Entergy

Indian Point Energy Center
450 Broadway, GSB
P.O. Box 249
Buchanan, N.Y. 10511-0249
Tel (914) 734-6710

Robert Walpole
Manager, Licensing

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

Subject: **Indian Point Nuclear Power Plants Units 1, 2 and 3**
Annual Radiological Environmental Operating Report for 2009
Indian Point Units 1, 2 & 3
Docket Nos. 50-003, 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) site Annual Radiological Environmental Operating Report for the period January 1, 2009 to December 31, 2009.

This report is submitted in accordance with facility Technical Specification section 5.6.2 for DPR-5, DPR-26, and DPR-64, Indian Point Unit Nos. 1, 2 and 3 respectively. No commitments are being made by this report.

Should you or your staff have any questions, please contact Mr. Reid Tagliamonte, Acting - Radiation Protection Manager at 914-736-8401.

Sincerely yours,

RW/as

Enclosure

cc: w/o enclosure

Mr. John P. Boska, Senior Project Manager, NRC NRR DORL
Mr. Samuel J. Collins, Regional Administrator, NRC Region 1
Mr. Theodore B. Smith, Project Manager
NRC Resident Inspectors Office, Indian Point Energy Center
Mr. Francis J. Murray, Jr. President and CEO NYSERDA
Mr. Paul Eddy, New York State Dept. of Public Service
Mr. Tim Rice, New York State DEC

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, 2009

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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 2009 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 2009 AREOR also contains summaries and discussions of the results of the 2009 program, trend analyses, and potential impact on the environment, land use census, and inter-laboratory comparisons.

During 2009, a total of 1199 samples were obtained out of a planned load of 1203 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 2009. 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 2009, 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. 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 2009. These changes were captured in the ODCM. Groundwater sample results for 2009 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 2009 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 2009; however, residual radioactivity from atmospheric weapons tests and naturally occurring radioactivity were the predominant sources of radioactivity in the samples collected. Analysis of the 2009 REMP sample results supports the premise 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 Nuclear Northeast Nuclear Environmental Monitoring (NEM) 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 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 2009, an offsite well at the Lafarge plant (106) was established to replace MW-40 and MW-51. These groundwater sample locations are shown in Figure A-3.

Groundwater samples from MW-40 and MW-51 were obtained quarterly for the first half of the year and thereafter once semi-annually at Lafarge. 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 a predetermined concentration or activity level used to establish a detection limit for the analytical procedures.

The Nuclear Regulatory Commission (NRC) specifies the maximum acceptable LLDs for each radionuclide in specific media. The LLDs are determined by taking into account overall measurement methods. The equation (from the ODCM) used to calculate the LLD reduces to:

$$LLD = 4.66\ K\ S_b,$$

where: S_b = standard deviation of the background count rate,

and

K consists of variables, which account for such parameters as:
- Instrument characteristics (e.g., efficiency)
- Sample size
- Counting time
- Media density (self-absorption)
- Radioactive decay
- Chemical yield

In the ODCM program, LLDs are used to ensure that minimum acceptable detection capabilities for the counting system are met with specified statistical confidence levels (95% detection probability with 5% probability of a false negative). 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. Table A-2 presents the ODCM required LLDs for specific

media and radionuclides as specified by the NRC. The LLDs actually achieved are usually much lower since the ODCM required LLDs represent the maximum allowed.

The critical level (L_c) is defined as that net sample counting rate which has a 5% probability of being exceeded when the actual sample activity is zero (e.g., when counting background only). It is determined using the following equation.

$$L_c = k_a S_b (1 + T_b/T_s)^{0.5} \text{ in cpm}$$

where:

k_a = 1.645 (corresponds to a 95% confidence level)
S_b = standard deviation of the background count rate = $(R_b/T_b)^{0.5}$
R_b = background count rate (cpm)
T_b = background count time (min)
T_s = sample count time (min)

For the REMP, net sample results which are less than the L_c value are considered not detected, and the L_c value is reported as the "less than" value, unless otherwise noted. Values above the L_c are considered positively detected radioactivity in the environmental media of interest (with a 5% chance of false positive).

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 1999 through 2008. The 2009 average values are included in these historic tables for purposes of comparison.

SECTION 4

RESULTS AND DISCUSSION

4.0 RESULTS AND DISCUSSION

The 2009 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 2009 and assessed the significance of the findings.

A summary of the results of the 2009 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 2009 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 2009, 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 2009 REMP comprises those that may be attributable to current plant operations. During 2009 Cs-137, I-131, Sr-90 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. Small amounts of H-3 were detected in groundwater boundary wells in 7 of 40 samples at levels which were much lower than the required Lower Limit of Detection (3000 pCi/L); however, they were detectable.

Cs-137 and Cs-134 are both produced in and released from fission reactors and were introduced into the environment from the accident at Chernobyl in 1986. Because Cs-134 has a short half-life relative to Cs-137, Cs-134 from Chernobyl is not likely to be present in 2009. Cs-137 is ubiquitous in the environment from atmospheric testing debris and a lesser amount from the Chernobyl accident. In 2009, there were three detections of Cs-137 in shoreline soil (2 indicator samples and one control sample). In bottom sediment there were seven positive detections of Cs-137 (6 indicator samples, and one of two control samples.) The two discharge canal samples, separated by only three months, were quite dissimilar – with the June result indistinguishable from the control location and the September result

significantly higher. Compared to 2007-2009 results for comparable samples, the September value appears exceptional but is consistent with historical values. A sample of aquatic vegetation at Lents Cove showed 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.

The fact that there was no Cs-134 present (recent plant releases would contain Cs-134) and that there was detection also at a control location indicates that the activity may be due to atmospheric weapons testing, with some contribution from plant releases from several years past.

All preliminary results for Sr-90 in fish and invertebrate samples are questionable and under review. When available, re-analyzed and certified results will be provided.

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 2009 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 2009 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 2009 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 2009, 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 1999 through 2008. The 2009 means are also presented in Table B-4. Table B-5 presents the 2009 TLD data for the inner ring and outer ring of TLDs.

The 2009 mean value for the direct radiation sample points was 14.0 mR per standard quarter – a slight and insignificant decrease from 2008. At those locations where the 2009 mean value was higher, 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 14.6 mR per standard quarter and also average for the outer ring was 14.3 mR per standard quarter. The control location average for 2009 was 15.1 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 2009 averages are consistent with the historical data. The 2009 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 2009 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 2009 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 2009.

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.
No radionuclides other than those that are naturally occurring were detected in the Hudson River Water samples. 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 2009 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 2009. Cs-137 was detected at the Verplanck location in both samples (averaging 143 pCi/kg) 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 (99 pCi/kg). The average concentration for the indicator locations that had positive indication of Cs-137 was 143 pCi/kg-dry with a maximum concentration of 148 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.

4.6 Broad Leaf Vegetation

Table B-2 contains a summary of the broad leaf vegetation sample analysis results. Data from analysis of the 2009 samples are presented in Table B-14. Analyses of broad leaf vegetation samples revealed only naturally occurring radionuclides.

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; however, Cs-137 was not detected in 2009.

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 2009. 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 2009. No Ni-63 was found in 2009. Results for Sr-90 in all fish and invertebrate samples are under review and not reliable. When the certified results are available they will be submitted as an addendum to this report.

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 2009.

The laboratory reported positive Cs-137 (17.3 +/- 4.1 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. 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 2009. Cs-137 was detected at 6 of 6 indicator station samples and at one of 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. Notably, the discharge canal bottom sediments were 232 pCi/kg and 1810 pCi.kg on samples taken three months apart. There is nothing in release data and in monitoring well data that corresponds to this difference, yet the larger result is significantly different from other indicator and control locations from 2009 and the historical record. The average in 2009 is 493 pCi/kg. This is consistent with historical annual average concentration for indicator locations. The first samples (June 2010) of the current year will be examined for their corroborative value.

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 250 pCi/kg over the last three years. 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 2009. 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 1999; 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 2009. 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 2009 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.

Tritium was detected at very low concentrations in 7 of the 40 groundwater samples analyzed. The amount detected ranged from 193 to 329 pCi/L and averaged 244 pCi/L - which are well below the required LLD of 3000 pCi/L.

Other than tritium, there were no potentially plant-related radionuclides detected in the groundwater samples.

4.13 Land Use Census

A census was performed in the vicinity of Indian Point in 2009. 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 2009 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 2009 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 2009 REMP reveal that operations at the station did not result in an adverse impact on the environment.

The 2009 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 2009 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	R/S 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
104	**	MW-40 Boundary Well, lower parking lot	Onsite - 0.21 mi (SW)	Groundwater
105	**	MW-51 Boundary Well, middle parking lot	Onsite - 0.18 mi (SSW)	Groundwater
106	**	Lafarge Monitoring Well	0.63 mi SW	Groundwater

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

FIGURE A-1

SAMPLING LOCATIONS
Within Two Miles of Indian Point

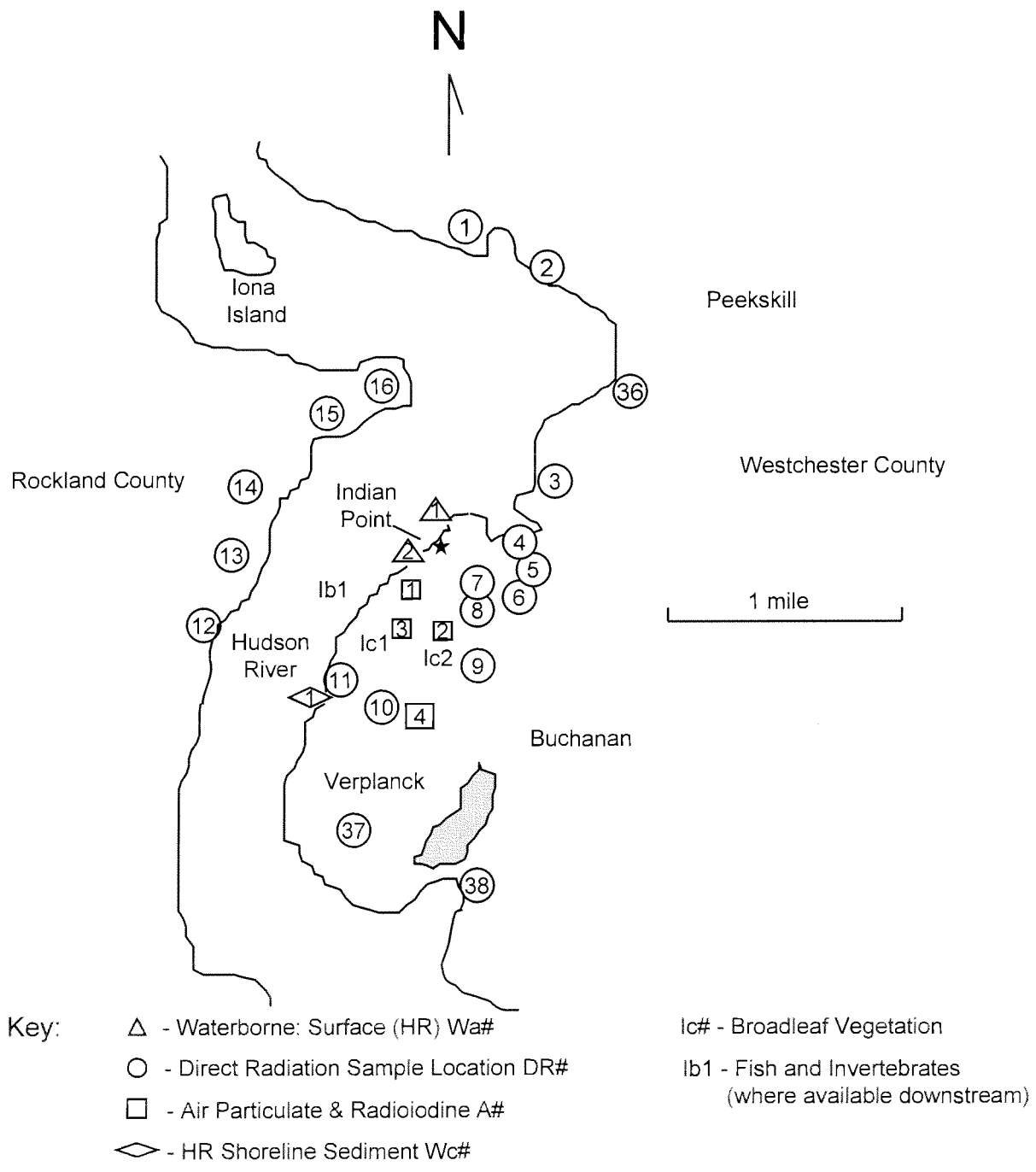
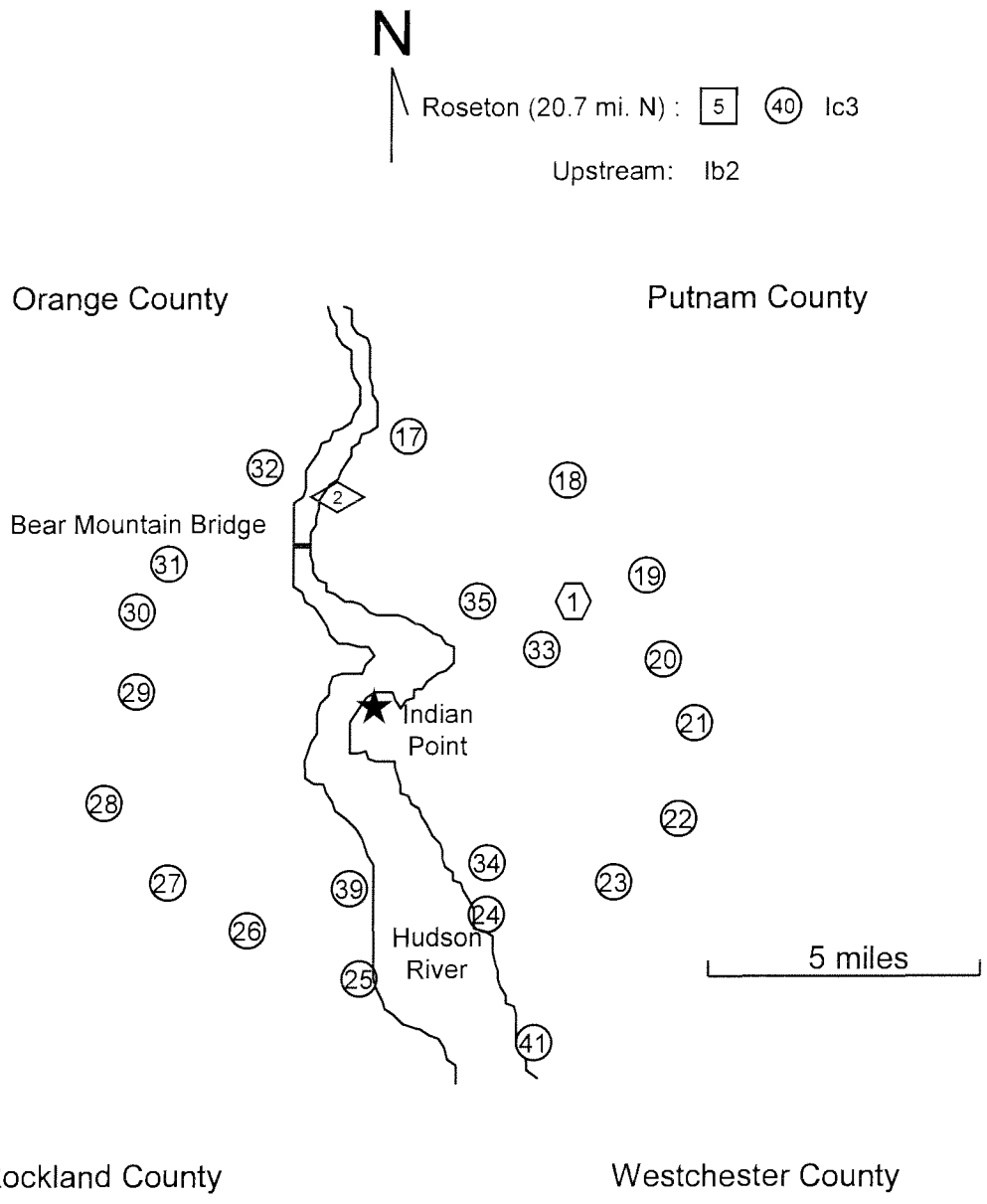


FIGURE A-2

SAMPLING LOCATIONS
Greater Than 2 Miles From Indian Point



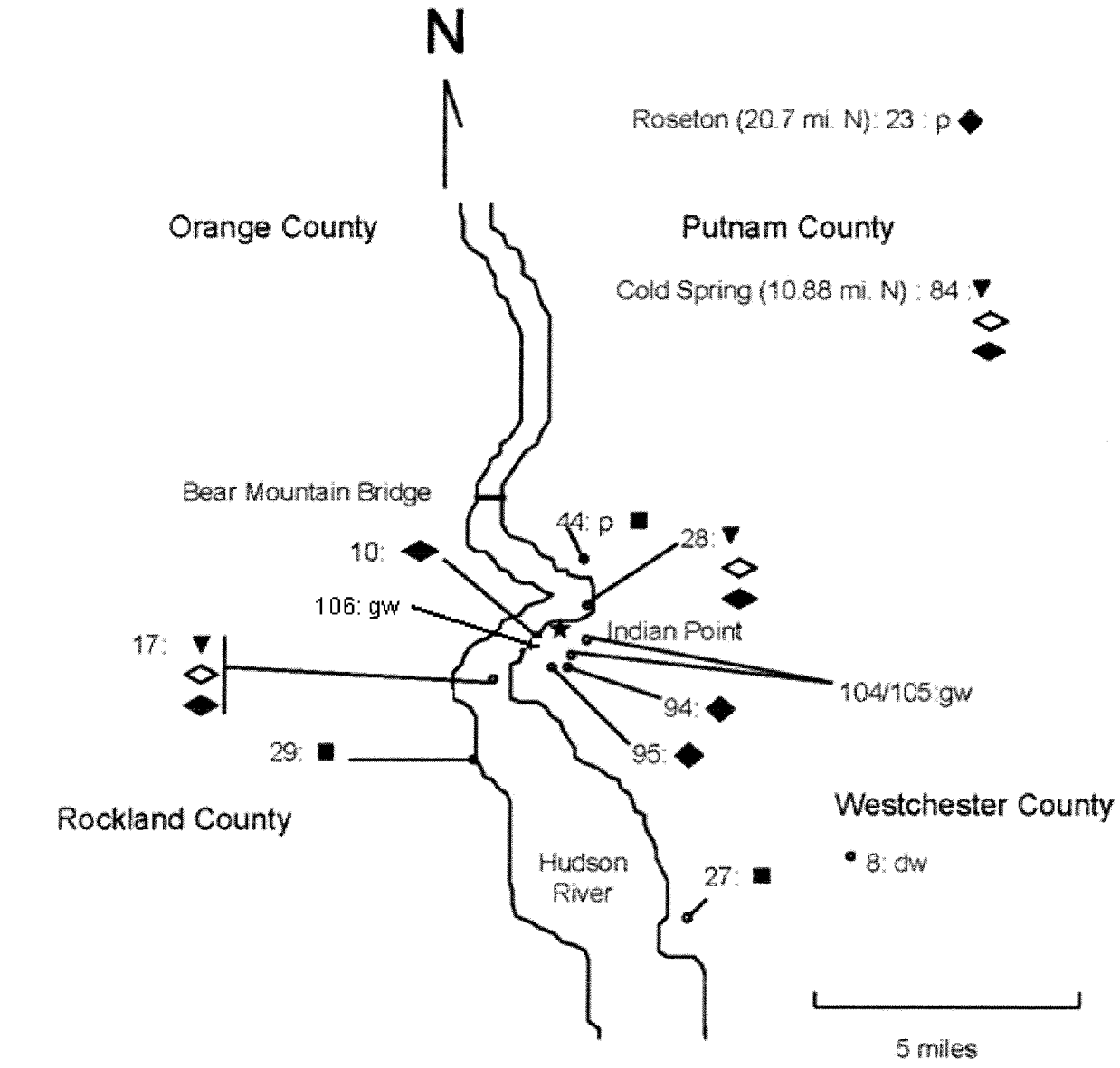
Key:

- ○ - Direct Radiation Sample Location DR#
- □ - Air Particulate & Radioiodine A#
- ◇ - HR Shoreline Sediment Wc#
- ⬡ - Waterborne: Drinking Wb#

Ic3 - Broadleaf Vegetation
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 Sediment
- ◆ - Soil
- gw – Ground Water Boundary Monitoring (see detailed site map)

TABLE A-2

LOWER LIMIT OF DETECTION (LLD) REQUIREMENTS FOR ENVIRONMENTAL SAMPLE ANALYSIS [a] [b]

ANALYSIS	WATER (pCi/L)	AIRBORNE PARTICULATES OR GASES (pCi/m3)	FISH (pCi/kg, wet)	MILK (pCi/L)	FOOD PRODUCTS (pCi/kg, wet)	SEDIMENT (pCi/kg, dry)
Gross β	4	0.01				
H-3	2,000 [c]					
Mn-54	15		130			
Fe-59	30		260			
Co-58	15		130			
Co-60	15		130			
Zn-65	30		260			
Zr-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-La-140	15			15		
Sr-90	1 [e]		5			5,000

(a) This list shows required LLD's, but other radionuclides are considered. Other identifiable peaks from gamma spectroscopy shall also be analyzed and reported in the Annual Radiological Environmental Operating Report.

(b) Required detection capabilities for thermoluminescent dosimeters used for environmental measurements are given in Regulatory Guide 4.13 (Reference 27).

(c) LLD for drinking water samples. If no drinking water pathway exists, a value of 3000 pCi/L may be used.

(d) LLD for drinking water samples. If no drinking water pathway exists, a value of 15 pCi/L may be used.

(e) The Sr-90 water LLD is only for groundwater samples locations 104 and 105 (see Table A-1)

TABLE A-3

REPORTING LEVELS FOR RADIOACTIVITY CONCENTRATIONS IN ENVIRONMENTAL SAMPLES

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

(a) For drinking water samples. This is the 40 CFR Part 141 value. If no drinking water pathway exists, a value of 30,000 pCi/L may be used.

(b) If no drinking water pathway exists, a value of 20 pCi/L may be used.

APPENDIX B

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM RESULTS SUMMARY

APPENDIX B

B.1 2009 Annual Radiological Environmental Monitoring Program Summary

The results of the 2009 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 2009. 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 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 2009, environmental sampling was performed for 12 media types addressed in the ODCM and for direct radiation. A total of 1199 samples of 1203 scheduled were obtained. Of the scheduled samples, 99.7% 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

One fish sample could not be re-analyzed for Ni-63, due to a lack of sufficient mass of the unused remnant.

B.5 Special Reports

No special reports were required under the REMP.

TABLE B-1

SUMMARY OF SAMPLING DEVIATIONS
2009

MEDIA	TOTAL SCHEDULED SAMPLES	NUMBER OF DEVIATIONS*	SAMPLING EFFICIENCY %	REASON FOR DEVIATION
MEDIA				
PARTICULATES IN AIR	416	2	99.5%	See Table B-1a
CHARCOAL FILTER	416	2	99.5%	See Table B-1a
TLD	164	0	100%	N/A
HUDSON RIVER WATER	32	0	100%	N/A
DRINKING WATER	32	0	100%	N/A
SHORELINE SOIL	10	0	100%	N/A
BROAD LEAF VEGETATION	61	0	100%	N/A
FISH & INVERTEBRATES	23	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	25	0	100%	N/A
TOTALS	1203	4	99.7%	

TOTAL NUMBER OF SAMPLES COLLECTED = 1199

* Samples not collected or unable to be analyzed.

TABLE B-1a / B-1b/B-1c

TABLE B-1a
2009 Air Sampling Deviations

STATION	WEEK	PROBLEM / ACTIONS TO PREVENT RECURRENCE
N.Y.U. Tower	6/23/2009	64 hours lost due to GFI trip
N.Y.U. Tower	12/1/2009 - 12/15/2009	Damage to station from fallen tree; not restored until 12/16/09
GRASSY POINT	6/30/2009	Power turned off inadvertently from inside the building; 97 hour outage
GRASSY POINT	8/17/2009	Repeat of previous outage; maintenance has placed tag on breaker; 99 hour outage

TABLE B-1b
2009 TLD Deviations

STATION	QUARTER	PROBLEM / ACTIONS TO PREVENT RECURRENCE
		None

TABLE B-1c
2009 Other Media Deviations

STATION	SAMPLE SCHEDULE	PROBLEM / ACTIONS TO PREVENT RECURRENCE
HUDSON RIVER	1/16/09 - 1/23/09	Frozen sample line; grab sample taken
HUDSON RIVER	1/23/09 - 1/30/09	Frozen sample line; grab sample taken
HUDSON RIVER	1/30/09 - 2/6/09	Frozen sample line; grab sample taken

TABLE B-2
ODCM ANNUAL SUMMARY - 2009

MEDIUM (UNITS) SEE TABLE	TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LLD (b)	INDICATOR LOCATIONS: MEAN (a) RANGE	LOCATION OF HIGHEST ANNUAL MEAN: LOCATIONS AND DESIGNATION MEAN (a) RANGE	CONTROL LOCATION: MEAN (a) RANGE	NUMBER OF NON-ROUTINE REPORTS
DIRECT RADIATION (mR / standard quarter) B-3	TLD Reads 164	N/A	*14 (160/160) / 9.9 - 20.8*	West Shore Drive - North 1.21 Mi (W) at 276° DR13 19.9 *(4/4) / 19 - 20.8*	*15.2 (4/4) / 13.9 - 16.6*	0
AIR PARTICULATES AND RADIOIODINE (pCi/m^3) B-6, B-7, B-8	GB (467)	0.01	*0.013 (360/364) / 0 - 0.026*	#4 Algonquin Gas Line 0.28 Mi (SW) at 234° 0.013 (52/52) / 0.004-0.024	*0.013 (52/52) / 0.003-0.025*	0
	I-131 (466)	0.07	<Lc	<Lc	<Lc	0
	GSA (36) Cs-134	0.05	<Lc	<Lc	<Lc	0
	GSA (36) 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	<Lc	0
	GSA (24)					
	Mn-54	15	<Lc	<Lc	<Lc	0
	Co-58	15	<Lc	<Lc	<Lc	0
	Fe-59	30	<Lc	<Lc	<Lc	0
	Co-60	15	<Lc	<Lc	<Lc	0
	Zn-65	30	<Lc	<Lc	<Lc	0
	Zr/Nb-95	15	<Lc	<Lc	<Lc	0
	I-131	15	<Lc	<Lc	<Lc	0
	Cs-134	15	<Lc	<Lc	<Lc	0
	Cs-137	18	<Lc	<Lc	<Lc	0
	Ba/La-140	15	<Lc	<Lc	<Lc	0

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

TABLE B-2
ODCM ANNUAL SUMMARY - 2009

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	GB (24)	4				
	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	*143 (2/8) / <L_c - 149*	#17 Off Verplanck 1.5 Mi (SSW) at 202.5° *143 (2/2) / 137 - 149*	*#50 Manitou Inlet 99 (1/2) / <L_c - 99*	0
	Sr-90 (6)	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 - 2009

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 (61)					
	I-131	60	<Lc	<Lc	<Lc	0
	Co-60	N/A	<Lc	<Lc	<Lc	0
	Cs-134	60	<Lc	<Lc	<Lc	0
	Cs-137	80	<Lc	<Lc	<Lc	0
FISH AND INVERTEBRATES (pCi/kg - wet) B-15	GSA (23)					
	Mn-54	130	<Lc	<Lc	<Lc	0
	Co-58	130	<Lc	<Lc	<Lc	0
	Fe-59	260	<Lc	<Lc	<Lc	0
	Ni-63	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 (27)	5	TBD	TBD	TBD	0
AQUATIC VEGETATION (pCi/kg - WET)	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	17.3 *(1/4)* / *<L_c - 17.3*	#28 Lents Cove 0 .45 Mi (ENE) at 069° *17.3 (1/2) / <L_c - 17.3*	<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 - 2009

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)	GSA(8)					
	Co-60	NONE	<Lc	<Lc	<Lc	0
	Cs-134	150	<Lc	<Lc	<Lc	0
	Cs-137	180	*493 (6/6) / 65 - 1810*	#10 Discharge Canal 0.3 Mi WSW *1021 (2/2) / 232 - 1810*	#84 Cold Spring 20.7 Mi (N) at 356° *224 (1/2) / <L_c - 224*	0
SOIL (pCi/kg - DRY)	GSA(3)					
	Co-60	NONE	<Lc	<Lc	<Lc	0
	Cs-134	150	<Lc	<Lc	<Lc	0
	Cs-137	180	<Lc	<Lc	<Lc	0
PRECIPITATION (pCi/L)	GSA(8)					
	H-3	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

(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 - 2009

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
GROUNDWATER (pCi/L)	GSA(25)					
	H-3 (25)	3000 (c)	187 (8/25) / *L_c - 262*	#104 MW-40 0.18 mi - SSW *185 (7/12) / L_c - 262*	N/A	0
	Co-60 (25)	15	<Lc	<Lc	N/A	0
	Cs-134 (25)	15	<Lc	<Lc	N/A	0
	Cs-137 (25)	18	<Lc	<Lc	N/A	0
	Sr-90 (25)	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

2009 DIRECT RADIATION, QUARTERLY DATA

(mR per STANDARD QUARTER)

Station ID	Sector	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Mean	Yearly
DR-01	N	15.53 ± 1.27	13.82 ± 0.51	15.48 ± 0.96	15.54 ± 0.57	15.1	60.4
DR-02	NNE	13.85 ± 0.74	13.33 ± 0.66	15.58 ± 1.49	15.86 ± 1.47	14.7	58.6
DR-03	NE	11.81 ± 0.77	10.70 ± 0.40	12.56 ± 0.52	12.50 ± 0.61	11.9	47.6
DR-04	ENE	13.18 ± 0.91	12.72 ± 0.74	14.24 ± 0.72	13.71 ± 0.78	13.5	53.9
DR-05	ENE	13.32 ± 0.78	12.61 ± 0.53	14.56 ± 0.69	14.00 ± 0.70	13.6	54.5
DR-06	ESE	13.82 ± 0.71	13.38 ± 0.88	14.37 ± 0.65	14.64 ± 0.82	14.1	56.2
DR-07	SE	15.92 ± 0.93	15.28 ± 0.57	16.74 ± 1.67	16.97 ± 0.70	16.2	64.9
DR-08	SSE	12.22 ± 0.75	11.73 ± 0.64	12.76 ± 1.10	12.31 ± 0.72	12.3	49.0
DR-09	S	13.26 ± 0.85	12.30 ± 0.50	13.90 ± 0.64	14.45 ± 0.81	13.5	53.9
DR-10	SSW	13.64 ± 0.84	13.56 ± 0.64	13.86 ± 0.89	15.24 ± 0.71	14.1	56.3
DR-11	SW	10.95 ± 0.67	9.85 ± 0.42	10.89 ± 0.60	11.19 ± 0.67	10.7	42.9
DR-12	WSW	15.32 ± 0.90	14.22 ± 0.39	15.24 ± 0.80	16.15 ± 0.84	15.2	60.9
DR-13	WSW	19.46 ± 1.48	18.99 ± 0.84	20.38 ± 1.03	20.80 ± 0.94	19.9	79.6
DR-14	WNW	12.95 ± 0.87	12.59 ± 0.55	14.12 ± 1.60	13.85 ± 0.74	13.4	53.5
DR-15	NW	12.68 ± 0.68	12.05 ± 0.75	13.16 ± 0.80	13.58 ± 0.75	12.9	51.5
DR-16	NNW	14.35 ± 0.97	13.57 ± 0.76	15.08 ± 1.16	14.59 ± 0.69	14.4	57.6
DR-17	N	14.29 ± 0.73	13.31 * 0.74	14.98 ± 1.47	15.19 ± 0.97	14.4	57.8
DR-18	NNE	13.71 ± 0.98	13.58 ± 0.58	14.15 ± 0.85	14.79 ± 0.55	14.1	56.2
DR-19	NE	14.69 ± 0.69	13.79 ± 0.49	15.56 ± 1.02	14.99 ± 0.65	14.8	59.0
DR-20	ENE	13.22 ± 0.82	12.02 ± 0.69	13.41 ± 0.91	13.57 ± 0.63	13.1	52.2
DR-21	E	13.84 ± 0.89	13.23 ± 0.70	14.70 ± 0.92	14.26 ± 0.86	14.0	56.0
DR-22	ESE	11.05 ± 0.70	10.58 ± 0.77	11.64 ± 1.39	11.32 ± 0.70	11.1	44.6
DR-23	SE	13.24 ± 0.95	13.16 ± 0.48	14.43 ± 0.80	14.43 ± 0.59	13.8	55.3
DR-24	SSE	14.30 ± 0.82	13.76 ± 0.65	14.38 ± 0.95	15.24 ± 0.56	14.4	57.7
DR-25	S	12.85 ± 0.72	11.63 ± 0.55	12.68 ± 0.62	12.36 ± 0.48	12.4	49.5
DR-26	SSW	13.54 ± 1.00	12.91 ± 0.88	13.68 ± 0.62	14.36 ± 1.22	13.6	54.5
DR-27	SW	13.50 ± 0.78	12.28 ± 0.40	13.84 ± 1.15	13.57 ± 0.58	13.3	53.2
DR-28	NW	19.65 ± 1.22	18.48 ± 0.59	20.65 ± 1.07	19.55 ± 0.57	19.6	78.3
DR-29	W	14.52 ± 0.75	12.97 ± 0.90	14.96 ± 0.75	14.38 ± 0.93	14.2	56.8
DR-30	SNS	14.49 ± 0.67	13.07 ± 0.72	15.30 ± 0.76	14.76 ± 0.68	14.4	57.6
DR-31	WSW	16.56 ± 0.81	15.42 ± 1.50	17.23 ± 1.12	16.37 ± 0.58	16.4	65.6
DR-32	NNW	13.35 ± 0.95	11.43 ± 0.49	13.41 ± 1.07	13.04 ± 0.67	12.8	51.2
DR-33	NE	13.49 ± 0.87	13.31 ± 0.60	12.97 ± 0.98	14.12 ± 0.86	13.5	53.9
DR-34	SE	12.87 ± 0.78	12.16 * 0.40	13.00 ± 0.69	13.30 ± 0.51	12.8	51.3
DR-35	NNE	13.14 ± 0.72	12.46 ± 1.08	14.38 ± 1.17	14.27 ± 0.98	13.6	54.3
DR-36	NE	14.11 ± 0.82	14.30 ± 0.82	14.60 ± 0.75	14.74 ± 0.45	14.4	57.8
DR-37	SSW	13.18 ± 1.09	12.57 ± 0.61	13.98 ± 1.04	14.65 ± 0.73	13.6	54.4
DR-38	S	11.40 ± 0.79	11.71 ± 1.32	12.06 ± 0.55	12.75 ± 0.68	12.0	47.9
DR-39	SSW	14.95 ± 0.95	14.47 ± 0.94	15.62 ± 0.71	16.02 ± 0.61	15.3	61.1
DR-40**	N	14.95 ± 1.07	13.88 ± 0.55	16.57 ± 0.81	15.22 ± 0.78	15.2	60.6
DR-41	SSE	13.05 ± 1.04	12.19 ± 0.79	12.88 ± 0.85	13.88 ± 0.64	13.0	52.0
AVERAGE		13.9	13.1	14.4	14.5	14.0	56

* Data not available

** Control Location

TABLE B-4

DIRECT RADIATION, 1999 THROUGH 2009 DATA

(mR per Standard Quarter Basis)

Station ID	Mean (1999-2008)	Standard Deviation (1999-2008)	Minimum Value (1999-2008)	Maximum Value (1999-2008)	2009 Mean
DR-01	62.5	2.9	58.4	68.0	60.4
DR-02	60.5	7.2	53.6	79.2	58.6
DR-03	47.8	1.9	44.0	50.0	47.6
DR-04	53.8	3.6	46.8	58.8	53.9
DR-05	54.2	2.3	48.4	57.2	54.5
DR-06	54.0	3.1	46.4	56.8	56.2
DR-07	63.8	3.6	55.6	68.8	64.9
DR-08	51.3	2.9	47.2	56.4	49.0
DR-09	53.3	2.8	47.2	58.0	53.9
DR-10	56.6	2.1	53.2	60.0	56.3
DR-11	44.4	2.0	40.8	47.2	42.9
DR-12	67.0	4.1	60.8	76.0	60.9
DR-13	76.0	3.7	68.0	80.4	79.6
DR-14	53.2	1.9	50.0	56.0	53.5
DR-15	53.6	3.8	46.4	60.0	51.5
DR-16	59.0	2.5	55.2	62.8	57.6
DR-17	60.1	3.0	56.4	66.8	57.8
DR-18	56.4	2.1	52.4	58.8	56.2
DR-19	59.4	2.3	55.2	61.6	59.0
DR-20	53.8	3.3	47.6	58.8	52.2
DR-21	54.7	2.5	50.0	58.8	56.0
DR-22	45.6	2.8	40.4	50.8	44.6
DR-23	55.6	2.7	49.6	58.8	55.3
DR-24	56.6	2.9	49.2	60.0	57.7
DR-25	49.4	2.3	44.8	52.8	49.5
DR-26	54.9	2.5	50.4	58.8	54.5
DR-27	54.6	3.3	46.8	59.2	53.2
DR-28	67.2	8.6	57.2	78.8	78.3
DR-29	63.4	7.9	54.8	74.0	56.8
DR-30	62.0	5.9	52.4	71.2	57.6
DR-31	70.5	5.3	62.0	78.4	65.6
DR-32	52.6	3.2	46.0	57.2	51.2
DR-33	46.4	9.5	34.0	55.2	53.9
DR-34	52.8	4.6	43.2	60.8	51.3
DR-35	56.0	3.8	48.8	61.2	54.3
DR-36	60.7	4.9	52.4	70.4	57.8
DR-37	54.5	2.9	48.8	58.8	54.4
DR-38	51.7	3.1	48.8	58.4	47.9
DR-39	61.9	3.8	55.2	66.4	61.1
DR-40**	63.2	6.1	54.8	75.2	60.6
DR-41	52.3	3.6	44.4	58.0	52.0
Average	56.8		50.4	62.6	56.1

