (Conover 1980). These non-parametric tests were chosen because of their ability to reduce the influence of outlier data. A difference was considered significant when the probability was less than 0.05 ($P < 0.05$).

RESULTS

Edible Tissue Samples

^{90}Sr was detected in only one sample of edible tissues, i.e., 8 ± 3 pCi/kg in blue crab taken from the vicinity of the Indian Point facility. Detection limits ranged between 3 and 6 pCi/kg (Table 2). Only the determinations made by the NYSDOH Wadsworth Center for Labs and Research are reported since their analytical methods were the most sensitive of the three laboratories conducting the analyses. No detectable radionuclides were reported by the other two laboratories.

Bone and Carapace Samples

^{90}Sr concentrations in bone of fish or the carapace of blue crabs are shown in Table 3. ^{90}Sr concentrations are relatively consistent among all fish species, including striped bass, within locations. Mean and standard deviation concentrations for all fish at the three locations were:

Location	n	^{90}Sr Concentration (pCi/kg)
Indian Point	10	199 ± 58
Roseton	10	222 ± 67
Catskill	10	271 ± 69

The single blue crab sample, taken from the Roseton area, had 760 pCi/kg of ^{90}Sr in the carapace. This is the highest ^{90}Sr concentration reported, and twice the highest fish concentration of 360 pCi/kg in yellow perch from the Catskill area.

Among other radionuclides analyzed, ^{134}Cs, ^{137}Cs, ^{58}Co and ^{60}Co were not detected in bone or carapace of any sample. Detection limits ranged from 0.2 to 80 pCi/kg for ^{134}Cs, ^{137}Cs and ^{60}Co, and an order of magnitude greater for ^{58}Co. ^{40}K was present in nearly all samples within a limited range of concentrations and with mean and standard concentrations by area in fish as follows:

Location	n	^{40}K Concentration (pCi/kg)
Indian Point	9	2840 ± 678
Roseton	10	3540 ± 978
Catskill	10	2740 ± 614

Table 4 presents concentrations of other radionuclides that were detected in bones of fish.

DISCUSSION

^{90}Sr in bone versus edible tissues

Whicker *et al*. (1990) compared ^{90}Sr concentrations in bone and edible flesh of fish taken from a cooling water pond at the USDOE Savannah River nuclear power plant. Similar comparisons were made for fish in waters downstream of the Nuclear Fuels Services Inc. nuclear waste treatment plant in West Valley, NY, and in Lake Ontario (NYSDEC 1971) (Table 5). In these studies the ratio of ^{90}Sr in bone to that in edible fish tissue (^{90}Sr bone:flesh ratio) ranged from less than one to 1198. The highest value is considered an outlier. The mean ^{90}Sr bone:flesh ratio, excluding the outlier, was about 35. (The mean must be viewed with caution since the West Valley study did not indicate whether the ^{90}Sr quantification method was the same as that used in the Savannah River study; wet weight versus dry mass in flesh, or original mass versus ash weight of bone. If the methods used are not the same the ratios may not be comparable.) If it is assumed that the two studies are comparable, and we apply this ratio to bone in the present study, the ^{90}Sr concentration in edible tissues would very near or below the detection limit. This tends to confirm the reported lack of detection of ^{90}Sr in edible flesh of fish from the lower Hudson River (Tables 2 and 5) in 2007.

Spatial differences

There were no significant differences (P = 0.096) in ^{90}Sr concentrations between the three locations for resident fish. Looking at reference stations only, there was no significant difference in ^{90}Sr at Catskill and Roseton. Inclusion of striped bass, a migratory fish species, would not have changed the overall conclusion because of the similarity of ^{90}Sr concentrations.

In contrast, ^{40}K was statistically greater (P = 0.018) at the Roseton station than at either Indian Point or Catskill (which were equivalent) despite the small difference in average ^{40}K concentrations. Inclusion of striped bass would not have changed the finding. ^{40}K is a naturally occurring "primordial" radionuclide (Copplestone *et al*. 2001) which is expected to be found at these concentrations in fish and is not associated with nuclear waste for power production or fallout from weapons testing (Eisler 1994). The differing levels, albeit they are small differences, have no known significance.

Lastly, there were no differences between stations for ^{224}Ra. There were insufficient data to assess spatial differences for other radionuclides.

Relationship to criteria

The U.S. Department of Energy (USDOE) developed ecological standards for the protection of terrestrial animals, terrestrial plants, and aquatic animals based on published literature reviews of the effects of ionizing radiation on biota (NCRP 1991; IAEA 1992; UNSCEAR 1996). The standard for the protection of aquatic animals is:

> "The absorbed dose to aquatic animals should not exceed 1 rad/day (10 mGy/day or 400 µGy/hr[1]) from exposure to radiation or radioactive material releases into the aquatic environment."

This dose is specified in DOE Order 5400.5 (USDOE 2002). This standard is designed to protect populations of aquatic organisms, not individuals. At absorbed dose rates below the standard, populations will be maintained but some individual animals can suffer adverse impacts.

USDOE (2002) provides dose conversion factors (DCF) which can be used to estimate the absorbed dose from the internal abundance/activity of a radionuclide accumulated by an aquatic organism. The DCF calculations are conservative in that they assume all of the energies of radioactive decay are retained in the tissue of the organism, and that the radionuclides were presumed to be homogenously distributed in tissue. They are expressed in units of Rad/day per pCi/g wet weight. Using the DCFs it is possible to estimate the absorbed dose from the internal radionuclide concentration. Additional conversions were employed to express the total dose in

[1] A Gray (Gy) is a standard international unit of absorbed dose of radiation adopted by the International Commission on Radiological Protection in 1977. 1 Rad = 0.01 Gy; conversely, 1 Gy = 100 Rads.

the Standard International (SI) units for chronic absorbed dose rates of µGy/hr. USDOE (2002) did not report DCFs for ^{224}Ra and ^{40}K.

The highest tissue/bone concentrations of radionuclides listed in Tables 1 – 4 are the upper bound concentrations (i.e., measured concentration plus the 95% confidence interval) of 809 pCi/kg of ^{90}Sr from blue crab carapace (Table 3), 370 pCi/kg of ^{238}U and 320 pCi/kg ^{232}Th measured in the bones of striped bass (Table 4). All three samples were collected from the Roseton Generating Station (River Mile 65). Using the DCFs from (USDOE 2002), these concentrations can be converted to an internal dose rates:

> 809 pCi/kg of ^{90}Sr would result in an estimated internal dose rate of 0.02 µGy/hr;
> 370 pCi/kg of ^{238}U would result in an estimated internal dose rate of 0.7 µGy/hr; and
> 320 pCi/kg of ^{232}Th would result in an estimated internal dose rate of 5.5 µGy/hr.

All of these dose rates range from about two to five orders of magnitude below the USDOE (2002) standard of protection for aquatic animals. While the highest internal dose to striped bass from a single radionuclide was from ^{232}Th. However, to estimate the total internal dose, the internal doses from all radionuclides present must be summed. Using the upper bound concentrations for ^{226}Ra, ^{232}Th, and ^{238}U with the DCFs from (USDOE 2002), the total internal dose to striped bass collected at the Roseton Power Generating Station can be estimated to be 8.4 µGy/hr. A DCF for ^{224}Ra is not available, probably because this is a short-lived radionuclide with a half-life of only 3.7 days (Eisler 1994). ^{224}Ra disintegrates rapidly through a series of seven daughter radionuclides to the stable nuclide ^{208}Pb with a total half-life for the whole series of about 65 minutes (Nebergall *et al*. 1968).

The standards of protection published in USDOE (2002) were derived from a qualitative evaluation of radiological effects data. The European Union (EU) took a more quantitative approach to deriving ecological standards. EU assembled a large database of the impacts of ionizing radiation to biota and evaluated the studies to identify critical toxicity endpoints. Once the critical toxicity endpoints were determined, they were used with standard EU risk assessment protocols to derive a chronic Predicted-No-Effect-Dose Rates (PNEDR) screening value of 10 µGy/hr for freshwater, terrestrial, and marine/estuarine ecosystems (Garnier-Laplace and Gilbin 2006). The total absorbed dose from the internal concentration of ^{232}Th, ^{226}Ra, and ^{238}U in striped bass is less than the chronic screening no effects dose rate derived by the EU.

The internal dose rate conversion factors from USDOE (2002) are conservative, but they do not take into account absorbed doses received from external sources, such as radionuclides in the water and sediment. There is no way to estimate those dose rates without measurements.

USDOE (2002) provides a method for estimating the total absorbed dose to biota from both external and internal sources. This approach uses Biota Concentration Guides (BCG)s which are concentrations of 23 different radionuclides in water, soil, and sediment. If the BCG concentrations are not exceeded, the total absorbed dose will not exceed the USDOE (2002) standards of protection. In order to utilize this method, simultaneous samples of water and sediment must be collected and analyzed in the immediate vicinity of suspected unregulated releases of radioactive materials into the Hudson River.

No excursions above ecological standards for the protection of aquatic animals appear to have occurred. However, the current monitoring effort does not allow for the full assessment of risks to aquatic animals. To fully evaluate the risks, the concentrations of the full range of 23 radionuclides listed in USDOE (2002) in both water and sediment samples collected from the same location simultaneously should be sampled. This would allow for the full use of the "Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota" as described in USDOE (2002) to be employed to evaluate and assess risks to aquatic biota.

The 23 radionuclides which should be sampled include: ^{241}Am, ^{144}Ce, ^{135}Cs, ^{137}Cs, ^{60}Co, ^{154}Eu, ^{155}Eu, ^{3}H, ^{129}I, ^{131}I, ^{239}Pu, ^{226}Ra, ^{228}Ra, ^{125}Sb, ^{90}Sr, ^{99}Tc, ^{232}Th, ^{233}U, ^{234}U, ^{235}U, ^{238}U, ^{65}Zn, and ^{95}Zr.

CONCLUSIONS

Two conclusions can be made.

1. There are no apparent excursions above criteria for the protection of biota based on the radionuclide data available. The levels of radionuclides - including ^{90}Sr – were two to five orders of magnitude lower than criteria established for protection of freshwater ecosystems.

2. There were no spatial differences in concentrations of ^{90}Sr and ^{224}Ra in resident fish from the three locations sampled in the lower Hudson River (i.e., Indian Point Nuclear Power Plant, and the reference sites at the Roseton Generating Station and at Catskill). In contrast, ^{40}K levels were somewhat greater in the vicinity of Roseton Generating Station, but the differing concentrations have no known significance.

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Table 1: ^{90}Sr concentrations in edible tissues of fish taken from the lower Hudson River in 2006.

Location	Species	^{90}Sr concentration (pCi/kg wet weight)	
		Measured detection limit (DL)	Sample[1]
Indian Point Nuclear Power Plant (indicator site)	Striped bass	8.5	<DL
	Blue crab	5.7	<DL
	American eel	7.1	<DL
	Catfish	6.4	<DL
	Sunfish	15	<DL
	White perch	9.0	18.8
Roseton Generating Station (reference site)	Striped bass	4.2	<DL
	Blue crab	11.0	13.6
	American eel	4.3	<DL
	Catfish	7.6	<DL
	Sunfish	9.6	17.1
	White perch	8.7	24.5

[1] Analyses by Entergy Nuclear Operations, Inc. contract laboratory, i.e., AREVA, Inc.