** Control Location

TABLE B-5

2009 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	62.6	42.6
DR-02	DR-18	NNE	59.8	58.6
DR-03	DR-19	NE	48.5	60.7
DR-04	DR-20	ENE	55.8	55.2
DR-05	DR-21	E	56.7	57.5
DR-06	DR-22	ESE	57.4	46.5
DR-07	DR-23	SE	66.6	58.1
DR-08	DR-24	SSE	50.6	58.9
DR-09	DR-25	S	54.9	50.4
DR-10	DR-26	SSW	58.8	55.7
DR-11	DR-27	SW	45.5	53.7
DR-12	DR-28	WSW	63.1	78.5
DR-13	DR-29	W	82.1	57.8
DR-14	DR-30	WNW	55.3	59.0
DR-15	DR-31	NW	53.6	65.3
DR-16	DR-32	NNW	59.4	53.0
Average			58.2	57.0

TABLE B-6

IPEC

ENVIRONMENTAL AIRBORNE PARTICULATE SAMPLES - 2009

GROSS BETA ACTIVITY pCi/ m^3 ± 1 Sigma

SAMPLE STATION #

Week Number	Week End Date	4	5	94	95	23**	27	29	44
1	1/5/2009	0.017 ± 0.001	0.019 ± 0.002	0.018 ± 0.001	0.019 ± 0.001	0.017 ± 0.001	0.018 ± 0.001	0.017 ± 0.001	-0.001 ± 0.000
2	1/13/2009	0.014 ± 0.001	0.012 ± 0.001	0.014 ± 0.001	0.015 ± 0.001	0.013 ± 0.001	0.014 ± 0.001	0.014 ± 0.001	0.014 ± 0.001
3	1/20/2009	0.023 ± 0.002	0.020 ± 0.001	0.019 ± 0.001	0.020 ± 0.001	0.020 ± 0.001	0.021 ± 0.001	0.020 ± 0.001	0.022 ± 0.001
4	1/27/2009	0.020 ± 0.001	0.026 ± 0.002	0.022 ± 0.001	0.019 ± 0.001	0.023 ± 0.002	0.023 ± 0.002	0.022 ± 0.001	0.023 ± 0.002
5	2/3/2009	0.022 ± 0.001	0.020 ± 0.001	0.022 ± 0.001	0.023 ± 0.001	0.025 ± 0.002	0.020 ± 0.001	0.024 ± 0.001	0.024 ± 0.002
6	2/10/2009	0.024 ± 0.002	0.022 ± 0.002	0.017 ± 0.001	0.020 ± 0.001	0.021 ± 0.001	0.020 ± 0.001	0.020 ± 0.001	0.022 ± 0.002
7	2/17/2009	0.010 ± 0.001	0.010 ± 0.001	0.009 ± 0.001	0.011 ± 0.001	0.012 ± 0.001	0.010 ± 0.001	0.010 ± 0.001	0.011 ± 0.001
8	2/24/2009	0.013 ± 0.001	0.015 ± 0.001	0.013 ± 0.001	0.013 ± 0.001	0.011 ± 0.001	0.015 ± 0.001	0.012 ± 0.001	0.013 ± 0.001
9	3/3/2009	0.016 ± 0.001	0.015 ± 0.001	0.018 ± 0.001	0.017 ± 0.001	0.016 ± 0.001	0.018 ± 0.001	0.015 ± 0.001	0.020 ± 0.001
10	3/10/2009	0.018 ± 0.001	0.017 ± 0.001	0.018 ± 0.001	0.018 ± 0.001	0.018 ± 0.001	0.020 ± 0.001	0.020 ± 0.001	0.020 ± 0.002
11	3/17/2009	0.024 ± 0.002	0.023 ± 0.002	0.020 ± 0.001	0.024 ± 0.001	0.018 ± 0.001	0.022 ± 0.001	0.020 ± 0.001	0.020 ± 0.001
12	3/24/2009	0.019 ± 0.001	0.019 ± 0.001	0.018 ± 0.001	0.015 ± 0.001	0.018 ± 0.001	0.020 ± 0.001	0.018 ± 0.001	0.019 ± 0.001
13	3/31/2009	0.009 ± 0.001	0.011 ± 0.001	0.008 ± 0.001	0.009 ± 0.001	0.012 ± 0.001	0.008 ± 0.001	0.013 ± 0.001	0.011 ± 0.001
14	4/7/2009	0.005 ± 0.001	0.009 ± 0.001	0.008 ± 0.001	0.008 ± 0.001	0.006 ± 0.001	0.008 ± 0.001	0.007 ± 0.001	0.008 ± 0.001
15	4/14/2009	0.019 ± 0.001	0.013 ± 0.001	0.016 ± 0.001	0.015 ± 0.001	0.015 ± 0.001	0.014 ± 0.001	0.013 ± 0.001	0.013 ± 0.001
16	4/21/2009	0.019 ± 0.001	0.017 ± 0.001	0.017 ± 0.001	0.017 ± 0.001	0.019 ± 0.001	0.019 ± 0.001	0.021 ± 0.001	0.017 ± 0.001
17	4/28/2009	0.015 ± 0.001	0.015 ± 0.001	0.016 ± 0.001	0.013 ± 0.001	0.011 ± 0.001	0.014 ± 0.001	0.010 ± 0.001	0.013 ± 0.001
18	5/5/2009	0.014 ± 0.001	0.015 ± 0.001	0.015 ± 0.001	0.016 ± 0.001	0.012 ± 0.001	0.015 ± 0.001	0.015 ± 0.001	0.015 ± 0.001
19	5/12/2009	0.010 ± 0.001	0.006 ± 0.001	0.007 ± 0.001	0.009 ± 0.001	0.008 ± 0.001	0.009 ± 0.001	0.006 ± 0.001	0.009 ± 0.001
20	5/19/2009	0.010 ± 0.001	0.010 ± 0.001	0.013 ± 0.001	0.014 ± 0.001	0.013 ± 0.001	0.012 ± 0.001	0.013 ± 0.001	0.012 ± 0.001
21	5/26/2009	0.017 ± 0.001	0.016 ± 0.001	0.019 ± 0.001	0.016 ± 0.001	0.015 ± 0.001	0.016 ± 0.001	0.015 ± 0.001	0.014 ± 0.001
22	6/2/2009	0.006 ± 0.001	0.009 ± 0.001	0.009 ± 0.001	0.008 ± 0.001	0.008 ± 0.001	0.008 ± 0.001	0.008 ± 0.001	0.007 ± 0.001
23	6/9/2009	0.013 ± 0.001	0.013 ± 0.001	0.013 ± 0.001	0.013 ± 0.001	0.012 ± 0.001	0.012 ± 0.001	0.014 ± 0.001	0.014 ± 0.001
24	6/15/2009	0.004 ± 0.001	0.006 ± 0.001	0.005 ± 0.001	0.004 ± 0.001	0.005 ± 0.001	0.004 ± 0.001	0.006 ± 0.001	0.006 ± 0.001
25	6/23/2009	0.005 ± 0.001	0.004 ± 0.001	0.005 ± 0.001	0.005 ± 0.001	0.003 ± 0.001	0.003 ± 0.001	0.005 ± 0.001	0.002 ± 0.001
26	6/30/2009	0.008 ± 0.001	0.007 ± 0.001	0.008 ± 0.001	0.009 ± 0.001	0.008 ± 0.001	0.009 ± 0.001	0.004 ± 0.001	0.003 ± 0.001

** Control sample location

TABLE B-6 (Continued)

IPEC

ENVIRONMENTAL AIRBORNE PARTICULATE SAMPLES - 2009

GROSS BETA ACTIVITY pCi/ m^3 ± 1 Sigma

SAMPLE STATION #

Week Number	Week End Date	4	5	94	95	23**	27	29	44
27	6/30/2009	0.008 ± 0.001	0.007 ± 0.001	0.008 ± 0.001	0.009 ± 0.001	0.011 ± 0.001	0.009 ± 0.001	0.013 ± 0.001	0.010 ± 0.001
28	7/7/2009	0.010 ± 0.001	0.010 ± 0.001	0.010 ± 0.001	0.011 ± 0.001	0.006 ± 0.001	0.010 ± 0.001	0.009 ± 0.001	0.011 ± 0.001
29	7/13/2009	0.005 ± 0.001	0.007 ± 0.001	0.008 ± 0.001	0.008 ± 0.001	0.008 ± 0.001	0.008 ± 0.001	0.011 ± 0.001	0.012 ± 0.001
30	7/21/2009	0.009 ± 0.001	0.011 ± 0.001	0.012 ± 0.001	0.011 ± 0.001	0.011 ± 0.001	0.010 ± 0.001	0.012 ± 0.001	0.012 ± 0.001
31	7/28/2009	0.010 ± 0.001	0.012 ± 0.001	0.012 ± 0.001	0.013 ± 0.001	0.014 ± 0.001	0.013 ± 0.001	0.015 ± 0.001	0.015 ± 0.001
32	8/4/2009	0.013 ± 0.001	0.012 ± 0.001	0.015 ± 0.001	0.014 ± 0.001	0.015 ± 0.001	0.013 ± 0.001	0.015 ± 0.001	0.015 ± 0.001
33	8/11/2009	0.014 ± 0.001	0.014 ± 0.001	0.014 ± 0.001	0.015 ± 0.001	0.020 ± 0.001	0.015 ± 0.001	0.018 ± 0.002	0.017 ± 0.001
34	8/17/2009	0.016 ± 0.001	0.015 ± 0.001	0.018 ± 0.002	0.016 ± 0.001	0.014 ± 0.001	0.017 ± 0.001	0.016 ± 0.001	0.015 ± 0.001
35	8/24/2009	0.013 ± 0.001	0.014 ± 0.001	0.017 ± 0.001	0.016 ± 0.001	0.012 ± 0.001	0.014 ± 0.001	0.008 ± 0.001	0.010 ± 0.001
36	9/1/2009	0.009 ± 0.001	0.009 ± 0.001	0.012 ± 0.001	0.010 ± 0.001	0.014 ± 0.001	0.009 ± 0.001	0.013 ± 0.001	0.016 ± 0.001
37	9/9/2009	0.019 ± 0.001	0.015 ± 0.001	0.017 ± 0.001	0.016 ± 0.001	0.013 ± 0.001	0.016 ± 0.001	0.012 ± 0.001	0.012 ± 0.001
38	9/15/2009	0.009 ± 0.001	0.012 ± 0.001	0.009 ± 0.001	0.009 ± 0.001	0.011 ± 0.001	0.007 ± 0.001	0.011 ± 0.001	0.013 ± 0.001
39	9/22/2009	0.013 ± 0.001	0.012 ± 0.001	0.012 ± 0.001	0.012 ± 0.001	0.011 ± 0.001	0.011 ± 0.001	0.012 ± 0.001	0.012 ± 0.001
40	9/29/2009	0.012 ± 0.001	0.013 ± 0.001	0.012 ± 0.001	0.013 ± 0.001	0.008 ± 0.001	0.012 ± 0.001	0.011 ± 0.001	0.010 ± 0.001
41	10/6/2009	0.006 ± 0.001	0.006 ± 0.001	0.007 ± 0.001	0.005 ± 0.001	0.011 ± 0.001	0.007 ± 0.001	0.009 ± 0.001	0.009 ± 0.001
42	10/14/2009	0.011 ± 0.001	0.010 ± 0.001	0.008 ± 0.001	0.010 ± 0.001	0.009 ± 0.001	0.010 ± 0.001	0.009 ± 0.001	0.009 ± 0.001
43	10/20/2009	0.011 ± 0.001	0.007 ± 0.001	0.009 ± 0.001	0.007 ± 0.001	0.014 ± 0.001	0.010 ± 0.001	0.017 ± 0.001	0.017 ± 0.001
44	10/27/2009	0.019 ± 0.001	0.016 ± 0.001	0.016 ± 0.001	0.014 ± 0.001	0.009 ± 0.001	0.017 ± 0.001	0.008 ± 0.001	0.008 ± 0.001
45	11/3/2009	0.007 ± 0.001	0.008 ± 0.001	0.007 ± 0.001	0.007 ± 0.001	0.009 ± 0.001	0.007 ± 0.001	0.012 ± 0.001	0.010 ± 0.001
46	11/10/2009	0.014 ± 0.001	0.014 ± 0.001	0.014 ± 0.001	0.015 ± 0.001	0.012 ± 0.001	0.015 ± 0.001	0.014 ± 0.001	0.013 ± 0.001
47	11/17/2009	0.010 ± 0.001	0.008 ± 0.001	0.007 ± 0.001	0.007 ± 0.001	0.016 ± 0.001	0.010 ± 0.001	0.017 ± 0.001	0.015 ± 0.001
48	11/24/2009	0.015 ± 0.001	0.018 ± 0.001	0.015 ± 0.001	0.014 ± 0.001	0.013 ± 0.001	0.016 ± 0.001	0.012 ± 0.001	0.009 ± 0.001
49	12/1/2009	0.010 ± 0.001	0.009 ± 0.001	0.010 ± 0.001	0.012 ± 0.001	0.009 ± 0.001	0.012 ± 0.001	0.010 ± 0.001	0.009 ± 0.001
50	12/8/2009	0.010 ± 0.001	0.000 ± 0.000	0.013 ± 0.001	0.012 ± 0.001	0.015 ± 0.001	0.012 ± 0.001	0.018 ± 0.001	0.017 ± 0.001
51	12/15/2009	0.021 ± 0.001	0.000 ± 0.000	0.017 ± 0.001	0.015 ± 0.001	0.017 ± 0.001	0.016 ± 0.001	0.015 ± 0.001	0.016 ± 0.001
52	12/22/2009	0.015 ± 0.001	0.018 ± 0.002	0.016 ± 0.001	0.015 ± 0.001	0.010 ± 0.001	0.014 ± 0.001	0.006 ± 0.001	0.010 ± 0.001

** Control sample location

TABLE B-7
CONCENTRATIONS OF GAMMA EMITTERS IN QUARTERLY COMPOSITES
OF SITE AIR PARTICULATE SAMPLES - 2009
Results in Units of 10E-3 pCi/ m³ ± 1 Sigma

SAMPLE LOCATIONS - 1ST QTR 2009

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	142.3 +/- 14.4	144.3 +/- 14.7	141.4 +/- 15.7	156.8 +/- 15.8	133.6 +/- 13.9	140.1 +/- 14.0	127.0 +/- 11.7	156.4 +/- 14.9
Cs-134	< 0.6	< 0.8	< 0.6	< 0.9	< 0.9	< 1.0	< 0.6	< 0.9
Cs-137	< 0.6	< 0.3	< 0.5	< 0.3	< 0.8	< 0.5	< 0.3	< 0.4
Zr-95	< 1.8	< 1.1	< 1.5	< 1.5	< 0.9	< 1.7	< 1.1	< 1.2
Nb-95	< 0.7	< 0.9	< 1.6	< 1.2	< 1.2	< 1.4	< 0.8	< 0.8
Co-58	< 0.8	< 0.6	< 0.5	< 1.2	< 1.0	< 0.4	< 0.4	< 0.6
Mn-54	< 0.3	< 0.6	< 0.3	< 0.8	< 0.7	< 0.3	< 0.5	< 0.6
Zn-65	< 1.1	< 1.4	< 1.6	< 1.7	< 1.8	< 1.2	< 1.4	< 2.3
Co-60	< 0.5	< 0.6	< 0.5	< 0.6	< 0.7	< 0.7	< 0.3	< 0.5
K-40	< 4.2	< 5.8	< 5.7	46.7 +/- 10.7	41.0 +/- 8.8	< 5.6	< 3.3	< 7.2

** Control Sample Location

SAMPLE LOCATIONS - 2ND QTR 2009

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	93.1 +/- 11.1	127.7 +/- 13.2	118.0 +/- 11.1	121.9 +/- 10.3	103.7 +/- 10.0	89.0 +/- 10.0	121.4 +/- 10.2	114.3 +/- 13.0
Cs-134	< 0.7	< 0.7	< 0.6	< 0.5	< 0.5	< 0.6	< 0.7	< 0.8
Cs-137	< 0.5	< 0.4	< 0.4	< 0.2	< 0.3	< 0.4	< 0.5	< 0.6
Zr-95	< 1.2	< 1.1	< 0.8	< 1.0	< 1.3	< 1.1	< 1.4	< 1.5
Nb-95	< 1.3	< 0.9	< 0.4	< 0.8	< 0.9	< 1.0	< 1.1	< 1.6
Co-58	< 1.0	< 0.8	< 0.5	< 0.4	< 0.5	< 0.8	< 0.4	< 0.6
Mn-54	< 0.4	< 0.8	< 0.2	< 0.2	< 0.3	< 0.7	< 0.6	< 0.8
Zn-65	< 1.6	< 1.6	< 1.4	< 1.3	< 0.7	< 1.3	< 1.5	< 1.8
Co-60	< 0.9	< 0.5	< 0.5	< 0.5	< 0.3	< 0.4	< 0.4	< 0.7
K-40	< 4.4	< 5.9	< 3.5	< 3.0	< 3.1	48.5 +/- 8.8	47.2 +/- 6.6	< 5.5

** Control Sample Location

TABLE B-7 (Continued)
CONCENTRATIONS OF GAMMA EMITTERS IN QUARTERLY COMPOSITES
OF SITE AIR PARTICULATE SAMPLES - 2009
Results in Units of 10E-3 pCi/ m^3 ± 1 Sigma

SAMPLE LOCATIONS - 3RD QTR 2009

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	126.0 +/- 13.5	123.2 +/- 14.7	161.0 +/- 15.3	134.7 +/- 14.5	128.3 +/- 11.2	119.3 +/- 13.3	156.8 +/- 13.3	140.1 +/- 14.7
Cs-134	< 0.6	< 0.9	< 1.0	< 0.5	< 0.6	< 0.7	< 0.3	< 0.6
Cs-137	< 0.4	< 0.7	< 0.6	< 0.5	< 0.2	< 0.5	< 0.5	< 0.7
Zr-95	< 1.3	< 1.5	< 1.4	< 1.5	< 0.6	< 1.3	< 1.1	< 1.7
Nb-95	< 1.0	< 1.2	< 1.2	< 1.4	< 0.9	< 1.4	< 0.5	< 1.0
Co-58	< 0.4	< 1.0	< 0.9	< 1.0	< 0.5	< 0.6	< 0.7	< 1.1
Mn-54	< 0.5	< 0.8	< 0.6	< 0.8	< 0.3	< 0.5	< 0.5	< 0.9
Zn-65	< 0.8	< 2.2	< 1.8	< 1.1	< 0.6	< 1.3	< 0.7	< 2.0
Co-60	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.6	< 0.3	< 0.5
K-40	< 4.1	38.0 +/- 9.7	49.2 +/- 10.3	< 5.2	< 4.1	< 4.6	< 4.0	41.4 +/- 11.6

** Control Sample Location

SAMPLE LOCATIONS - 4TH QTR 2009

Nuclide	Algonquin Sta #4	NYU Tower #5	Croton Point #27	Training Bldg #94	Met Tower #95	Roseton #23 **	Grassy Point #29	Peekskill #44
Be-7	94.9 +/- 12.6	110.0 +/- 17.8	100.7 +/- 13.4	103.9 +/- 12.1	101.5 +/- 11.6	84.5 +/- 12.0	100.5 +/- 11.5	94.6 +/- 10.1
Cs-134	< 0.9	< 1.3	< 1.1	< 0.8	< 0.3	< 0.8	< 0.6	< 0.6
Cs-137	< 0.3	< 0.8	< 0.5	< 0.7	< 0.5	< 0.6	< 0.6	< 0.3
Zr-95	< 1.5	< 1.7	< 2.2	< 1.1	< 0.9	< 0.9	< 0.9	< 1.2
Nb-95	< 1.3	< 2.4	< 1.7	< 1.6	< 1.1	< 0.8	< 0.9	< 1.5
Co-58	< 0.9	< 1.7	< 1.4	< 0.6	< 0.6	< 0.9	< 0.5	< 0.8
Mn-54	< 0.7	< 1.2	< 0.8	< 0.4	< 0.5	< 0.6	< 0.4	< 0.3
Zn-65	< 2.4	< 2.7	< 2.3	< 1.3	< 1.8	< 1.1	< 1.0	< 0.9
Co-60	< 0.6	< 1.4	< 0.4	< 0.5	< 0.5	< 0.6	< 0.4	< 0.4
K-40	< 10.1	< 10.3	48.3 +/- 11.6	< 7.0	< 6.8	< 5.9	< 5.0	< 10.5

** Control Sample Location

TABLE B-8

IPEC

ENVIRONMENTAL CHARCOAL CARTRIDGE SAMPLES - 2009

I-131 ACTIVITY pCi/ m^3 ± 1 Sigma

SAMPLE STATION #

Week Number	Week End Date	4	5	94	95	23**	27	29	44
1	01/05/09	< 0.046	< 0.040	< 0.027	< 0.017	< 0.036	< 0.025	< 0.026	< 0.037
2	01/13/09	< 0.015	< 0.012	< 0.020	< 0.016	< 0.026	< 0.018	< 0.017	< 0.021
3	01/20/09	< 0.020	< 0.023	< 0.023	< 0.015	< 0.022	< 0.023	< 0.014	< 0.022
4	01/27/09	< 0.020	< 0.016	< 0.021	< 0.017	< 0.032	< 0.013	< 0.027	< 0.028
5	02/03/09	< 0.026	< 0.024	< 0.021	< 0.021	< 0.029	< 0.023	< 0.031	< 0.026
6	02/10/09	< 0.022	< 0.018	< 0.016	< 0.014	< 0.028	< 0.017	< 0.027	< 0.022
7	02/17/09	< 0.019	< 0.024	< 0.022	< 0.016	< 0.010	< 0.022	< 0.015	< 0.023
8	02/24/09	< 0.021	< 0.014	< 0.020	< 0.017	< 0.034	< 0.017	< 0.024	< 0.025
9	03/02/09	< 0.024	< 0.027	< 0.021	< 0.017	< 0.018	< 0.027	< 0.016	< 0.017
10	03/10/09	< 0.021	< 0.013	< 0.014	< 0.020	< 0.027	< 0.013	< 0.019	< 0.028
11	03/17/09	< 0.020	< 0.014	< 0.017	< 0.018	< 0.020	< 0.023	< 0.012	< 0.020
12	03/24/09	< 0.025	< 0.021	< 0.023	< 0.027	< 0.027	< 0.019	< 0.019	< 0.022
13	03/31/09	< 0.024	< 0.019	< 0.014	< 0.017	< 0.020	< 0.026	< 0.021	< 0.021
14	04/07/09	< 0.024	< 0.025	< 0.018	< 0.017	< 0.023	< 0.022	< 0.018	< 0.030
15	04/14/09	< 0.022	< 0.021	< 0.014	< 0.022	< 0.024	< 0.020	< 0.013	< 0.020
16	04/21/09	< 0.023	< 0.014	< 0.016	< 0.019	< 0.025	< 0.018	< 0.021	< 0.032
17	04/28/09	< 0.024	< 0.022	< 0.014	< 0.015	< 0.025	< 0.014	< 0.017	< 0.026
18	05/05/09	< 0.031	< 0.022	< 0.025	< 0.015	< 0.029	< 0.019	< 0.024	< 0.021
19	05/12/09	< 0.025	< 0.019	< 0.021	< 0.018	< 0.021	< 0.019	< 0.018	< 0.016
20	05/19/09	< 0.042	< 0.028	< 0.032	< 0.034	< 0.041	< 0.024	< 0.036	< 0.034
21	05/26/09	< 0.033	< 0.022	< 0.018	< 0.018	< 0.017	< 0.018	< 0.022	< 0.025
22	06/02/09	< 0.026	< 0.020	< 0.022	< 0.016	< 0.022	< 0.011	< 0.020	< 0.021
23	06/09/09	< 0.017	< 0.019	< 0.021	< 0.018	< 0.020	< 0.025	< 0.018	< 0.029
24	06/15/09	< 0.027	< 0.016	< 0.022	< 0.020	< 0.025	< 0.018	< 0.022	< 0.033
25	06/23/09	< 0.023	< 0.035	< 0.015	< 0.026	< 0.030	< 0.010	< 0.017	< 0.025
26	06/30/09	< 0.024	< 0.026	< 0.018	< 0.020	< 0.022	< 0.017	< 0.036	< 0.030

** Control sample location

TABLE B-8 (Continued)

IPEC

ENVIRONMENTAL CHARCOAL CARTRIDGE SAMPLES - 2009

I-131 ACTIVITY pCi/ m^3 ± 1 Sigma

SAMPLE STATION #

Week Number	Week End Date	4	5	94	95	23**	27	29	44
27	07/07/09	< 0.015	< 0.023	< 0.014	< 0.015	< 0.020	< 0.022	< 0.015	< 0.023
28	07/13/09	< 0.020	< 0.019	< 0.018	< 0.025	< 0.019	< 0.022	< 0.022	< 0.024
29	07/21/09	< 0.023	< 0.022	< 0.017	< 0.017	< 0.009	< 0.027	< 0.014	< 0.023
30	07/28/09	< 0.021	< 0.025	< 0.027	< 0.018	< 0.021	< 0.022	< 0.022	< 0.021
31	08/04/09	< 0.019	< 0.023	< 0.020	< 0.015	< 0.018	< 0.026	< 0.014	< 0.025
32	08/11/09	< 0.020	< 0.020	< 0.010	< 0.013	< 0.023	< 0.011	< 0.024	< 0.026
33	08/17/09	< 0.029	< 0.023	< 0.016	< 0.020	< 0.030	< 0.017	< 0.060	< 0.020
34	08/24/09	< 0.022	< 0.022	< 0.018	< 0.013	< 0.027	< 0.020	< 0.029	< 0.029
35	09/01/09	< 0.014	< 0.022	< 0.027	< 0.018	< 0.026	< 0.026	< 0.018	< 0.018
36	09/09/09	< 0.029	< 0.025	< 0.015	< 0.026	< 0.035	< 0.025	< 0.017	< 0.015
37	09/15/09	< 0.027	< 0.027	< 0.022	< 0.019	< 0.025	< 0.026	< 0.030	< 0.020
38	09/22/09	< 0.024	< 0.024	< 0.026	< 0.016	< 0.029	< 0.019	< 0.012	< 0.021
39	09/29/09	< 0.019	< 0.022	< 0.029	< 0.019	< 0.029	< 0.017	< 0.028	< 0.025
40	10/06/09	< 0.025	< 0.011	< 0.021	< 0.024	< 0.024	< 0.019	< 0.026	< 0.026
41	10/14/09	< 0.027	< 0.021	< 0.017	< 0.020	< 0.030	< 0.014	< 0.021	< 0.024
42	10/20/09	< 0.021	< 0.015	< 0.021	< 0.023	< 0.036	< 0.021	< 0.024	< 0.032
43	10/27/09	< 0.020	< 0.026	< 0.019	< 0.023	< 0.025	< 0.014	< 0.018	< 0.019
44	11/03/09	< 0.029	< 0.016	< 0.023	< 0.022	< 0.015	< 0.021	< 0.024	< 0.021
45	11/10/09	< 0.020	< 0.017	< 0.019	< 0.020	< 0.030	< 0.021	< 0.030	< 0.025
46	11/16/09	< 0.029	< 0.023	< 0.021	< 0.022	< 0.024	< 0.019	< 0.018	< 0.019
47	11/24/09	< 0.039	< 0.029	< 0.027	< 0.026	< 0.042	< 0.032	< 0.038	< 0.036
48	12/01/09	< 0.023	< 0.038	< 0.025	< 0.015	< 0.018	< 0.027	< 0.016	< 0.025
49	12/08/09	< 0.017		< 0.017	< 0.018	< 0.033	< 0.017	< 0.021	< 0.029
50	12/15/09	< 0.014		< 0.019	< 0.021	< 0.018	< 0.016	< 0.019	< 0.031
51	12/22/09	< 0.028	< 0.025	< 0.030	< 0.024	< 0.034	< 0.024	< 0.027	< 0.039
52	12/29/09	< 0.022	< 0.022	< 0.018	< 0.021	< 0.030	< 0.019	< 0.015	< 0.023

** Control sample location

TABLE B-9
CONCENTRATIONS OF GAMMA EMITTERS IN SURFACE WATER SAMPLES – 2009
Results in Units of pCi/liter ± 1 Sigma
#9 PLANT INLET (HUDSON RIVER INTAKE)

Date	1/30/2009	2/27/2009	3/27/2009	4/24/2009	5/29/2009	6/26/2009
NUCLIDE						
I-131	< 3.51	< 3.85	< 2.62	< 5.52	< 4.68	< 3.33
Cs-134	< 0.76	< 0.64	< 0.84	< 0.58	< 0.93	< 0.87
Cs-137	< 0.73	< 0.87	< 0.72	< 0.81	< 0.78	< 0.77
Zr-95	< 1.35	< 1.79	< 1.37	< 1.60	< 1.77	< 1.41
Nb-95	< 0.98	< 1.30	< 0.94	< 1.22	< 1.18	< 0.98
Co-58	< 0.78	< 0.97	< 0.84	< 0.93	< 0.98	< 0.89
Mn-54	< 0.76	< 1.00	< 0.67	< 0.74	< 0.83	< 0.76
Fe-59	< 2.23	< 2.77	< 2.13	< 2.43	< 2.98	< 2.26
Zn-65	< 1.62	< 1.88	< 0.93	< 0.96	< 1.85	< 0.94
Co-60	< 0.68	< 0.80	< 0.81	< 0.70	< 0.81	< 0.70
K-40	35.18 +/- 5.82	26.66 +/- 7.29	46.54 +/- 5.99	49.28 +/- 6.71	98.16 +/- 9.21	47.4 +/- 6.21
Ba/La-140	< 2.03	< 2.58	< 1.91	< 3.16	< 2.90	< 2.12
Date	7/31/2009	8/28/2009	9/25/2009	10/30/2009	11/25/2009	12/31/2009
NUCLIDE						
I-131	< 6.38	< 4.49	< 5.06	< 4.81	< 3.04	< 6.10
Cs-134	< 1.22	< 1.04	< 0.82	< 0.69	< 0.45	< 0.70
Cs-137	< 1.07	< 0.94	< 0.68	< 0.94	< 0.61	< 0.98
Zr-95	< 2.06	< 2.06	< 1.55	< 2.09	< 1.32	< 2.20
Nb-95	< 1.80	< 1.34	< 1.05	< 1.37	< 0.93	< 1.63
Co-58	< 1.22	< 1.06	< 0.86	< 1.16	< 0.69	< 1.25
Mn-54	< 1.04	< 0.83	< 0.68	< 1.05	< 0.63	< 1.05
Fe-59	< 4.02	< 3.38	< 2.35	< 3.49	< 1.85	< 3.69
Zn-65	< 1.45	< 1.14	< 1.61	< 2.36	< 0.78	< 2.42
Co-60	< 1.00	< 1.02	< 0.68	< 1.09	< 0.67	< 1.16
K-40	80.67 +/- 11.48	112.8 +/- 10.49	69.13 +/- 6.17	185.7 +/- 12.05	32.6 +/- 4.07	176.8 +/- 12.10
Ba/La-140	< 3.85	< 2.78	< 2.82	< 3.99	< 2.03	< 4.22

TABLE B-9 (Continued)
CONCENTRATIONS OF GAMMA EMITTERS IN SURFACE WATER SAMPLES – 2009
Results in Units of pCi/liter ± 1 Sigma
#10 DISCHARGE CANAL (MIXING ZONE)

Date	1/30/2009	2/27/2009	3/27/2009	4/24/2009	5/29/2009	6/26/2009
NUCLIDE						
I-131	< 3.89	< 4.79	< 3.10	< 6.47	< 4.75	< 4.03
Cs-134	< 0.52	< 1.16	< 0.90	< 1.02	< 0.73	< 1.01
Cs-137	< 0.79	< 0.88	< 0.79	< 0.85	< 1.01	< 0.83
Zr-95	< 1.80	< 2.21	< 1.76	< 2.09	< 1.89	< 1.85
Nb-95	< 1.25	< 1.42	< 1.05	< 1.38	< 1.15	< 1.22
Co-58	< 0.99	< 1.06	< 0.95	< 1.13	< 1.11	< 0.95
Mn-54	< 0.80	< 1.16	< 0.82	< 0.82	< 0.98	< 0.86
Fe-59	< 2.86	< 3.43	< 2.56	< 3.33	< 2.94	< 2.77
Zn-65	< 0.93	< 2.30	< 1.89	< 1.10	< 2.18	< 0.96
Co-60	< 0.77	< 0.90	< 0.85	< 0.90	< 1.16	< 0.91
K-40	84.89 +/- 8.68	113.3 +/- 11.60	89.08 +/- 9.27	105.6 +/- 9.92	42.97 +/- 9.02	107.8 +/- 9.29
Ba/La-140	< 2.68	< 2.99	< 2.33	< 3.76	< 3.90	< 2.96
Date	7/31/2009	8/28/2009	9/25/2009	10/30/2009	11/25/2009	12/31/2009
NUCLIDE						
1-131	< 5.65	< 4.72	< 7.11	< 4.66	< 3.08	< 5.99
Cs-134	< 0.85	< 0.83	< 0.62	< 0.60	< 0.55	< 0.69
Cs-137	< 1.13	< 1.04	< 0.76	< 0.91	< 0.79	< 1.08
Zr-95	< 2.23	< 1.79	< 1.75	< 1.83	< 1.40	< 2.40
Nb-95	< 1.43	< 1.53	< 1.34	< 1.29	< 0.94	< 1.69
Co-58	< 1.45	< 1.17	< 1.08	< 1.03	< 0.81	< 1.35
Mn-54	< 1.20	< 1.12	< 0.91	< 0.85	< 0.80	< 1.14
Fe-59	< 4.35	< 2.96	< 2.74	< 2.83	< 2.37	< 3.48
Zn-65	< 3.13	< 2.76	< 2.11	< 1.20	< 1.70	< 1.45
Co-60	< 1.34	< 1.23	< 0.80	< 0.83	< 0.75	< 1.06
K-40	37.93 +/- 11.11	24.0 +/- 8.60	61.19 +/- 9.04	401.7 +/- 12.49	90.02 +/- 7.88	408.1 +/- 15.17
Ba/La-140	< 3.53	< 3.26	< 4.07	< 2.70	< 2.38	< 4.04

TABLE B-10
CONCENTRATIONS OF TRITIUM IN SURFACE WATER SAMPLES – 2009
(QUARTERLY COMPOSITE SAMPLES)

Results in Units of pCi/l ± 1 Sigma

STATION CODE	PERIOD	DATE		TRITIUM
PLANT INTAKE (HUDSON RIVER) (09, INLET) **	First Quarter	03/27/09	06/26/09	<410
	Second Quarter	06/26/09	09/25/09	<409
	Third Quarter	09/25/09	12/31/09	<409
	Fourth Quarter	12/31/09	12/31/08	<424
DISCHARGE CANAL (10, MIXING ZONE)	First Quarter	03/27/09	06/26/09	<410
	Second Quarter	06/26/09	09/25/09	<409
	Third Quarter	09/25/09	12/31/09	<409
	Fourth Quarter	12/31/09	12/31/08	<424

** Control Sample location

TABLE B-11
CONCENTRATIONS OF GAMMA EMITTERS IN DRINKING WATER SAMPLES – 2009
Results in Units of pCi/liter ± 1 Sigma
CAMP FIELD RESERVOIR

Date	1/13/2009	2/10/2009	3/10/2009	4/14/2009	5/12/2009	6/15/2009
NUCLIDE						
I-131	< 3.04	< 2.36	< 1.80	< 2.15	< 2.79	< 2.25
Cs-134	< 2.97	< 2.38	< 2.39	< 1.33	< 1.67	< 1.26
Cs-137	< 2.54	< 2.30	< 1.52	< 1.99	< 2.31	< 1.56
Zr-95	< 4.96	< 3.68	< 2.59	< 2.60	< 3.58	< 2.68
Nb-95	< 2.58	< 2.22	< 1.61	< 1.38	< 2.57	< 1.77
Co-58	< 2.82	< 2.46	< 1.51	< 1.55	< 2.77	< 1.64
Mn-54	< 2.27	< 1.92	< 1.92	< 1.68	< 2.36	< 1.72
Fe-59	< 6.37	< 6.63	< 5.04	< 4.45	< 4.51	< 4.45
Zn-65	< 6.92	< 4.76	< 4.30	< 4.61	< 5.70	< 2.56
Co-60	< 1.79	< 1.81	< 1.52	< 1.61	< 2.77	< 1.90
K-40	194.4 +/- 35.67	82.13 +/- 20.85	< 18.16	< 15.92	< 22.59	< 20.76
Ba/La-140	< 3.59	< 2.56	< 1.33	< 2.41	< 3.69	< 1.89
Date	7/13/2009	8/11/2009	9/22/2009	10/27/2009	11/16/2009	12/15/2009
NUCLIDE						
I-131	< 2.65	< 1.81	< 2.43	< 2.03	< 2.47	< 2.27
Cs-134	< 2.19	< 1.00	< 1.73	< 2.12	< 1.67	< 1.42
Cs-137	< 1.95	< 1.61	< 2.02	< 1.60	< 2.43	< 1.49
Zr-95	< 2.76	< 1.96	< 2.48	< 3.21	< 3.55	< 3.01
Nb-95	< 1.96	< 1.45	< 2.45	< 1.76	< 2.23	< 1.49
Co-58	< 1.93	< 1.48	< 1.98	< 1.70	< 1.67	< 1.79
Mn-54	< 2.36	< 1.63	< 1.98	< 1.60	< 2.23	< 1.14
Fe-59	< 3.83	< 3.96	< 6.11	< 4.17	< 4.92	< 3.64
Zn-65	< 4.61	< 1.83	< 6.64	< 2.49	< 5.24	< 4.76
Co-60	< 2.31	< 1.69	< 2.62	< 1.69	< 2.71	< 1.37
K-40	88.98 +/- 21.80	< 16.41	< 31.25	< 17.44	90.82 +/- 22.37	< 12.62
Ba/La-140	< 2.87	< 1.85	< 3.14	< 1.72	< 3.82	< 1.92

TABLE B-11(Continued)
CONCENTRATIONS OF GAMMA EMITTERS IN DRINKING WATER SAMPLES – 2009
Results in Units of pCi/liter ± 1 Sigma
NEW CROTON RESERVOIR