Table 2: ^{90}Sr and other radionuclide concentrations in edible tissues of fish and blue crab from three locations on the lower Hudson River in June 2007[1]**.**

Location	Species	No. in sample	Concentration (pCi/kg wet weight)[2]					
			^{90}Sr	^{134}Cs	^{137}Cs	^{58}Co	^{60}Co	^{40}K
Indian Point Nuclear Power Plant (RM 42)[3]	Blue crab	62	8 ± 3	<3	<3	<3	<4	2510 ± 180
	Striped bass	7	<4	<1.9	<2	<2	<2	2400 ± 150
	White perch	57	<3	<2	<3	<3	<3	2750 ± 170
	Catfish	15	<4	<1.9	<2	<3	<2	2580 ± 150
	American eel	19	<4	<2	<3	<3	<2	2320 ± 150
	Carp	2	<5	<1.7	<2	<3	<1.8	2590 ± 150
	Sunfishes	79	<6	<2	<2	<3	<2	2660 ± 170
Roseton Generating Station (RM 65)	Striped bass	1	NA[4]	NA	NA	NA	NA	NA
	White perch	116	<5	<2	<3	<3	<2	2440 ± 160
	Catfish	45	<3	<1.8	<2	<2	<1.8	2620 ± 150
	American eel	15	<4	<2	<3	<3	<2	2490 ± 160
	Carp	4	<4	<1.7	<1.9	<3	<1.8	2480 ± 150
	Sunfishes	30	<3	<3	<3	<3	<3	2590 ± 170
Catskill Region (RM 107 – 125)	White perch	108	<4	<2	6 ± 3	<3	<2	2390 ± 160
	Catfish	18	<3	<1.9	9 ± 3	<3	<1.9	2640 ± 160
	American eel	15	<4	<2	<3	<3	<2	2000 ± 140
	Carp	2	<4	<2	<2	<3	<2	2450 ± 150
	Sunfishes	18	<4	<2	<3	<3	<2	2620 ± 170

[1] All analyses by the New York State Department of Health's Wadsworth Center for Labs and Research.
[2] A less than (<) value indicates the concentration is less than the specified detection limit for the sample.
[3] RM = Approximate location in river mile(s).
[4] NA = Not analyzed. Analyses by the Nuclear Regulatory Commission's laboratory, Oak Ridge Institute for Science and Education [ORISE], reported ^{90}Sr at <4 pCi/kg, and ^{134}Cs, ^{137}Cs, ^{58}Co and ^{60}Co as <10 pCi/kg each; no analyses were conducted of ^{40}K.

Table 3: ^{90}Sr and other radionuclide concentrations in bone of fish and carapace of blue crab from three locations on the lower Hudson River in June 2007.

Location	Species	No. in sample	Concentration (pCi/kg wet weight)[1]					
			^{90}Sr	^{134}Cs	^{137}Cs	^{58}Co	^{60}Co	^{40}K
Indian Point Nuclear Power Plant (River Mile 42)	Striped bass	7	96 ± 89	<4	<4	<21	<4	2710 ± 190
	White perch	28	190 ± 34	<5	<4	<21	<3	2240 ± 170
	Yellow perch	27	240 ± 50	<7	<6	<30	<6	2600 ± 200
	Brown bullhead	8	220 ± 62	<7	<6	<30	<6	4100 ± 300
	Channel catfish	1	230 ± 48	nd	nd	nd	nd	nd
	White catfish	7	160 ± 46	<5	<4	<20	<5	3000 ± 200
	American eel	21	150 ± 31	<9	<9	<41	<8	3200 ± 300
	Carp	2	290 ± 62	<3	<3	<17	<3	1670 ± 130
	Pumpkinseed	5	250 ± 58	<20	<16	<100	<19	2800 ± 400
	Sunfishes	35	160 ± 32	<7	<6	<30	<6	3200 ± 300
Roseton Generating Station (River Mile 65)	Blue crab	6	760 ± 49	<11	<9	<90	<9	3800 ± 300
	Striped bass	1	140 ± 57	<7	<5	<60	<6	2030 ± 160
	White perch	55	270 ± 62	<9	<7	<80	<8	3100 ± 300
	White perch	70	270 ± 39	<8	<8	<70	<8	3000 ± 300
	Brown bullhead	6	250 ± 72	<5	<4	<40	<4	3110 ± 180
	Brown bullhead	33	220 ± 63	<6	<6	<60	<5	3400 ± 300
	Channel catfish	5	130 ± 79	<6	<6	<60	<6	4900 ± 300
	American eel	15	140 ± 78	<10	<9	<90	<10	3500 ± 300
	Perch	9	260 ± 42	<12	<10	<100	<10	3100 ± 300
	Sunfishes	26	210 ± 66	<10	<10	<90	<8	3900 ± 400
	Rock bass	1	330 ± 310	<80	<60	<600	<80	5400 ± 100
Catskill Region (River Miles 107 – 125)	White perch	74	310± 46	<8	<6	<70	<6	2300 ± 200
	Brown bullhead	6	300 ± 50	<10	<7	<90	<8	2700 ± 200
	Channel catfish	11	220 ± 83	<4	<4	<60	<4	2800 ± 200
	American eel	16	120 ± 77	<11	<8	<90	<9	3300 ± 300
	Sunfishes	23	290 ± 95	<10	<8	<90	<10	4000 ± 400
	Carp	2	260 ± 31	<4	<4	<40	<3	2050 ± 180
	Largemouth bass	6	220 ± 38	<3	<2	<40	<2	2530 ± 130
	Smallmouth bass	2	330 ± 45	<10	<13	<170	<15	2800 ± 300
	Black crappie	1	300 ± 120	<30	<20	<200	<20	3000 ± 400
	Perch	17	360 ± 41	<12	<9	<140	<10	1900 ± 200

[1] A less than (<) value indicates the concentration is less than the specified detection limit for the sample. nd = not determined.

Table 4: Radionuclide concentrations measured in bone of fish from three locations on the lower Hudson River in June 2007.

Location	Species	No. in sample	Concentration (pCi/kg wet weight)			
			^{224}Ra	^{226}Ra	^{232}Th	^{238}U
Indian Point Nuclear Power Plant (River Mile 42)	Striped bass	7	26 ± 9.0	21 ± 9.0	47 ± 15	
	White perch	28	33 ± 9.0	25 ± 9.0		
	Yellow perch	27	31 ± 13	30 ± 14		
	Brown bullhead	8	23 ± 10	22 ± 12		
	White catfish	7	17 ± 8.0			
Roseton Generating Station (River Mile 65)	Striped bass	1	105 ± 14	153 ± 19	290 ± 30	290 ± 80
	White perch	55	31 ± 17	28 ± 17		
	White perch	70	47 ± 16			
	Brown bullhead	33	24 ± 11		50 ± 20	
	Perch	9	59 ± 17	34 ± 18		
Catskill Region (River Miles 107 – 125)	White perch	74	40 ± 20			
	Brown bullhead	6			60 ± 20	
	Sunfishes	23	48 ± 18			
	Carp	2	16 ± 7.0	19 ± 9.0		
	Perch	17	21 ± 18	<20	50 ± 30	

Table 5: Comparison of ^{90}Sr concentrations in bone and edible flesh of fish.

State/Site	Location	Species	n	Concentration		Ratio bone:flesh	Reference
				Bone	Edible flesh		
South Carolina/ USDOE Savannah River Plant	Pond B	Largemouth bass	28	~ 14.5 Bq/g ash	0.47 Bq/g dm[1]	31	Whicker *et al.* 1990
		Yellow bullhead	28	~ 13	0.086	151	
New York/ Nuclear Fuel Services, Inc.	Cattaraugus Cr.						NYSDEC 1971
	- Rt. 16 bridge	Suckers	nr[2]	228 pCi/kg	82 pCi/kg	2.8	
	- Springville Dam	Suckers	nr	10491	1679	6.2	
		Suckers	nr	31000	500	62	
	- mouth (Sunset Bay)	Rainbow trout	nr	127	3	42	
		Carp	nr	606	23	26	
		Suckers	nr	9587	8	1198	
		Salmon	nr	173	246	0.7	
New York/ Nuclear Fuel Services, Inc.	Buttermilk Cr. - at Bond Road	Trout	nr	320,000 pCi/kg	5400 pCi/kg	59	NYSDEC 1971
		Suckers	nr	620,000	12,000	52	
		Suckers	nr	89,537	14,456	6.2	
New York	Lake Ontario - at Brockwood (Wayne County)	Bass	nr	1410 pCi/kg	< DL	nc[4]	NYSDEC 1971
		Bluegill	nr	312	62 pCi/kg	5.0	
		Bullhead	nr	330	24	14	
		Sunfish	nr	89	17	5.3	
		Perch	nr	3516	40	88	
		Sucker	nr	497	15	33	
		Black crappie	nr	671	< DL[3]	nc	
		Perch	nr	271	29	9.3	
		Largemouth bass	nr	408	10	41	
		Rock bass	nr	270	25	11	
		Silver bass	nr	485	13	37	
		Carp	nr	898	15	60	
New York/Indian Point Nuclear Power Plant	Hudson River	5 species	5	204	< 6	≥ 34	This study
New York/Roseton Generating Station	Hudson River	4 species	5	204	< 5	≥ 41	This study
New York	Hudson River - at Catskill	5 species	5	240	< 4	≥ 60	This study

[1] dm = dry mass. [2] nr = Not reported. [3] DL = Detection limit. [4] nc = Not calculated; detection limit not reported.

Figure 1: Sampling locations for the project "^{90}Sr Analysis of Bone Taken from Hudson River Fish"

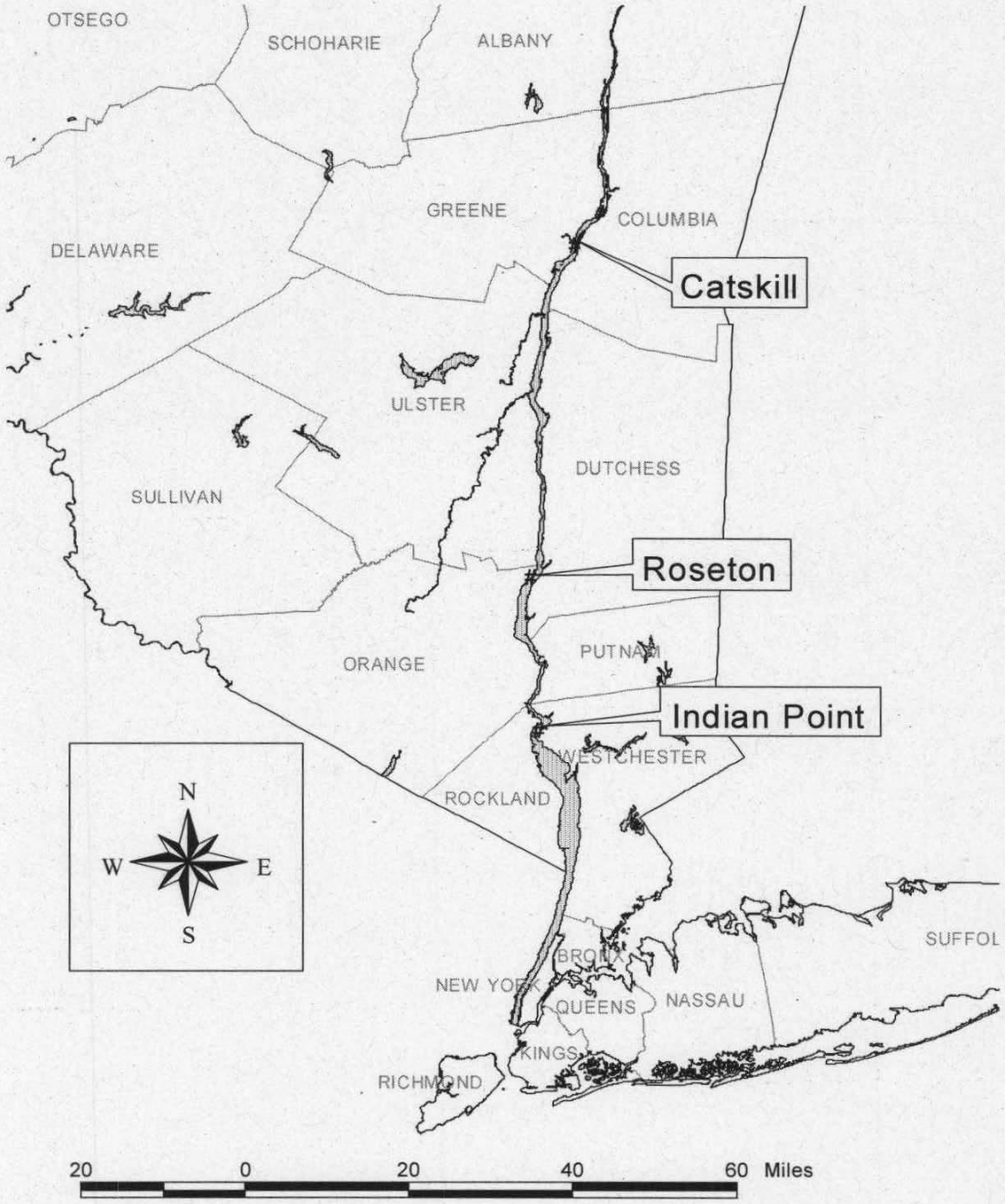

Figure 1

New York State Department of Environmental Conservation
Division of Fish, Wildlife & Marine Resources
Bureau of Habitat, 5th Floor
625 Broadway, Albany, New York 12233-4756
Phone: (518) 402-8924 • **FAX:** (518) 402-8925
Website: www.dec.ny.gov