Date	1/13/2009	2/10/2009	3/10/2009	4/14/2009	5/12/2009	6/15/2009
NUCLIDE						
I-131	< 3.29	< 2.51	< 2.29	< 2.34	< 3.11	< 2.34
Cs-134	< 1.34	< 2.50	< 2.05	< 2.38	< 1.85	< 2.63
Cs-137	< 2.86	< 2.26	< 1.78	< 1.84	< 2.91	< 2.30
Zr-95	< 4.06	< 4.46	< 4.21	< 2.60	< 4.52	< 4.22
Nb-95	< 2.55	< 2.83	< 2.28	< 1.81	< 2.39	< 1.74
Co-58	< 2.01	< 2.21	< 1.86	< 1.61	< 3.34	< 2.34
Mn-54	< 2.58	< 2.15	< 2.13	< 1.50	< 2.82	< 1.70
Fe-59	< 6.34	< 4.17	< 3.84	< 4.85	< 4.81	< 5.95
Zn-65	< 5.68	< 4.28	< 4.29	< 4.29	< 6.92	< 3.95
Co-60	< 2.31	< 2.39	< 2.22	< 1.70	< 3.09	< 2.03
K-40	458.6 +/- 36.17	< 14.38	< 23.64	76.26 +/- 18.83	196.5 +/- 38.41	< 22.63
Ba/La-140	< 2.71	< 2.52	< 2.23	< 2.41	< 3.86	< 2.58
Date	7/13/2009	8/11/2009	9/22/2009	10/27/2009	11/16/2009	12/15/2009
NUCLIDE						
I-131	< 2.32	< 2.27	< 2.29	< 1.77	< 3.19	< 2.22
Cs-134	< 2.89	< 1.71	< 2.50	< 1.58	< 2.76	< 2.84
Cs-137	< 2.11	< 1.50	< 1.43	< 1.51	< 2.02	< 1.96
Zr-95	< 4.27	< 3.00	< 3.57	< 2.73	< 3.63	< 3.24
Nb-95	< 2.28	< 1.96	< 2.16	< 1.48	< 2.19	< 2.05
Co-58	< 2.53	< 1.86	< 2.02	< 1.24	< 2.12	< 1.59
Mn-54	< 2.07	< 1.67	< 1.95	< 1.57	< 2.00	< 2.77
Fe-59	< 6.05	< 4.46	< 4.73	< 3.84	< 3.89	< 4.60
Zn-65	< 7.09	< 2.32	< 5.74	< 3.35	< 5.86	< 4.53
Co-60	< 2.44	< 1.99	< 2.28	< 1.37	< 2.69	< 2.18
K-40	< 30.61	92.2 +/- 17.79	88.56 +/- 21.59	< 16.41	< 22.63	82.5 +/- 20.35
Ba/La-140	< 1.31	< 2.68	< 1.65	< 1.62	< 2.47	< 2.81

TABLE B-12
CONCENTRATIONS OF TRITIUM IN DRINKING WATER SAMPLES – 2009
(QUARTERLY COMPOSITE SAMPLES)

Results in Units of pCi/l ± 1 Sigma

STATION CODE	PERIOD	DATE		TRITIUM
CAMP FIELD RESERVOIR	First Quarter	12/15/08	03/10/09	< 403
	Second Quarter	03/10/09	06/15/09	< 416
	Third Quarter	06/15/09	12/15/09	< 406
	Fourth Quarter	12/15/09	09/23/08	< 416
NEW CROTON RESERVOIR	First Quarter	12/15/08	03/10/09	< 403
	Second Quarter	03/10/09	06/15/09	< 416
	Third Quarter	06/15/09	12/15/09	< 406
	Fourth Quarter	12/15/09	09/23/08	< 416

TABLE B-13
CONCENTRATIONS OF RADIONUCLIDES IN SHORELINE SOIL SAMPLES – 2009
Results in Units of pCi/kg ± 1 Sigma

Sample Location / Date		COLD SPRING SHORELINE 6/10/2009	LENTS COVE SHORELINE 6/10/2009	MANITOU SHORELINE 6/10/2009	VERPLANCK SHORELINE 6/15/2009	WHITE BEACH SHORELINE 6/15/2009
Client ID	Req. CL (pCi)	ISS842409	ISS282409	ISS502409	ISS172409	ISS532409
Radionuclide						
Be-7		< 232.5	< 369.4	< 438.5	< 187.3	< 158.7
I-131		< 52.7	< 79.1	< 87.6	< 24.0	< 24.4
Cs-134	**75**	< 25.6	< 27.5	< 33.0	< 18.6	< 19.9
Cs-137	**90**	< 26.2	< 43.7	< 37.9	137.1 +/- 28.6	< 15.5
Zr-95		< 48.1	< 70.9	< 77.6	< 38.9	< 30.4
Nb-95		< 31.4	< 47.6	< 53.1	< 28.2	< 15.3
Co-58		< 27.0	< 46.8	< 52.2	< 26.1	< 15.4
Mn-54		< 29.7	< 38.9	< 41.8	< 25.8	< 16.4
Zn-65		< 41.3	< 59.7	< 151.6	< 83.1	< 47.5
Fe-59		< 83.7	< 106.6	< 119.2	< 62.4	< 43.8
Co-60		< 25.9	< 35.0	< 26.6	< 29.2	< 21.3
Ba/La-140		< 31.2	< 71.2	< 89.9	< 36.9	< 15.7
Ru-103		< 27.1	< 37.3	< 52.4	< 20.4	< 17.9
Ru-106		< 245.4	< 342.4	< 434.5	< 296.6	< 194.7
Ce-141		< 47.9	< 76.6	< 70.5	< 38.8	< 27.5
Ce-144		< 184.4	< 302.4	< 294.7	< 157.2	< 116.4
AcTh-228		388.2 +/- 81.1	1630.0 +/- 168.5	1726.0 +/- 210.8	367.1 +/- 102.0	< 65.0
Ra-226		1554.0 +/- 476.3	4418.0 +/- 869.9	3291.0 +/- 755.6	< 568.1	685.5 +/- 321.7
K-40		29810.0 +/- 862.6	20010.0 +/- 942.0	13020.0 +/- 922.9	14990.0 +/- 780.8	10730.0 +/- 544.0
Sr-90	**3000**	< 180	< 170	< 170	< 170	< 780

TABLE B-13 (Continued)
CONCENTRATIONS OF RADIONUCLIDES IN SHORELINE SOIL SAMPLES – 2009
Results in Units of pCi/kg ± 1 Sigma

Sample Location / Date		COLD SPRING SHORELINE 9/8/2009	LENTS COVE SHORELINE 9/8/2009	MANITOU SHORELINE 9/8/2009	VERPLANCK SHORELINE 9/9/2009	WHITE BEACH SHORELINE 9/9/2009
Client ID		ISS843609	ISS283609	ISS503609	ISS173609	ISS533609
Radionuclide	Req. CL (pCi)					
Be-7		< 211.7	< 319.0	< 325.1	< 205.0	< 190.1
I-131		< 58.6	< 87.5	< 66.8	< 49.0	< 39.6
Cs-134	**75**	< 24.7	< 34.5	< 24.3	< 20.8	< 19.0
Cs-137	**90**	< 36.0	< 42.9	99.2 +/- 31.6	148.7 +/- 28.0	< 24.2
Zr-95		< 54.5	< 77.3	< 52.0	< 42.8	< 36.9
Nb-95		< 37.0	< 37.1	< 40.1	< 34.5	< 31.4
Co-58		< 40.8	< 50.1	< 26.6	< 27.8	< 24.5
Mn-54		< 34.5	< 47.5	< 36.6	< 31.9	< 22.8
Zn-65		< 104.1	< 66.0	< 51.7	< 92.9	< 73.3
Fe-59		< 122.4	< 121.3	< 121.5	< 68.6	< 79.8
Co-60		< 35.6	< 12.1	< 38.3	< 19.1	< 19.7
Ba/La-140		< 40.1	< 62.6	< 62.0	< 38.1	< 47.2
Ru-103		< 32.1	< 48.7	< 38.5	< 25.2	< 23.3
Ru-106		< 330.0	< 392.1	< 276.6	< 310.3	< 261.2
Ce-141		< 49.3	< 70.9	< 60.3	< 38.3	< 44.0
Ce-144		< 183.6	< 338.0	< 220.4	< 159.6	< 151.7
AcTh-228		523.0 +/- 130.3	1574.0 +/- 175.6	954.3 +/- 152.8	487.4 +/- 97.4	< 83.3
Ra-226		< 659.6	2770.0 +/- 793.4	1245.0 +/- 599.7	< 579.5	794.8 +/- 386.7
K-40		33190.0 +/- 1202.0	16240.0 +/- 965.9	16050.0 +/- 917.3	14260.0 +/- 793.2	11550.0 +/- 602.9
Sr-90	**3000**	< 110	< 100	< 230	< 91	< 310

TABLE B-14
CONCENTRATIONS OF GAMMA EMITTERS IN BROADLEAF VEGETATION SAMPLES – 2009
Results in Units of pCi/kg ± 1 Sigma
#95 Meteorological Tower

Sample Location Date		MET TOWER 4/28/2009	MET TOWER 4/28/2009	MET TOWER 5/19/2009	MET TOWER 5/19/2009	MET TOWER 5/19/2009	MET TOWER 6/23/2009
Client ID		IBV951709S1	IBV951709S2	IBV952009S1	IBV952009S2	IBV952009S3	IBV952509S1
Radionuclide	Req. CL (pCi)	RAGWEED	MULLEN	RAGWEED	MULLEIN	GRAPE LEAF	CATALPA
Be-7		610.7 +/- 68.4	2835.0 +/- 186.7	1256.0 +/- 76.2	1230.0 +/- 104.0	559.3 +/- 71.3	2041.0 +/- 134.3
I-131	50	< 9.72	< 18.33	< 10.79	< 14.98	< 12.87	< 12.68
Cs-134	50	< 6.13	< 12.95	< 7.22	< 13.46	< 9.36	< 13.32
Cs-137	50	< 6.23	< 15.55	< 6.44	< 10.73	< 6.49	< 12.25
Zr-95		< 14.72	< 29.40	< 13.55	< 20.16	< 11.59	< 18.03
Nb-95		< 9.40	< 17.69	< 7.88	< 14.08	< 8.25	< 11.07
Co-58		< 9.15	< 15.05	< 6.49	< 9.91	< 8.07	< 12.32
Mn-54		< 8.50	< 17.66	< 6.85	< 10.38	< 7.55	< 10.91
Zn-65		< 14.39	< 24.46	< 18.42	< 26.01	< 21.55	< 30.12
Fe-59		< 21.26	< 44.53	< 23.48	< 28.61	< 18.14	< 34.21
Co-60		< 10.94	< 14.06	< 9.06	< 11.84	< 9.05	< 14.03
Ba/La-140		< 6.65	< 17.56	< 8.22	< 9.38	< 7.24	< 13.01
Ru-103		< 7.58	< 17.14	< 7.19	< 9.54	< 7.50	< 11.06
Ru-106		< 91.85	< 127.30	< 73.58	< 98.16	< 67.44	< 119.20
Ce-141		< 11.08	< 23.08	< 10.46	< 12.92	< 10.32	< 14.60
Ce-144		< 41.48	< 94.59	< 39.20	< 54.26	< 38.58	< 65.34
AcTh-228		< 26.88	< 65.80	53.1 +/- 21.0	< 32.62	< 28.11	< 43.32
Ra-226		< 144.30	515.4 +/- 268.3	< 126.30	< 172.40	206.5 +/- 97.2	< 221.90
K-40		6617.0 +/- 253.9	6733.0 +/- 378.0	8078.0 +/- 235.1	5999.0 +/- 290.3	4612.0 +/- 237.1	3906.0 +/- 264.3

TABLE B-14 (Continued)

CONCENTRATIONS OF GAMMA EMITTERS IN BROADLEAF VEGETATION SAMPLES – 2009
Results in Units of pCi/kg ± 1 Sigma

#95 Meteorological Tower

Sample Location / Date		MET TOWER 6/23/2009	MET TOWER 6/23/2009
Client ID		IBV952509S2	IBV952509S3
Radionuclide	Req. CL (pCi)	BURDICK	RAGWEED
Be-7		2854.0 +/- 139.4	2417.0 +/- 148.2
I-131	50	< 11.52	< 13.99
Cs-134	50	< 7.27	< 13.45
Cs-137	50	< 11.41	< 9.18
Zr-95		< 16.78	< 20.55
Nb-95		< 12.80	< 10.07
Co-58		< 9.20	< 12.43
Mn-54		< 9.52	< 12.68
Zn-65		< 31.04	< 29.69
Fe-59		< 28.74	< 29.54
Co-60		< 12.15	< 13.35
Ba/La-140		< 15.25	< 12.17
Ru-103		< 10.86	< 10.78
Ru-106		< 103.90	< 119.60
Ce-141		< 15.77	< 14.79
Ce-144		< 62.90	< 56.47
AcTh-228		< 37.90	< 46.57
Ra-226		345.9 +/- 165.0	< 217.30
K-40		7143.0 +/- 291.2	7546.0 +/- 372.8

TABLE B-14 (Continued)
CONCENTRATIONS OF GAMMA EMITTERS IN BROADLEAF VEGETATION SAMPLES – 2009
Results in Units of pCi/kg ± 1 Sigma
#95 Meteorological Tower

Sample Location Date		MET TOWER 7/20/2009	MET TOWER 7/20/2009	MET TOWER 7/20/2009	MET TOWER 8/17/2009	MET TOWER 8/17/2009	MET TOWER 8/17/2009
Client ID		IBV952909S1	IVB952909S2	IBV952909S3	IBV953309S1	IBV953309S2	IBV953309S3
Radionuclide	Req. CL (pCi)	RAGWEED	BURDOCK	CATALPA	RAGWEED	GRAPE LEAVES	CATALPA
Be-7		2642.0 +/- 159.2	1535.0 +/- 116.6	1267.0 +/- 141.6	1550.0 +/- 179.9	1377.0 +/- 128.5	2267.0 +/- 214.9
I-131	50	< 17.13	< 11.87	< 15.97	< 21.18	< 15.45	< 24.13
Cs-134	50	< 16.25	< 10.72	< 18.71	< 13.29	< 15.77	< 25.69
Cs-137	50	< 14.27	< 11.13	< 13.01	< 18.26	< 11.95	< 16.20
Zr-95		< 23.84	< 22.37	< 24.55	< 30.98	< 21.60	< 18.32
Nb-95		< 15.95	< 9.91	< 14.53	< 15.39	< 15.13	< 15.01
Co-58		< 11.44	< 11.01	< 14.63	< 15.48	< 12.16	< 16.42
Mn-54		< 14.00	< 11.43	< 15.49	< 19.13	< 13.76	< 18.15
Zn-65		< 19.09	< 30.32	< 33.42	< 24.76	< 32.65	< 59.66
Fe-59		< 32.68	< 35.99	< 38.30	< 52.71	< 23.70	< 37.41
Co-60		< 11.93	< 11.71	< 13.38	< 19.63	< 13.65	< 18.64
Ba/La-140		< 13.72	< 13.52	< 20.36	< 18.64	< 15.41	< 32.48
Ru-103		< 13.41	< 11.32	< 15.84	< 14.64	< 10.59	< 17.33
Ru-106		< 141.60	< 102.20	< 111.70	< 186.10	< 115.20	< 170.70
Ce-141		< 19.71	< 13.62	< 16.68	< 24.05	< 15.13	< 23.53
Ce-144		< 81.75	< 57.19	< 70.98	< 106.00	< 62.39	< 92.62
AcTh-228		< 46.43	< 36.55	< 59.80	< 76.44	< 44.11	< 54.22
Ra-226		< 272.60	262.1 +/- 165.2	< 220.20	530.9 +/- 239.9	< 202.00	< 324.00
K-40		7113.0 +/- 335.2	7631.0 +/- 337.1	4255.0 +/- 333.1	6530.0 +/- 411.7	4566.0 +/- 308.0	5179.0 +/- 436.9

TABLE B-14 (Continued)
CONCENTRATIONS OF GAMMA EMITTERS IN BROADLEAF VEGETATION SAMPLES – 2009
Results in Units of pCi/kg ± 1 Sigma

#95 Meteorological Tower

Sample Location / Date		MET TOWER 9/15/2009	MET TOWER 9/15/2009	MET TOWER 9/15/2009	MET TOWER 10/20/2009	MET TOWER 10/20/2009	MET TOWER 10/20/2009
Client ID	Req. CL (pCi)	IBV953709S1	IBV953709S2	IBV953709S3	IBV954209S1	IBV954209S2	IBV954209S3
Radionuclide		RAGWEED	MULLEN	GRAPE LEAVES	RAGWEED	MULLEN	BURDOCK
Be-7		3336.0 +/- 180.7	854.1 +/- 131.2	940.4 +/- 135.6	5812.0 +/- 266.0	2011.0 +/- 155.9	992.1 +/- 150.2
I-131	50	< 14.67	< 13.27	< 16.71	< 17.41	< 12.38	< 18.24
Cs-134	50	< 18.23	< 17.63	< 10.23	< 18.55	< 15.96	< 11.49
Cs-137	50	< 15.88	< 15.87	< 16.49	< 15.09	< 12.72	< 14.69
Zr-95		< 23.03	< 28.25	< 21.50	< 21.93	< 17.17	< 24.26
Nb-95		< 14.24	< 17.46	< 15.81	< 15.70	< 12.47	< 15.75
Co-58		< 14.32	< 16.09	< 16.41	< 15.23	< 17.09	< 20.67
Mn-54		< 12.80	< 14.47	< 15.80	< 16.52	< 15.11	< 20.14
Zn-65		< 31.69	< 39.02	< 45.77	< 47.21	< 31.56	< 45.37
Fe-59		< 39.53	< 35.54	< 25.11	< 43.33	< 37.63	< 38.02
Co-60		< 14.94	< 19.50	< 16.29	< 17.08	< 16.09	< 17.44
Ba/La-140		< 15.01	< 19.22	< 19.10	< 13.68	< 19.29	< 17.70
Ru-103		< 12.63	< 14.21	< 16.00	< 13.71	< 10.60	< 13.26
Ru-106		< 130.70	< 129.80	< 143.10	< 152.80	< 148.50	< 160.70
Ce-141		< 19.95	< 19.33	< 18.74	< 25.52	< 16.56	< 17.72
Ce-144		< 75.15	< 76.90	< 83.44	< 97.95	< 71.83	< 82.10
AcTh-228		< 54.90	< 55.21	< 30.55	< 63.34	< 65.64	< 68.09
Ra-226		< 257.00	368.6 +/- 232.1	< 310.90	679.1 +/- 299.8	< 219.20	< 345.40
K-40		5973.0 +/- 334.7	6641.0 +/- 406.6	4106.0 +/- 347.4	7584.0 +/- 416.1	5046.0 +/- 341.7	6061.0 +/- 455.5

TABLE B-14 (Continued)
CONCENTRATIONS OF GAMMA EMITTERS IN BROADLEAF VEGETATION SAMPLES – 2009
Results in Units of pCi/kg ± 1 Sigma
#94 IPEC Training Center

Sample Location / Date		TRAINING BLDG 4/28/2009	TRAINING BLDG 4/28/2009	TRAINING BLDG 5/19/2009	TRAINING BLDG 5/19/2009	TRAINING BLDG 5/19/2009	TRAINING BLDG 6/23/2009
Client ID		IBV941709S1	IBV941709S2	IBV942009S1	IBV942009S2	IBV942009S3	IBV942509S1
Radionuclide	Req. CL (pCi)	EWICK	MULLEN	GRAPE	RAGWEED	BURDOCK	CATALPA
Be-7		161.8 +/- 74.8	904.1 +/- 101.0	803.4 +/- 67.5	740.3 +/- 62.0	949.7 +/- 95.3	971.4 +/- 130.1
I-131	**50**	< 13.64	< 14.40	< 11.25	< 11.21	< 15.15	< 18.42
Cs-134	**50**	< 9.94	< 14.45	< 8.21	< 7.50	< 11.03	< 17.39
Cs-137	**50**	< 9.46	< 5.67	< 7.54	< 6.98	< 11.03	< 13.05
Zr-95		< 21.28	< 20.06	< 11.89	< 10.85	< 14.50	< 23.74
Nb-95		< 10.88	< 13.84	< 8.58	< 7.47	< 10.87	< 11.82
Co-58		< 11.14	< 10.74	< 6.68	< 8.18	< 10.58	< 13.94
Mn-54		< 10.50	< 10.18	< 5.75	< 6.79	< 13.74	< 12.02
Zn-65		< 33.81	< 35.09	< 10.84	< 18.06	< 26.58	< 42.63
Fe-59		< 34.35	< 37.23	< 18.27	< 23.53	< 26.02	< 57.00
Co-60		< 11.30	< 11.42	< 6.88	< 5.35	< 9.75	< 15.27
Ba/La-140		< 13.97	< 13.77	< 9.80	< 10.13	< 13.89	< 23.08
Ru-103		< 11.59	< 11.21	< 6.46	< 7.77	< 10.59	< 15.57
Ru-106		< 134.70	< 105.10	< 57.17	< 64.39	< 121.20	< 161.40
Ce-141		< 15.19	< 13.57	< 9.63	< 8.15	< 12.49	< 16.25
Ce-144		< 68.62	< 60.40	< 39.56	< 33.91	< 44.60	< 77.08
AcTh-228		< 34.18	< 39.01	< 23.24	< 19.62	< 37.97	< 64.50
Ra-226		< 198.50	292.2 +/- 142.1	214.0 +/- 106.9	< 120.10	< 184.70	603.8 +/- 201.1
K-40		5390.0 +/- 313.1	5778.0 +/- 311.2	3621.0 +/- 162.3	6584.0 +/- 236.6	5391.0 +/- 296.7	3708.0 +/- 307.2

TABLE B-14 (Continued)

CONCENTRATIONS OF GAMMA EMITTERS IN BROADLEAF VEGETATION SAMPLES – 2009 Results in pCi/kg + 1 Sigma

#94 IPEC Training Center

Sample Location		TRAINING BLDG	TRAINING BLDG
Date		6/23/2009	6/23/2009
Client ID		IBV942509S2	IBV942509S3
Radionuclide	Req. CL (pCi)	RAGWEED	MULLEN
Be-7		2183.0 +/- 141.1	2223.0 +/- 153.6
I-131	**50**	< 13.28	< 13.62
Cs-134	**50**	< 16.38	< 20.00
Cs-137	**50**	< 11.95	< 9.98
Zr-95		< 24.33	< 20.11
Nb-95		< 11.58	< 12.59
Co-58		< 11.84	< 11.77
Mn-54		< 12.52	< 11.70
Zn-65		< 34.54	< 34.73
Fe-59		< 37.56	< 32.10
Co-60		< 11.81	< 13.88
Ba/La-140		< 10.84	< 14.49
Ru-103		< 13.31	< 12.17
Ru-106		< 139.90	< 116.30
Ce-141		< 15.09	< 17.16
Ce-144		< 65.89	< 72.12
AcTh-228		< 40.67	< 37.34
Ra-226		359.1 +/- 172.9	< 252.70
K-40		8700.0 +/- 376.6	6612.0 +/- 353.5

TABLE B-14 (Continued)
CONCENTRATIONS OF GAMMA EMITTERS IN BROADLEAF VEGETATION SAMPLES – 2009
Results in Units of pCi/kg ± 1 Sigma
#94 IPEC Training Center

Sample Location / Date		TRAINING BLDG 7/20/2009	TRAINING BLDG 7/20/2009	TRAINING BLDG 7/20/2009	TRAINING BLDG 8/17/2009	TRAINING BLDG 8/17/2009	TRAINING BLDG 8/17/2009
Client ID	Req. CL (pCi)	IBV942909S1	IBV942909S2	IBV942909S3	IBV943309S1	IBV943309S2	IBV943309S3
Radionuclide		MULLEN	RAGWEED	CATALPA	MULLEN	RAGWEED	CATALPA
Be-7		3438.0 +/- 178.5	1756.0 +/- 175.2	1262.0 +/- 136.9	2158.0 +/- 159.8	2702.0 +/- 242.0	3520.0 +/- 238.5
I-131	50	< 18.29	< 19.29	< 18.98	< 13.79	< 26.87	< 27.48
Cs-134	50	< 12.86	< 24.63	< 12.26	< 15.94	< 18.50	< 24.19
Cs-137	50	< 14.35	< 19.31	< 13.29	< 12.95	< 22.27	< 20.58
Zr-95		< 27.99	< 33.36	< 24.20	< 18.64	< 30.44	< 35.42
Nb-95		< 16.22	< 16.37	< 18.35	< 12.61	< 21.89	< 20.52
Co-58		< 16.48	< 17.22	< 14.96	< 10.39	< 19.81	< 21.09
Mn-54		< 16.00	< 18.11	< 15.58	< 10.75	< 21.34	< 23.34
Zn-65		< 21.51	< 44.20	< 40.34	< 41.30	< 58.90	< 58.49
Fe-59		< 37.63	< 63.01	< 43.93	< 38.93	< 68.14	< 56.29
Co-60		< 17.02	< 24.18	< 17.31	< 13.09	< 24.05	< 17.99
Ba/La-140		< 21.37	< 19.66	< 19.46	< 19.50	< 32.03	< 29.84
Ru-103		< 16.38	< 19.68	< 13.93	< 13.05	< 19.66	< 22.64
Ru-106		< 160.00	< 205.20	< 146.10	< 131.80	< 231.20	< 192.60
Ce-141		< 24.27	< 21.33	< 19.57	< 17.17	< 27.76	< 31.72
Ce-144		< 88.76	< 89.98	< 82.82	< 65.58	< 114.00	< 116.30
AcTh-228		< 53.19	< 84.57	< 57.65	< 41.34	< 83.78	< 72.04
Ra-226		1231.0 +/- 265.1	< 362.30	< 261.30	347.2 +/- 190.2	1223.0 +/- 350.9	< 364.60
K-40		8766.0 +/- 344.3	8751.0 +/- 497.3	4501.0 +/- 325.5	5404.0 +/- 337.4	8971.0 +/- 544.1	7017.0 +/- 424.3

TABLE B-14 (Continued)
CONCENTRATIONS OF GAMMA EMITTERS IN BROADLEAF VEGETATION SAMPLES – 2009
Results in Units of pCi/kg ± 1 Sigma
#94 IPEC Training Center

Sample Location / Date		TRAINING BLDG 9/15/2009	TRAINING BLDG 9/15/2009	TRAINING BLDG 9/15/2009	TRAINING BLDG 10/20/2009	TRAINING BLDG 10/20/2009	TRAINING BLDG 10/20/2009
Client ID	Req. CL (pCi)	IBV943709S1	IBV943709S2	IBV943709S3	IBV944209S1	IBV944209S2	IBV944209S3
Radionuclide		RAGWEED	MULLEN	GRAPE	RAGWEED	MULLEN	M WORT
Be-7		5728.0 +/- 268.8	1101.0 +/- 148.8	3999.0 +/- 236.8	5384.0 +/- 227.7	2028.0 +/- 149.7	1932.0 +/- 202.5
I-131	50	< 17.38	< 15.41	< 24.57	< 14.18	< 13.09	< 17.93
Cs-134	50	< 21.82	< 12.13	< 25.99	< 10.12	< 15.33	< 14.83
Cs-137	50	< 15.46	< 16.52	< 16.75	< 15.60	< 13.51	< 20.13
Zr-95		< 32.33	< 30.66	< 33.01	< 25.12	< 21.03	< 27.32
Nb-95		< 15.70	< 14.85	< 24.87	< 15.17	< 16.62	< 17.98
Co-58		< 19.36	< 13.43	< 21.62	< 10.36	< 16.42	< 20.04
Mn-54		< 17.15	< 12.78	< 23.54	< 11.58	< 16.42	< 22.45
Zn-65		< 38.68	< 52.30	< 30.98	< 34.87	< 16.61	< 60.20
Fe-59		< 41.96	< 51.24	< 58.75	< 29.20	< 34.32	< 41.22
Co-60		< 18.32	< 22.03	< 24.95	< 13.18	< 14.21	< 23.90
Ba/La-140		< 7.79	< 16.51	< 24.52	< 14.70	< 15.18	< 24.32
Ru-103		< 15.40	< 17.38	< 17.62	< 13.47	< 12.84	< 13.64
Ru-106		< 190.90	< 181.50	< 254.90	< 112.40	< 142.60	< 140.90
Ce-141		< 21.26	< 21.81	< 28.39	< 17.81	< 16.87	< 20.72
Ce-144		< 105.80	< 99.17	< 108.00	< 89.87	< 77.66	< 104.90
AcTh-228		< 62.33	< 58.80	< 63.62	< 39.70	< 55.61	< 59.30
Ra-226		< 346.00	591.5 +/- 225.6	573.4 +/- 253.4	< 276.90	< 245.80	< 389.90
K-40		8241.0 +/- 468.7	7618.0 +/- 473.5	6532.0 +/- 427.9	6544.0 +/- 353.9	5441.0 +/- 345.7	7113.0 +/- 537.5

TABLE B-14 (Continued)
CONCENTRATIONS OF GAMMA EMITTERS IN BROADLEAF VEGETATION SAMPLES – 2009
Results in Units of pCi/kg ± 1 Sigma
#23 Roseton **

Sample Location Date		ROSETON 4/27/2009	ROSETON 4/27/2009	ROSETON 4/27/2009	ROSETON 5/18/2009	ROSETON 5/18/2009	ROSETON 5/18/2009
Client ID		IBV231709S1	IBV231709S2	IBV231709S3	IBV232009S1	IBV232009S2	IBV232009S3
Radionuclide	Req. CL (pCi)	MULLEN	BURDOCK	THISTLE	MULLEN	BURDOCK	RAGWEED
Be-7		683.6 +/- 97.3	247.7 +/- 50.7	< 92.67	934.4 +/- 114.7	1425.0 +/- 112.5	707.0 +/- 62.6
I-131	50	< 14.34	< 8.10	< 11.84	< 23.50	< 18.29	< 12.63
Cs-134	50	< 17.31	< 8.68	< 11.42	< 12.85	< 11.00	< 5.25
Cs-137	50	< 9.19	< 7.17	< 9.17	< 12.93	< 10.72	< 6.61
Zr-95		< 17.99	< 11.71	< 18.66	< 24.55	< 17.59	< 12.84
Nb-95		< 12.04	< 6.87	< 10.81	< 14.77	< 10.82	< 6.88
Co-58		< 12.02	< 6.63	< 10.19	< 13.01	< 10.74	< 6.85
Mn-54		< 9.94	< 5.37	< 9.27	< 10.80	< 9.16	< 6.55
Zn-65		< 33.45	< 18.96	< 32.13	< 34.55	< 30.77	< 17.99
Fe-59		< 32.40	< 22.11	< 32.86	< 40.36	< 41.50	< 25.14
Co-60		< 9.45	< 6.23	< 10.64	< 13.59	< 12.31	< 8.04
Ba/La-140		< 12.27	< 3.24	< 13.79	< 26.03	< 17.43	< 7.34
Ru-103		< 9.59	< 6.65	< 11.74	< 12.83	< 9.57	< 7.56
Ru-106		< 134.30	< 64.78	< 101.70	< 111.10	< 116.60	< 61.35
Ce-141		< 13.68	< 10.45	< 13.89	< 17.11	< 15.47	< 11.96
Ce-144		< 59.77	< 35.00	< 55.65	< 63.64	< 51.43	< 43.44
AcTh-228		< 43.48	< 24.61	< 49.22	< 36.41	< 44.33	< 26.54
Ra-226		< 187.10	< 115.40	< 182.90	556.6 +/- 176.4	< 183.90	257.7 +/- 115.8
K-40		4513.0 +/- 331.6	8001.0 +/- 233.6	4687.0 +/- 293.5	4605.0 +/- 268.6	7815.0 +/- 330.5	6529.0 +/- 210.9

** Control Sample Location

TABLE B-14 (Continued)
CONCENTRATIONS OF GAMMA EMITTERS
IN BROADLEAF VEGETATION SAMPLES - 2009
Results in Units of pCi/kg ± 1 Sigma
#23 Roseton **

Sample Location / Date		ROSETON 6/22/2009	ROSETON 6/22/2009	ROSETON 6/22/2009
Client ID	Req. CL (pCi)	IBV232509S1	IBV232509S2	IBV232509S3
Radionuclide		BURDOCK	RAGWEED	MULLEN
Be-7		1423.0 +/- 108.9	3450.0 +/- 177.1	1491.0 +/- 118.5
I-131	**50**	< 12.47	< 16.01	< 14.09
Cs-134	**50**	< 8.16	< 18.45	< 14.63
Cs-137	**50**	< 10.56	< 9.88	< 10.41
Zr-95		< 17.87	< 23.03	< 21.53
Nb-95		< 10.80	< 13.81	< 12.18
Co-58		< 10.89	< 11.61	< 11.35
Mn-54		< 11.03	< 14.33	< 10.78
Zn-65		< 29.97	< 36.29	< 27.06
Fe-59		< 28.89	< 37.29	< 38.33
Co-60		< 12.79	< 12.01	< 13.10
Ba/La-140		< 9.73	< 16.21	< 12.13
Ru-103		< 10.49	< 13.31	< 10.86
Ru-106		< 87.53	< 117.80	< 93.07
Ce-141		< 14.84	< 19.70	< 13.86
Ce-144		< 62.95	< 86.68	< 59.89
AcTh-228		< 39.92	< 49.60	< 41.79
Ra-226		462.9 +/- 167.2	< 248.00	< 203.30
K-40		5469.0 +/- 257.5	7011.0 +/- 337.8	3455.0 +/- 243.8

** Control Sample Location

TABLE B-14 (Continued)
CONCENTRATIONS OF GAMMA EMITTERS IN BROADLEAF VEGETATION SAMPLES – 2009
Results in Units of pCi/kg ± 1 Sigma
#23 Roseton **

Sample Location / Date		ROSETON 7/20/2009	ROSETON 7/20/2009	ROSETON 7/20/2009	ROSETON 8/17/2009	ROSETON 8/17/2009	ROSETON 8/17/2009
Client ID		IBV232909S1	IBV232909S2	IBV232909S3	IBV233309S1	IBV233309S2	IBV233309S3
Radionuclide	Req. CL (pCi)	MULLEN	CATALPA	RAGWEED	MULLEN	CATALPA	RAGWEED
Be-7		3335.0 +/- 191.0	911.4 +/- 85.2	3368.0 +/- 187.0	5082.0 +/- 237.5	1657.0 +/- 158.4	2936.0 +/- 229.0
I-131	50	< 18.59	< 9.44	< 15.83	< 19.77	< 17.71	< 26.57
Cs-134	50	< 12.08	< 8.93	< 8.59	< 11.86	< 21.01	< 22.78
Cs-137	50	< 13.04	< 8.03	< 13.21	< 15.12	< 15.32	< 18.32
Zr-95		< 28.97	< 14.60	< 25.01	< 23.33	< 18.81	< 26.97
Nb-95		< 17.74	< 8.45	< 15.98	< 14.80	< 20.40	< 17.64
Co-58		< 14.73	< 8.74	< 12.62	< 16.45	< 14.23	< 14.58
Mn-54		< 15.14	< 8.22	< 12.11	< 13.82	< 16.81	< 12.47
Zn-65		< 25.36	< 26.96	< 44.27	< 39.34	< 40.60	< 51.14
Fe-59		< 32.29	< 24.91	< 40.54	< 43.17	< 48.06	< 59.89
Co-60		< 16.69	< 8.51	< 14.11	< 15.92	< 14.63	< 23.38
Ba/La-140		< 19.72	< 12.61	< 23.53	< 14.17	< 21.71	< 26.40
Ru-103		< 15.82	< 8.12	< 14.50	< 15.38	< 14.74	< 15.39
Ru-106		< 159.50	< 73.21	< 153.70	< 148.90	< 152.20	< 133.50
Ce-141		< 23.36	< 10.97	< 19.00	< 22.26	< 19.42	< 24.21
Ce-144		< 93.00	< 51.68	< 71.51	< 107.20	< 75.68	< 84.48
AcTh-228		106.0 +/- 42.5	< 30.75	< 62.82	< 56.07	< 56.52	< 55.53
Ra-226		747.9 +/- 253.6	< 159.60	< 269.20	699.7 +/- 267.7	< 289.30	< 331.80
K-40		6478.0 +/- 343.1	3467.0 +/- 208.9	7571.0 +/- 395.2	4914.0 +/- 325.2	4254.0 +/- 343.1	8930.0 +/- 548.9

** Control Sample Location

TABLE B-14 (Continued)
CONCENTRATIONS OF GAMMA EMITTERS IN BROADLEAF VEGETATION SAMPLES – 2009
Results in Units of pCi/kg ± 1 Sigma

#23 Roseton **

Sample Location / Date		ROSETON 9/14/2009	ROSETON 9/14/2009	ROSETON 9/14/2009	ROSETON 10/19/2009	ROSETON 10/19/2009	ROSETON 10/19/2009
Client ID	Req. CL (pCi)	IBV233709S1	IBV233709S2	IBV233709S3	IBV234209S1	IBV234209S2	IBV234209S3
Radionuclide		RAGWEED	MULLEN	CATALPA	RAGWEED	MULLEN	BURDOCK
Be-7		2485.0 +/- 170.2	1869.0 +/- 159.6	1876.0 +/- 175.9	3679.0 +/- 231.9	1510.0 +/- 178.9	2658.0 +/- 162.9
I-131	50	< 17.49	< 18.75	< 18.06	< 21.13	< 23.45	< 17.30
Cs-134	50	< 23.59	< 12.24	< 21.08	< 20.76	< 26.91	< 14.13
Cs-137	50	< 15.82	< 16.11	< 17.77	< 13.15	< 19.35	< 12.26
Zr-95		< 29.00	< 25.29	< 33.69	< 22.40	< 42.77	< 21.81
Nb-95		< 17.17	< 10.16	< 16.85	< 15.77	< 21.31	< 13.95
Co-58		< 13.73	< 15.36	< 20.30	< 14.95	< 21.25	< 13.35
Mn-54		< 15.76	< 14.92	< 15.66	< 15.95	< 20.07	< 11.73
Zn-65		< 46.62	< 19.18	< 23.33	< 37.88	< 46.23	< 32.54
Fe-59		< 34.74	< 42.68	< 44.27	< 45.26	< 52.23	< 34.86
Co-60		< 13.40	< 19.88	< 19.13	< 16.66	< 23.19	< 17.15
Ba/La-140		< 15.61	< 15.82	< 27.93	< 16.75	< 28.31	< 15.70
Ru-103		< 16.39	< 15.03	< 15.89	< 15.08	< 18.88	< 12.10
Ru-106		< 156.10	< 155.40	< 203.50	< 163.80	< 197.00	< 122.20
Ce-141		< 23.05	< 20.07	< 24.11	< 19.04	< 23.48	< 18.16
Ce-144		< 94.83	< 93.06	< 97.64	< 87.68	< 109.60	< 82.28
AcTh-228		68.9 +/- 39.4	< 49.49	< 46.23	< 61.39	< 75.55	< 52.35
Ra-226		663.8 +/- 295.7	< 322.10	587.4 +/- 302.7	< 296.40	< 327.30	384.8 +/- 186.2
K-40		7706.0 +/- 391.3	6030.0 +/- 347.3	3453.0 +/- 325.9	6804.0 +/- 426.7	7431.0 +/- 492.6	5815.0 +/- 318.2

** Control Sample Location

TABLE B-15
CONCENTRATIONS OF RADIONUCLIDES IN FISH SAMPLES – 2009
Results in Units of pCi/kg ± 1 Sigma
#25 Downstream (Hudson River)

Sample Location Date		VOP FISH 5/6/2009	VOP FISH 5/6/2009	VOP FISH 5/6/2009	VOP FISH 5/7/2009	VOP FISH 5/7/2009	VOP FISH 6/18/2009
Client ID	Req. CL (pCi)	IFH251809S3	IFH251809S5	IFH251809S6	IFH251809S2	IFH251809S4	IFH252409S1
Radionuclide		CATFISH	WHITE PERCH	STRIPED BASS	SUNFISH	EEL	BLUE CRAB
Be-7		< 194.8	< 253.6	< 331.7	< 269.7	< 250.0	< 269.4
I-131		< 17020.0	< 22020.0	< 29580.0	< 25560.0	< 19260.0	< 1126.0
Cs-134	65	< 9.2	< 7.8	< 8.8	< 13.3	< 10.1	< 18.9
Cs-137	75	< 7.6	< 10.4	< 12.5	< 10.6	< 10.6	< 19.4
Zr-95		< 35.4	< 49.7	< 52.2	< 42.7	< 40.8	< 56.0
Nb-95		< 48.5	< 65.2	< 60.6	< 56.4	< 51.5	< 26.7
Co-58	65	< 17.4	< 24.0	< 28.3	< 27.1	< 19.7	< 24.6
Mn-54	65	< 9.4	< 14.3	< 14.4	< 12.5	< 11.8	< 19.4
Zn-65	130	< 19.5	< 23.1	< 21.3	< 30.5	< 32.4	< 45.1
Fe-59	130	< 60.0	< 109.7	< 112.8	< 104.0	< 114.4	< 98.1
Co-60	65	< 8.3	< 13.3	< 13.3	< 13.0	< 10.1	< 17.0
Ba/La-140		< 985.8	< 1625.0	< 1693.0	< 1353.0	< 1361.0	< 202.7
Ru-103		< 39.7	< 50.8	< 61.6	< 49.6	< 47.1	< 31.5
Ru-106		< 84.2	< 134.1	< 143.7	< 147.5	< 105.3	< 190.0
Ce-141		< 66.3	< 91.4	< 114.2	< 84.5	< 82.5	< 51.6
Ce-144		< 56.5	< 70.4	< 87.9	< 64.6	< 62.7	< 96.5
AcTh-228		< 31.3	117.7 +/- 33.9	100.0 +/- 37.4	< 45.9	< 38.3	< 61.4
Ra-226		466.3 +/- 130.8	658.0 +/- 149.8	1332.0 +/- 215.4	300.1 +/- 158.7	654.4 +/- 150.1	< 315.1
K-40		3456.0 +/- 153.0	6131.0 +/- 237.8	7001.0 +/- 240.3	3694.0 +/- 232.4	3160.0 +/- 180.0	2512.0 +/- 301.7
Ni-63	100	< 47.0	< 79.0	< 48.0	< 92.0	< 94.0	< 97.0
Sr-90	5	Note 1	Note 1	Note 1	Note 1	Note 1	Note 1

Note 1: Initial analytical results are indeterminate and are currently under review; final results to be forwarded separately

TABLE B-15 (Continued)

CONCENTRATIONS OF RADIONUCLIDES IN FISH SAMPLES – 2009

Results in Units of pCi/kg ± 1 Sigma

#25 Downstream (Hudson River)

Sample Location Date		VOP FISH 8/16/2009	VOP FISH 8/19/2009	VOP FISH 8/26/2009	VOP FISH 8/28/2009	VOP FISH 8/28/2009	VOP FISH 9/19/2009
Client ID	Req. CL (pCi)	IFH254106S6	IFH254109S1	IFH254109S2	IFH254109S3	IFH254109S4	IFH254109S5
Radionuclide		STRIPED BASS	BLUE CRAB	SUNFISH	CATFISH	EEL	WHITE PERCH
Be-7		< 319.5	< 263.3	< 272.7	< 227.6	< 301.2	< 163.9
I-131		< 4702.0	< 2420.0	< 1947.0	< 1174.0	< 1572.0	< 181.9
Cs-134	65	< 12.2	< 15.2	< 18.6	< 13.6	< 21.0	< 15.0
Cs-137	75	< 18.0	< 16.8	< 17.8	< 12.8	< 18.5	< 15.7
Zr-95		< 63.9	< 38.9	< 52.9	< 40.5	< 49.5	< 32.9
Nb-95		< 61.1	< 37.9	< 54.6	< 37.5	< 48.5	< 29.2
Co-58	65	< 34.4	< 26.8	< 29.8	< 21.4	< 24.6	< 17.4
Mn-54	65	< 19.2	< 20.3	< 19.3	< 14.9	< 19.0	< 15.8
Zn-65	130	< 45.9	< 38.7	< 55.7	< 21.1	< 55.8	< 22.5
Fe-59	130	< 115.0	< 104.0	< 111.0	< 64.0	< 98.4	< 62.6
Co-60	65	< 19.7	< 16.9	< 17.4	< 13.5	< 20.1	< 16.2
Ba/La-140		< 609.0	< 401.2	< 398.2	< 245.6	< 272.4	< 86.8
Ru-103		< 52.8	< 36.5	< 41.0	< 32.4	< 44.7	< 22.2
Ru-106		< 205.1	< 151.7	< 218.1	< 140.3	< 219.8	< 162.8
Ce-141		< 79.7	< 59.9	< 71.1	< 55.7	< 64.1	< 32.1
Ce-144		< 101.5	< 84.2	< 105.7	< 91.3	< 114.5	< 78.7
AcTh-228		< 67.9	< 75.0	146.4 +/- 60.4	63.5 +/- 39.1	< 58.0	131.1 +/- 40.6
Ra-226		1460.0 +/- 278.4	< 257.4	< 340.3	880.1 +/- 203.9	629.0 +/- 275.0	536.3 +/- 183.4
K-40		7697.0 +/- 294.9	2266.0 +/- 282.5	7167.0 +/- 365.9	8398.0 +/- 253.0	3329.0 +/- 284.7	6564.0 +/- 292.2
Ni-63	100	Note 2	< 95.0	< 76.0	< 81.0	< 80.0	< 90.0
Sr-90	5	Note 1	Note 1	Note 1	Note 1	Note 1	Note 1

Note 1: Initial analytical results are indeterminate and are currently under review; final results to be forwarded separately

Note 2: Original analysis was cross-contaminated; inadequate remnant for re-analysis

TABLE B-15 (Continued)
CONCENTRATIONS OF RADIONUCLIDES IN FISH SAMPLES – 2009
Results in Units of pCi/kg ± 1 Sigma
#23 Roseton (Control)

Sample Location Date		ROSETON FISH 5/7/2009	ROSETON FISH 5/7/2009	ROSETON FISH 5/7/2009	ROSETON FISH 5/8/2009	ROSETON FISH 5/8/2009	ROSETON FISH 8/19/2009
Client ID		IFH231809S1	IFH231809S3	IFH231809S4	IFH231809S2	IFH231809S5	IFH234109S4
Radionuclide	Req. CL (pCi)	CATFISH	STRIPED BASS	WHITE PERCH	EEL	SUNFISH	WHITE PERCH
Be-7		< 200.1	< 194.3	< 217.4	< 169.7	< 216.4	< 177.4
I-131		< 18800.0	< 17170.0	< 19470.0	< 14560.0	< 17540.0	< 1771.0
Cs-134	65	< 7.1	< 5.3	< 6.2	< 5.0	< 9.4	< 6.5
Cs-137	75	< 9.5	< 7.4	< 8.9	< 7.0	< 9.3	< 9.5
Zr-95		< 39.3	< 34.5	< 39.1	< 28.8	< 42.1	< 35.8
Nb-95		< 51.0	< 38.7	< 49.2	< 36.6	< 54.6	< 32.4
Co-58	65	< 21.7	< 16.5	< 20.2	< 16.4	< 22.1	< 16.4
Mn-54	65	< 11.9	< 8.7	< 9.9	< 8.5	< 11.4	< 11.7
Zn-65	130	< 25.6	< 22.1	< 29.1	< 20.3	< 31.7	< 29.0
Fe-59	130	< 82.7	< 71.7	< 96.4	< 65.9	< 93.0	< 63.6
Co-60	65	< 9.7	< 8.1	< 9.1	< 5.7	< 10.6	< 11.4
Ba/La-140		< 1271.0	< 1032.0	< 1330.0	< 899.8	< 1339.0	< 258.7
Ru-103		< 39.6	< 36.3	< 39.5	< 32.7	< 40.5	< 30.3
Ru-106		< 113.6	< 87.1	< 109.7	< 87.7	< 113.2	< 113.2
Ce-141		< 81.7	< 61.4	< 72.0	< 34.9	< 75.2	< 45.5
Ce-144		< 66.2	< 54.2	< 57.0	< 40.0	< 57.5	< 62.3
AcTh-228		110.4 +/- 29.3	< 26.9	< 31.1	< 32.2	145.6 +/- 31.3	87.1 +/- 27.8
Ra-226		886.8 +/- 143.3	479.2 +/- 117.4	837.9 +/- 136.9	518.4 +/- 115.8	637.5 +/- 126.7	619.0 +/- 152.9
K-40		3180.0 +/- 158.2	4902.0 +/- 154.4	4798.0 +/- 171.0	3352.0 +/- 134.2	6355.0 +/- 190.8	4329.0 +/- 192.6
Ni-63	100	< 62.0	< 45.0	< 74.0	< 49.0	< 63.0	< 98.0
Sr-90	5	Note 1	Note 1	Note 1	Note 1	Note 1	Note 1

Note 1: Initial analytical results are indeterminate and are currently under review; final results to be forwarded separately

TABLE B-15 (Continued)
CONCENTRATIONS OF RADIONUCLIDES IN FISH SAMPLES – 2009
Results in Units of pCi/kg ± 1 Sigma
#23 Roseton (Control)

Sample Location Date		ROSETON FISH 8/19/2009	ROSETON FISH 8/26/2009	ROSETON FISH 9/3/2009	ROSETON FISH 9/4/2009	ROSETON FISH 9/4/2009
Client ID	Req. CL (pCi)	IFH234109S6	IFH234109S5	IFH234109S3	IFH234109S1	IFH234109S2
Radionuclide		BLUE CRAB	SUN FISH	STRIPED BASS	CATFISH	EEL
Be-7		< 254.4	< 211.4	< 215.1	< 142.7	< 317.6
I-131		< 2100.0	< 1308.0	< 979.7	< 482.6	< 704.4
Cs-134	**65**	< 14.4	< 13.2	< 19.4	< 7.8	< 21.6
Cs-137	**75**	< 12.0	< 12.0	< 15.6	< 9.0	< 23.8
Zr-95		< 43.2	< 35.6	< 50.2	< 29.5	< 62.6
Nb-95		< 47.6	< 38.8	< 41.5	< 23.2	< 54.0
Co-58	**65**	< 26.2	< 20.2	< 25.6	< 16.2	< 27.0
Mn-54	**65**	< 12.3	< 13.6	< 20.5	< 13.0	< 22.8
Zn-65	**130**	< 39.0	< 33.0	< 46.0	< 28.0	< 69.0
Fe-59	**130**	< 106.0	< 68.7	< 88.0	< 55.0	< 92.1
Co-60	**65**	< 17.2	< 15.9	< 18.4	< 9.1	< 21.7
Ba/La-140		< 392.6	< 257.5	< 261.8	< 174.9	< 438.8
Ru-103		< 40.0	< 34.6	< 42.3	< 19.7	< 40.6
Ru-106		< 140.9	< 131.5	< 209.0	< 122.8	< 226.8
Ce-141		< 63.7	< 46.7	< 52.7	< 29.7	< 67.0
Ce-144		< 83.5	< 70.3	< 109.7	< 54.8	< 105.9
AcTh-228		< 49.5	< 48.3	< 72.6	< 37.2	< 84.8
Ra-226		< 226.8	802.1 +/- 185.4	< 308.6	435.6 +/- 150.4	< 374.2
K-40		2115.0 +/- 219.6	5101.0 +/- 235.5	4650.0 +/- 371.7	4372.0 +/- 229.9	4084.0 +/- 382.6
Ni-63	**100**	< 83.0	< 97.0	< 95.0	< 80.0	< 65.0
Sr-90	**5**	Note 1	Note 1	Note 1	Note 1	Note 1

Note 1: Initial analytical results are indeterminate and are currently under review; final results to be forwarded separately

TABLE B-16
CONCENTRATIONS OF GAMMA EMITTERS IN AQUATIC VEGETATION SAMPLES – 2009
Results in Units of pCi/kg ± 1 Sigma

Sample Location / Date		COLD SPRING 9/8/2009	LENTS COVE 6/15/2009	LENTS COVE 9/8/2009	VERPLANCK 6/15/2009	VERPLANCK 9/9/2009
Client ID		IAV843609	IAV282409	IAV283609	IAV172409	IAV173609
Radionuclide	Req. CL (pCi)	MYRO	MILLFOIL	MYRO	MILLFOIL	MYRO
Be-7		167.8 +/- 47.7	618.9 +/- 57.5	407.5 +/- 53.8	148.5 +/- 56.5	< 77.5
I-131	**30**	< 10.8	< 9.1	< 11.1	< 8.8	< 13.5
Cs-134	**30**	< 9.2	< 4.6	< 7.6	< 11.0	< 10.3
Cs-137	**40**	< 6.9	< 6.6	17.3 * +/- 4.1	< 8.5	< 9.4
Zr-95		< 13.8	< 9.1	< 11.9	< 14.3	< 15.0
Nb-95		< 9.4	< 6.6	< 8.6	< 7.8	< 10.4
Co-58		< 9.6	< 5.9	< 7.3	< 9.9	< 7.2
Mn-54		< 7.8	< 6.0	< 6.1	< 9.5	< 6.0
Zn-65		< 11.9	< 8.4	< 16.9	< 20.0	< 24.0
Fe-59		< 21.1	< 15.5	< 17.8	< 21.8	< 25.2
Co-60		< 8.6	< 5.4	< 7.1	< 8.8	< 8.8
Ba/La-140		< 10.5	< 7.3	< 7.2	< 7.7	< 13.9
Ru-103		< 9.6	< 6.2	< 7.0	< 7.6	< 9.7
Ru-106		< 61.3	< 49.8	< 62.7	< 91.0	< 90.4
Ce-141		< 12.1	< 8.9	< 9.8	< 10.8	< 12.2
Ce-144		< 47.4	< 36.8	< 37.8	< 43.1	< 43.0
AcTh-228		131.8 +/- 27.4	73.7 +/- 19.2	312.5 +/- 29.1	< 29.6	133.2 +/- 29.6
Ra-226		333.6 +/- 124.4	143.5 +/- 91.6	661.3 +/- 121.8	< 150.4	377.3 +/- 131.3
K-40		3974.0 +/- 199.2	2115.0 +/- 124.7	4317.0 +/- 176.6	2491.0 +/- 187.2	2823.0 +/- 188.6

* greater than critical level, but less than LLD

TABLE B-17
CONCENTRATIONS OF GAMMA EMITTERS IN BOTTOM SEDIMENT SAMPLES – 2009
Results in Units of pCi/kg ± 1 Sigma

Sample Location Date		COLD SPRING 6/10/2009	COLD SPRING 9/8/2009	LENTS COVE 6/15/2009	LENTS COVE 9/8/2009	VERPLANCK 6/15/2009	VERPLANCK 9/9/2009
Client ID		IBS842409	IBS843609	IBS282409	IBS283609	IBS172409	IBS173609
Radionuclide	Req. CL (pCi)						
Be-7		< 326.2	< 378.3	< 444.7	< 301.0	< 164.0	< 376.9
I-131		< 59.3	< 87.5	< 83.8	< 103.5	< 33.8	< 81.3
Cs-134	75	< 29.1	< 45.4	< 35.6	< 64.8	< 23.6	< 46.4
Cs-137	90	< 40.1	224.3 +/- 45.3	287.3 +/- 47.5	223.8 +/- 47.9	65.5 +/- 21.1	337.8 +/- 49.0
Zr-95		< 47.6	< 81.3	< 62.6	< 74.0	< 40.7	< 76.1
Nb-95		< 38.9	< 60.8	< 50.4	< 59.8	< 24.3	< 46.1
Co-58		< 40.2	< 48.8	< 53.4	< 35.6	< 19.2	< 45.5
Mn-54		< 37.4	< 48.9	< 47.3	< 47.5	< 26.8	< 36.6
Zn-65		< 132.3	< 92.6	< 163.5	< 127.6	< 70.4	< 72.6
Fe-59		< 106.9	< 140.8	< 139.0	< 148.0	< 70.2	< 145.2
Co-60		< 44.4	< 46.7	< 53.5	< 57.4	< 22.9	< 40.0
Ba/La-140		< 53.5	< 82.5	< 43.8	< 88.9	< 20.5	< 82.7
Ru-103		< 38.7	< 53.3	< 51.4	< 55.4	< 29.2	< 34.4
Ru-106		< 361.3	< 526.6	< 437.0	< 604.3	< 222.7	< 330.3
Ce-141		< 61.6	< 73.2	< 89.4	< 64.6	< 43.1	< 68.5
Ce-144		< 224.2	< 360.7	< 343.7	< 241.5	< 164.7	< 235.4
AcTh-228		643.4 +/- 154.7	1305.0 +/- 208.3	816.9 +/- 184.0	960.3 +/- 177.7	426.9 +/- 87.9	1296.0 +/- 173.7
Ra-226		1196.0 +/- 645.1	4535.0 +/- 950.5	3622.0 +/- 919.0	3580.0 +/- 781.1	< 551.5	2775.0 +/- 719.5
K-40		33750.0 +/- 1318.0	22570.0 +/- 1279.0	22200.0 +/- 1168.0	14430.0 +/- 1107.0	7938.0 +/- 536.0	21560.0 +/- 1137.0

TABLE B-17 (Continued)
CONCENTRATIONS OF GAMMA EMITTERS
IN BOTTOM SEDIMENT SAMPLES - 2009
Results in Units of pCi/kg ± 1 Sigma

Sample Location / Date		DISCHARGE CANAL 6/15/2009	DISCHARGE CANAL 9/9/2009
Client ID		IBS102409	IBS103609
Radionuclide	Req. CL (pCi)		
Be-7		< 182.8	< 396.4
I-131		< 30.5	< 92.2
Cs-134	75	< 25.3	< 35.1
Cs-137	90	232.4 +/- 27.2	1810.0 +/- 65.3
Zr-95		< 34.0	< 69.3
Nb-95		< 27.2	< 45.5
Co-58		< 17.8	< 33.6
Mn-54		< 18.9	< 37.9
Zn-65		< 59.2	< 115.9
Fe-59		< 54.8	< 135.5
Co-60		< 31.1	< 38.9
Ba/La-140		< 26.7	< 33.2
Ru-103		< 21.6	< 55.3
Ru-106		< 233.6	< 410.2
Ce-141		< 28.4	< 84.6
Ce-144		< 116.0	< 287.6
AcTh-228		386.6 +/- 77.3	963.5 +/- 164.2
Ra-226		711.5 +/- 418.6	2299.0 +/- 766.4
K-40		13900.0 +/- 705.6	20560.0 +/- 1064.0

TABLE B-18
CONCENTRATIONS OF RADIONUCLIDES IN RAINWATER SAMPLES – 2009
Results in Units of pCi/L ± 1 Sigma

Sample Location		PEEKSKILL RAINWATER	PEEKSKILL RAINWATER	PEEKSKILL RAINWATER	PEEKSKILL RAINWATER
Date		3/30/2009	6/29/2009	9/28/2009	12/28/2009
Client ID		IRF44Q109	IRF44Q209	IRF44Q309	IRF44Q409
Radionuclide	Req. CL (pCi)				
H-3		< 415.0	< 410.0	< 405.0	< 411.0
Be-7		< 42.7	75.8 +/- 25.0	< 39.3	< 32.7
I-131		< 24.5	< 28.6	< 24.9	< 29.4
Cs-134	7.5	< 1.8	< 2.1	< 1.7	< 2.3
Cs-137	9	< 2.7	< 2.0	< 2.3	< 2.0
Zr-95		< 6.4	< 5.7	< 4.7	< 5.8
Nb-95		< 6.8	< 4.1	< 5.5	< 5.1
Co-58		< 4.1	< 3.2	< 3.0	< 3.4
Mn-54		< 2.7	< 1.7	< 2.2	< 2.7
Zn-65		< 3.7	< 4.7	< 6.8	< 7.4
Fe-59		< 11.2	< 10.0	< 12.8	< 11.4
Co-60	7.5	< 2.6	< 1.7	< 2.4	< 2.1
Ba/La-140		< 16.0	< 18.3	< 15.4	< 11.2
Ru-103		< 6.6	< 4.8	< 4.9	< 5.7
Ru-106		< 25.0	< 24.4	< 24.7	< 22.2
Ce-141		< 12.3	< 8.7	< 10.3	< 9.4
Ce-144		< 24.5	< 15.9	< 22.0	< 15.7
AcTh-228		< 9.0	< 6.8	20.5 +/- 7.3	< 8.8
Ra-226		96.1 +/- 54.2	96.1 +/- 37.1	79.7 +/- 48.9	< 48.6
K-40		357.6 +/- 36.4	119.8 +/- 18.7	475.7 +/- 36.7	96.6 +/- 22.3

TABLE B-18
CONCENTRATIONS OF RADIONUCLIDES IN RAINWATER SAMPLES – 2009
Results in Units of pCi/L ± 1 Sigma

Sample Location / Date		PEEKSKILL RAINWATER 3/30/2009	PEEKSKILL RAINWATER 6/29/2009	PEEKSKILL RAINWATER 9/28/2009	PEEKSKILL RAINWATER 12/28/2009
Client ID / Radionuclide	Req. CL (pCi)	IRF44Q109	IRF44Q209	IRF44Q309	IRF44Q409
H-3		< 415.0	< 410.0	< 405.0	< 411.0
Be-7		< 42.7	75.8 +/- 25.0	< 39.3	< 32.7
I-131		< 24.5	< 28.6	< 24.9	< 29.4
Cs-134	**7.5**	< 1.8	< 2.1	< 1.7	< 2.3
Cs-137	**9**	< 2.7	< 2.0	< 2.3	< 2.0
Zr-95		< 6.4	< 5.7	< 4.7	< 5.8
Nb-95		< 6.8	< 4.1	< 5.5	< 5.1
Co-58		< 4.1	< 3.2	< 3.0	< 3.4
Mn-54		< 2.7	< 1.7	< 2.2	< 2.7
Zn-65		< 3.7	< 4.7	< 6.8	< 7.4
Fe-59		< 11.2	< 10.0	< 12.8	< 11.4
Co-60	**7.5**	< 2.6	< 1.7	< 2.4	< 2.1
Ba/La-140		< 16.0	< 18.3	< 15.4	< 11.2
Ru-103		< 6.6	< 4.8	< 4.9	< 5.7
Ru-106		< 25.0	< 24.4	< 24.7	< 22.2
Ce-141		< 12.3	< 8.7	< 10.3	< 9.4
Ce-144		< 24.5	< 15.9	< 22.0	< 15.7
AcTh-228		< 9.0	< 6.8	20.5 +/- 7.3	< 8.8
Ra-226		96.1 +/- 54.2	96.1 +/- 37.1	79.7 +/- 48.9	< 48.6
K-40		357.6 +/- 36.4	119.8 +/- 18.7	475.7 +/- 36.7	96.6 +/- 22.3

TABLE B-19
CONCENTRATIONS OF GAMMA EMITTERS IN SOIL SAMPLES – 2009
Results in Units of pCi/kg ± 1 Sigma

Sample Location Date		ROSETON 9/28/2009	MET TOWER 9/29/2009	TRAINING BLDG 9/29/2009
Client ID		ISO233909	ISO953909	ISO943909
Radionuclide	Req. CL (pCi)			
Be-7		1245.0 +/- 289.6	909.2 +/- 258.1	790.6 +/- 221.1
I-131		< 49.1	< 33.2	< 34.9
Cs-134	**75**	< 25.1	< 24.5	< 19.9
Cs-137	**90**	< 40.3	< 19.0	< 39.1
Zr-95		< 60.4	< 60.4	< 62.2
Nb-95		< 39.7	< 29.5	< 40.9
Co-58		< 35.1	< 27.4	< 25.7
Mn-54		< 38.8	< 30.9	< 27.1
Zn-65		< 135.4	< 74.0	< 110.3
Fe-59		< 100.7	< 78.9	< 95.4
Co-60		< 35.2	< 24.9	< 45.2
Ba/La-140		< 40.1	< 16.0	< 48.7
Ru-103		< 42.5	< 24.3	< 34.1
Ru-106		< 380.5	< 266.7	< 351.8
Ce-141		< 72.9	< 37.3	< 50.0
Ce-144		< 306.1	< 190.1	< 213.0
AcTh-228		991.5 +/- 150.1	456.0 +/- 103.5	549.1 +/- 127.1
Ra-226		1816.0 +/- 805.2	< 639.6	1839.0 +/- 607.8
K-40		15520.0 +/- 908.4	14540.0 +/- 866.2	19780.0 +/- 1032.0

TABLE B-20

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

Monitoring Well **Sample Name** **Sample Date**		**MW-40** MW-40-027-006 1/19/2009	**MW-40** MW-40-027-007 4/13/2009
Radionuclide	Req. MDC		
H-3		< 148.0	198.0 + / - 145.0
Cs-137	**18**	< 3.86	< 4.57
Co-60		< 3.58	< 3.81
Sr-90	**1**	< 0.68	< 0.96
Ni-63		< 20.9	< 21.2

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

TABLE B-20 (Continued)

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

Monitoring Well **Sample Name** **Sample Date**		**MW-40** MW-40-046-007 1/19/2009	**MW-40** MW-40-046-008 4/13/2009
Radionuclide	Req. MDC		
H-3		< 148.0	152 + / - 137
Cs-137	**18**	< 3.0	< 3.4
Co-60		< 2.8	< 2.9
Sr-90	**1**	< 0.57	< 0.71
Ni-63		< 22.2	< 23.2

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

TABLE B-20 (Continued)

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

Monitoring Well **Sample Name** **Sample Date**		**MW-40** MW-40-081-007 1/19/2009	**MW-40** MW-40-081-008 4/13/2009
Radionuclide	Req. MDC		
H-3		161 + / - 137	231 + / - 150
Cs-137	**18**	< 4.0	< 4.8
Co-60		< 3.9	< 6.1
Sr-90	**1**	< 0.65	< 0.82
N-63		< 20.9	< 24.2

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

TABLE B-20 (Continued)

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

Monitoring Well **Sample Name** **Sample Date**		**MW-40** MW-40-100-009 1/19/2009	**MW-40** MW-40-100-0010 4/13/2009
Radionuclide	Req. MDC		
H-3		< 148	262 + / - 156
Cs-137	**18**	< 3.9	< 4.4
Co-60		< 3.6	< 4.5
Sr-90	**1**	< 0.72	< 0.68
Ni-63		< 22.4	< 21.7

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-20 (Continued)

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

Monitoring Well **Sample Name** **Sample Date**		**MW-40** MW-40-127-009 1/19/2009	**MW-40** MW-40-127-010 4/13/2009
Radionuclide	Req. MDC		
H-3		< 148	152 + / - 137
Cs-137	**18**	< 3.9	< 4.8
Co-60		< 4.5	< 4.8
Sr-90	**1**	< 0.9	< 0.77
Ni-63		< 21.6	< 22.2

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

TABLE B-20 (Continued)

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

Monitoring Well **Sample Name** **Sample Date**		**MW-40** MW-40-162-007 1/19/2009	**MW-40** MW-40-162-008 4/13/2009
Radionuclide	Req. MDC		
H-3		< 148	142 + / - 137
Cs-137	**18**	< 3.7	< 3.9
Co-60		< 3.4	< 4.1
Sr-90	**1**	< 0.62	< 0.55
Ni-63		< 22.0	< 21.7

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-20 (Continued)

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

Monitoring Well **Sample Name** **Sample Date**		**MW-51** MW-51-040-010 1/20/2009	**MW-51** MW-51-040-011 5/7/2009
Radionuclide	Req. MDC		
H-3		< 192	203 + / - 176
Cs-137	**18**	< 3.3	< 4.7
Co-60		< 3.3	< 5.1
Sr-90	**1**	< 0.97	< 0.83
Ni-63		< 18.7	< 21.1

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-20 (Continued)

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

Monitoring Well **Sample Name** **Sample Date**		**MW-51** MW-51-079-010 1/20/2009	**MW-51** MW-51-079-011 5/7/2009
Radionuclide	Req. MDC		
H-3		< 148	< 181
Cs-137	**18**	< 3.7	< 5.1
Co-60		< 3.6	< 7.0
Sr-90	**1**	< 0.50	< 0.83
Ni-63		< 19.0	< 20.0

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-20 (Continued)

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

Monitoring Well **Sample Name** **Sample Date**		**MW-51** MW-51-104-008 1/20/2009	**MW-51** MW-51-104-009 5/7/2009
Radionuclide	Req. MDC		
H-3		< 148	< 178
Cs-137	**18**	< 3.0	< 3.9
Co-60		< 2.4	< 4.0
Sr-90	**1**	< 0.50	< 0.80
Ni-63		< 23.3	< 27.1

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-20 (Continued)

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

Monitoring Well **Sample Name** **Sample Date**		**MW-51** MW-51-135-008 1/20/2009	**MW-51** MW-51-135-009 5/7/2009
Radionuclide	Req. MDC		
H-3		< 148	< 171
Cs-137	**18**	< 4.3	< 4.7
Co-60		< 3.7	< 4.0
Sr-90	**1**	< 0.58	< 0.58
Ni-63		< 21.0	< 26.0

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-20 (Continued)

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

Monitoring Well Sample Name Sample Date		MW-51 MW-51-163-008 1/20/2009	MW-51 MW-51-163-009 5/7/2009
Radionuclide	Req. MDC		
H-3		< 148	< 181
Cs-137	**18**	< 3.3	< 3.4
Co-60		< 3.5	< 3.8
Sr-90	**1**	< 0.70	< 0.61
Ni-63		< 21.4	< 21.5

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-20 (Continued)

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

Monitoring Well Sample Name Sample Date		MW-51 MW-51-189-008 1/20/2009	MW-51 MW-51-189-009 5/7/2009
Radionuclide	Req. MDC		
H-3		< 148	< 181
Cs-137	18	< 3.6	< 6.3
Co-60		< 4.2	< 6.1
Sr-90	1	< 0.56	< 0.64
Ni-63		< 21.1	< 21.4

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-20 (Continued)

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

Monitoring Well **Sample Name** **Sample Date**		**MW-LAF** MW-LAF-002-012 11/19/2009
Radionuclide	Req. MDC	
H-3		< 165
Cs-137	**18**	< 10.2
Co-60		< 12.7
Sr-90	**1**	< 0.73
Ni-63		< 16.8

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.
Note 3: These are the first semi-annual results post-July's ODCM change

Table B-21
LAND USE CENSUS - RESIDENCE and MILCH ANIMAL RESULTS
2009

The 2009 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
2009

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, Dec 2004 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 2009 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

1999-2009

Average Quarterly Dose (mR/Quarter)			
Year	**Inner Ring**	**Outer Ring**	**Control Location**
1999	15.0	15.0	16.0
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**
Historical Average 1999-2008	14.3	14.4	16.0

FIGURE C-1
DIRECT RADIATION, ANNUAL SUMMARY
1999 to 2009

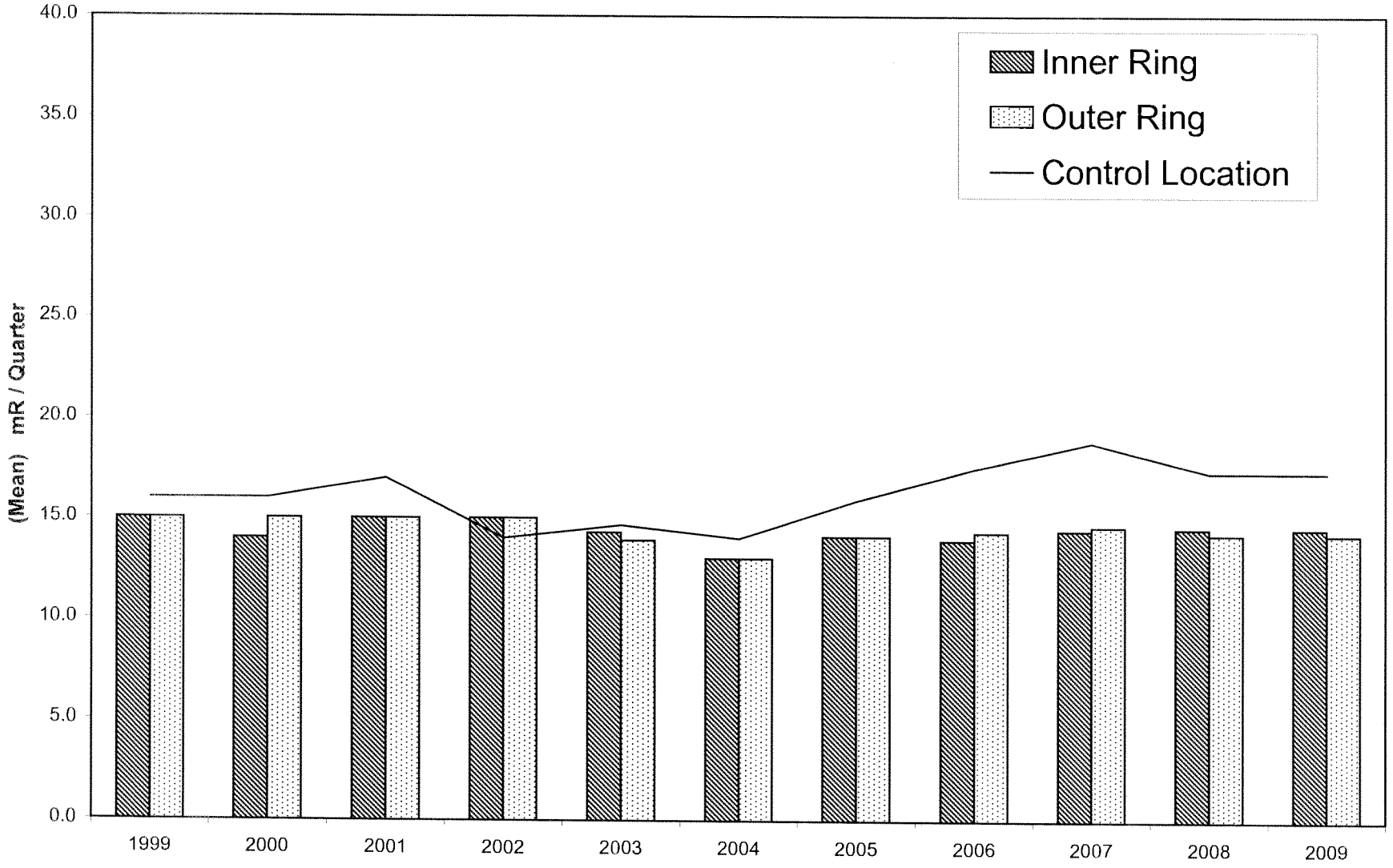


TABLE C-2

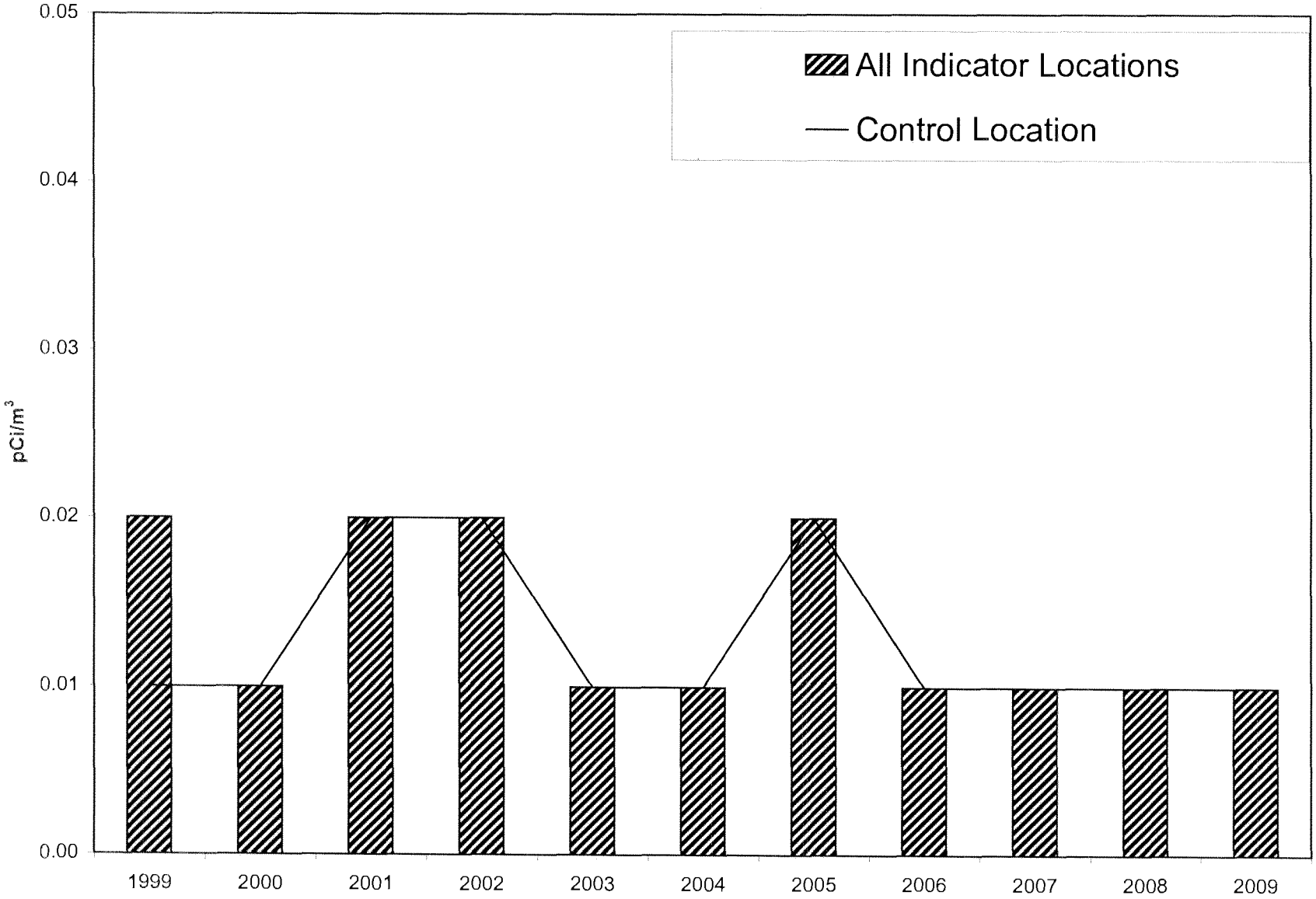
RADIONUCLIDES IN AIR
1999 to 2009
(pCi/m^3)

Year	Gross Beta		Cs-137	
	All Indicator Locations	Control Location	All Indicator Locations	Control Location
1999	0.02	0.01	$< L_c$	$< L_c$
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**	**$< L_c$**	**$< L_c$**
Historical Average 1999-2008	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
1999 to 2009



* Includes ODCM and non-ODCM indicator locations.