Alexander B. Grannis
Commissioner

original to go w/ samples

I, Lawrence C. Skinner of the NYS Department of Environmental Conservation, have received from Joseph Bopp of the NYS Museum, on 11 day of December, 2007 the following samples of fish bones collected for Entergy Inc. for radionuclide surveillance of the Indian Point nuclear power plant. A copy of the related chain of custody for the samples is appended.

List of samples Entergy Region 4

07-0026-H	white catfish	07-0031-H	Brown bullhead
07-0027-H	Pumpkinseed	07-0032-H	Carp
07-0028-H	channel catfish	07-0033-H	White perch
07-0029-H	Yellow perch	07-0034-H	Striped bass
07-0030-H	Sunfishes	07-0035-H	American eels

RECIPIENT (PRINT NAME) Lawrence C. Skinner	TIME AND DATE 1540 12/11/07	PURPOSE OF TRANSFER Sample debugging + transfer to DOH
SIGNATURE Lawrence C Skinner	UNIT Bur. of Habitat	
RECIPIENT (PRINT NAME) Traci A Menia	TIME AND DATE 12/14/07 13:30	PURPOSE OF TRANSFER analysis
SIGNATURE	UNIT DEDP LINC	
RECIPIENT (PRINT NAME)	TIME AND DATE	PURPOSE OF TRANSFER
SIGNATURE	UNIT	
LOGGED IN BY (PRINT NAME)	TIME AND DATE	ACCESSION NUMBERS
SIGNATURE	UNIT	

New York State Department of Environmental Conservation
Division of Fish, Wildlife & Marine Resources
Bureau of Habitat, 5th Floor
625 Broadway, Albany, New York 12233-4756
Phone: (518) 402-8924 • **FAX:** (518) 402-8925
Website: www.dec.ny.gov

Alexander B. Grannis
Commissioner

CHAIN OF CUSTODY

I, Lawrence C. Skinner of the NYS Department of Environmental Conservation, have received from Joseph Bopp of the NYS Museum, on 8th day of February, 2008 the following samples of fish bones collected for Entergy Inc. for radionuclide surveillance of the Indian Point nuclear power plant. A copy of the related chain of custody for the samples is appended.

List of samples

07-0004-H	White perch	07-0016-H	American eel
07-0005-H	Blue crab	07-0017-H	Sunfish
07-0006-H	Yellow perch	07-0018-H	White perch
07-0007-H	White perch	07-0019-H	Brown bullhead
07-0008-H	Rock bass	07-0020-H	Smallmouth bass
07-0009-H	Sunfish	07-0021-H	Black crappie
07-0010-H	Channel catfish	07-0022-H	Yellow perch
07-0011-H	Brown bullhead	07-0023-H	Carp
07-0013-H	Striped bass	07-0024-H	Channel catfish
07-0014-H	Brown bullhead	07-0025-H	Largemouth bass
07-0015-H	American eel		

RECIPIENT (PRINT NAME) Lawrence C. Skinner	TIME AND DATE 2/8/08 @ 1520	PURPOSE OF TRANSFER Debugging and transfer to DOH
SIGNATURE Lawrence C. Skinner	UNIT DEC - Habitat	
RECIPIENT (PRINT NAME) Traci A. Menia	TIME AND DATE 02/15/08 @ 11:00	PURPOSE OF TRANSFER chemical analysis
SIGNATURE	UNIT DOH - nuclear chem.	
RECIPIENT (PRINT NAME)	TIME AND DATE	PURPOSE OF TRANSFER
SIGNATURE	UNIT	
LOGGED IN BY (PRINT NAME)	TIME AND DATE	ACCESSION NUMBERS
SIGNATURE	UNIT	

LAB #	TAG #	SPECIES	SAMPLE DATE	LOCATION	PROGRAM	NUMBER OF FISH OR CRABS
07-0004-H	07-0004-H	WP	2007	ENTERGY REG. 7	ENTERGY-2007	55
07-0005-H	07-0005-H	BCRAB	2007	ENTERGY REG. 7	ENTERGY-2007	6
07-0006-H	07-0006-H	PERCH	2007	ENTERGY REG. 7	ENTERGY-2007	9
07-0007-H	07-0007-H	WP	2007	ENTERGY REG. 7	ENTERGY-2007	70
07-0008-H	07-0008-H	RB	2007	ENTERGY REG. 7	ENTERGY-2007	1
07-0009-H	07-0009-H	SUN	2007	ENTERGY REG. 7	ENTERGY-2007	26
07-0010-H	07-0010-H	CHC	2007	ENTERGY REG. 7	ENTERGY-2007	5
07-0011-H	07-0011-H	BB	2007	ENTERGY REG. 7	ENTERGY-2007	33
07-0012-H	07-0012-H	CARP	2007	ENTERGY REG. 7	ENTERGY-2007	4
07-0013-H	07-0013-H	STB	2007	ENTERGY REG. 7	ENTERGY-2007	1
07-0014-H	07-0014-H	BB	2007	ENTERGY REG. 7	ENTERGY-2007	6
07-0015-H	07-0015-H	AMEL	2007	ENTERGY REG. 7	ENTERGY-2007	15
07-0016-H	07-0016-H	AMEL	2007	ENTERGY REG.11	ENTERGY-2007	16
07-0017-H	07-0017-H	SUN	2007	ENTERGY REG.11	ENTERGY-2007	23
07-0018-H	07-0018-H	WP	2007	ENTERGY REG.11	ENTERGY-2007	74
07-0019-H	07-0019-H	BB	2007	ENTERGY REG.11	ENTERGY-2007	6
07-0020-H	07-0020-H	SMB	2007	ENTERGY REG.11	ENTERGY-2007	2
07-0021-H	07-0021-H	BLC	2007	ENTERGY REG.11	ENTERGY-2007	1
07-0022-H	07-0022-H	PERCH	2007	ENTERGY REG.11	ENTERGY-2007	17
07-0023-H	07-0023-H	CARP	2007	ENTERGY REG.11	ENTERGY-2007	2
07-0024-H	07-0024-H	CHC	2007	ENTERGY REG.11	ENTERGY-2007	11
07-0025-H	07-0025-H	LMB	2007	ENTERGY REG.11	ENTERGY-2007	6
07-0026-H	07-0026-H	WC	2007	ENTERGY REG.4	ENTERGY-2007	7
07-0027-H	07-0027-H	PKSD	2007	ENTERGY REG.4	ENTERGY-2007	5
07-0028-H	07-0028-H	CHC	2007	ENTERGY REG.4	ENTERGY-2007	1
07-0029-H	07-0029-H	PERCH	2007	ENTERGY REG.4	ENTERGY-2007	27
07-0030-H	07-0030-H	SUN	2007	ENTERGY REG.4	ENTERGY-2007	35
07-0031-H	07-0031-H	BB	2007	ENTERGY REG.4	ENTERGY-2007	8
07-0032-H	07-0032-H	CARP	2007	ENTERGY REG.4	ENTERGY-2007	2
07-0033-H	07-0033-H	WP	2007	ENTERGY REG.4	ENTERGY-2007	28
07-0034-H	07-0034-H	STB	2007	ENTERGY REG.4	ENTERGY-2007	7
07-0035-H	07-0035-H	AMEL	2007	ENTERGY REG.4	ENTERGY-2007	21

Received 11/2/07 Bay Wlatt
NYSM Fish Lab 145 Jordan Rd Troy NY 12180

n = 32 records

Each record is a bag containing dried fish or dried crabs.

NORMANDEAU ASSOCIATES
ENVIRONMENTAL CONSULTANTS

www.normandeau.com (603) 472-5191

Chain of Custody Form

Project Name: ENTERGY INDIAN POINT REMP
Project Number: 21020.002
Originating Contact: JOAN BLAN
Originator Location: WEST HAVERSTRAW, N.Y.
Final Destination: INDIAN POINT ENERGY CENTER
Sampler(s): CHRIS BURNETT, LAWSON UPCHURCH

Page 1 of 6

Method of Shipment:

Sample No.	Identification	Collection Date	Collection Time	Containers No.	Containers Type	Grab.	Comp.	Presv. (FROZEN)	Parameters	Comments Below:
1	PERCH	6/6/07	1519	1	ZIPLOCK BAG	✓		✓		REG. 4
2	BLUE CRAB	6/6/07	1544	1		✓				REG. 4
2●	PERCH	6/6/07	1544	1		✓				REG. 4
3	PERCH	6/7/07	0930	1		✓				REG. 7
3	BROWN BULLHEAD	6/7/07	0930	1		✓				REG. 7
3	CARP	6/7/07	0930	1		✓				REG. 7
4	BROWN BULLHEAD	6/7/07	0959	1		✓				REG. 7
	CHANNEL CAT	6/7/07		1		✓				REG. 7
	EEL			1		✓				REG. 7
	PERCH			1		✓				REG. 7
4	CARP	6/7/07	0959	1		✓				REG. 7-2 BAGS
5	PERCH	6/7/07	1100	1		✓				REG. 7
5	BROWN BULLHEAD	6/7/07	1100	1		✓				REG. 7
5	EEL	6/7/07	1100	1		✓				REG. 7
6	EEL	6/7/07	1201	1		✓				REG. 7
6	PERCH	6/7/07	1201	1		✓				REG. 7
7	CARP	6/7/07	1230	1		✓				REG. 7
8	CHANNEL CAT	6/7/07	1348	1	ZIPLOCK BAG	✓		✓		REG. 7
			Total	18						

Relinquished by: (signature)	Received by: (signature)	Relinquished by: (signature)	Received by: (signature)	Relinquished by: (signature)	Received by: (signature)
Joan Blan	Joseph Strube	Joseph Strube	John Finn	Tim Prediccia	Lawrence C. Skinner
Printed Name: JOAN BLAN	Printed Name: Joseph Strube	Printed Name: Joseph Strube	Printed Name: JOHN FINN	Printed Name: Tim Prediccia	Printed Name: Lawrence C. Skinner
Date: 7-11-07	Date: 7/12/07	Date: 7/18/07	Date: 7/19/07 12:00pm	Date: 10/17/07 page 1 of 6	Date: 10/17/07 1115 pg. 1 of 6

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07/19/2007 08:14 FAX 603 472 7052 NORMANDEAU ASSOCIATES 002

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Originator Location: WEST HAVERSTRAW, N.Y.
Final Destination: INDIAN POINT ENERGY CENTER
Sampler(s): CHRIS BURNETT, LAWSON UPCHURCH

Page 2 of 6

Method of Shipment:

Sample No.	Sample Identification	Collection Date	Collection Time	Containers No.	Containers Type	Grab.	Comp.	Presv.	Parameters	Comments Below:
8	BROWN BULLHEAD	6/7/07	1348	1	ZIPLOCK BAG	✓		FROZEN		REG. 7
8	PERCH	6/7/07	1348	1		✓				REG. 7
9	PERCH	6/7/07	1420	1		✓				REG. 7
9	BROWN BULLHEAD	6/7/07	1420	1		✓				REG. 7
10	STRIPED BASS	6/7/07	1543	1		✓				REG. 4
11	PERCH	6/8/07	0822	1		✓				REG. 4
11	WHITE CATFISH	6/8/07	0822	1		✓				REG. 4
11	CARP	6/8/07	0822	1		✓				REG. 4
12	PERCH	6/8/07	0851	1		✓				REG. 4
13	CHANNEL CAT	6/8/07	0916	1		✓				REG. 4
13	PERCH	6/8/07	0916	1		✓				REG. 4
13	STRIPED BASS	6/8/07	0916	1		✓				REG. 4
14	CHANNEL CAT	6/12/07	1230	1		✓				REG. 11
14	SUNFISH	6/12/07	1230	1		✓				REG. 11
15	BROWN BULLHEAD	6/12/07	1500	1		✓				REG. 11
15	PERCH	6/12/07	1500	1		✓				REG. 11
15	POMPKINSEED	6/12/07	1500	1		✓				REG. 11
15	BLACK CRAPPIE	6/12/07	1500	1	ZIPLOCK BAG	✓				REG. 11
			Total	18						