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

TABLE C-3

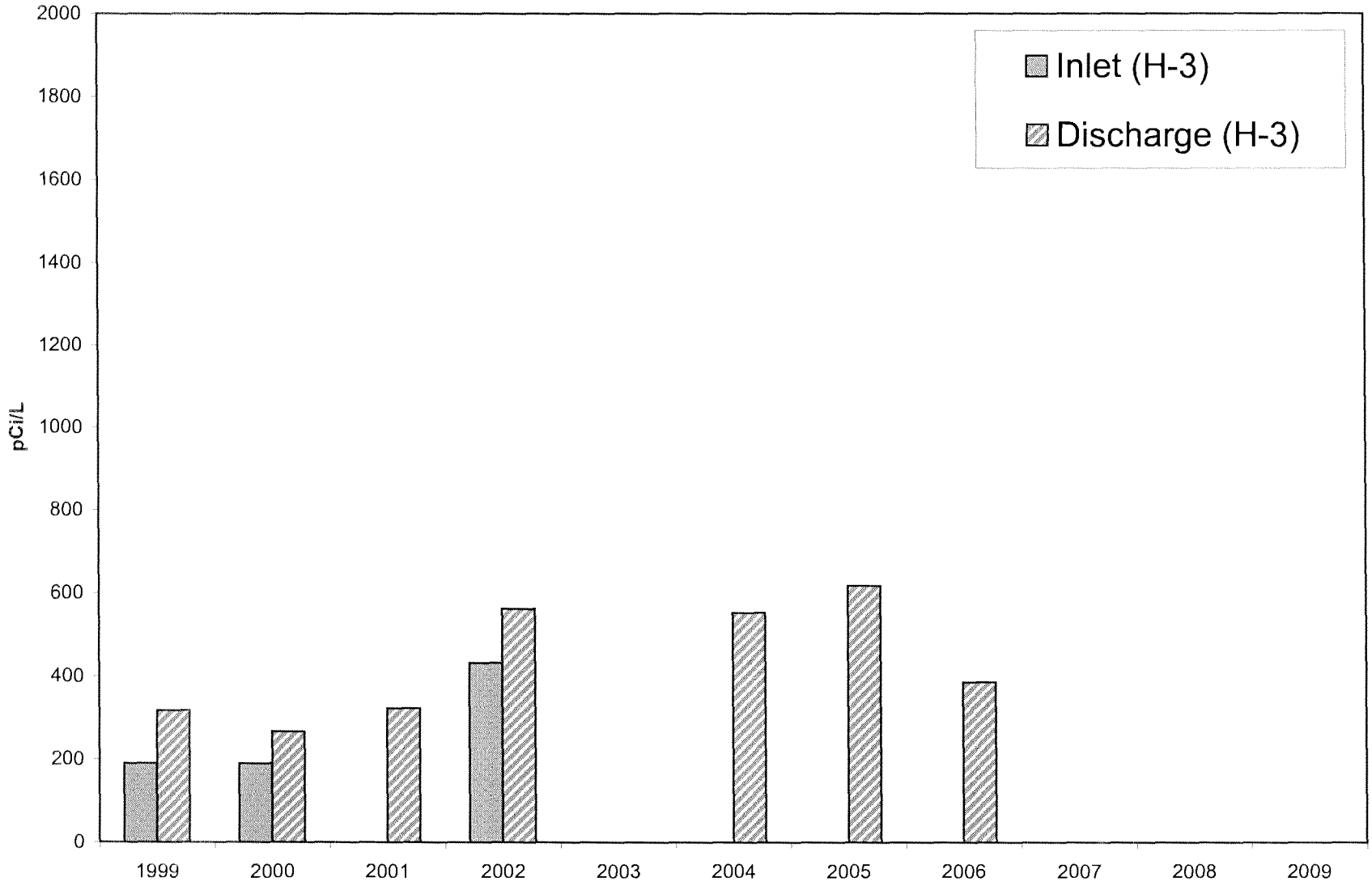
RADIONUCLIDES IN HUDSON RIVER WATER
1999 to 2009
(pCi/L)

	Tritium (H-3)		Cs-137	
Year	**Inlet**	**Discharge**	**Inlet**	**Discharge**
1999	191	318	$< L_c$	$< L_c$
2000	190	267	$< L_c$	$< L_c$
2001	$< L_c$	323	$< L_c$	$< L_c$
2002	432	562	$< L_c$	$< L_c$
2003	$< L_c$	$< L_c$	$< L_c$	$< L_c$
2004	$< L_c$	553	$< L_c$	$< L_c$
2005	$< L_c$	618	$< L_c$	$< L_c$
2006	$< L_c$	386	$< L_c$	$< L_c$
2007	$< L_c$	$< L_c$	$< L_c$	$< L_c$
2008	$< L_c$	$< L_c$	$< L_c$	$< L_c$
2009	**$< L_c$**	**$< L_c$**	**$< L_c$**	**$< L_c$**
Historical Average 1999-2008	271	432	$< L_c$	$< L_c$

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
1999 to 2009



Tritium ODCM required LLD = 3000 pCi/L

TABLE C-4

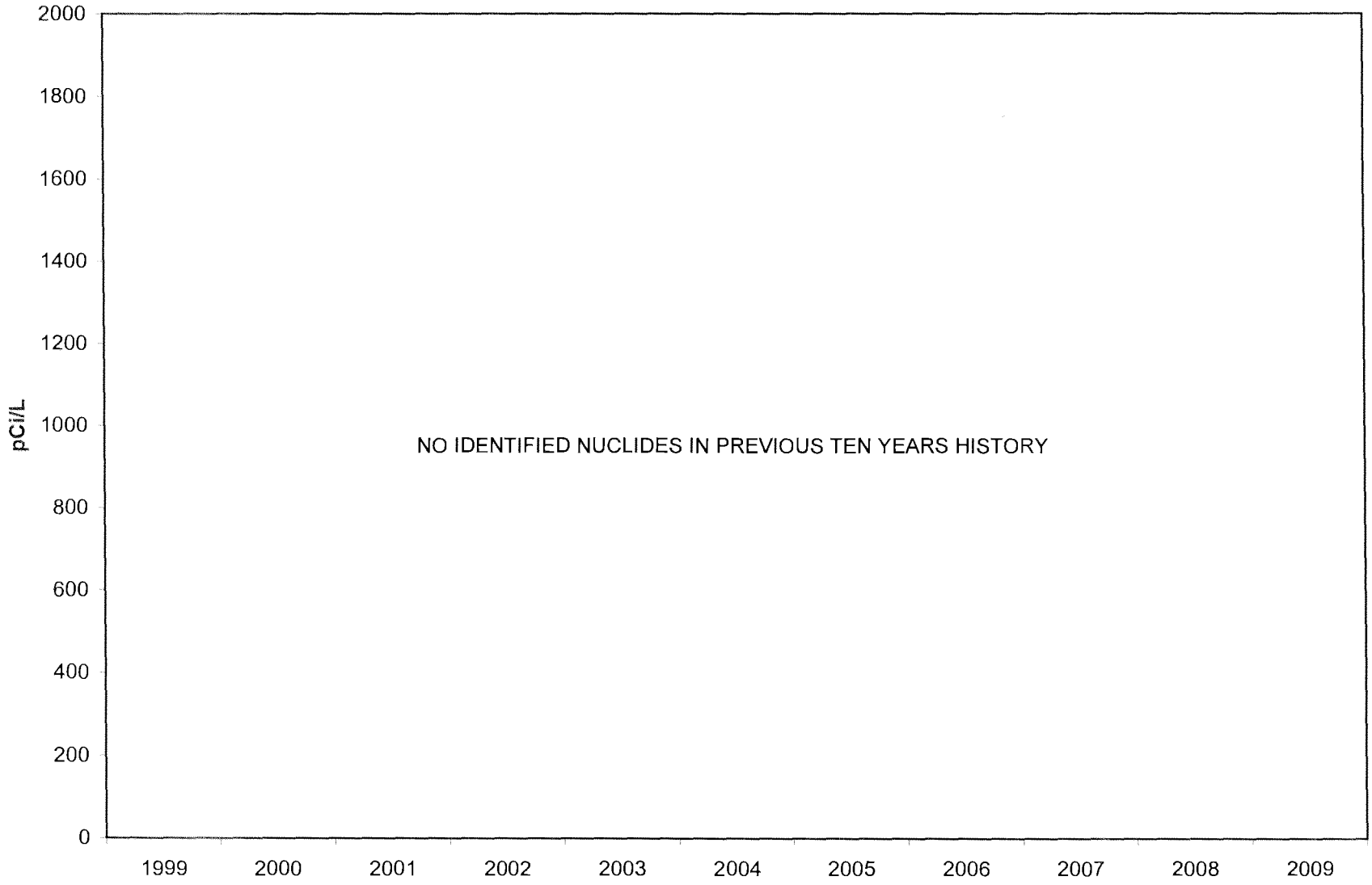
RADIONUCLIDES IN DRINKING WATER
1999 to 2009
(pCi/L)

Year	Tritium (H-3)	Cs-137
1999	< L_c	< L_c
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**
Historical Average 1999-2008	< 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
1999 to 2009



Tritium ODCM required LLD = 2000 pCi/L

TABLE C-5

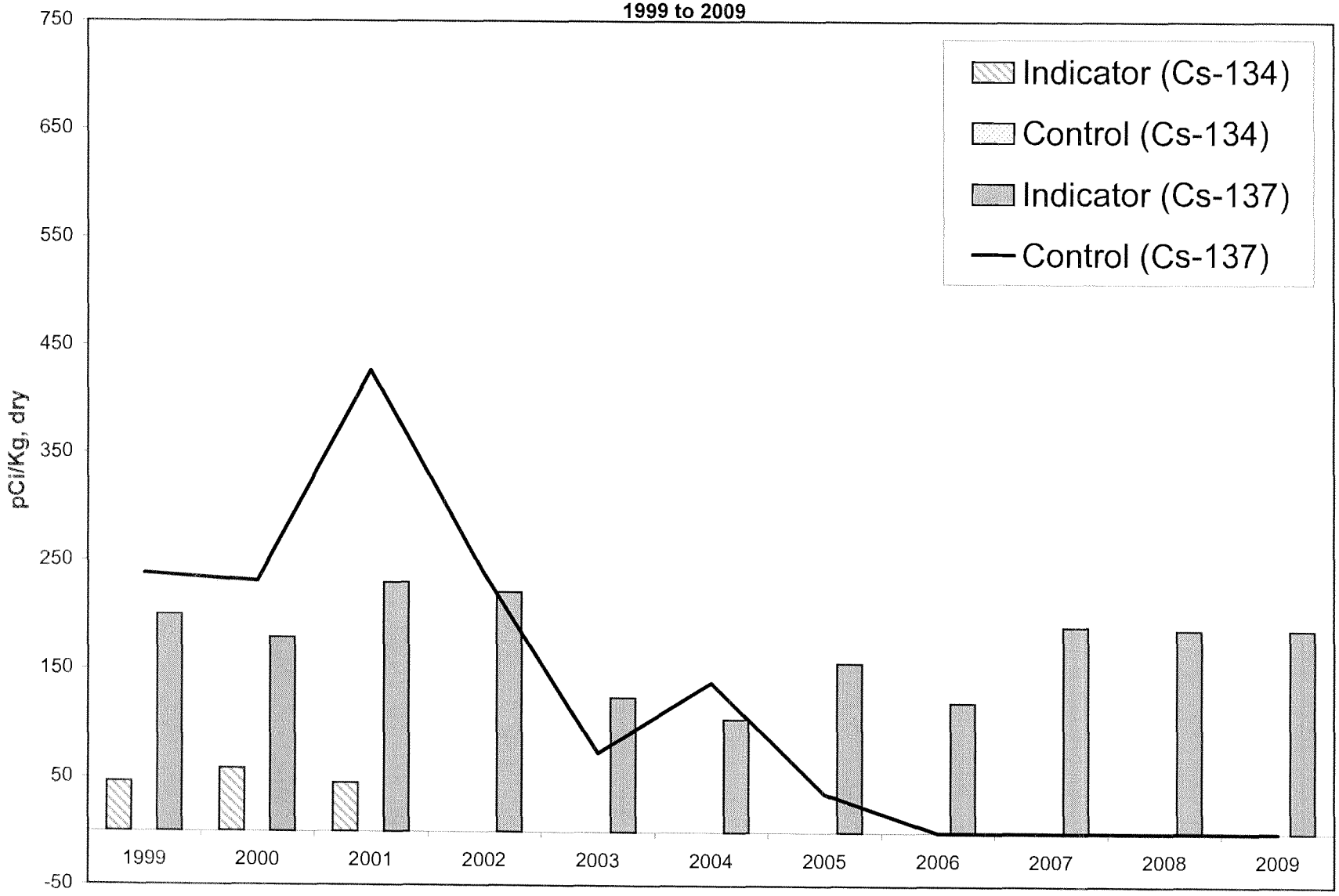
RADIONUCLIDES IN SHORELINE SOIL
1999 to 2009
(pCi/Kg, dry)

	Cs-134		Cs-137	
Year	Indicator	Control	Indicator	Control
1999	46	< L_c	200	238
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**	**187**	**< L_c**
Historical Average 1999-2008	50	< L_c	169	197

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
1999 to 2009



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

TABLE C-6

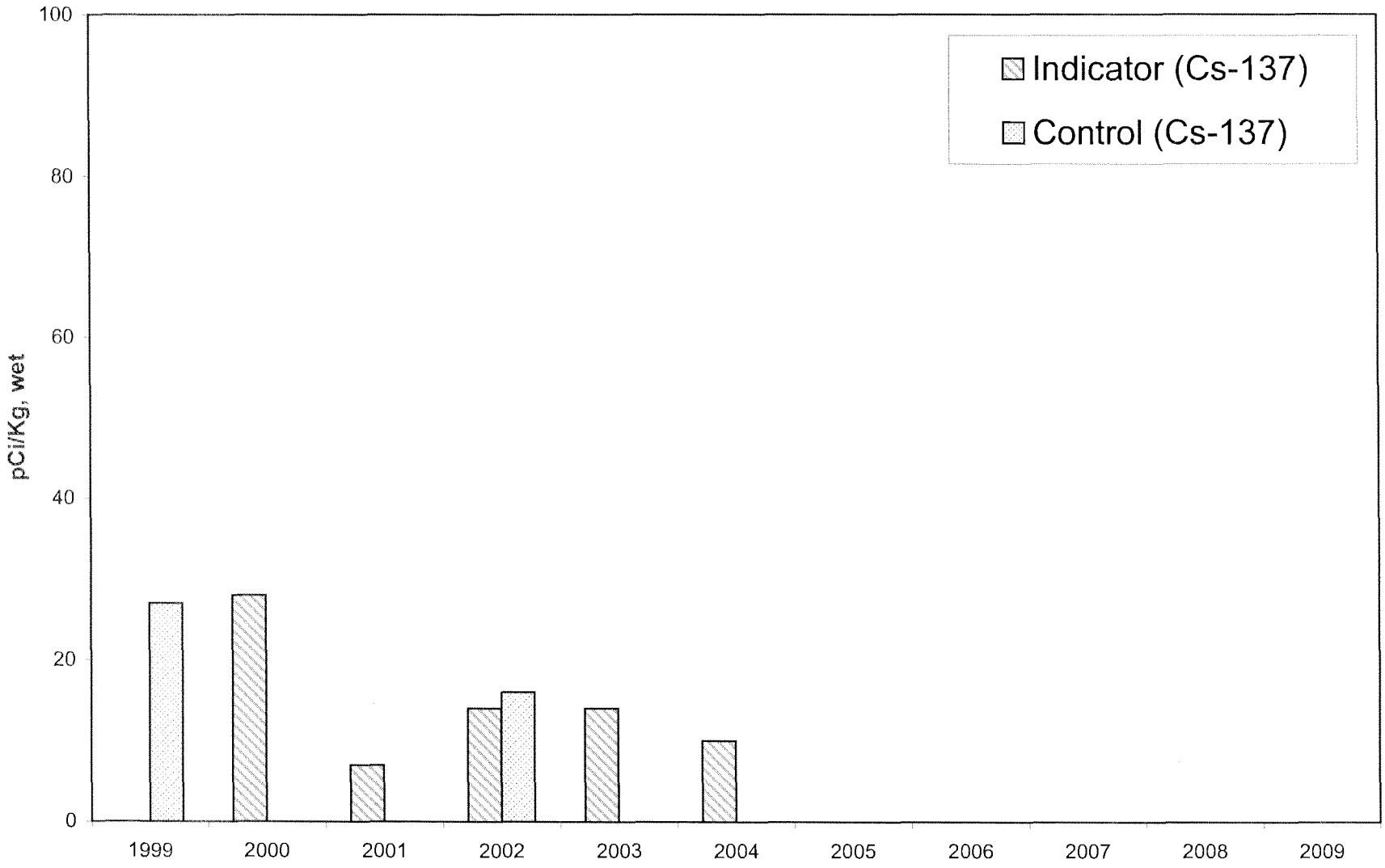
BROAD LEAF VEGETATION - Cs-137
1999 to 2009
(pCi/Kg, wet)

	Cs-137	
Year	**Indicator**	**Control**
1999	< L_c	27
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**
Historical Average 1999-2008	15	22

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
1999 to 2009



ODCM required LLD = 80 pCi/Kg, wet

TABLE C-7

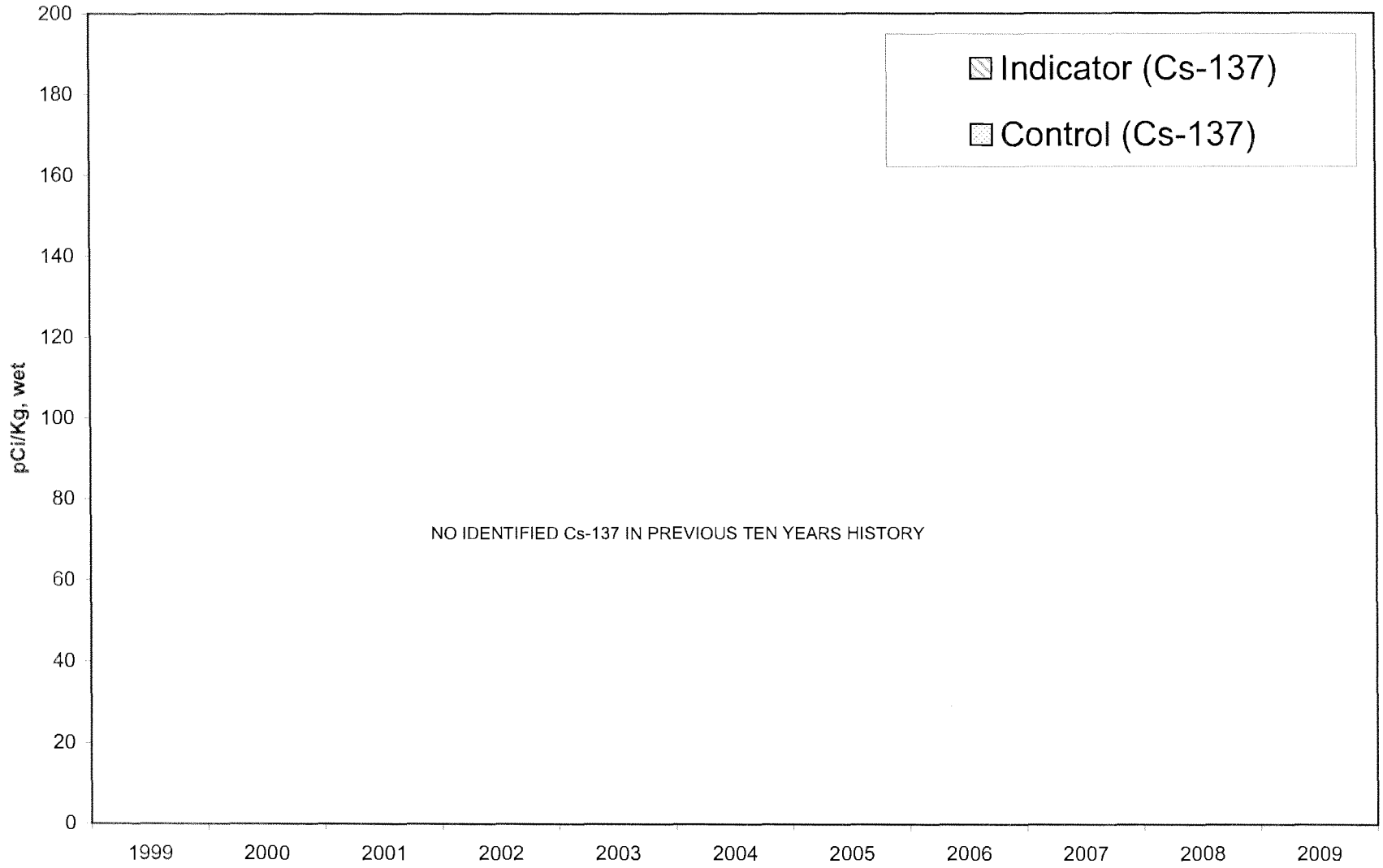
FISH AND INVERTEBRATES - Cs-137
1999 to 2009
(pCi/Kg, dry)

	Cs-137	
Year	**Indicator**	**Control**
1999	< L_c	< L_c
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**
Historical Average 1999-2008	< 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
1999 to 2009



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

APPENDIX D

INTERLABORATORY COMPARISON PROGRAM

APPENDIX D

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 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 8.3.1

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 2009 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 130 individual analyses on the 34 QA samples. Of the 130 analyses performed, 129 were in agreement using the NRC acceptance criteria for a 99.2% agreement ratio.

There was one non-conformity in the 2009 program.

D.4.1.1 ECKERT & ZIEGLER ANALYTICS SAMPLE NONCONFORMITY

Eckert & Ziegler Analytics Sample 6570-05, Fe-59 on Air Filter
Nonconformity No. 2009-02
Corrective Action No. CR-JAF-2009-01758

A spiked mixed gamma on an air particulate filter sample supplied by Eckert & Ziegler Analytics, Inc., was analyzed in accordance with standard laboratory procedures. The sample contained a total of nine radionuclides for analysis. Nine of the nine radionuclides present were quantified. Eight of the nine radionuclides were quantified within the acceptable range. The mean result for Fe-59 was determined to be outside the QA Acceptance Criteria resulting in sample nonconformity and subsequent corrective action. The filter was analyzed three times using three different detectors. An average Fe-59 value of 153 pCi was reported. The known result for the sample was 121 pCi as determined by the supplier. All nine radionuclides values quantified at the E-lab were biased high when compared to reference values.

INITIAL RESULTS ON FILTER (NON-CONFORMITY ON Fe-59)								
Sample Media:	Filter				Sample Date:		3/19/2009	
Analytics #:	E56570-05				Sample Units:		pCi	
Radionuclide	JAF				REFERENCE			%Recovery
Ce-141	131	±	1.3		115	±	1.92	114%
Cr-51	435	±	7.9		370	±	6.18	118%
Cs-134	134	±	2.0		114	±	1.9	118%
Cs-137	150	±	1.8		135	±	2.25	111%
Co-58	168	±	2.0		145	±	2.41	116%
Mn-54	191	±	2.1		155	±	2.59	123%
Fe-59	153	±	2.3		121	±	2.02	126%
Zn-65	233	±	3.9		189	±	3.16	123%
Co-60	193	±	1.7		173	±	2.88	112%

Reviewed JAF E-lab data from prior years and observed a high bias for this media starting in 2008. In November of 2007, a new 16SF source geometry was purchased. The 16SF source geometry is a quarterly composite filter geometry. It was very similar to the old 16SF geometry. However, the petri dish used in our new 16SF source geometry is slightly deeper and the filters used in our new source geometry aren't as tightly packed as the old model. Sample geometry should match source geometry as close as possible to ensure accurate measurements are obtained. Existing guidance for preparing a QC filter composite sample directs the use of extra material to ensure filters are compressed; however this was for the old 16SF source geometry. Extra material to compress the filters when preparing the QC filter composite sample is no longer needed. We have stopped using extra material to compress QC filters when preparing for analysis.

To validate the cause and resolution for exceeding 25% error on Fe-59, the QC sample was prepared again without using additional packing material. The results were in good agreement and are presented below.

REANALYSIS ON FILTER WITH OUT PACKING MATERIAL								
Sample Media:	Filter				Sample Date:		3/19/2009	
Analytics #:	E56570-05				Sample Units:		pCi	
Radionuclide	JAF				REFERENCE			%Recovery
Ce-141	107	±	4.2		115	±	1.92	93%
Cr-51	326	±	34.0		370	±	6.18	88%
Cs-134	120	±	3.2		114	±	1.9	106%
Cs-137	131	±	2.8		135	±	2.25	97%
Co-58	141	±	4.1		145	±	2.41	97%
Mn-54	164	±	3.4		155	±	2.59	106%
Fe-59	126	±	6.1		121	±	2.02	104%
Zn-65	202	±	6.5		189	±	3.16	107%
Co-60	174	±	2.8		173	±	2.88	100%

The E-lab "Guidance for the Processing and Reporting of Blind Spike Quality Assurance Samples" was updated in the Procedures Reference and Laboratory Manual. In addition, a section was added to the guidance document concerning impact of future geometry changes to the JAF E-lab QA program. The following results were obtained on next available QA Spiked Air Particulate Filter.

BLIND QA SPIKE SAMPLE FOLLOWING CHANGE								
Sample Media:	Filter			Sample Date:			9/17/2009	
Analytics #:	E6838-05			Sample Units:			pCi	
Radionuclide	JAF			REFERENCE			%Recovery	
Ce-141	232	±	2.1	234	±	3.91	99%	
Cr-51	180	±	8.2	188	±	3.15	96%	
Cs-134	111	±	2.3	105	±	1.75	106%	
Cs-137	156	±	2.2	158	±	2.63	99%	
Co-58	83.3	±	1.7	84.8	±	1.42	98%	
Mn-54	185	±	2.5	176	±	2.93	105%	
Fe-59	136	±	2.7	126	±	2.1	108%	
Zn-65	192	±	4.2	174	±	2.9	110%	
Co-60	132	±	1.7	137	±	2.28	96%	

Note: The geometry change did not have an impact on client filters as they are not compressed prior to analysis. Additionally, no plant related radionuclides have been detected in client air particulate filter composites in the past 2 years.

D.4.2 NUMERICAL RESULTS TABLES

TABLE D.4.2-1
INTERLABORATORY INTERCOMPARISON PROGRAM
Gross Beta Analysis of Air Particulate Filter

DATE	SAMPLE ID NO.	MEDIUM	ANALYSIS	JAF E-LAB RESULTS pCi ±1 sigma	REFERENCE LAB* pCi ±1 sigma	RATIO (1)
06/18/2009	E6758-05	Filter	GROSS BETA	1.15E+02 ± 1.90E+00 1.18E+02 ± 1.92E+00 1.16E+02 ± 1.91E+00 Mean = 1.16E+02 ± 1.10E+00	1.08E+02 ± 1.80E+00	1.08 A
06/18/2009	E6723-09	Filter	GROSS BETA	1.05E+02 ± 1.82E+00 1.04E+02 ± 1.81E+00 1.07E+02 ± 1.83E+00 Mean = 1.05E+02 ± 1.05E+00	9.88E+01 ± 1.65E+00	1.07 A
12/10/2009	E6960-05	Filter	GROSS BETA	1.08E+02 ± 2.56E+00 1.07E+02 ± 2.55E+00 1.07E+02 ± 2.54E+00 Mean = 1.07E+02 ± 1.47E+00	9.80E+01 ± 1.64E+00	1.09 A

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

TABLE D.4.2 - 1 (Continued)
Tritium Analysis of Water

DATE	SAMPLE ID NO.	MEDIUM	ANALYSIS	JAF E-LAB RESULTS pCi/liter ±1 sigma	REFERENCE LAB* pCi/liter ±1 sigma	RATIO (1)
3/19/2009	E6568-05	Water	H-3	4.81E+03 ± 1.64E+02 4.94E+03 ± 1.65E+02 4.86E+03 ± 1.65E+02 Mean = 4.87E+03 ± 9.51E+01	4.48E+03 ± 7.48E+01	1.09 A
6/18/2009	E6757-05	Water	H-3	9.39E+02 ± 1.32E+02 9.55E+02 ± 1.32E+02 9.95E+02 ± 1.33E+02 Mean = 9.63E+02 ± 7.64E+01	9.71E+02 ± 1.62E+01	0.99 A
9/17/2009	E6842-05	Water	H-3	1.05E+03 ± 1.34E+02 9.10E+02 ± 1.33E+02 1.01E+03 ± 1.33E+02 Mean = 9.91E+02 ± 7.70E+01	9.91E+02 ± 1.66E+01	1.00 A
12/10/2009	E6957-09	Water	H-3	1.49E+04 ± 2.30E+02 1.45E+04 ± 2.28E+02 1.43E+04 ± 2.27E+02 Mean = 1.46E+04 ± 1.32E+02	1.40E+04 ± 2.33E+02	1.04 A
12/10/2009	E6958-09	Water	H-3	1.45E+04 ± 2.28E+02 1.43E+04 ± 2.26E+02 1.45E+04 ± 2.28E+02 Mean = 1.44E+04 ± 1.31E+02	1.40E+04 ± 2.33E+02	1.03 A

(1) Ratio = Reported/Analytics

* Sample provided by Eckert & Ziegler Analytics, Inc.

A=Acceptable

U=Unacceptable

TABLE D.4.2 - 1 (Continued)
Gross Beta Analysis of Water

DATE	SAMPLE ID NO.	MEDIUM	ANALYSIS	JAF E-LAB RESULTS pCi/liter ±1 sigma	REFERENCE LAB* pCi/liter ±1 sigma	RATIO (1)
03/19/2009	E6571-05	Water	GROSS BETA	2.34E+02 ± 2.40E+00 2.33E+02 ± 2.40E+00 2.31E+02 ± 2.40E+00 Mean = 2.33E+02 ± 1.39E+00	2.35E+02 ± 3.92E+00	0.99 A
06/18/2009	E6763-05	Water	GROSS BETA	2.59E+02 ± 2.60E+00 2.61E+02 ± 2.60E+00 2.55E+02 ± 2.60E+00 Mean = 2.58E+02 ± 1.50E+00	2.77E+02 ± 4.63E+00	0.93 A
09/17/2009	E6841-05	Water	GROSS BETA	2.20E+02 ± 2.30E+00 2.15E+02 ± 2.30E+00 2.20E+02 ± 2.30E+00 Mean = 2.18E+02 ± 1.33E+00	2.23E+02 ± 3.72E+00	0.98 A

(1) Ratio = Reported/Analytics

* Sample provided by Eckert & Ziegler Analytics, Inc.

A=Acceptable

U=Unacceptable

TABLE D.4.2 - 1 (Continued)
I-131 Gamma Analysis of Air Charcoal

DATE	SAMPLE ID NO.	MEDIUM	ANALYSIS	JAF E-LAB RESULTS pCi ±1 sigma	REFERENCE LAB* pCi ±1 sigma	RATIO (1)
3/19/2009	E6544-09	Air	I-131	8.30E+01 ± 1.55E+00 8.60E+01 ± 3.04E+00 8.50E+01 ± 3.21E+00 Mean = 8.47E+01 ± 1.56E+00	7.93E+01 ± 1.32E+00	1.07 A
6/18/2009	E6761-05	Air	I-131	9.20E+01 ± 2.57E+00 8.79E+01 ± 2.49E+00 8.90E+01 ± 1.34E+00 Mean = 8.96E+01 ± 1.27E+00	9.47E+01 ± 1.58E+00	0.95 A
9/17/2009	E6840-05	Air	I-131	8.98E+01 ± 2.63E+00 8.74E+01 ± 2.98E+00 8.67E+01 ± 3.04E+00 Mean = 8.80E+01 ± 1.67E+00	9.19E+01 ± 1.54E+00	0.96 A
9/17/2009	E683109	Air	I-131	9.24E+01 ± 2.74E+00 9.17E+01 ± 1.69E+00 9.13E+01 ± 2.93E+00 Mean = 9.18E+01 ± 1.45E+00	9.17E+01 ± 1.53E+00	1.00 A

(1) Ratio = Reported/Analytics

* Sample provided by Eckert & Ziegler Analytics, Inc.

A=Acceptable

U=Unacceptable

TABLE D.4.2 - 1 (Continued)
INTERLABORATORY INTERCOMPARISON PROGRAM
Gamma Analysis of Water

DATE	SAMPLE ID NO.	MEDIUM	ANALYSIS	JAF E-LAB RESULTS pCi/liter ±1 sigma	REFERENCE LAB* pCi/liter ±1 sigma	RATIO (1)
3/19/2009	E6569-05	Water	Ce-141	1.22E+02 ± 4.90E+00 1.24E+02 ± 3.61E+00 1.23E+02 ± 3.67E+00 Mean = 1.23E+02 ± 2.37E+00	1.20E+02 ± 2.01E+00	1.03 A
			Cr-51	4.11E+02 ± 2.53E+01 3.73E+02 ± 1.68E+01 4.27E+02 ± 1.82E+01 Mean = 4.04E+02 ± 1.18E+01	3.87E+02 ± 6.46E+00	1.04 A
			Cs-134	1.26E+02 ± 3.99E+00 1.28E+02 ± 3.13E+00 1.25E+02 ± 3.33E+00 Mean = 1.26E+02 ± 2.02E+00	1.19E+02 ± 1.98E+00	1.06 A
			Cs-137	1.46E+02 ± 4.33E+00 1.42E+02 ± 3.03E+00 1.36E+02 ± 3.11E+00 Mean = 1.41E+02 ± 2.04E+00	1.41E+02 ± 2.36E+00	1.00 A
			Co-58	1.63E+02 ± 4.38E+00 1.53E+02 ± 3.03E+00 1.53E+02 ± 3.35E+00 Mean = 1.56E+02 ± 2.10E+00	1.51E+02 ± 2.52E+00	1.04 A
			Mn-54	1.69E+02 ± 4.50E+00 1.69E+02 ± 3.34E+00 1.73E+02 ± 3.40E+00 Mean = 1.70E+02 ± 2.18E+00	1.62E+02 ± 2.70E+00	1.05 A
			Fe-59	1.35E+02 ± 4.85E+00 1.39E+02 ± 3.46E+00 1.35E+02 ± 3.81E+00 Mean = 1.36E+02 ± 2.36E+00	1.27E+02 ± 2.11E+00	1.07 A
			Zn-65	2.13E+02 ± 8.07E+00 2.12E+02 ± 5.69E+00 1.97E+02 ± 6.25E+00 Mean = 2.07E+02 ± 3.90E+00	1.97E+02 ± 3.30E+00	1.05 A
			Co-60	1.88E+02 ± 3.69E+00 1.89E+02 ± 2.63E+00 1.88E+02 ± 2.70E+00 Mean = 1.88E+02 ± 1.76E+00	1.80E+02 ± 3.01E+00	1.05 A
			I-131**	7.20E+01 ± 2.15E+00 6.87E+01 ± 1.07E+00 7.04E+01 ± 9.82E-01 Mean = 7.04E+01 ± 8.65E-01	6.90E+01 ± 1.15E+00	1.02 A

(1) Ratio = Reported/Analytics

* Sample provided by Eckert & Ziegler Analytics, Inc.

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

A=Acceptable

U=Unacceptable

TABLE D.4.2 - 1 (Continued)
INTERLABORATORY INTERCOMPARISON PROGRAM
Gamma Analysis of Water

DATE	SAMPLE ID NO.	MEDIUM	ANALYSIS	JAF E-LAB RESULTS pCi/liter ±1 sigma	REFERENCE LAB* pCi/liter ±1 sigma	RATIO (1)
6/18/2009	E6722-09	Water	Ce-141	2.19E+02 ± 7.10E+00 2.18E+02 ± 7.42E+00 2.22E+02 ± 4.21E+00 Mean = 2.20E+02 ± 3.70E+00	2.16E+02 ± 3.60E+00	1.02 A
			Cr-51	2.77E+02 ± 3.12E+01 2.93E+02 ± 3.14E+01 3.09E+02 ± 2.02E+01 Mean = 2.93E+02 ± 1.62E+01	3.04E+02 ± 5.08E+00	0.96 A
			Cs-134	1.24E+02 ± 4.58E+00 1.27E+02 ± 4.80E+00 1.38E+02 ± 3.13E+00 Mean = 1.30E+02 ± 2.45E+00	1.26E+02 ± 2.10E+00	1.03 A
			Cs-137	1.40E+02 ± 4.66E+00 1.44E+02 ± 4.73E+00 1.45E+02 ± 3.01E+00 Mean = 1.43E+02 ± 2.43E+00	1.46E+02 ± 2.43E+00	0.98 A
			Co-58	6.74E+01 ± 3.96E+00 7.12E+01 ± 4.14E+00 7.54E+01 ± 2.55E+00 Mean = 7.13E+01 ± 2.09E+00	6.98E+01 ± 1.17E+00	1.02 A
			Mn-54	1.07E+02 ± 4.23E+00 1.07E+02 ± 4.51E+00 1.07E+02 ± 2.87E+00 Mean = 1.07E+02 ± 2.27E+00	1.04E+02 ± 1.74E+00	1.03 A
			Fe-59	1.02E+02 ± 5.50E+00 9.63E+01 ± 5.65E+00 9.66E+01 ± 3.75E+00 Mean = 9.83E+01 ± 2.91E+00	9.29E+01 ± 1.55E+00	1.06 A
			Zn-65	1.41E+02 ± 8.34E+00 1.57E+02 ± 8.56E+00 1.39E+02 ± 5.26E+00 Mean = 1.46E+02 ± 4.35E+00	1.33E+02 ± 2.22E+00	1.10 A
			Co-60	2.53E+02 ± 4.63E+00 2.43E+02 ± 4.72E+00 2.42E+02 ± 2.99E+00 Mean = 2.46E+02 ± 2.42E+00	2.37E+02 ± 3.95E+00	1.04 A
			I-131**	8.41E+01 ± 4.42E+00 9.26E+01 ± 4.28E+00 9.55E+01 ± 3.98E+00 Mean = 9.07E+01 ± 1.83E+00	8.83E+01 ± 1.47E+00	1.03 A

(1) Ratio = Reported/Analytics

* Sample provided by Eckert & Ziegler Analytics, Inc.

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

A=Acceptable

U=Unacceptable

TABLE D.4.2 - 1 (Continued)
INTERLABORATORY INTERCOMPARISON PROGRAM
Gamma Analysis of Water

DATE	SAMPLE ID NO.	MEDIUM	ANALYSIS	JAF E-LAB RESULTS pCi/liter ±1 sigma	REFERENCE LAB* pCi/liter ±1 sigma	RATIO (1)
9/17/2009	E6837-05	Water	Ce-141	2.77E+02 ± 3.61E+00 2.69E+02 ± 6.49E+00 2.61E+02 ± 6.66E+00 Mean = 2.69E+02 ± 3.33E+00	2.64E+02 ± 4.40E+00	1.02 A
			Cr-51	2.24E+02 ± 1.26E+01 2.10E+02 ± 2.22E+01 2.20E+02 ± 2.82E+01 Mean = 2.18E+02 ± 1.27E+01	2.12E+02 ± 3.54E+00	1.03 A
			Cs-134	1.26E+02 ± 2.15E+00 1.21E+02 ± 4.13E+00 1.25E+02 ± 5.23E+00 Mean = 1.24E+02 ± 2.33E+00	1.18E+02 ± 1.97E+00	1.05 A
			Cs-137	1.77E+02 ± 2.40E+00 1.76E+02 ± 4.67E+00 1.79E+02 ± 5.37E+00 Mean = 1.77E+02 ± 2.50E+00	1.77E+02 ± 2.96E+00	1.00 A
			Co-58	9.64E+01 ± 1.91E+00 9.90E+01 ± 4.02E+00 9.12E+01 ± 4.23E+00 Mean = 9.55E+01 ± 2.05E+00	9.54E+01 ± 1.59E+00	1.00 A
			Mn-54	2.14E+02 ± 2.64E+00 2.08E+02 ± 5.07E+00 2.04E+02 ± 5.96E+00 Mean = 2.09E+02 ± 2.75E+00	1.98E+02 ± 3.30E+00	1.05 A
			Fe-59	1.55E+02 ± 2.73E+00 1.52E+02 ± 5.29E+00 1.48E+02 ± 6.36E+00 Mean = 1.52E+02 ± 2.90E+00	1.41E+02 ± 2.36E+00	1.08 A
			Zn-65	2.14E+02 ± 4.25E+00 2.25E+02 ± 8.57E+00 2.05E+02 ± 9.89E+00 Mean = 2.15E+02 ± 4.59E+00	1.95E+02 ± 3.26E+00	1.10 A
			Co-60	1.55E+02 ± 1.73E+00 1.53E+02 ± 3.42E+00 1.58E+02 ± 4.11E+00 Mean = 1.55E+02 ± 1.87E+00	1.54E+02 ± 2.57E+00	1.01 A
			I-131**	1.00E+02 ± 1.19E+00 9.91E+01 ± 3.05E+00 1.01E+02 ± 2.92E+00 Mean = 1.00E+02 ± 1.46E+00	9.84E+01 ± 1.64E+00	1.02 A

(1) Ratio = Reported/Analytics

* Sample provided by Eckert & Ziegler Analytics, Inc.

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

A=Acceptable

U=Unacceptable

TABLE D.4.2 - 1 (Continued)
INTERLABORATORY INTERCOMPARISON PROGRAM
Gamma Analysis of Water

DATE	SAMPLE ID NO.	MEDIUM	ANALYSIS	JAF E-LAB RESULTS pCi/liter ±1 sigma	REFERENCE LAB* pCi/liter ±1 sigma	RATIO (1)
12/10/2009	E6959-09	Water	Ce-141	2.14E+02 ± 8.89E+00 2.14E+02 ± 4.58E+00 2.01E+02 ± 9.53E+00 Mean = 2.10E+02 ± 4.60E+00	2.04E+02 ± 3.41E+00	1.03 A
			Cr-51	5.40E+02 ± 4.35E+01 5.37E+02 ± 2.11E+01 5.36E+02 ± 4.64E+01 Mean = 5.38E+02 ± 2.23E+01	5.54E+02 ± 9.25E+00	0.97 A
			Cs-134	2.62E+02 ± 7.33E+00 2.60E+02 ± 3.69E+00 2.67E+02 ± 7.12E+00 Mean = 2.63E+02 ± 3.62E+00	2.55E+02 ± 4.26E+00	1.03 A
			Cs-137	1.64E+02 ± 5.87E+00 1.82E+02 ± 3.00E+00 1.77E+02 ± 5.71E+00 Mean = 1.74E+02 ± 2.91E+00	1.81E+02 ± 3.02E+00	0.96 A
			Co-58	2.18E+02 ± 6.96E+00 2.14E+02 ± 3.28E+00 2.28E+02 ± 6.54E+00 Mean = 2.20E+02 ± 3.37E+00	2.13E+02 ± 3.56E+00	1.03 A
			Mn-54	1.99E+02 ± 6.21E+00 1.94E+02 ± 3.12E+00 1.93E+02 ± 6.25E+00 Mean = 1.95E+02 ± 3.12E+00	1.79E+02 ± 3.00E+00	1.09 A
			Fe-59	1.85E+02 ± 8.16E+00 1.90E+02 ± 3.99E+00 2.02E+02 ± 8.10E+00 Mean = 1.92E+02 ± 4.06E+00	1.79E+02 ± 3.00E+00	1.07 A
			Zn-65	3.82E+02 ± 1.34E+01 3.72E+02 ± 6.54E+00 3.96E+02 ± 1.32E+01 Mean = 3.83E+02 ± 6.64E+00	3.48E+02 ± 5.82E+00	1.10 A
			Co-60	2.62E+02 ± 5.43E+00 2.60E+02 ± 2.61E+00 2.58E+02 ± 5.18E+00 Mean = 2.60E+02 ± 2.65E+00	2.58E+02 ± 4.31E+00	1.01 A
			I-131**	9.41E+01 ± 2.11E+00 9.37E+01 ± 5.70E+00 9.05E+01 ± 6.83E+00 Mean = 9.28E+01 ± 3.05E+00	9.61E+01 ± 1.61E+00	0.97 A

(1) Ratio = Reported/Analytics

* Sample provided by Eckert & Ziegler Analytics, Inc.

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

A=Acceptable

U=Unacceptable

TABLE D.4.2 - 1 (Continued)
INTERLABORATORY INTERCOMPARISON PROGRAM
Gamma Analysis of Milk

DATE	SAMPLE ID NO.	MEDIUM	ANALYSIS	JAF E-LAB RESULTS pCi/liter ±1 sigma	REFERENCE LAB* pCi/liter ±1 sigma	RATIO (1)
3/19/2009	E6545-09	MILK	Ce-141	9.19E+01 ± 8.41E+00 8.83E+01 ± 8.48E+00 9.86E+01 ± 3.75E+00 9.36E+01 ± 3.55E+00 Mean = 9.31E+01 ± 3.25E+00	9.49E+01 ± 1.58E+00	0.98 A
			Cr-51	3.18E+02 ± 4.44E+01 3.02E+02 ± 4.52E+01 2.94E+02 ± 2.04E+01 3.04E+02 ± 1.74E+01 Mean = 3.05E+02 ± 1.72E+01	3.05E+02 ± 5.10E+00	1.00 A
			Cs-134	8.97E+01 ± 7.19E+00 9.17E+01 ± 7.67E+00 9.25E+01 ± 2.94E+00 9.26E+01 ± 2.99E+00 Mean = 9.16E+01 ± 2.83E+00	9.37E+01 ± 1.57E+00	0.98 A
			Cs-137	1.10E+02 ± 7.56E+00 9.81E+01 ± 7.53E+00 1.09E+02 ± 3.15E+00 1.05E+02 ± 3.17E+00 Mean = 1.06E+02 ± 2.89E+00	1.11E+02 ± 1.86E+00	0.95 A
			Co-58	1.10E+02 ± 7.89E+00 1.19E+02 ± 8.32E+00 1.19E+02 ± 3.47E+00 1.17E+02 ± 3.48E+00 Mean = 1.16E+02 ± 3.12E+00	1.19E+02 ± 1.99E+00	0.98 A
			Mn-54	1.42E+02 ± 8.51E+00 1.22E+02 ± 8.28E+00 1.42E+02 ± 3.61E+00 1.30E+02 ± 3.49E+00 Mean = 1.34E+02 ± 3.22E+00	1.28E+02 ± 2.13E+00	1.05 A
			Fe-59	1.02E+02 ± 9.68E+00 8.94E+01 ± 9.85E+00 1.13E+02 ± 4.35E+00 1.01E+02 ± 4.29E+00 Mean = 1.01E+02 ± 3.78E+00	9.99E+01 ± 1.67E+00	1.01 A
			Zn-65	1.48E+02 ± 1.58E+01 1.51E+02 ± 6.52E+00 1.63E+02 ± 6.63E+00 Mean = 1.54E+02 ± 6.11E+00	1.56E+02 ± 2.60E+00	0.99 A
			Co-60	1.43E+02 ± 6.60E+00 1.55E+02 ± 6.91E+00 1.34E+02 ± 2.73E+00 1.46E+02 ± 2.91E+00 Mean = 1.45E+02 ± 2.59E+00	1.42E+02 ± 2.38E+00	1.02 A
			I-131**	8.63E+01 ± 2.54E+00 1.02E+02 ± 7.17E+00 8.14E+01 ± 5.34E+00 7.73E+01 ± 3.59E+00 Mean = 8.68E+01 ± 2.49E+00	7.93E+01 ± 1.32E+00	1.09 A

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

* Sample provided by Eckert & Ziegler Analytics, Inc.

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

TABLE D.4.2 - 1 (Continued)
INTERLABORATORY INTERCOMPARISON PROGRAM
Gamma Analysis of Milk

DATE	SAMPLE ID NO.	MEDIUM	ANALYSIS	JAF E-LAB RESULTS pCi/liter ±1 sigma	REFERENCE LAB* pCi/liter ±1 sigma	RATIO (1)
6/18/2009	E6759-05	MILK	Ce-141	2.99E+02 ± 3.04E+00 3.00E+02 ± 6.52E+00 2.95E+02 ± 8.38E+00 Mean = 2.98E+02 ± 3.68E+00	2.84E+02 ± 4.74E+00	1.05 A
			Cr-51	4.17E+02 ± 1.11E+01 3.91E+02 ± 2.61E+01 3.79E+02 ± 3.51E+01 Mean = 3.96E+02 ± 1.50E+01	4.00E+02 ± 6.69E+00	0.99 A
			Cs-134	1.78E+02 ± 2.04E+00 1.55E+02 ± 8.58E+00 1.72E+02 ± 6.73E+00 Mean = 1.68E+02 ± 3.70E+00	1.66E+02 ± 2.77E+00	1.01 A
			Cs-137	1.95E+02 ± 2.14E+00 1.97E+02 ± 5.28E+00 1.85E+02 ± 6.96E+00 Mean = 1.92E+02 ± 3.00E+00	1.92E+02 ± 3.20E+00	1.00 A
			Co-58	9.71E+01 ± 1.59E+00 8.91E+01 ± 3.95E+00 9.06E+01 ± 5.74E+00 Mean = 9.23E+01 ± 2.38E+00	9.19E+01 ± 1.53E+00	1.00 A
			Mn-54	1.45E+02 ± 1.95E+00 1.42E+02 ± 4.54E+00 1.41E+02 ± 6.56E+00 Mean = 1.43E+02 ± 2.74E+00	1.37E+02 ± 2.29E+00	1.04 A
			Fe-59	1.30E+02 ± 2.27E+00 1.29E+02 ± 5.47E+00 1.26E+02 ± 7.83E+00 Mean = 1.28E+02 ± 3.27E+00	1.22E+02 ± 2.04E+00	1.05 A
			Zn-65	1.91E+02 ± 3.66E+00 1.86E+02 ± 8.64E+00 1.82E+02 ± 1.26E+01 Mean = 1.86E+02 ± 5.24E+00	1.75E+02 ± 2.93E+00	1.06 A
			Co-60	3.18E+02 ± 2.05E+00 3.11E+02 ± 4.92E+00 3.10E+02 ± 6.99E+00 Mean = 3.13E+02 ± 2.93E+00	3.12E+02 ± 5.21E+00	1.00 A
			I-131**	9.17E+01 ± 8.96E-01 9.38E+01 ± 2.70E+00 9.50E+01 ± 2.56E+00 Mean = 9.35E+01 ± 1.28E+00	1.02E+02 ± 1.70E+00	0.92 A

(1) Ratio = Reported/Analytics

* Sample provided by Eckert & Ziegler Analytics, Inc.

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

A=Acceptable

U=Unacceptable

TABLE D.4.2 - 1 (Continued)
INTERLABORATORY INTERCOMPARISON PROGRAM
Gamma Analysis of Milk

DATE	SAMPLE ID NO.	MEDIUM	ANALYSIS	JAF E-LAB RESULTS pCi/liter ±1 sigma	REFERENCE LAB* pCi/liter ±1 sigma	RATIO (1)
9/17/2009	E6839-05	MILK	Ce-141	2.84E+02 ± 7.55E+00 2.74E+02 ± 3.93E+00 2.86E+02 ± 7.43E+00 Mean = 2.81E+02 ± 3.77E+00	2.75E+02 ± 4.59E+00	1.02 A
			Cr-51	2.16E+02 ± 2.57E+01 1.93E+02 ± 1.55E+01 2.13E+02 ± 2.86E+01 Mean = 2.07E+02 ± 1.38E+01	2.21E+02 ± 3.69E+00	0.94 A
			Cs-134	1.17E+02 ± 7.61E+00 1.30E+02 ± 2.57E+00 1.27E+02 ± 4.73E+00 Mean = 1.25E+02 ± 3.11E+00	1.23E+02 ± 2.06E+00	1.01 A
			Cs-137	1.71E+02 ± 4.94E+00 1.77E+02 ± 2.88E+00 1.79E+02 ± 5.63E+00 Mean = 1.76E+02 ± 2.67E+00	1.85E+02 ± 3.09E+00	0.95 A
			Co-58	1.06E+02 ± 4.03E+00 1.01E+02 ± 2.28E+00 9.29E+01 ± 4.75E+00 Mean = 1.00E+02 ± 2.21E+00	9.94E+01 ± 1.66E+00	1.01 A
			Mn-54	2.15E+02 ± 5.51E+00 2.22E+02 ± 3.20E+00 2.04E+02 ± 5.98E+00 Mean = 2.14E+02 ± 2.91E+00	2.06E+02 ± 3.44E+00	1.04 A
			Fe-59	1.49E+02 ± 5.67E+00 1.59E+02 ± 3.40E+00 1.56E+02 ± 6.85E+00 Mean = 1.55E+02 ± 3.17E+00	1.47E+02 ± 2.46E+00	1.05 A
			Zn-65	2.16E+02 ± 9.24E+00 2.21E+02 ± 5.43E+00 2.19E+02 ± 1.07E+01 Mean = 2.19E+02 ± 5.05E+00	2.04E+02 ± 3.40E+00	1.07 A
			Co-60	1.59E+02 ± 3.67E+00 1.62E+02 ± 2.13E+00 1.57E+02 ± 4.26E+00 Mean = 1.59E+02 ± 2.00E+00	1.60E+02 ± 2.68E+00	1.00 A
			I-131**	9.36E+01 ± 1.14E+00 9.12E+01 ± 2.82E+00 8.91E+01 ± 2.98E+00 Mean = 9.13E+01 ± 1.42E+00	9.86E+01 ± 1.65E+00	0.93 A

(1) Ratio = Reported/Analytics

* Sample provided by Eckert & Ziegler Analytics, Inc.

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

A=Acceptable

U=Unacceptable

TABLE D.4.2 - 1 (Continued)
INTERLABORATORY INTERCOMPARISON PROGRAM
Gamma Analysis of Air Particulate Filter

DATE	SAMPLE ID NO.	MEDIUM	ANALYSIS	JAF E-LAB RESULTS pCi ±1 sigma	REFERENCE LAB* pCi ±1 sigma	RATIO (1)
3/19/2009	E6570-05	FILTER	Ce-141	1.33E+02 ± 1.69E+00 1.31E+02 ± 3.28E+00 1.30E+02 ± 1.52E+00 Mean = 1.31E+02 ± 1.33E+00	1.15E+02 ± 1.92E+00	1.14 A
			Cr-51	4.28E+02 ± 1.01E+01 4.63E+02 ± 1.94E+01 4.15E+02 ± 9.20E+00 Mean = 4.35E+02 ± 7.91E+00	3.70E+02 ± 6.18E+00	1.18 A
			Cs-134	1.33E+02 ± 2.20E+00 1.33E+02 ± 5.10E+00 1.36E+02 ± 2.40E+00 Mean = 1.34E+02 ± 2.02E+00	1.14E+02 ± 1.90E+00	1.18 A
			Cs-137	1.52E+02 ± 2.14E+00 1.44E+02 ± 4.55E+00 1.53E+02 ± 2.15E+00 Mean = 1.50E+02 ± 1.82E+00	1.35E+02 ± 2.25E+00	1.11 A
			Co-58	1.70E+02 ± 2.30E+00 1.65E+02 ± 4.94E+00 1.69E+02 ± 2.27E+00 Mean = 1.68E+02 ± 1.97E+00	1.45E+02 ± 2.41E+00	1.16 A
			Mn-54	1.89E+02 ± 2.46E+00 1.92E+02 ± 5.32E+00 1.93E+02 ± 2.52E+00 Mean = 1.91E+02 ± 2.13E+00	1.55E+02 ± 2.59E+00	1.23 A
			Fe-59	1.58E+02 ± 2.81E+00 1.42E+02 ± 5.72E+00 1.58E+02 ± 2.76E+00 Mean = 1.53E+02 ± 2.31E+00	1.21E+02 ± 2.02E+00	1.26 U
			Zn-65	2.33E+02 ± 4.53E+00 2.29E+02 ± 9.63E+00 2.37E+02 ± 4.59E+00 Mean = 2.33E+02 ± 3.86E+00	1.89E+02 ± 3.16E+00	1.23 A
			Co-60	1.95E+02 ± 1.96E+00 1.89E+02 ± 4.34E+00 1.95E+02 ± 2.04E+00 Mean = 1.93E+02 ± 1.73E+00	1.73E+02 ± 2.88E+00	1.12 A

(1) Ratio = Reported/Analytics

* Sample provided by Eckert & Ziegler Analytics, Inc.

A=Acceptable

U=Unacceptable

TABLE D.4.2 - 1 (Continued)
INTERLABORATORY INTERCOMPARISON PROGRAM
Gamma Analysis of Air Particulate Filter

DATE	SAMPLE ID NO.	MEDIUM	ANALYSIS	JAF E-LAB RESULTS pCi ±1 sigma	REFERENCE LAB* pCi ±1 sigma	RATIO (1)
9/17/2009	E6838-05	FILTER	Ce-141	2.36E+02 ± 4.09E+00 2.30E+02 ± 1.95E+00 2.30E+02 ± 4.44E+00 Mean = 2.32E+02 ± 2.11E+00	2.34E+02 ± 3.91E+00	0.99 A
			Cr-51	1.67E+02 ± 1.58E+01 1.79E+02 ± 8.12E+00 1.94E+02 ± 1.69E+01 Mean = 1.80E+02 ± 8.17E+00	1.88E+02 ± 3.15E+00	0.96 A
			Cs-134	1.04E+02 ± 4.61E+00 1.13E+02 ± 2.18E+00 1.17E+02 ± 4.64E+00 Mean = 1.11E+02 ± 2.30E+00	1.05E+02 ± 1.75E+00	1.06 A
			Cs-137	1.57E+02 ± 4.36E+00 1.51E+02 ± 2.28E+00 1.61E+02 ± 4.39E+00 Mean = 1.56E+02 ± 2.20E+00	1.58E+02 ± 2.63E+00	0.99 A
			Co-58	8.50E+01 ± 3.53E+00 8.42E+01 ± 1.83E+00 8.08E+01 ± 3.39E+00 Mean = 8.33E+01 ± 1.74E+00	8.48E+01 ± 1.42E+00	0.98 A
			Mn-54	1.84E+02 ± 4.87E+00 1.77E+02 ± 2.57E+00 1.93E+02 ± 5.02E+00 Mean = 1.85E+02 ± 2.48E+00	1.76E+02 ± 2.93E+00	1.05 A
			Fe-59	1.40E+02 ± 5.35E+00 1.41E+02 ± 2.90E+00 1.28E+02 ± 5.32E+00 Mean = 1.36E+02 ± 2.69E+00	1.26E+02 ± 2.10E+00	1.08 A
			Zn-65	1.88E+02 ± 8.32E+00 1.98E+02 ± 4.35E+00 1.90E+02 ± 8.48E+00 Mean = 1.92E+02 ± 4.22E+00	1.74E+02 ± 2.90E+00	1.10 A
			Co-60	1.38E+02 ± 3.45E+00 1.32E+02 ± 1.86E+00 1.26E+02 ± 3.32E+00 Mean = 1.32E+02 ± 1.71E+00	1.37E+02 ± 2.28E+00	0.96 A

(1) Ratio = Reported/Analytics

* Sample provided by Eckert & Ziegler Analytics, Inc.

A=Acceptable

U=Unacceptable

TABLE D.4.2 - 1 (Continued)
INTERLABORATORY INTERCOMPARISON PROGRAM
Gamma Analysis of Soil

DATE	SAMPLE ID NO.	MEDIUM	ANALYSIS	JAF E-LAB RESULTS pCi/g ±1 sigma	REFERENCE LAB* pCi/g ±1 sigma	RATIO (1)
6/18/2009	E6760-05	SOIL	Ce-141	4.58E-01 ± 1.18E-02 4.39E-01 ± 2.42E-02 4.33E-01 ± 2.36E-02 Mean = 4.43E-01 ± 8.95E-03	4.62E-01 ± 7.72E-03	0.96 A
			Cr-51	6.89E-01 ± 6.85E-02 6.78E-01 ± 1.11E-01 6.46E-01 ± 1.05E-01 Mean = 6.71E-01 ± 4.19E-02	6.52E-01 ± 1.09E-02	1.03 A
			Cs-134	2.94E-01 ± 9.32E-03 2.50E-01 ± 1.93E-02 2.69E-01 ± 1.69E-02 Mean = 2.71E-01 ± 6.82E-03	2.70E-01 ± 4.51E-03	1.00 A
			Cs-137	3.86E-01 ± 1.02E-02 3.76E-01 ± 2.09E-02 4.04E-01 ± 1.85E-02 Mean = 3.89E-01 ± 7.43E-03	4.06E-01 ± 6.78E-03	0.96 A
			Co-58	1.38E-01 ± 7.57E-03 1.37E-01 ± 1.65E-02 1.61E-01 ± 1.47E-02 Mean = 1.45E-01 ± 5.84E-03	1.50E-01 ± 2.51E-03	0.97 A
			Mn-54	2.35E-01 ± 9.13E-03 2.16E-01 ± 2.13E-02 2.34E-01 ± 1.69E-02 Mean = 2.28E-01 ± 7.17E-03	2.23E-01 ± 3.72E-03	1.02 A
			Fe-59	2.14E-01 ± 1.06E-02 1.88E-01 ± 2.34E-02 2.16E-01 ± 2.02E-02 Mean = 2.06E-01 ± 8.17E-03	1.99E-01 ± 3.32E-03	1.04 A
			Zn-65	3.19E-01 ± 1.57E-02 3.18E-01 ± 3.37E-02 3.30E-01 ± 3.01E-02 Mean = 3.22E-01 ± 1.20E-02	2.86E-01 ± 4.78E-03	1.13 A
			Co-60	5.23E-01 ± 9.15E-03 4.97E-01 ± 1.87E-02 4.78E-01 ± 1.56E-02 Mean = 4.99E-01 ± 6.50E-03	5.07E-01 ± 8.47E-03	0.98 A

(1) Ratio = Reported/Analytics

* Sample provided by Eckert & Ziegler Analytics, Inc.

A=Acceptable

U=Unacceptable

TABLE D.4.2 - 1 (Continued)
INTERLABORATORY INTERCOMPARISON PROGRAM
Gamma Analysis of Vegetation

DATE	SAMPLE ID NO.	MEDIUM	ANALYSIS	JAF E-LAB RESULTS pCi/g ±1 sigma			REFERENCE LAB* pCi/g ±1 sigma			RATIO (1)	
6/18/2009	E6762-05	VEG	Ce-141	3.93E-01	±	1.26E-02	4.10E-01	±	6.85E-03	0.96	A
				3.96E-01	±	1.46E-02					
				3.87E-01	±	6.92E-03					
				3.94E-01	±	1.20E-02					
				Mean = 3.93E-01	±	5.94E-03					
			Cr-51	4.88E-01	±	5.04E-02	5.78E-01	±	9.65E-03	0.95	A
				5.19E-01	±	5.88E-02					
				5.33E-01	±	3.28E-02					
				6.47E-01	±	5.81E-02					
				Mean = 5.47E-01	±	2.56E-02					
			Cs-134	2.63E-01	±	1.09E-02	2.39E-01	±	3.99E-03	1.10	A
				2.64E-01	±	1.50E-02					
				2.75E-01	±	7.31E-03					
				2.50E-01	±	8.19E-03					
				Mean = 2.63E-01	±	5.39E-03					
			Cs-137	2.65E-01	±	1.05E-02	2.77E-01	±	4.63E-03	0.95	A
				2.72E-01	±	1.32E-02					
				2.50E-01	±	6.74E-03					
				2.66E-01	±	7.82E-03					
				Mean = 2.63E-01	±	4.94E-03					
			Co-58	1.21E-01	±	7.80E-03	1.33E-01	±	2.22E-03	0.91	A
				1.23E-01	±	1.06E-02					
				1.18E-01	±	5.01E-03					
				1.20E-01	±	7.39E-03					
				Mean = 1.21E-01	±	3.98E-03					
			Mn-54	1.97E-01	±	9.87E-03	1.98E-01	±	3.31E-03	0.98	A
				1.91E-01	±	1.29E-02					
				1.86E-01	±	6.51E-03					
				2.05E-01	±	8.74E-03					
				Mean = 1.95E-01	±	4.89E-03					
			Fe-59	1.68E-01	±	1.13E-02	1.77E-01	±	2.96E-03	0.97	A
				1.83E-01	±	1.47E-02					
				1.64E-01	±	8.18E-03					
				1.71E-01	±	1.12E-02					
				Mean = 1.72E-01	±	5.79E-03					
			Zn-65	2.37E-01	±	1.93E-02	2.53E-01	±	4.23E-03	0.98	A
				2.52E-01	±	2.30E-02					
				2.33E-01	±	1.35E-02					
				2.73E-01	±	1.38E-02					
				Mean = 2.49E-01	±	8.92E-03					
			Co-60	4.40E-01	±	1.03E-02	4.50E-01	±	7.52E-03	0.95	A
				4.27E-01	±	1.32E-02					
				4.28E-01	±	6.96E-03					
				4.16E-01	±	7.77E-03					
				Mean = 4.28E-01	±	4.93E-03					

(1) Ratio = Reported/Analytics

* Sample provided by Eckert & Ziegler Analytics, Inc.

A=Acceptable

U=Unacceptable

TABLE D.4.2 - 1 (Continued)
INTERLABORATORY INTERCOMPARISON PROGRAM
Gamma Analysis of Vegetation

DATE	SAMPLE ID NO.	MEDIUM	ANALYSIS	JAF E-LAB RESULTS pCi/g ±1 sigma	REFERENCE LAB* pCi/g ±1 sigma	RATIO (1)
9/17/2009	E6832-09	VEG	Ce-141	6.92E-01 ± 1.50E-02 6.91E-01 ± 9.31E-03 7.15E-01 ± 1.55E-02 Mean = 6.99E-01 ± 7.83E-03	6.54E-01 ± 1.09E-02	1.07 A
			Cr-51	5.12E-01 ± 5.80E-02 5.44E-01 ± 3.83E-02 5.69E-01 ± 6.52E-02 Mean = 5.42E-01 ± 3.18E-02	5.26E-01 ± 8.78E-03	1.03 A
			Cs-134	3.72E-01 ± 1.25E-02 3.42E-01 ± 7.99E-03 3.59E-01 ± 1.24E-02 Mean = 3.58E-01 ± 6.45E-03	2.93E-01 ± 4.89E-03	1.22 A
			Cs-137	4.76E-01 ± 1.32E-02 4.57E-01 ± 8.28E-03 4.44E-01 ± 1.27E-02 Mean = 4.59E-01 ± 6.70E-03	4.40E-01 ± 7.35E-03	1.04 A
			Co-58	2.42E-01 ± 1.08E-02 2.50E-01 ± 6.69E-03 2.43E-01 ± 1.04E-02 Mean = 2.45E-01 ± 5.47E-03	2.37E-01 ± 3.96E-03	1.03 A
			Mn-54	5.32E-01 ± 1.44E-02 5.44E-01 ± 9.24E-03 5.47E-01 ± 1.41E-02 Mean = 5.41E-01 ± 7.39E-03	4.91E-01 ± 8.20E-03	1.10 A
			Fe-59	3.88E-01 ± 1.56E-02 3.97E-01 ± 1.01E-02 3.71E-01 ± 1.54E-02 Mean = 3.85E-01 ± 8.05E-03	3.50E-01 ± 5.85E-03	1.10 A
			Zn-65	5.74E-01 ± 2.50E-02 5.40E-01 ± 1.58E-02 5.28E-01 ± 2.40E-02 Mean = 5.47E-01 ± 1.27E-02	4.85E-01 ± 8.10E-03	1.13 A
			Co-60	4.01E-01 ± 1.01E-02 3.97E-01 ± 6.33E-03 3.99E-01 ± 9.63E-03 Mean = 3.99E-01 ± 3.83E-03	3.82E-01 ± 6.38E-03	1.04 A

(1) Ratio = Reported/Analytics

* Sample provided by Eckert & Ziegler Analytics, Inc.

A=Acceptable

U=Unacceptable

D.5 REFERENCES

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

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

GEL Laboratories LLC

a member of The GEL Group INC

PO Box 30712 Charleston, SC 29417
2040 Savage Road Charleston, SC 29407
P 843.556.8171 F 843.766.1178

www.gel.com

2009 INTERLABORATORY COMPARISON PROGRAM REPORT

In accordance with US Nuclear Regulatory Commission requirements, GEL Laboratories, LLC (GEL) participates in an Interlaboratory Comparison Programs (ICP) that satisfies the requirements of both Regulatory Guide 4.15, Revision 1, "Quality Assurance for Radiological Monitoring Programs (Normal Operations) - Effluent Streams and the Environment", February 1979 and Regulatory Guide 4.15, Revision 2, "Quality Assurance for Radiological Monitoring Programs (Inception through Normal Operations to License Termination) - Effluent Streams and the Environment", July, 2007. Both guides indicate the ICP is to be conducted with the Environmental Protection Agency (EPA) Environmental Radioactivity Laboratory Intercomparison Studies (Cross-check) Program or an equivalent program, and the ICP should include all sample medium/radionuclide combinations that are offered by the EPA and included in the REMP.

Intercomparison samples were obtained from Eckert & Zeigler Analytics of Atlanta, Environmental Resource Associates of Arvada, Colorado and the Mixed Analyte Performance Evaluation Program (MAPEP). Each provider has a documented Quality Assurance (QA) program and the capability to prepare Quality Control (QC) materials traceable to the National Institute of Standards and Technology. The ICP is a third party blind testing program which provides a means to ensure independent checks are performed on the accuracy and precision of the measurements of radioactive materials in environmental sample matrices. The providers supply the crosscheck samples to GEL. Upon receipt, the laboratory performs the analyses in a normal manner. The results are then reported to the provider for evaluation.

The samples offered by ICP providers and included in GEL's analyses are gamma isotopic analyses of an air filter, milk, water, soil and vegetation, Sr-89/90 in Milk and water and I-131 in cartridges. The accuracy of each result reported to Analytics, Inc is measured by the ratio of GEL's result to the known value. Accuracy for all other results is based on statistically derived acceptance ranges calculated by the providers. An investigation is undertaken whenever the ratio or reported result fell outside of the acceptance range.

A summary of GEL's results is provided in the tables below for the required sample matrix types and isotopic distribution. Delineated in the table are: the Sample Number or Study ID; Analysis quarter and year; sample media; specific radionuclide; its unit; its result; the known values supplied by the providers; GEL's ratio to the known value or acceptance criteria provided by the provider; evaluation criteria.

GEL analyzed 31 samples for 151 parameters in 2009. All results except one met the acceptance criteria and are discussed below.

- The root cause of the Sr-90 failures was determined to be a batch quality control issue. The carrier yield for the second separation was greater than 100%. The elevated yield caused the Sr-90 result to be biased low. Even though the yield fell within its acceptance range, if

problem solved

adjusted to reflect recoveries typically observed in this procedure, the sample results would be within the acceptance range.