Relinquished by: (signature)	Received by: (signature)	Relinquished by: (signature)	Received by: (signature)	Relinquished by: (signature)	Received by: (signature)
Joan Blan	Joseph Strube		John Finn		
Printed Name: JOAN BLAN	Printed Name: Joseph Strube	Printed Name:	Printed Name: JOHN FINN	Printed Name:	Printed Name:
Date: 7-11-07	Date: 7/12/07	Date:	Date: 7/19/07 12:00pm	Date:	Date:

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Presv.: FROZEN

Parameters

Page 3 of 6

Method of Shipment:

Sample No.	Sample Identification	Collection Date	Collection Time	Containers No.	Containers Type	Grab.	Comp.	Comments Below:
16	PERCH	6/13/07	1303	1	ZIPLOCK BAG	✓		REG. 7
1	SUNFISH			1		✓		REG. 7
	BROWN BULLHEAD			1		✓		REG. 7
16	WHITE CATFISH		1303	1		✓		REG. 7
17	EEL		1430	1		✓		REG. 4
18	BLUE CRAB	6/13/07	1438	1		✓		REG. 4
19	CARP	6/14/07	0730	1		✓		REG. 4
19	WHITE CATFISH	6/14/07	0730	1		✓		REG. 4
19	PERCH		0730	1		✓		REG. 4
20	BLUE CRAB		0745	1		✓		REG. 4
21	EEL		0756	1		✓		REG. 4
22	STRIPED BASS		0910	1		✓		REG. 7
23	EEL		0940	1		✓		REG. 7
24	SUNFISH	6/14/07	1006	1		✓		REG. 7
25	BROWN BULLHEAD	6/15/07	0824	1		✓		REG. 11
25	CHANNEL CATFISH			1		✓		REG. 11
25	EEL			1		✓		REG. 11
25	PERCH			1		✓		REG. 11
			Total	18				

Relinquished by: (signature)	Received by: (signature)	Relinquished by: (signature)	Received by: (signature)	Relinquished by: (signature)	Received by: (signature)
Joan Blan	Joseph Struhe		John Finn		
Printed Name: JOAN BLAN	Printed Name: Joseph Struhe	Printed Name:	Printed Name: JOHN FINN	Printed Name:	Printed Name:
Date: 7-11-07	Date: 7/12/07	Date:	Date: 7/19/07 12:00 pm	Date:	Date:

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Chain of Custody Form

Project Name: ENTERGY INDIAN POINT REMP
Project Number: 21020.002
Originating Contact: JOAN BLAN
Originator Location: WEST HAVERSTRAW, N.Y.
Final Destination: INDIAN POINT ENERGY CENTER
Sampler(s): CHRIS BURNETT, LAWSON UPCHURCH

Page 4 of 6

Method of Shipment:

Sample No.	Sample Identification	Collection Date	Collection Time	Containers No.	Containers Type	Grab.	Comp.	Presv. FROZEN	Parameters	Comments Below:
26	CHANNEL CAT	6/15/07	0845	1	ZIP LOCK BAG	✓		✓		REG-11
26	CARP		0845	1		✓				REG-11
26	LARGEMOUTH BASS		0845	1		✓				REG-11
27	EEL		0902	1		✓				REG-11
28	BROWN BULLHEAD		0922	1		✓				REG-11
28	CHANNEL CAT		0922	1		✓				REG-11
29	WHITE PERCH		1030	1		✓				REG-11
29	~~CRAPPIE~~ SUNFISH		1030	1		✓				REG-11
29	BROWN BULLHEAD		1030	1		✓				REG-11
30	EEL	6/15/07	1104	1		✓				REG-11
31	BLUE CRAB	6/18/07	0800	1		✓				REG-4
32	SUNFISH	6/11/07	1522	1		✓				REG-4
33	BLUE CRAB	6/18/07	0950	1		✓				REG-4
33	WHITE CAT			1		✓				REG-4
33	PERCH			1		✓				REG-4
33	BROWN BULLHEAD			1		✓				REG-4
33	EEL			1		✓				REG-4
33	SUNFISH			1		✓				REG-4
			Total	18						

Relinquished by: (signature)	Received by: (signature)	Relinquished by: (signature)	Received by: (signature)	Relinquished by: (signature)	Received by: (signature)
Joan Blan	Joseph Strube		John Finn		
Printed Name: JOAN BLAN	Printed Name: Joseph Strube	Printed Name:	Printed Name: JOHN FINN	Printed Name:	Printed Name:
Date: 7-11-07	Date: 7/12/07	Date:	Date: 7/19/07 12:00pm	Date:	Date:

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Chain of Custody Form

Project Name: ENTERGY INDIAN POINT REMP
Project Number: 21020.002
Originating Contact: JOAN BLAN
Originator Location: WEST HAVERSTRAW, N.Y.
Final Destination: INDIAN POINT ENERGY CENTER
Sampler(s): CHRIS BURNETT, LAWSON UPCHURCH

Page 5 of 6

Method of Shipment:

Sample No.	Sample Identification	Collection Date	Collection Time	Containers No.	Containers Type	Grab.	Comp.	Presv.	Parameters	Comments Below:
34	ROCK BASS	6/18/07	1155	1	ZIPLOCK BAG	✓		FROZEN		REQ. 7
34	PERCH		1155	1		✓				REQ. 7
34	BLUE CRAB		1155	1		✓				REQ. 7
35	EEL	6/18/07	1230	1		✓				REQ. 7
36	PERCH	6/19/07	0730	1		✓				REQ. 4
36	BLUE CRAB		0730	1		✓				REQ. 4
37	BLUE CRAB		0740	1		✓				REQ. 4
38	BLUE CRAB		0809	1		✓				REQ. 4
39	EEL	6/19/07	0815	1		✓				REQ. 4
40	CARP	6/19/07	1400	1		✓				REQ. 11
	LARGEMOUTH BASS			1		✓				REQ. 11
	SMALLMOUTH BASS			1		✓				REQ. 11
	PERCH			1		✓				REQ. 11
40	SUNFISH		1400	1		✓				REQ. 11
41	CHANNEL CAT	6/19/07	1510	1		✓				REQ. 11
41	PERCH		1510	1		✓				REQ. 11
41	SUNFISH		1510	1		✓				REQ. 11
42	PERCH	6/19/07	1610	1		✓				REQ. 11
			Total	18						