Sample Number	Quarter / Year	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
E6582-278	1st / 2009	Cartridge	pCi	I-131	7.77E+01	7.94E+01	0.98	Acceptable
E6584-278	1st / 2009	Milk	pCi/L	Ce-141	9.78E+01	9.49E+01	1.03	Acceptable
E6584-278	1st / 2009	Milk	pCi/L	Co-58	1.23E+02	1.19E+02	1.03	Acceptable
E6584-278	1st / 2009	Milk	pCi/L	Co-60	1.50E+02	1.42E+02	1.05	Acceptable
E6584-278	1st / 2009	Milk	pCi/L	Cr-51	2.97E+02	3.05E+02	0.97	Acceptable
E6584-278	1st / 2009	Milk	pCi/L	Cs-134	9.06E+01	9.37E+01	0.97	Acceptable
E6584-278	1st / 2009	Milk	pCi/L	Cs-137	1.16E+02	1.11E+02	1.04	Acceptable
E6584-278	1st / 2009	Milk	pCi/L	Fe-59	1.16E+02	7.61E+00	1.16	Acceptable
E6584-278	1st / 2009	Milk	pCi/L	I-131	7.97E+01	7.93E+01	1.01	Acceptable
E6584-278	1st / 2009	Milk	pCi/L	Mn-54	1.33E+02	1.28E+02	1.04	Acceptable
E6584-278	1st / 2009	Milk	pCi/L	Zn-65	1.72E+02	1.56E+02	1.1	Acceptable
E6585-278	1st / 2009	Water	pCi/L	Ce-141	1.22E+02	1.20E+02	1.02	Acceptable
E6585-278	1st / 2009	Water	pCi/L	Co-58	1.59E+02	1.51E+02	1.05	Acceptable
E6585-278	1st / 2009	Water	pCi/L	Co-60	1.92E+02	1.80E+02	1.06	Acceptable
E6585-278	1st / 2009	Water	pCi/L	Cr-51	3.92E+02	3.87E+02	1.01	Acceptable
E6585-278	1st / 2009	Water	pCi/L	Cs-134	1.19E+02	1.19E+02	1.00	Acceptable
E6585-278	1st / 2009	Water	pCi/L	Cs-137	1.44E+02	1.41E+02	1.02	Acceptable
E6585-278	1st / 2009	Water	pCi/L	Fe-59	1.28E+02	1.27E+02	1.01	Acceptable
E6585-278	1st / 2009	Water	pCi/L	I-131	7.55E+01	6.90E+01	1.09	Acceptable
E6585-278	1st / 2009	Water	pCi/L	Mn-54	1.80E+02	1.62E+02	1.11	Acceptable
E6585-278	1st / 2009	Water	pCi/L	Zn-65	2.24E+02	1.97E+02	1.13	Acceptable
RAD - 76	1st / 2009	Water	pCi/L	Gross Alpha	51.3	52.3	27.3 - 65.5	Acceptable
RAD - 76	1st / 2009	Water	pCi/L	Gross Beta	41.9	46.1	31.0 - 53.3	Acceptable
RAD - 76	1st / 2009	Water	pCi/L	H-3	3760.0	4230	3610 - 4660	Acceptable
RAD - 76	1st / 2009	Water	pCi/L	I-131	25.1	22.2	18.4 - 26.5	Acceptable
RAD - 76	1st / 2009	Water	pCi/L	Sr-89	72.8	65	52.7 - 73.0	Acceptable
RAD - 76	1st / 2009	Water	pCi/L	Sr-90	36.5	41.9	30.8 - 48.1	Acceptable
E6729-278	2nd / 2009	Cartridge	pCi	I-131	9.27E+01	9.55E+01	0.97	Acceptable
E6730-278	2nd / 2009	Milk	pCi/L	Sr-89	8.51E+01	1.12E+02	0.76	Acceptable
E6730-278	2nd / 2009	Milk	pCi/L	Sr-90	1.09E+01	1.67E+01	0.65	Not Acceptable
E6731-278	2nd / 2009	Milk	pCi/L	Ce-141	2.84E+02	2.84E+02	1	Acceptable
E6731-278	2nd / 2009	Milk	pCi/L	Co-58	9.48E+01	9.19E+01	1.03	Acceptable
E6731-278	2nd / 2009	Milk	pCi/L	Co-60	3.15E+02	3.12E+02	1.01	Acceptable

E6731-278	2nd / 2009	Milk	pCi/L	Cr-51	4.04E+02	4.00E+02	1.01	Acceptable
E6731-278	2nd / 2009	Milk	pCi/L	Cs-134	1.58E+02	1.66E+02	0.95	Acceptable
E6731-278	2nd / 2009	Milk	pCi/L	Cs-137	1.92E+02	1.92E+02	1	Acceptable
E6731-278	2nd / 2009	Milk	pCi/L	Fe-59	1.23E+02	1.22E+02	1.01	Acceptable
E6731-278	2nd / 2009	Milk	pCi/L	I-131	8.98E+01	1.02E+02	0.88	Acceptable
E6731-278	2nd / 2009	Milk	pCi/L	Mn-54	1.42E+02	1.37E+02	1.04	Acceptable
E6731-278	2nd / 2009	Milk	pCi/L	Zn-65	1.79E+02	1.75E+02	1.02	Acceptable
E6732-278	2nd / 2009	Water	pCi/L	Ce-141	2.29E+02	2.16E+02	1.06	Acceptable
E6732-278	2nd / 2009	Water	pCi/L	Co-58	7.21E+01	6.98E+01	1.03	Acceptable
E6732-278	2nd / 2009	Water	pCi/L	Co-60	2.42E+02	2.37E+02	1.02	Acceptable
E6732-278	2nd / 2009	Water	pCi/L	Cr-51	3.11E+02	3.04E+02	1.02	Acceptable
E6732-278	2nd / 2009	Water	pCi/L	Cs-134	1.37E+02	1.26E+02	1.09	Acceptable
E6732-278	2nd / 2009	Water	pCi/L	Cs-137	1.51E+02	1.46E+02	1.04	Acceptable
E6732-278	2nd / 2009	Water	pCi/L	Fe-59	9.04E+01	9.29E+01	0.97	Acceptable
E6732-278	2nd / 2009	Water	pCi/L	I-131	8.52E+01	8.83E+01	0.97	Acceptable
E6732-278	2nd / 2009	Water	pCi/L	Mn-54	1.07E+02	1.04E+02	1.03	Acceptable
E6732-278	2nd / 2009	Water	pCi/L	Zn-65	1.38E+02	1.33E+02	1.04	Acceptable
MAPEP 09-GrF20	2nd / 2009	Filter	Bq	Gross Alpha	0.069	0.35	>0.0 - 0.696	Acceptable
MAPEP 09-GrF20	2nd / 2009	Filter	Bq	Gross Beta	0.297	0.28	0.140 - 0.419	Acceptable
MAPEP 09-GrW20	2nd / 2009	Water	Bq/L	Gross Alpha	0.506	0.64	>0.0 - 1.270	Acceptable
MAPEP 09-GrW20	2nd / 2009	Water	Bq/L	Gross Beta	1.337	1.27	0.64 - 1.91	Acceptable
MAPEP 09-MaS20	2nd / 2009	Soil	Bq/kg	Co-57	-0.30	0.00	----	Acceptable
MAPEP 09-MaS20	2nd / 2009	Soil	Bq/kg	Co-60	3.6	4.113		Acceptable
MAPEP 09-MaS20	2nd / 2009	Soil	Bq/kg	Cs-134	468	467	327 - 607	Acceptable
MAPEP 09-MaS20	2nd / 2009	Soil	Bq/kg	Cs-137	622	605	424 - 787	Acceptable
MAPEP 09-MaS20	2nd / 2009	Soil	Bq/kg	Fe-55	844.7	983	688 - 1278	Acceptable
MAPEP 09-MaS20	2nd / 2009	Soil	Bq/kg	K-40	608.7	570	399 - 741	Acceptable
MAPEP 09-MaS20	2nd / 2009	Soil	Bq/kg	Mn-54	322.3	307	215 - 399	Acceptable
MAPEP 09-MaS20	2nd / 2009	Soil	Bq/kg	Ni-63	550.3	514.9	360.4 - 669.4	Acceptable
MAPEP 09-MaS20	2nd / 2009	Soil	Bq/kg	Sr-90	262.33	257	180 - 334	Acceptable
MAPEP 09-MaS20	2nd / 2009	Soil	Bq/kg	Zn-65	261	242	169 -315	Acceptable
MAPEP 09-MaW20	2nd / 2009	Water	Bq/L	Co-57	18.8	18.9	13.2 - 24.6	Acceptable
MAPEP 09-MaW20	2nd / 2009	Water	Bq/L	Co-60	16.8	17.21	12.05 - 22.37	Acceptable
MAPEP 09-MaW20	2nd / 2009	Water	Bq/L	Cs-134	21.9	22.5	15.8 - 29.3	Acceptable
MAPEP 09-MaW20	2nd / 2009	Water	Bq/L	Cs-137	0.0	0	------	Acceptable
MAPEP 09-MaW20	2nd / 2009	Water	Bq/L	Mn-54	15.1	14.66	10.26 - 19.06	Acceptable
MAPEP 09-MaW20	2nd / 2009	Water	Bq/L	Ni-63	52.7	53.5	37.45 - 69.55	Acceptable
MAPEP 09-MaW20	2nd / 2009	Water	Bq/L	Sr-90	7.43	7.21	5.05 - 9.37	Acceptable
MAPEP 09-MaW20	2nd / 2009	Water	Bq/L	Zn-65	14.6	13.6	9.5 - 17.7	Acceptable
MAPEP 09-RdF20	2nd / 2009	Filter	Bq	Co-57	1.347	1.30	0.91 - 1.69	Acceptable

MAPEP 09-RdF20	2nd / 2009	Filter	Bq	Co-60	1.413	1.22	0.85 - 1.59	Acceptable
MAPEP 09-RdF20	2nd / 2009	Filter	Bq	Cs-134	2.763	2.93	2.05 - 3.81	Acceptable
MAPEP 09-RdF20	2nd / 2009	Filter	Bq	Cs-137	1.487	1.52	1.06 - 1.98	Acceptable
MAPEP 09-RdF20	2nd / 2009	Filter	Bq	Mn-54	2.403	2.27	1.5896 - 2.9522	Acceptable
MAPEP 09-RdF20	2nd / 2009	Filter	Bq	Sr-90	0.692	0.64	0.448 - 0.832	Acceptable
MAPEP 09-RdF20	2nd / 2009	Filter	Bq	Zn-65	1.613	1.36	0.95 - 1.77	Acceptable
MAPEP 09-RdV20	2nd / 2009	Vegetation	ug/sample	Co-57	2.557	2.36	1.65 - 3.07	Acceptable
MAPEP 09-RdV20	2nd / 2009	Vegetation	ug/sample	Co-60	-0.010	0.00	----	Acceptable
MAPEP 09-RdV20	2nd / 2009	Vegetation	ug/sample	Cs-134	3.430	3.40	2.38 - 4.42	Acceptable
MAPEP 09-RdV20	2nd / 2009	Vegetation	ug/sample	Cs-137	0.907	0.93	0.65 - 1.21	Acceptable
MAPEP 09-RdV20	2nd / 2009	Vegetation	ug/sample	Mn-54	2.353	2.30	1.61 - 2.99	Acceptable
MAPEP 09-RdV20	2nd / 2009	Vegetation	ug/sample	Sr-90	1.160	1.26	0.882 - 1.638	Acceptable
MAPEP 09-RdV20	2nd / 2009	Vegetation	ug/sample	Zn-65	1.350	1.35	0.948 1.760	Acceptable
E6843-278	3rd / 2009	Cartridge	pCi	I-131	9.54E+01	9.21E+01	1.04	Acceptable
E6844-278	3rd / 2009	Milk	pCi/L	Sr-89	1.19E+02	1.07E+02	1.12	Acceptable
E6844-278	3rd / 2009	Milk	pCi/L	Sr-90	1.68E+01	1.88E+01	0.89	Acceptable
E6845-278	3rd / 2009	Milk	pCi/L	Ce-141	2.83E+02	2.75E+02	1.03	Acceptable
E6845-278	3rd / 2009	Milk	pCi/L	Co-58	1.04E+02	9.94E+01	1.05	Acceptable
E6845-278	3rd / 2009	Milk	pCi/L	Co-60	1.58E+02	1.60E+02	0.99	Acceptable
E6845-278	3rd / 2009	Milk	pCi/L	Cr-51	2.43E+02	2.21E+02	1.1	Acceptable
E6845-278	3rd / 2009	Milk	pCi/L	Cs-134	1.23E+02	1.23E+02	1.00	Acceptable
E6845-278	3rd / 2009	Milk	pCi/L	Cs-137	1.92E+02	1.85E+02	1.04	Acceptable
E6845-278	3rd / 2009	Milk	pCi/L	Fe-59	1.64E+02	1.47E+02	1.11	Acceptable
E6845-278	3rd / 2009	Milk	pCi/L	I-131	1.01E+02	9.86E+01	1.02	Acceptable
E6845-278	3rd / 2009	Milk	pCi/L	Mn-54	2.11E+02	2.06E+02	1.02	Acceptable
E6845-278	3rd / 2009	Milk	pCi/L	Zn-65	2.24E+02	2.04E+02	1.1	Acceptable
E6846-278	3rd / 2009	Water	pCi/L	Ce-141	2.72E+02	2.64E+02	1.03	Acceptable
E6846-278	3rd / 2009	Water	pCi/L	Co-58	9.65E+01	9.54E+01	1.01	Acceptable
E6846-278	3rd / 2009	Water	pCi/L	Co-60	1.56E+02	1.54E+02	1.01	Acceptable
E6846-278	3rd / 2009	Water	pCi/L	Cr-51	2.21E+02	2.12E+02	1.04	Acceptable
E6846-278	3rd / 2009	Water	pCi/L	Cs-134	1.18E+02	1.18E+02	1.00	Acceptable
E6846-278	3rd / 2009	Water	pCi/L	Cs-137	1.86E+02	1.77E+02	1.05	Acceptable
E6846-278	3rd / 2009	Water	pCi/L	Fe-59	1.48E+02	1.41E+02	1.05	Acceptable
E6846-278	3rd / 2009	Water	pCi/L	I-131	1.02E+02	9.84E+01	1.04	Acceptable
E6846-278	3rd / 2009	Water	pCi/L	Mn-54	2.11E+02	1.98E+02	1.07	Acceptable
E6846-278	3rd / 2009	Water	pCi/L	Zn-65	2.19E+02	1.95E+02	1.12	Acceptable
RAD - 78	3rd / 2009	Water	pCi/L	Gross Alpha	43.8	55.3	28.9 - 69.0	Acceptable
RAD - 78	3rd / 2009	Water	pCi/L	Gross Beta	53.6	64.7	44.8 - 71.3	Acceptable
RAD - 78	3rd / 2009	Water	pCi/L	H-3	9440.0	10000	8690 - 11000	Acceptable

RAD - 78	3rd / 2009	Water	pCi/L	I-131	28.4	26.3	21.8 - 31.0	Acceptable
RAD - 78	3rd / 2009	Water	pCi/L	Sr-89	59.6	59.1	47.4 - 66.9	Acceptable
RAD - 78	3rd / 2009	Water	pCi/L	Sr-90	33.7	37.4	27.4 - 43.1	Acceptable
MAPEP 09-GrF21	4th / 2009	Filter	Bq	Gross Alpha	0.069	0.35	>0.0 - 0.696	Acceptable
MAPEP 09-GrF21	4th / 2009	Filter	Bq	Gross Beta	0.297	0.28	0.140 - 0.419	Acceptable
MAPEP 09-GrW21	4th / 2009	Water	Bq/L	Gross Alpha	0.982	1.05	>0.0 - 2.094	Acceptable
MAPEP 09-GrW21	4th / 2009	Water	Bq/L	Gross Beta	7.277	7.53	3.77 - 11.30	Acceptable
MAPEP 09-MaS21	4th / 2009	Soil	Bq/kg	Co-57	572.30	586.00	410 - 762	Acceptable
MAPEP 09-MaS21	4th / 2009	Soil	Bq/kg	Co-60	332.3	327.000	229 - 425	Acceptable
MAPEP 09-MaS21	4th / 2009	Soil	Bq/kg	Cs-134	0	0	-----	Acceptable
MAPEP 09-MaS21	4th / 2009	Soil	Bq/kg	Cs-137	683	669	468 - 870	Acceptable
MAPEP 09-MaS21	4th / 2009	Soil	Bq/kg	Fe-55	810.0	796	557 - 1035	Acceptable
MAPEP 09-MaS21	4th / 2009	Soil	Bq/kg	K-40	401.3	375	263 - 488	Acceptable
MAPEP 09-MaS21	4th / 2009	Soil	Bq/kg	Mn-54	834.7	796	557 - 1035	Acceptable
MAPEP 09-MaS21	4th / 2009	Soil	Bq/kg	Ni-63	640.0	680.0	476 - 884	Acceptable
MAPEP 09-MaS21	4th / 2009	Soil	Bq/kg	Sr-90	423.30	455	319 - 592	Acceptable
MAPEP 09-MaS21	4th / 2009	Soil	Bq/kg	Zn-65	1293	1178	825 - 1531	Acceptable
MAPEP 09-MaW21	4th / 2009	Water	Bq/L	Co-57	35.7	36.6	25.6 - 47.6	Acceptable
MAPEP 09-MaW21	4th / 2009	Water	Bq/L	Co-60	15.3	15.4	10.8 - 20.0	Acceptable
MAPEP 09-MaW21	4th / 2009	Water	Bq/L	Cs-134	31.6	32.2	22.5 - 41.9	Acceptable
MAPEP 09-MaW21	4th / 2009	Water	Bq/L	Cs-137	40.4	41.2	28.8 - 53.6	Acceptable
MAPEP 09-MaW21	4th / 2009	Water	Bq/L	Mn-54	0.07	0.00	-----	Acceptable
MAPEP 09-MaW21	4th / 2009	Water	Bq/L	Ni-63	45.8	44.2	30.9 - 57.5	Acceptable
MAPEP 09-MaW21	4th / 2009	Water	Bq/L	Sr-90	16.40	12.99	9.09 - 16.89	Acceptable
MAPEP 09-MaW21	4th / 2009	Water	Bq/L	Zn-65	28.9	26.9	18.8 - 35.0	Acceptable
MAPEP 09-RdF21	4th / 2009	Filter	Bq	Co-57	6.730	6.48	4.54 - 8.42	Acceptable
MAPEP 09-RdF21	4th / 2009	Filter	Bq	Co-60	1.127	1.03	0.72 - 1.34	Acceptable
MAPEP 09-RdF21	4th / 2009	Filter	Bq	Cs-134	0.034	0.00	-----	Acceptable
MAPEP 09-RdF21	4th / 2009	Filter	Bq	Cs-137	1.397	1.40	0.98 - 1.82	Acceptable
MAPEP 09-RdF21	4th / 2009	Filter	Bq	Mn-54	5.697	5.49	3.84 - 7.14	Acceptable
MAPEP 09-RdF21	4th / 2009	Filter	Bq	Sr-90	0.778	0.84	0.585 - 1.086	Acceptable
MAPEP 09-RdF21	4th / 2009	Filter	Bq	Zn-65	4.350	3.93	2.75 - 5.11	Acceptable
MAPEP 09-RdV21	4th / 2009	Vegetation	ug/sample	Co-57	8.333	8.00	5.6 - 10.4	Acceptable
MAPEP 09-RdV21	4th / 2009	Vegetation	ug/sample	Co-60	2.637	2.57	1.80 - 3.34	Acceptable
MAPEP 09-RdV21	4th / 2009	Vegetation	ug/sample	Cs-134	-0.014	0.00	-----	Acceptable
MAPEP 09-RdV21	4th / 2009	Vegetation	ug/sample	Cs-137	2.443	2.43	1.70 - 3.16	Acceptable
MAPEP 09-RdV21	4th / 2009	Vegetation	ug/sample	Mn-54	8.407	7.90	5.5 - 10.3	Acceptable
MAPEP 09-RdV21	4th / 2009	Vegetation	ug/sample	Sr-90	1.577	1.78	1.25 - 2.31	Acceptable
MAPEP 09-RdV21	4th / 2009	Vegetation	ug/sample	Zn-65	-0.029	0.00	-----	Acceptable

AREVA

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ENVIRONMENTAL LABORATORY

ANNUAL QUALITY ASSURANCE STATUS REPORT

FOR ENVIRONMENTAL ANALYSES

JANUARY – DECEMBER 2009

EL 034/10

Prepared By: _____ Date: 03/02/10

Approved By: _____ Date: 3/2/10

AREVA NP
Environmental Laboratory
29 Research Drive
Westborough, MA 01581-3913
Telephone: (508) 573-6650 Fax: (508) 573-6680

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I. INTRODUCTION

This report covers the Quality Assurance (QA) Program for the environmental monitoring aspects of the AREVA NP Environmental Laboratory (E-LAB) for 2009. The AREVA NP Environmental Laboratory QA Program is designed to monitor the quality of analytical processing associated with environmental, bioassay, effluent (10CFR Part 50), and waste (10CFR Part 61) sample analysis, as well as dosimetry processing. Due to the broad scope of quality control programs in which the E-LAB participates, this report covers only the following categories: Radiological Environmental Monitoring Program (REMP) analyses, additional environmental analyses that are outside the typical REMP scope, and direct radiation monitoring using environmental Thermoluminescent Dosimeters (TLDs). QA activities associated with waste analyses (10CFR 61), effluent analyses (10CFR 50), bioassay analyses, and personnel dosimetry are presented in separate reports.

This report includes:

- Intra-laboratory QC results analyzed during the reporting period.
- Inter-laboratory QC results, analyzed prior to the reporting period, for which "known values" were not previously available.
- Inter-laboratory QC results, analyzed during the reporting period, for which "known values" were available.

Any other inter-laboratory QC results for which performance results are not available will be included in the next annual report.

Manual 100, "Laboratory Quality Assurance Plan", Revision 13 (Reference 1), became effective on June 4, 2009, and Manual 120, "Dosimetry Services Quality System Manual", Revision 15 (Reference 2), became effective on October 16, 2009. The text of this report reflects the latest revisions of these manuals, as do the trending graphs and any data evaluations performed after the effective date.

A. Quality Control Programs for Environmental Sample Analyses

1. Inter-laboratory and Third Party

The E-LAB participates in the following inter-laboratory and third party quality control programs for environmental radioanalyses:

- Environmental Crosscheck Program administered by Eckert & Ziegler Analytics, Inc.,
- Environmental Resource Associates (ERA) Proficiency Test (PT) Program or equivalent State administered ELAP PT program,
- Department of Energy (DOE) Mixed Analyte Performance Evaluation Program (MAPEP)

The E-LAB purchases single-blind QC matrix spike samples from Eckert & Ziegler to verify the analysis of sample matrices processed at the E-LAB. The E-LAB'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.

The MAPEP program is administered by the Radiological and Environmental Sciences Laboratory (RESL) and consists of four media (water, soil, vegetation, and air filter) submitted twice each year. The MAPEP samples are designed to evaluate the ability and quality of analytical facilities performing sample measurements that contain hazardous and radioactive (mixed) analytes.

The ERA PT program and state administered ELAP PT programs consist of radionuclides in water submitted twice per year. These programs are used to maintain certification with the National Environmental Laboratory Accreditation Program (NELAP). The certification is necessary to perform analysis for projects that must meet EPA regulations for the Clean Water Act (CWA), Resource Conservation & Recovery Act (RCRA), or the Safe Drinking Water Act (SDWA).

2. Intra-laboratory

The internal QC Program is designed to include QC functions such as instrumentation checks (to insure proper instrument response), blank samples (to which no analyte radioactivity has been added), instrumentation backgrounds, duplicates, as well as overall staff qualification analyses and process controls. Both process control and qualification analyses samples seek to mimic the media type of those samples submitted for analysis by the various laboratory clients. These process controls (or process checks) are either actual samples submitted in duplicate in order to evaluate the precision of laboratory measurements, or blank samples which have been "spiked" with a known quantity of a radioisotope that is of interest to Laboratory clients. These QC samples, which represent either "single" or "double blind" unknowns, are intended to evaluate the entire radiochemical and radiometric process.

The E-LAB administers the QC program in accordance with an annual quality control and audit assessment schedule (Reference 3). The plan, which is approved on or before January 15th of each year and reviewed for adequacy at monthly LQARC meetings, describes the scheduled frequency and scope of quality assurance and control actions considered necessary for an adequate program. The magnitude of the process control program combines both internal and external sources targeted at 5% of the routine sample analysis load.

B. Quality Control Programs for Environmental Dosimetry

1. Inter-laboratory and Third Party

The E-LAB participates in the following inter-laboratory and third party quality control programs for Panasonic environmental dosimeters:

- Third-party testing conducted by Battelle Pacific Northwest Laboratories

- In-plant testing programs conducted by various users of E-LAB dosimetry.

Under the third party program, sets of six dosimeters are irradiated to ANSI specified testing criteria by Battelle Pacific Northwest Laboratories and are submitted for processing as "unknowns." The bias and precision of TLD processing is measured against this standard (Reference 4) and are used to indicate trends and changes in performance.

Standard test methods for in plant testing of Panasonic whole body and extremity dosimeters are described in the E-LAB report entitled "In Plant External Dosimetry Quality Assurance Testing Program" (Reference 5). This protocol provides standard test methods that may be used at plant sites utilizing E-LAB dosimeters. Clients have developed their own dosimetry test procedures modeled after Reference 5. Results of In-plant testing programs are not included in this report.

2. Intra-laboratory

The in house testing program conducted by the E-LAB QA Officer, involves in-house irradiations of sets of six Panasonic environmental dosimeters according to the schedule given in Reference 3. These dosimeters are submitted for processing as "unknowns." The bias and precision of TLD processing is measured against criteria given in Reference 2 and are used to indicate trends and changes in performance. Instrumentation checks, although routinely performed and representing between 5-10% of the TLDs processed, are not presented in this report.

C. Quality Assurance Program (Internal and External Assessments and Audits)

During each annual reporting period, at least one internal assessment is conducted in accordance with the pre-established schedule in Reference 3. In addition, the E-Lab may be audited by prospective customers during a pre-contract audit, and/or by existing clients who wish to conduct periodic audits in accordance with their contractual arrangements. A National Environmental Laboratory Accreditation Program (NELAP) audit is performed every two years as part of maintaining certification to perform EPA-related analyses.

An internal assessment of Dosimetry Services activities is conducted annually by the E-LAB QA Officer (Reference 3). The purpose of this assessment is to review analytical procedures, results, materials or components to identify opportunities to improve or enhance processes and/or services. In addition, a National Voluntary Laboratory Accreditation Program (NVLAP) audit is performed triennially of the dosimetry services area.

II. PERFORMANCE EVALUATION CRITERIA

A. Acceptance Criteria for Environmental Sample Analysis

The E-LAB has adopted a QC 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), the E-LAB will utilize the criteria for the specific program.
- For inter-laboratory or third party QC programs that have no preset acceptance criteria (e.g. the Analytics Environmental Cross-check Program), results will be evaluated in accordance with E-LAB internal acceptance criteria. Replicate analyses, performed in support of third party QC programs, will also be evaluated for precision in accordance with E-LAB internal acceptance criteria.

1. Internal Process Control Samples

Internal Process Control (PC) results are evaluated in accordance with two separate E-LAB acceptance criteria. A full discussion of the analytical services acceptance criteria can be found in Reference 1. 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 faithfully replicated by comparison of an individual result with the mean of all results for a given sample set. Quality control deviations falling outside the E-LAB acceptance criteria are discussed in the appendices.

(a) Bias

For each analytical measurement tested, the bias is the percent deviation of the reported result relative to the expected value (value of the spike known by comparison with or derivation from a standard reference material). The percent deviation relative to the known is calculated as follows:

$$\frac{(H_i' - H_i)}{H_i} 100$$

where:

H_i' = the value of the i^{th} measurement in a category being tested

H_i = the actual quantity in the test sample as defined by the spike

The Laboratory internal criterion for bias is that an analysis is considered in agreement if the value is within ±20% of the known value. If this condition is not met, the two-sigma range about the analyzed value is established. If the known value falls within the specified range, the analysis is considered in agreement.

Deviations from this general criterion, for specific radionuclides, are given in Table 1 and Reference 1.

E-LAB acceptance criteria are applied when the sample concentration is 10 or more times the method MDC. Otherwise, the "known value" and associated uncertainty are compared to the measured result and uncertainty using a two-tailed standard statistical test at the 95% confidence level.

(b) Precision

For a group of test measurements containing a given spiked level, the precision is the percent deviation of individual results relative to the mean reported measurement. At least two values are required for the determination of precision. The percent deviation relative to the mean reported measurement is calculated as follows:

$$\left(\frac{H_i' - \bar{H}}{\bar{H}}\right)100$$

where:

H_i' = the reported measurement for the ith analytical measurement

$\bar{H}$ = the mean analytical measurement

$$\bar{H} = \sum H_i'\left(\frac{1}{n}\right)$$

n = the number of samples in the test group

The E-LAB criterion for precision is that an analysis is considered in agreement if the individual value is within ±20% of the mean value. If this condition is not met, the two-sigma range about the analyzed value is established. If the mean value falls within the specified range, the analysis is considered in agreement.

Deviations from this general criterion, for specific radionuclides, are given in Tables 1.

(c) Mean Bias

For each group of analytical measurements tested, the mean bias is the percent deviation of the mean reported result relative to the expected value. The mean percent deviation relative to the expected value is calculated as follows:

$$\left(\left(\frac{\left(\bar{H}-H_i\right)}{H_i}\right)100\right)$$

where:

$\bar{H}$ = the mean analytical measurement

H_i = the actual quantity in the test sample as defined by the spike

2. Backgrounds

As discussed in Reference 1, backgrounds represent the ambient signal response, recorded by measuring instruments, which is independent of radioactivity contributed by the radionuclides being measured in the sample. Backgrounds will not normally contain any three-sigma statistically positive activity of the target parameters. The background signal is subtracted from the sample's signal.

3. Blanks

Wherever possible, equivalent media for preparing laboratory processing blanks will be used. Synthetic matrices may be used for bioassay if equivalency is proven.

4. NRC Resolution Criteria

Some Laboratory clients use the NRC Resolution Criteria to evaluate double blind Part 50 performance. NRC Resolution Criteria are based on an empirical relationship that combines prior experience and the accuracy needs of the program. As "Resolution" increases, the acceptability of one's measurement becomes more selective. Conversely, as "Resolution" decreases, agreement levels are widened to account for the increase in uncertainty.

5. DOE Evaluation Criteria

The Radiological & Environmental Sciences Laboratory (RESL) inter-comparison program, MAPEP, defines three levels of performance: Acceptable, Acceptable with Warning, and Not Acceptable. Performance is considered acceptable for a mean with a bias ≤20% of the reference value for the analyte. Performance is acceptable with warning for a mean result bias of >20% but ≤30% of the reference value. If the bias is greater than 30%, the results are deemed not acceptable. The MAPEP includes low activity "sensitivity tests" and individual radionuclide-free "false positive tests."

B. QC Investigation Criteria and Result Reporting for Environmental Sample Analysis

1. QC Investigation Criteria

Summarized below are the investigation criteria applied to QC analyses that failed E-LAB bias criteria. The Condition Report process tracks investigation results.

(a) No investigation is necessary when an individual QC result falls outside the QC performance criteria for bias or precision.

(b) Investigations shall be initiated when the mean of a QC process batch or the mean of three consecutive individual QC processes is outside the performance criterion for bias. Investigations shall also be initiated when more than one sample in a QC process batch or the mean of three consecutive individual QC processes is outside the performance criterion for precision.

2. Reporting of Analytical Results to Laboratory Customers

A similar set of guidelines was developed, applicable to reporting of results. The guidelines are as follows:

If an investigation is required for a process (normally after consecutive QC process check failures), and if the QC results requiring the investigation have a mean bias from the known of greater than ± (applicable E-LAB bias criterion +5%) for environmental processing then the Laboratory Quality Assurance Review Committee (LQARC) shall meet to determine the disposition of client results.

C. Acceptance Criteria for Environmental Dosimetry

1. Internal and Third Party Evaluations

(a) Bias

For each dosimeter tested, the measure of bias is the percent deviation of the reported result relative to the delivered exposure. The percent deviation relative to the delivered exposure is calculated as follows:

$$\frac{(H_i' - H_i)}{H_i} 100$$

where:

H_i' = the corresponding reported exposure for the i^{th} dosimeter (i.e., the reported exposure)

H_i = the exposure delivered to the i^{th} irradiated dosimeter (i.e., the delivered exposure)

(b) Mean Bias

For each group of test dosimeters, the mean bias is the average percent deviation of the reported result relative to the delivered exposure. The mean percent deviation relative to the delivered exposure is calculated as follows:

$$\sum \left(\frac{(H_i' - H_i)}{H_i} \right) 100 \left(\frac{1}{n} \right)$$

where:

H_i' = the corresponding reported exposure for the i^{th} dosimeter (i.e., the reported exposure)

H_i = the exposure delivered to the i^{th} irradiated test dosimeter (i.e., the delivered exposure)

n = the number of dosimeters in the test group

(c) Precision

For a group of test dosimeters irradiated to a given exposure, the measure of precision is the percent deviation of individual results relative to the mean reported exposure. At least two values are required for the determination of precision. The measure of precision for the i^{th} dosimeter is:

$$\left(\frac{(H_i' - \bar{H})}{\bar{H}}\right)100$$

where:

H_i' = the reported exposure for the i^{th} dosimeter (i.e., the reported exposure)

$\bar{H}$ = the mean reported exposure; i.e., $\bar{H} = \sum H_i'\left(\frac{1}{n}\right)$

n = the number of dosimeters in the test group

(d) E-LAB Internal Tolerance Limits

Tolerance limits for bias and precision applied to in-house and accredited third party testing were adopted on November 13, 1987. These criteria are only applied to individual test dosimeters irradiated with high-energy photons (Cs-137 or Co-60) and are as follows for Panasonic Environmental dosimeters: ± 20.1% for bias and ± 12.8% for precision.

D. QC Investigation Criteria and Result Reporting for Environmental Dosimetry

1. QC Investigation Criteria

E-LAB Manual 120 (Reference 2) specifies when an investigation is required due to a QC analysis that has failed the E-LAB bias criteria. The criteria are as follows:

(a) No investigation is necessary when an individual QC result falls outside the QC performance criteria for accuracy.

(b) Investigations are initiated when the mean of a QC processing batch is outside the performance criterion for bias.

2. Reporting of Environmental Dosimetry Results to Laboratory Customers

(a) All results are to be reported in a timely fashion.

(b) If the QA Officer determines that an investigation is required for a process, the results shall be issued as normal. If the QC results, prompting the investigation, have a mean bias from the known of greater than ±20% for environmental dosimetry, the results shall be issued with a note indicating that they may be updated in the future, pending resolution of a QA issue.

(c) Environmental dosimetry results do not require updating if the investigation has shown that the mean bias between the original results and the corrected results, based on applicable correction factors from the investigation, does not exceed ±20%.

E. Self-Assessment Program

In accordance with Reference 1, the E-LAB has established a Self-Assessment policy where all Laboratory staff members are strongly encouraged to continually evaluate laboratory activities for quality enhancements, cost savings, and time savings.

III. QUALITY CONTROL SYNOPSIS FOR ENVIRONMENTAL SAMPLE ANALYSES

A. General Discussion

Two-year trending graphs are provided in Appendix A of this report to allow evaluation of trends or biases. In the event that an analysis does not meet E-LAB performance criteria, a brief explanation is included on the graph. It should be noted that MAPEP and ERA/ELAP samples are evaluated against criteria specific to those programs. Therefore, only MAPEP sample results which fell in the "Warning" or "Non-Agreement" categories will be addressed in Appendix A. Beginning in 2009, ELAP samples are no longer included on the trending graphs due to the unique way in which the acceptance limits are calculated.

If any questions arise regarding previous analyses, please refer to the annual status report corresponding to the sample analysis date. In all cases, the QC database is available for each individual analysis to back-up the data presented on the graph.

B. Result Summary

During this annual reporting period, thirty-two nuclides associated with seven media types were analyzed by means of the E-LAB's internal process control, MAPEP, ERA/ELAP and by Eckert & Ziegler Analytics QC programs. Media types representative of client company analyses performed during this reporting period were selected.

Presented below is a synopsis of the media types evaluated.

Air Filter	Charcoal (Air Iodine)	Water
Milk	Sediment/soil	Vegetation
Fish		

1. Analytics Environmental Cross Check Program

During this period the Eckert & Ziegler Analytics cross check program provided 426 individual environmental analyses for bias and 426 for precision evaluation (Table 1). Of the 426 analyses evaluated for bias, 98.6% (420/426) of all results fell within E-LAB acceptance criteria. Of the 426 analyses evaluated for precision, 99.8% (425/426) fell within E-LAB tolerance limits. Appendix A graphically summarizes the results by two-year trending graphs.

Table 2 provides a report of the E-LAB's participation in the Eckert & Ziegler Analytics' cross check program for the fourth quarter of 2008 and the first three quarters of 2009. Using the E-LAB's internal acceptance

criteria as the basis of evaluation, 141 out of 142 mean results were within agreement criteria. The single failure pertained to the gross alpha analysis of the 1st quarter 2009 water sample and was addressed by Condition Report (CR) 09-21.

2. Summary of Participation in the MAPEP Monitoring Program.

During this reporting period, two sets of MAPEP samples were processed and reported (Table 3). Using the DOE acceptance criteria as the basis of evaluation, 65 out of 74 mean results came within agreement criteria. For MAPEP 20, six results fell into the "warning" category as follows: Pu-238 and Pu-239/40 on the filter, Cs-137, Mn-54, and K-40 in soil, and Am-241 in water. CR 09-12 and CR-09-13 were issued to investigate the plutonium and americium low biases, respectively. CR-09-14 was issued to investigate the high biases in soil, including Zn-65, which was "not acceptable". Two results for MAPEP 21 fell into the "warning" category, as follows: Pu-239/40 in water and Am-241 in water. CR 09-12 and CR-09-13 remain open to investigate the plutonium and americium low biases, respectively.

3. ERA PT Program and New York ELAP PT Program

During this reporting period, a total of 18 individual results were evaluated by the New York State Department of Health ELAP program. Using the evaluation criteria set by NELAP, 100% (18/18) of the radionuclides were "Satisfactory". Table 4 provides a report of the Laboratory's participation in this PT program.

The AREVA NP Environmental Laboratory (Lab ID# 11823) maintained NELAP accreditation from the New York State Department of Health through the Environmental Laboratory Approval Program for the following methods for both potable and non-potable waters:

- Gross Alpha, Method EPA 900.0
- Gross Beta, Method EPA 900.0
- Iodine-131, Method ASTM D4785-00a
- Photon Emitters, Method EPA 901.1
- Radioactive Cesium, Method EPA 901.1
- Tritium, Method EPA 906.0

4. Process Control Program for REMP Analyses

The E-Lab internal (intra-laboratory) process control program evaluated 478 individual analyses for bias and 133 analyses for precision for standard REMP media and nuclides. The results are summarized in Table 5.

Of the 478 internal process control analyses evaluated for bias, 99.8% met Laboratory acceptance criteria. Also, 95.5% of the 133 results for precision were found to be acceptable.

Table 6 presents the internal process control data combined with Eckert & Ziegler Analytics cross-check data (evaluated for bias and precision) and individual MAPEP analyses (evaluated for precision only) for standard REMP media and nuclides. For this data set, 99.2% of the 904 analyses evaluated for bias and 99.0% of the 705 analyses evaluated for precision met Laboratory acceptance criteria.

To support the efforts required for the EPRI Groundwater Monitoring Program at client sites, the E-LAB performs low-level QC testing specifically for H-3 in water. The E-LAB prepares these spikes internally using a low activity H-3 spike obtained from Eckert & Ziegler Analytics. Activities ranged from approximately 1,700 – 9,000 pCi/L. A chart of low activity H-3 spike performance is provided in Appendix A. All 2009 analyses were within the acceptance criteria.

5. Process Control Program for Environmental Analysis of Additional Radionuclides

To support the efforts of various monitoring programs at client sites, the E-LAB performs low-level analyses of additional nuclides that are not normally included in a standard REMP. The QC analysis results for these nuclides are presented in Table 7 by analysis type. Eighteen of 19 analyses (94.7%) evaluated for accuracy met E-Lab acceptance criteria. One hundred percent of the 60 analyses evaluated for precision met the E-LAB acceptance criteria.

6. Analytical Blanks

During this reporting period, statistically positive activity, (activity greater than three (3) times the standard deviation) was not reported for any of the 149 environmental analytical blanks analyzed.

7. Overall Data Summary for the Reporting Period January-December 2009

The intra- and inter-laboratory QC data for all environmental process control nuclide analyses, evaluated to internal E-LAB performance criteria, are summarized in Table 8, presented by analysis type. Excluded from this table are evaluations of MAPEP and ELAP samples for accuracy, as these samples are evaluated to program specific acceptance criteria. Nine hundred fifteen of 923 individual results evaluated to internal E-LAB performance criteria (99.1%) fell within the E-LAB bias acceptance criteria, while 99.1% of the 765 analyses passed the acceptance criteria for precision.

8. Summary of Environmental Quality Control Results by Year

The historical summary of the E-LAB process control program performance for the environmental monitoring function is provided in Table 9. For 2009, 99.1% of the analyses fell within the E-LAB acceptance criteria for bias as compared to a historical percentage of 97.0. Similarly, 99.1% of the analyses evaluated for precision met the E-LAB acceptance criteria as compared to 99.4% of analyses for the 33-year operating history.

Trending graphs associated with the performance results for this program are given in Appendix A.

IV. QUALITY CONTROL SYNOPSIS FOR ENVIRONMENTAL DOSIMETERY

A. General Discussion

Summaries of the performance tests for the reporting period are given in Tables 10 through 12 and Appendix B. Results are presented only for performance tests conducted under well-characterized conditions. Results are reported for the twelve-month period January-December 2009.

Table 10 provides a summary of individual dosimeter results evaluated against the E-LAB internal acceptance criteria for high-energy photons only. During this period, 100% (84/84) of the individual dosimeters, evaluated against these criteria met the tolerance limits for accuracy and 100% (84/84) met the criterion for precision.

Table 11 presents the third-party testing results for dosimeters processed during this annual period. The mean percent bias and standard deviation for each group of six dosimeters are shown.

Table 12 provides the performance results for each group (N=6) of dosimeters evaluated against the internal tolerance criteria (third party and in-house irradiations). Overall, 100% (14/14) of the dosimeter sets evaluated against the internal tolerance performance criteria met these criteria.

B. Result Trending

One of the main benefits of performing quality control tests on a routine basis is to identify trends or performance changes. The results of the Panasonic environmental dosimeter performance tests are presented in Appendix B for a two year period. The results are evaluated against each of the performance criteria listed in Section II, namely: individual dosimeter bias, individual dosimeter precision, and mean bias.

All of the results presented in Appendix B are fade corrected to the irradiation date and plotted sequentially by processing date. This allows assessment of performance without the confounding effect of the variation in number of days between irradiation and readout. Therefore, the results include any bias produced by the fade algorithm.

If fade is not corrected to the date of irradiation, the possibility of a bias due to signal fading exists. When Dosimetry Services processes a TLD, the software calculates a fade correction using one half the number of days between the processing date and the anneal date. The use of the midpoint for fade correction can bias the results of performance tests of TLDs irradiated at either the beginning or end of a wear period. Results for performance tests conducted near the beginning of the period will be biased low and those irradiated near the end of a period will be biased high, assuming there are no other system biases.

For individual Panasonic environmental TLDs processed in 2009, 100% of the 84 tests came within the E-LAB bias and precision tolerance limits. All 14

Panasonic environmental TLD test sets (mean bias, n=6) were reported within the internal tolerance criteria for bias.

V. STATUS OF CONDITION REPORTS (CR)

Table 13 provides a synopsis of CR activity for environmental processing during 2009. Twenty-two condition reports were closed and nineteen were opened during this reporting period. As of December 31, 2009, a total of eight CRs remain open, two of which are older than 6 months.

VI. STATUS OF AUDITS/ASSESSMENTS

A. Internal

Corporate QA Audit No. 09-11, was conducted from July 6, 2009 through July 10, 2009. The audit was conducted to verify compliance with E-LAB QA Manual 100 and Dosimetry QA Manual 120. There were no findings or recommendations pertaining to the E-LAB.