Relinquished by: (signature)	Received by: (signature)	Relinquished by: (signature)	Received by: (signature)	Relinquished by: (signature)	Received by: (signature)
Joan Blan	Joseph Struhs		John Finn		
Printed Name: JOAN BLAN	Printed Name: Joseph Struhs	Printed Name:	Printed Name: JOHN FINN	Printed Name:	Printed Name:
Date: 7-11-07	Date: 7/12/07	Date:	Date: 7/19/07	Date:	Date:

Chain of Custody Form.doc 12/8/06

07/19/2007 08:15 FAX 603 472 7052 NORMANDEAU ASSOCIATES 006

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Chain of Custody Form

Project Name: ENTERGY INDIAN POINT REMP
Project Number: 21020.002
Originating Contact: JOAN BLAN
Originator Location: WEST HAVERSTRAW, N.Y.
Final Destination: INDIAN POINT ENERGY CENTER
Sampler(s): CHRIS BURNETT, LAWSON UPCHURCH

Page 6 of 6

Method of Shipment:

Sample No.	Sample Identification	Collection Date	Collection Time	Containers No.	Containers Type	Grab.	Comp.	Presv. (FROZEN)	Parameters	Comments Below:
42	SUNFISH	6/19/07	1610	1	2 ZLOCK BAG	✓		✓		REQ. 11
43	EEL		1331	1		✓				REQ. 7
	BLUE CRAB			1		✓				REQ. 7
	PERCH			1		✓				REQ. 7
43	SUNFISH		1331	1		✓				REQ. 7
44	EEL		1600	1		✓				REQ. 4
	WPERCH			1		✓				REQ. 4
	BLUE CRAB			1		✓				REQ. 4
44	SUNFISH	6/19/07	1600	1		✓				REQ. 4
45	SUNFISH	6/20/07	1230	1		✓				REQ. 7
45	PERCH	6/20/07	1230	1		✓				REQ. 7
46	SUNFISH	6/21/07	0800	1		✓				REQ. 4
47	Blue Crab	6/22/07	0830	1	ZLOCK BAG	✓		✓		Req. 7
			Total	13						

Relinquished by: (signature)	Received by: (signature)	Relinquished by: (signature)	Received by: (signature)	Relinquished by: (signature)	Received by: (signature)
Joan Blan	Joseph Strube		John Finn		
Printed Name: JOAN BLAN	Printed Name: Joseph Strube	Printed Name:	Printed Name: John FINN	Printed Name:	Printed Name:
Date: 7-11-07	Date: 7/12/07	Date:	Date: 7/19/07	Date:	Date:

Chain of Custody Form.doc 12/8/06

NORMANDEAU ASSOCIATES
Environmental Consultants
600 Beach Road
West Haverstraw, NY 10993

(845) 947-0390
(845) 947-4057 (Fax)

Facsimile Transmittal

To: LARRY SKINNER **Fax #:** 518 402-8925

From: JOAN BLAN **Date:** 11-18-09

Re: 2007 REMP **Pages:** 4

CC: MIKE RICCI
DARA GRAY

NOTES

THE FOLLOWING PAGES REFLECT THE NUMBER OF FISH & CRAB MEASURED, WEIGHED AND PROCESSED BY THE BEDFORD LAB FOR SPRING REMP 2007.

REGION 4 INDIAN PT.

SAM.#	SPECIES	COUNT	SAM.#	SPECIES	COUNT
1	PERCH	16	36	CRAB	6
2	PERCH	1	37	CRAB	22
10	S. BASS	1	38	CRAB	4
11	PERCH	4	39	EEL	7
11	CATFISH	4	44	PERCH	12
11	CARP	1	44	SUNFISH	3
12	PERCH	1	44	EEL	1
13	PERCH	1	44	CRAB	2
13	CATFISH	1	46	SUNFISH	64
13	S. BASS	6			
17	EEL	5			
18	CRAB	6			
19	PERCH	1			
19	CATFISH	1			
19	CARP	1			
20	CRAB	9			
21	EEL	5			
31	CRAB	10			
32	SUNFISH	7			
33	CATFISH	9			
33	CRAB	3			
33	PERCH	18			
33	SUNFISH	5			
33	EEL	1			
36	PERCH	3			

REGION 7 POUGHKEEPSIE

SAM.#	SPECIES	COUNT	SAM.#	SPECIES	COUNT
3	CATFISH	3	43	EEL	2
3	CARP	1	45	SUNFISH	19
4	PERCH	87	45	PERCH	1
4	EEL	2			
4	CATFISH	24			
4	CARP	2			
5	EEL	3			
5	CATFISH	3			
6	PERCH	2			
7	CARP	1			
8	PERCH	1			
8	CATFISH	2			
9	CATFISH	8			
16	SUNFISH	5			
16	PERCH	20			
16	CATFISH	5			
22	S. BASS	1			
23	EEL	6			
24	SUNFISH	3			
34	SUNFISH	1			
34	PERCH	3			
35	EEL	2			
43	SUNFISH	2			
43	PERCH	2			

REGION 11 CATSKILL

SAM. #	SPECIES	COUNT
14	CATFISH	3
15	PERCH	3
15	CATFISH	1
25	PERCH	2
25	EEL	2
25	CATFISH	4
26	SUNFISH	1
26	CATFISH	6
26	CARP	1
27	EEL	8
28	CATFISH	2
29	PERCH	20
29	CATFISH	1
30	EEL	5
40	SUNFISH	11
40	PERCH	66
40	CARP	1
41	PERCH	16
41	CATFISH	1
42	SUNFISH	6
42	PERCH	1