One additional internal QA assessment was conducted for processes involved in the environmental monitoring area during 2009. Internal Assessment 09-02 evaluated areas of the E-Lab Quality Assurance Program applicable to NELAC accredited techniques. Condition reports were issued to document the findings from this assessment, and recommendations were entered into the E-Lab task tracking system.

B. External

A National Voluntary Laboratory Accreditation Program (NVLAP) audit was conducted from May 6, 2009 to May 8, 2009 in the Dosimetry Services area. No nonconformities were reported. Recommendations were entered into the E-Lab task tracking system.

The Exelon Nuclear audit, No. SR-2009-23, was conducted from August 10, 2009 through August 14, 2009. There were three findings issued. The E-LAB responded to these items and the findings were closed on October 1, 2009.

VII. UPDATED PROCEDURES ISSUED DURING JANUARY-DECEMBER 2009

A list of procedures, pertaining to environmental monitoring, which were updated during 2009 is included in Table 14.

VIII. REFERENCES

1. AREVA NP Environmental Laboratory Manual 100 "Laboratory Quality Assurance Plan", Revision 13, June 4, 2009.
2. E-LAB Manual No.120, "Dosimetry Services Quality System Manual", Rev. 15, October 16, 2009.
3. AREVA NP Environmental Laboratory 2009 Quality Control and Audit Assessment Schedule.
4. American National Standard for Performance Testing of Extremity Dosimeters, ANSI N13.32-1995 (Draft), Health Physics Society, 1313 Dolley Madison Blvd., Suite 402, McLean, VA 22101.
5. "In-Plant External Dosimetry Quality Assurance Testing Program," E-LAB, Revision 2, December 1986.

TABLE 1

AREVA NP ENVIRONMENTAL LABORATORY
ECKERT & ZIEGLER ANALYTICS ENVIRONMENTAL
CROSSCHECK PROGRAM RESULTS BY
ACCEPTANCE CRITERIA, MEDIA AND ANALYSIS CATEGORIES
JANUARY – DECEMBER 2009

	Bias Criteria (1)		Precision Criteria (1)	
	WITHIN CRITERIA	OUTSIDE CRITERIA	WITHIN CRITERIA	OUTSIDE CRITERIA
I. Air Particulate				
Gross Alpha	11	1	12	0
Gross Beta	12	0	12	0
Gamma	54	0	54	0
II. Air Charcoal				
Gamma	12	0	12	0
III. Milk				
Gamma	120	0	120	0
Iodine (LL)	12	0	12	0
Sr-89	6	0	6	0
Sr-90	6	0	6	0
IV. Water				
Gross Alpha	9	3	12	0
Gross Beta	12	0	12	0
Gamma	118	2	119	1
Iodine (LL)	12	0	12	0
Sr-89	12	0	12	0
Sr-90	12	0	12	0
Tritium	12	0	12	0
Total Number In Range:	**420**	**6**	**425**	**1**
Percentage of Total Processed	**98.6**	**1.4**	**99.8**	**0.2**
Sum of Analyses:	**426**		**426**	

(1) Bias and Precision as noted in Table 1.

TABLE 1

AREVA NP ENVIRONMENTAL LABORATORY
ECKERT & ZIEGLER ANALYTICS ENVIRONMENTAL
CROSSCHECK PROGRAM RESULTS BY
ACCEPTANCE CRITERIA, MEDIA AND ANALYSIS CATEGORIES
JANUARY – DECEMBER 2009
(Continued)

A. Percent Bias Acceptance Criteria

≤20 (or within 2 sigma of known, see Reference 1)

For Gross Alpha and Beta	≤25 (or within 2 sigma of known)
For Sr-89/90	≤25 (or within 2 sigma of known)

B. Percent Precision Acceptance Criteria

≤20 (or within 2 sigma of mean, see Reference 1). Exceptions as above.

TABLE 2

AREVA NP ENVIRONMENTAL LABORATORY
ECKERT & ZIEGLER ANALYTICS ENVIRONMENTAL CROSS CHECK PROGRAM
PERFORMANCE EVALUATION

SAMPLE NUMBER	QUARTER/ YEAR	SAMPLE MEDIA	NUCLIDE	UNITS	REPORTED VALUE	KNOWN VALUE	RATIO E-LAB/ ANALYTICS	PERFORMANCE EVALUATION
E6346-162	4th/2008	Water	Gross Alpha	pCi/L	104	114	0.91	Agreement
E6346-162	4th/2008	Water	Gross Beta	pCi/L	208	204	1.02	Agreement
E6347-162	4th/2008	Water	I-131LL	pCi/L	57.5	64.1	0.90	Agreement
E6347-162	4th/2008	Water	I-131	pCi/L	54.3	64.1	0.85	Agreement
E6347-162	4th/2008	Water	Ce-141	pCi/L	209	224	0.93	Agreement
E6347-162	4th/2008	Water	Cr-51	pCi/L	299	288	1.04	Agreement
E6347-162	4th/2008	Water	Cs-134	pCi/L	141	157	0.90	Agreement
E6347-162	4th/2008	Water	Cs-137	pCi/L	134	140	0.96	Agreement
E6347-162	4th/2008	Water	Co-58	pCi/L	115	122	0.94	Agreement
E6347-162	4th/2008	Water	Mn-54	pCi/L	172	178	0.97	Agreement
E6347-162	4th/2008	Water	Fe-59	pCi/L	122	117	1.04	Agreement
E6347-162	4th/2008	Water	Zn-65	pCi/L	203	214	0.95	Agreement
E6347-162	4th/2008	Water	Co-60	pCi/L	154	156	0.99	Agreement
E6348-162	4th/2008	Water	Sr-89	pCi/L	78.8	97.7	0.81	Agreement
E6348-162	4th/2008	Water	Sr-90	pCi/L	14.1	13.4	1.05	Agreement
E6349-162	4th/2008	Water	H-3	pCi/L	10300	10200	1.01	Agreement
E6350-162	4th/2008	Charcoal	I-131	pCi	53.1	53.6	0.99	Agreement
E6351-162	4th/2008	Filter	Gross Alpha	pCi	72.3	63.2	1.14	Agreement
E6351-162	4th/2008	Filter	Gross Beta	pCi	127	113	1.12	Agreement
E6352-162	4th/2008	Filter	Ce-141	pCi	112	119	0.94	Agreement
E6352-162	4th/2008	Filter	Cr-51	pCi	152	153	0.99	Agreement
E6352-162	4th/2008	Filter	Cs-134	pCi	77.8	83.6	0.93	Agreement
E6352-162	4th/2008	Filter	Cs-137	pCi	76.8	74.6	1.03	Agreement
E6352-162	4th/2008	Filter	Co-58	pCi	63.1	64.9	0.97	Agreement
E6352-162	4th/2008	Filter	Mn-54	pCi	91.8	94.6	0.97	Agreement
E6352-162	4th/2008	Filter	Fe-59	pCi	60.4	62.5	0.97	Agreement
E6352-162	4th/2008	Filter	Zn-65	pCi	110	114	0.96	Agreement
E6353-162	4th/2008	Milk	I-131LL	pCi/L	72.4	79.9	0.91	Agreement
E6353-162	4th/2008	Milk	I-131	pCi/L	74.3	79.9	0.93	Agreement
E6353-162	4th/2008	Milk	Ce-141	pCi/L	184	191	0.96	Agreement
E6353-162	4th/2008	Milk	Cr-51	pCi/L	235	246	0.96	Agreement
E6353-162	4th/2008	Milk	Cs-134	pCi/L	125	134	0.93	Agreement
E6353-162	4th/2008	Milk	Cs-137	pCi/L	119	120	1.00	Agreement
E6353-162	4th/2008	Milk	Co-58	pCi/L	105	104	1.01	Agreement
E6353-162	4th/2008	Milk	Mn-54	pCi/L	152	152	1.00	Agreement
E6353-162	4th/2008	Milk	Fe-59	pCi/L	107	100	1.06	Agreement
E6353-162	4th/2008	Milk	Zn-65	pCi/L	177	183	0.97	Agreement
E6353-162	4th/2008	Milk	Co-60	pCi/L	135	133	1.01	Agreement

TABLE 2

AREVA NP ENVIRONMENTAL LABORATORY
ECKERT & ZIEGLER ANALYTICS ENVIRONMENTAL CROSS CHECK PROGRAM
PERFORMANCE EVALUATION
(Continued)

SAMPLE NUMBER	QUARTER/ YEAR[3]	SAMPLE MEDIA	NUCLIDE	UNITS	REPORTED VALUE	KNOWN VALUE	RATIO E-LAB/ ANALYTICS	PERFORMANCE EVALUATION
E6558-162	1st/2009	Water	Gross Alpha	pCi/L	120	162	0.75	Non-Agreement[1]
E6558-162	1st/2009	Water	Gross Beta	pCi/L	189	203	0.93	Agreement
E6559-162	1st/2009	Water	I-131LL	pCi/L	63.2	69.0	0.92	Agreement
E6559-162	1st/2009	Water	I-131	pCi/L	58.8	69.0	0.85	Agreement
E6559-162	1st/2009	Water	Ce-141	pCi/L	114	120	0.95	Agreement
E6559-162	1st/2009	Water	Cr-51	pCi/L	365	387	0.94	Agreement
E6559-162	1st/2009	Water	Cs-134	pCi/L	107	119	0.90	Agreement
E6559-162	1st/2009	Water	Cs-137	pCi/L	136	141	0.96	Agreement
E6559-162	1st/2009	Water	Co-58	pCi/L	145	151	0.96	Agreement
E6559-162	1st/2009	Water	Mn-54	pCi/L	165	162	1.02	Agreement
E6559-162	1st/2009	Water	Fe-59	pCi/L	128	127	1.01	Agreement
E6559-162	1st/2009	Water	Zn-65	pCi/L	192	197	0.97	Agreement
E6559-162	1st/2009	Water	Co-60	pCi/L	184	180	1.02	Agreement
E6560-162	1st/2009	Water	Sr-89	pCi/L	80.5	94.5	0.85	Agreement
E6560-162	1st/2009	Water	Sr-90	pCi/L	14.9	15.1	0.99	Agreement
E6561-162	1st/2009	Water	H-3	pCi/L	4090	4480	0.91	Agreement
E6562-162	1st/2009	Charcoal	I-131	pCi	70.5	79.4	0.89	Agreement
E6563-162	1st/2009	Filter	Gross Alpha	pCi	140	122	1.15	Agreement [2]
E6563-162	1st/2009	Filter	Gross Beta	pCi	168	153	1.10	Agreement
E6564-162	1st/2009	Milk	I-131LL	pCi/L	72.9	79.3	0.92	Agreement
E6564-162	1st/2009	Milk	I-131	pCi/L	69.1	79.3	0.87	Agreement
E6564-162	1st/2009	Milk	Ce-141	pCi/L	91.7	94.9	0.97	Agreement
E6564-162	1st/2009	Milk	Cr-51	pCi/L	300	305	0.98	Agreement
E6564-162	1st/2009	Milk	Cs-134	pCi/L	85	93.7	0.91	Agreement
E6564-162	1st/2009	Milk	Cs-137	pCi/L	115	111	1.04	Agreement
E6564-162	1st/2009	Milk	Co-58	pCi/L	121	119	1.01	Agreement
E6564-162	1st/2009	Milk	Mn-54	pCi/L	135	128	1.05	Agreement
E6564-162	1st/2009	Milk	Fe-59	pCi/L	109	99.9	1.09	Agreement
E6564-162	1st/2009	Milk	Zn-65	pCi/L	155	156	0.99	Agreement
E6564-162	1st/2009	Milk	Co-60	pCi/L	146	142	1.03	Agreement
E6565-162	1st/2009	Milk	Sr-89	pCi/L	80.1	97.7	0.82	Agreement
E6565-162	1st/2009	Milk	Sr-90	pCi/L	14.5	15.6	0.93	Agreement

[1] The percent difference of the mean value from the known value exceeded the Manual 100 criterion for accuracy. CR 09-21 was issued to investigate the failure.

[2] Eckert & Ziegler Analytics changed the filter preparation method by reducing the thickness of the filter coating from 0.85 mg/cm^2 to 0.5 mg/cm^2. An instrument recalibration, performed with a .5 mg/cm^2 coated filter, yielded an increase in alpha efficiency of 16%. Application of the new efficiency to the measured result yields a percent difference from the Analytics known value of -1.1%.

[3]These results were erroneously decay corrected to 03/20/09 rather than the true reference date of 03/19/09. This table reflects the results as reported to Analytics, prior to correction. All corrected results, other than gross alpha in water, met the agreement criteria. CR 09-29 was issued to address the reference date error.

TABLE 2

AREVA NP ENVIRONMENTAL LABORATORY
ECKERT & ZIEGLER ANALYTICS ENVIRONMENTAL CROSS CHECK PROGRAM
PERFORMANCE EVALUATION
(Continued)

SAMPLE NUMBER	QUARTER/ YEAR	SAMPLE MEDIA	NUCLIDE	UNITS	REPORTED VALUE	KNOWN VALUE	RATIO E-LAB/ ANALYTICS	PERFORMANCE EVALUATION
E6711-162	2nd/2009	Water	Gross Alpha	pCi/L	272	281	0.97	Agreement
E6711-162	2nd/2009	Water	Gross Beta	pCi/L	157	141	1.11	Agreement
E6712-162	2nd/2009	Water	I-131LL	pCi/L	83.5	88.3	0.95	Agreement
E6712-162	2nd/2009	Water	I-131	pCi/L	87.4	88.3	0.99	Agreement
E6712-162	2nd/2009	Water	Ce-141	pCi/L	206	216	0.96	Agreement
E6712-162	2nd/2009	Water	Cr-51	pCi/L	290	304	0.95	Agreement
E6712-162	2nd/2009	Water	Cs-134	pCi/L	111	126	0.88	Agreement
E6712-162	2nd/2009	Water	Cs-137	pCi/L	148	146	1.02	Agreement
E6712-162	2nd/2009	Water	Co-58	pCi/L	70.3	69.8	1.01	Agreement
E6712-162	2nd/2009	Water	Mn-54	pCi/L	107	104	1.03	Agreement
E6712-162	2nd/2009	Water	Fe-59	pCi/L	97.7	92.9	1.05	Agreement
E6712-162	2nd/2009	Water	Zn-65	pCi/L	142	133	1.07	Agreement
E6712-162	2nd/2009	Water	Co-60	pCi/L	231	237	0.97	Agreement
E6713-162	2nd/2009	Water	Sr-89	pCi/L	77.8	91.1	0.85	Agreement
E6713-162	2nd/2009	Water	Sr-90	pCi/L	13.1	13.6	0.96	Agreement
E6714-162	2nd/2009	Water	H-3	pCi/L	12300	13300	0.92	Agreement
E6715-162	2nd/2009	Charcoal	I-131	pCi	92.5	95.1	0.97	Agreement
E6716-162	2nd/2009	Filter	Gross Alpha	pCi	102	118	0.86	Agreement
E6716-162	2nd/2009	Filter	Gross Beta	pCi	60.3	59.3	1.02	Agreement
E6717-162	2nd/2009	Filter	Ce-141	pCi	79.7	85.6	0.93	Agreement
E6717-162	2nd/2009	Filter	Cr-51	pCi	116	121	0.96	Agreement
E6717-162	2nd/2009	Filter	Cs-134	pCi	46.9	49.9	0.94	Agreement
E6717-162	2nd/2009	Filter	Cs-137	pCi	59.8	57.9	1.03	Agreement
E6717-162	2nd/2009	Filter	Co-58	pCi	27.4	27.7	0.99	Agreement
E6717-162	2nd/2009	Filter	Mn-54	pCi	41.0	41.3	0.99	Agreement
E6717-162	2nd/2009	Filter	Fe-59	pCi	34.8	36.9	0.94	Agreement
E6717-162	2nd/2009	Filter	Zn-65	pCi	52.4	52.9	0.99	Agreement
E6717-162	2nd/2009	Filter	Co-60	pCi	88.3	94.0	0.94	Agreement
E6718-162	2nd/2009	Milk	I-131LL	pCi/L	94.7	102	0.93	Agreement
E6718-162	2nd/2009	Milk	I-131	pCi/L	97.7	102	0.96	Agreement
E6718-162	2nd/2009	Milk	Ce-141	pCi/L	275	284	0.97	Agreement
E6718-162	2nd/2009	Milk	Cr-51	pCi/L	395	400	0.99	Agreement
E6718-162	2nd/2009	Milk	Cs-134	pCi/L	146	166	0.88	Agreement
E6718-162	2nd/2009	Milk	Cs-137	pCi/L	187	192	0.97	Agreement
E6718-162	2nd/2009	Milk	Co-58	pCi/L	90.0	91.9	0.98	Agreement
E6718-162	2nd/2009	Milk	Mn-54	pCi/L	138	137	1.01	Agreement
E6718-162	2nd/2009	Milk	Fe-59	pCi/L	130	122	1.06	Agreement
E6718-162	2nd/2009	Milk	Zn-65	pCi/L	185	175	1.05	Agreement
E6718-162	2nd/2009	Milk	Co-60	pCi/L	316	312	1.01	Agreement

TABLE 2

AREVA NP ENVIRONMENTAL LABORATORY
ECKERT & ZIEGLER ANALYTICS ENVIRONMENTAL CROSS CHECK PROGRAM
PERFORMANCE EVALUATION
(Continued)

SAMPLE NUMBER	QUARTER/ YEAR	SAMPLE MEDIA	NUCLIDE	UNITS	REPORTED VALUE	KNOWN VALUE	RATIO E-LAB/ ANALYTICS	PERFORMANCE EVALUATION
E6823-162	3rd/2009	Water	Gross Alpha	pCi/L	275	324	0.85	Agreement
E6823-162	3rd/2009	Water	Gross Beta	pCi/L	281	287	0.98	Agreement
E6824-162	3rd/2009	Water	I-131LL	pCi/L	100.9	98.4	1.02	Agreement
E6824-162	3rd/2009	Water	I-131	pCi/L	87.7	98.4	0.89	Agreement
E6824-162	3rd/2009	Water	Ce-141	pCi/L	258	264	0.98	Agreement
E6824-162	3rd/2009	Water	Cr-51	pCi/L	199	212	0.94	Agreement
E6824-162	3rd/2009	Water	Cs-134	pCi/L	108	118	0.92	Agreement
E6824-162	3rd/2009	Water	Cs-137	pCi/L	175	177	0.99	Agreement
E6824-162	3rd/2009	Water	Co-58	pCi/L	94.8	95.4	0.99	Agreement
E6824-162	3rd/2009	Water	Mn-54	pCi/L	200	198	1.01	Agreement
E6824-162	3rd/2009	Water	Fe-59	pCi/L	146	141	1.04	Agreement
E6824-162	3rd/2009	Water	Zn-65	pCi/L	198	195	1.01	Agreement
E6824-162	3rd/2009	Water	Co-60	pCi/L	149	154	0.97	Agreement
E6825-162	3rd/2009	Water	Sr-89	pCi/L	88.9	105	0.85	Agreement
E6825-162	3rd/2009	Water	Sr-90	pCi/L	18.1	18.5	0.98	Agreement
E6826-162	3rd/2009	Water	H-3	pCi/L	13500	14100	0.96	Agreement
E6827-162	3rd/2009	Charcoal	I-131	pCi	89.5	92.0	0.97	Agreement
E6828-162	3rd/2009	Filter	Gross Alpha	pCi	251	265	0.95	Agreement
E6828-162	3rd/2009	Filter	Gross Beta	pCi	239	235	1.02	Agreement
E6829-162	3rd/2009	Milk	I-131LL	pCi/L	97.2	98.6	0.99	Agreement
E6829-162	3rd/2009	Milk	I-131	pCi/L	104	98.6	1.06	Agreement
E6829-162	3rd/2009	Milk	Ce-141	pCi/L	270	275	0.98	Agreement
E6829-162	3rd/2009	Milk	Cr-51	pCi/L	217	221	0.98	Agreement
E6829-162	3rd/2009	Milk	Cs-134	pCi/L	111	123	0.90	Agreement
E6829-162	3rd/2009	Milk	Cs-137	pCi/L	188	185	1.02	Agreement
E6829-162	3rd/2009	Milk	Co-58	pCi/L	99.2	99.4	1.00	Agreement
E6829-162	3rd/2009	Milk	Mn-54	pCi/L	210	206	1.02	Agreement
E6829-162	3rd/2009	Milk	Fe-59	pCi/L	159	147	1.08	Agreement
E6829-162	3rd/2009	Milk	Zn-65	pCi/L	209	204	1.02	Agreement
E6829-162	3rd/2009	Milk	Co-60	pCi/L	160	160	1.00	Agreement
E6830-162	3rd/2009	Milk	Sr-89	pCi/L	91.8	107	0.86.	Agreement
E6830-162	3rd/2009	Milk	Sr-90	pCi/L	18.1	18.8	0.96	Agreement

TABLE 3
DEPARTMENT OF ENERGY MIXED ANALYTE PERFORMANCE EVALUATION PROGRAM RESULTS
AREVA NP ENVIRONMENTAL LABORATORY

SAMPLE ID	MATRIX/ UNITS	REFERENCE DATE	RADIO-NUCLIDE	REPORTED MEAN VALUE Bq/Units	MAPEP VALUE Bq/Units	% BIAS	PERFORMANCE EVALUATION
MAPEP-09-RdF20	Filter (Bq/filter)	1-Jan-09	Am-241	0.1712	0.205	-16.5	Acceptable
MAPEP-09-RdF20	Filter (Bq/filter)	1-Jan-09	Cs-134	2.85	2.93	-2.7	Acceptable
MAPEP-09-RdF20	Filter (Bq/filter)	1-Jan-09	Cs-137	1.576	1.52	3.7	Acceptable
MAPEP-09-RdF20	Filter (Bq/filter)	1-Jan-09	Co-57	1.302	1.30	0.2	Acceptable
MAPEP-09-RdF20	Filter (Bq/filter)	1-Jan-09	Co-60	1.196	1.22	-2.0	Acceptable
MAPEP-09-RdF20	Filter (Bq/filter)	1-Jan-09	Mn-54	2.36	2.2709	3.9	Acceptable
MAPEP-09-RdF20	Filter (Bq/filter)	1-Jan-09	Pu-238	0.1394	0.1763	-20.9	Warning[1]
MAPEP-09-RdF20	Filter (Bq/filter)	1-Jan-09	Pu-239/240	0.1246	0.157	-20.6	Warning[1]
MAPEP-09-RdF20	Filter (Bq/filter)	1-Jan-09	Sr-90	0.571	0.640	-10.8	Acceptable
MAPEP-09-RdF20	Filter (Bq/filter)	1-Jan-09	Zn-65	1.374	1.36	1.0	Acceptable
MAPEP-09-MaS20	Soil (Bq/kg)	1-Jan-09	Cs-134	521	467	11.6	Acceptable
MAPEP-09-MaS20	Soil (Bq/kg)	1-Jan-09	Cs-137	750	605	24.0	Warning[2]
MAPEP-09-MaS20	Soil (Bq/kg)	1-Jan-09	Co-57	0.33	N/A	N/A	Acceptable
MAPEP-09-MaS20	Soil (Bq/kg)	1-Jan-09	Co-60	3.97	4.113	N/A	Acceptable
MAPEP-09-MaS20	Soil (Bq/kg)	1-Jan-09	Mn-54	387	307	26.1	Warning[2]
MAPEP-09-MaS20	Soil (Bq/kg)	1-Jan-09	K-40	714	570	25.3	Warning[2]
MAPEP-09-MaS20	Soil (Bq/kg)	1-Jan-09	Sr-90	250	257	-2.7	Acceptable
MAPEP-09-MaS20	Soil (Bq/kg)	1-Jan-09	Zn-65	317	242	31.0	Unacceptable[2]
MAPEP-09-RdV20	Veg.(Bq/sample)	1-Jan-09	Cs-134	3.22	3.40	-5.3	Acceptable
MAPEP-09-RdV20	Veg.(Bq/sample)	1-Jan-09	Cs-137	0.984	0.93	5.8	Acceptable
MAPEP-09-RdV20	Veg.(Bq/sample)	1-Jan-09	Co-57	2.50	2.36	5.9	Acceptable
MAPEP-09-RdV20	Veg.(Bq/sample)	1-Jan-09	Co-60	0.037	N/A	N/A	Acceptable
MAPEP-09-RdV20	Veg.(Bq/sample)	1-Jan-09	Mn-54	2.37	2.30	3.0	Acceptable
MAPEP-09-RdV20	Veg.(Bq/sample)	1-Jan-09	Sr-90	1.184	1.260	-6.0	Acceptable
MAPEP-09-RdV20	Veg.(Bq/sample)	1-Jan-09	Zn-65	1.52	1.354	12.3	Acceptable
MAPEP-09-MaW20	Water (Bq/L)	1-Jan-09	Am-241	0.506	0.636	-20.4	Warning[3]
MAPEP-09-MaW20	Water (Bq/L)	1-Jan-09	Cs-134	19.9	22.5	-11.6	Acceptable
MAPEP-09-MaW20	Water (Bq/L)	1-Jan-09	Cs-137	0.045	N/A	N/A	Acceptable
MAPEP-09-MaW20	Water (Bq/L)	1-Jan-09	Co-57	18.11	18.9	-4.2	Acceptable
MAPEP-09-MaW20	Water (Bq/L)	1-Jan-09	Co-60	16.58	17.21	-3.7	Acceptable
MAPEP-09-MaW20	Water (Bq/L)	1-Jan-09	H-3	337	330.9	1.8	Acceptable
MAPEP-09-MaW20	Water (Bq/L)	1-Jan-09	Fe-55	52.1	48.2	8.1	Acceptable
MAPEP-09-MaW20	Water (Bq/L)	1-Jan-09	Mn-54	14.67	14.66	0.1	Acceptable
MAPEP-09-MaW20	Water (Bq/L)	1-Jan-09	Ni-63	43.4	53.5	-18.9	Acceptable
MAPEP-09-MaW20	Water (Bq/L)	1-Jan-09	Pu-238	0.987	1.18	-16.4	Acceptable
MAPEP-09-MaW20	Water (Bq/L)	1-Jan-09	Pu-239/240	0.689	0.853	-19.2	Acceptable
MAPEP-09-MaW20	Water (Bq/L)	1-Jan-09	Sr-90	6.66	7.21	-7.6	Acceptable
MAPEP-09-MaW20	Water (Bq/L)	1-Jan-09	U-234	2.84	2.77	2.5	Acceptable
MAPEP-09-MaW20	Water (Bq/L)	1-Jan-09	U-238	2.92	2.88	1.4	Acceptable
MAPEP-09-MaW20	Water (Bq/L)	1-Jan-09	Zn-65	13.36	13.6	-1.8	Acceptable

[1]CR-09-12 was issued to investigate these negative biases. [2]CR-09-14 was issued to investigate these positive biases. [3]CR-09-13 was issued to investigate this negative bias

TABLE 3
DEPARTMENT OF ENERGY MIXED ANALYTE
PERFORMANCE EVALUATION PROGRAM RESULTS
AREVA NP ENVIRONMENTAL LABORATORY
Continued

SAMPLE ID	MATRIX/ UNITS	REFERENCE DATE	RADIO-NUCLIDE	REPORTED MEAN VALUE Bq/Units	MAPEP VALUE Bq/Units	% BIAS	PERFORMANCE EVALUATION
MAPEP-09-RdF21	Filter (Bq/filter)	1-Jul-09	Cs-134	-0.006		N/A	Acceptable
MAPEP-09-RdF21	Filter (Bq/filter)	1-Jul-09	Cs-137	1.437	1.40	2.6	Acceptable
MAPEP-09-RdF21	Filter (Bq/filter)	1-Jul-09	Co-57	6.7	6.48	3.4	Acceptable
MAPEP-09-RdF21	Filter (Bq/filter)	1-Jul-09	Co-60	1.010	1.03	-1.9	Acceptable
MAPEP-09-RdF21	Filter (Bq/filter)	1-Jul-09	Mn-54	5.77	5.49	5.1	Acceptable
MAPEP-09-RdF21	Filter (Bq/filter)	1-Jul-09	Zn-65	4.44	3.93	13.0	Acceptable
MAPEP-09-MaS21	Soil (Bq/kg)	1-Jul-09	Cs-134	1.7		N/A	Acceptable
MAPEP-09-MaS21	Soil (Bq/kg)	1-Jul-09	Cs-137	730	669	9.1	Acceptable
MAPEP-09-MaS21	Soil (Bq/kg)	1-Jul-09	Co-57	624	586	6.5	Acceptable
MAPEP-09-MaS21	Soil (Bq/kg)	1-Jul-09	Co-60	342	327	4.6	Acceptable
MAPEP-09-MaS21	Soil (Bq/kg)	1-Jul-09	Mn-54	880	796	10.6	Acceptable
MAPEP-09-MaS21	Soil (Bq/kg)	1-Jul-09	K-40	403	375	7.5	Acceptable
MAPEP-09-MaS21	Soil (Bq/kg)	1-Jul-09	Sr-90	410	455	-9.9	Acceptable
MAPEP-09-MaS21	Soil (Bq/kg)	1-Jul-09	Zn-65	1328	1178	12.7	Acceptable
MAPEP-09-RdV21	Veg.(Bq/sample)	1-Jul-09	Cs-134	0.02		N/A	Acceptable
MAPEP-09-RdV21	Veg.(Bq/sample)	1-Jul-09	Cs-137	2.41	2.43	-0.8	Acceptable
MAPEP-09-RdV21	Veg.(Bq/sample)	1-Jul-09	Co-57	7.63	8.0	-4.6	Acceptable
MAPEP-09-RdV21	Veg.(Bq/sample)	1-Jul-09	Co-60	2.46	2.57	-4.3	Acceptable
MAPEP-09-RdV21	Veg.(Bq/sample)	1-Jul-09	Mn-54	7.75	7.9	-1.9	Acceptable
MAPEP-09-RdV21	Veg.(Bq/sample)	1-Jul-09	Zn-65	-0.10		N/A	Acceptable
MAPEP-09-MaW21	Water (Bq/L)	1-Jul-09	Am-241	0.811	1.04	-22.0	Warning[1]
MAPEP-09-MaW21	Water (Bq/L)	1-Jul-09	Cs-134	28.6	32.2	-11.2	Acceptable
MAPEP-09-MaW21	Water (Bq/L)	1-Jul-09	Cs-137	40.9	41.2	-0.7	Acceptable
MAPEP-09-MaW21	Water (Bq/L)	1-Jul-09	Co-57	34.8	36.6	-4.9	Acceptable
MAPEP-09-MaW21	Water (Bq/L)	1-Jul-09	Co-60	14.67	15.4	-4.7	Acceptable
MAPEP-09-MaW21	Water (Bq/L)	1-Jul-09	H-3	585	634.1	-7.7	Acceptable
MAPEP-09-MaW21	Water (Bq/L)	1-Jul-09	Fe-55	58.9	60.8	-3.1	Acceptable
MAPEP-09-MaW21	Water (Bq/L)	1-Jul-09	Mn-54	-0.082		N/A	Acceptable
MAPEP-09-MaW21	Water (Bq/L)	1-Jul-09	Ni-63	39.6	44.2	-10.4	Acceptable
MAPEP-09-MaW21	Water (Bq/L)	1-Jul-09	Pu-238	0.0111	0.018	N/A	Acceptable
MAPEP-09-MaW21	Water (Bq/L)	1-Jul-09	Pu-239/240	1.260	1.64	-23.2	Warning[2]
MAPEP-09-MaW21	Water (Bq/L)	1-Jul-09	Sr-90	12.06	12.99	-7.2	Acceptable
MAPEP-09-MaW21	Water (Bq/L)	1-Jul-09	Tc-99	8.89	10	-11.1	Acceptable
MAPEP-09-MaW21	Water (Bq/L)	1-Jul-09	Zn-65	27.8	26.9	3.3	Acceptable

[1] These results are being addressed in conjunction with CR 09-13.
[2] These results are being addressed in conjunction with CR 09-12.

TABLE 4

NEW YORK STATE DEPARTMENT OF HEALTH
ENVIRONMENTAL LABORATORY APPROVAL PROGRAM
PROFICIENCY TEST RESULTS
AREVA NP ENVIRONMENTAL LABORATORY

ELAP LOT #/ REF. DATE	MATRIX/ UNITS	RADIO-NUCLIDE	REPORTED VALUE pCi/L	ELAP VALUE pCi/L	ELAP ACCEPTANCE LIMITS	PERFORMANCE EVALUATION
ALPBT 2263 04/07/09	Water pCi/L	Gross Alpha	31.8	43.7	25.6 – 61.8	Satisfactory
ALPBT 2263 04/07/09	Water pCi/L	Gross Beta	51.0	49.4	37.3 – 61.5	Satisfactory
PWTRIT 2266 04/07/09	Water pCi/L	Tritium	13100	14200	12600 – 15800	Satisfactory
PWGAMA 2262 04/07/09	Water pCi/L	Ba-133	56.4	56.2	48.1 – 64.3	Satisfactory
PWGAMA 2262 04/07/09	Water pCi/L	Cs-134	48.5	49.1	42.2 – 56.0	Satisfactory
PWGAMA 2262 04/07/09	Water pCi/L	Cs-137	88.3	87.5	78.5 – 96.4	Satisfactory
PWGAMA 2262 04/07/09	Water pCi/L	Co-60	101	107	97.3 – 117	Satisfactory
PWGAMA 2262 04/07/09	Water pCi/L	Zn-65	312	318	282 – 354	Satisfactory
PWIODINE 2264 4/07/09	Water pCi/L	I-131	21.8	23.0	18.9 – 27.2	Satisfactory

ELAP LOT #/ REF. DATE	MATRIX/ UNITS	RADIO-NUCLIDE	REPORTED VALUE pCi/L	ELAP VALUE pCi/L	ELAP ACCEPTANCE LIMITS	PERFORMANCE EVALUATION
ALPBT 2763 09/29/09	Water pCi/L	Gross Alpha	28.0	39.2	22.8 - 55.6	Satisfactory
ALPBT 2763 09/29/09	Water pCi/L	Gross Beta	35.1	31.2	21.6 - 40.9	Satisfactory
PWTRIT 2766 09/29/09	Water pCi/L	Tritium	19600	20800	18500 - 23100	Satisfactory
PWGAMA 2762 09/29/09	Water pCi/L	Ba-133	23.9	26.5	21.4 - 31.5	Satisfactory
PWGAMA 2762 09/29/09	Water pCi/L	Cs-134	71.2	69.7	60.7 - 78.7	Satisfactory
PWGAMA 2762 09/29/09	Water pCi/L	Cs-137	159	173	158 -188	Satisfactory
PWGAMA 2762 09/29/09	Water pCi/L	Co-60	63.2	66.8	59.8 - 73.8	Satisfactory
PWGAMA 2762 09/29/09	Water pCi/L	Zn-65	154	171	150 -192	Satisfactory
PWIODINE 2764 09/29/09	Water pCi/L	I-131	14.5	15.1	12.0 - 18.2	Satisfactory

TABLE 5

AREVA NP ENVIRONMENTAL LABORATORY
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM (REMP)
INTRA-LABORATORY ENVIRONMENTAL PROCESS CONTROL RESULTS BY ACCEPTANCE CRITERIA, MEDIA, AND ANALYSIS CATEGORIES
JANUARY - DECEMBER 2009

	Bias Criteria (1)		Precision Criteria (1), (2)	
	WITHIN CRITERIA	OUTSIDE CRITERIA	WITHIN CRITERIA	OUTSIDE CRITERIA
I. Air Particulate				
Gross Beta	255	0	0	0
II. Air Charcoal				
Gamma-Quantitative	156	0	0	0
III. Food (Aquatic/Terrestrial)				
Gamma	0	0	16	0
Sr-90	0	0	4	0
IV. Milk				
Gamma	0	0	0	0
Iodine (LL)	3	0	3	0
Sr-89	0	0	0	0
Sr-90	0	0	0	0
V. Soil/Sed.				
Gamma	0	0	0	0
Sr-90	0	0	0	0
H-3	0	0	6	0
VI. Vegetation (Aquatic/Terrestrial)				
Gamma	0	0	0	0
Iodine (LL)	0	0	0	0
VII. Water				
Gross Alpha	5	1	8	0
Gross Beta	6	0	10	2
Gamma	26	0	56	2
Iodine (LL)	0	0	0	2
Sr-89	0	0	0	0
Sr-90	3	0	0	0
Tritium	23	0	24	0
Total Number In Range:	**477**	**1**	**127**	**6**
Percentage of Total Processed	**99.8**	**0.2**	**95.5**	**4.5**
Sum of Analyses:	**478**		**133**	

(1) Bias and Precision as noted in Table 1, (2) Some Precision data generated from non-positive client samples for specific contractual evaluations.

TABLE 6

AREVA NP ENVIRONMENTAL LABORATORY
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM (REMP)
INTRA-LABORATORY AND INTER-LABORATORY
DATA SUMMARY: BIAS AND PRECISION BY MEDIA
JANUARY - DECEMBER 2009

	Bias Criteria (1)		Precision Criteria (1), (2)	
	WITHIN CRITERIA	OUTSIDE CRITERIA	WITHIN CRITERIA	OUTSIDE CRITERIA
I. Air Particulate				
Gross Alpha	11	1	12	0
Gross Beta	267	0	12	0
Gamma	54	0	87	0
Sr-90	0	0	2	0
II. Air Charcoal				
Gamma-Quantitative	168	0	12	0
III. Food (Aquatic/Terrestrial)				
Gamma	0	0	16	0
Sr-90	0	0	4	0
IV. Milk				
Gamma	120	0	120	0
Iodine (LL)	15	0	15	0
Sr-89	6	0	6	0
Sr-90	6	0	6	0
V. Soil/Sed.				
Gamma	0	0	36	0
Sr-90	0	0	5	0
H-3	0	0	6	0
VI. Vegetation (Aquatic/Terrestrial)				
Gamma	0	0	27	0
Iodine (LL)	0	0	0	0
Sr-90	0	0	3	0
VII. Water				
Gross Alpha	14	4	20	0
Gross Beta	18	0	22	2
Gamma	144	2	205	3
Iodine (LL)	12	0	12	2
Sr-89	12	0	12	0
Sr-90	15	0	16	0
Tritium	35	0	42	0
Total Number In Range:	**897**	**7**	**698**	**7**
Percentage of Total Processed	**99.2**	**0.8**	**99.0**	**1.0**
Sum of Analyses:	**904**		**705**	

(1) Bias and Precision as noted in Table 1. (2) Data includes intra-laboratory and Analytics cross-checks evaluated for accuracy and precision and MAPEP samples evaluated for precision only.

TABLE 7

AREVA NP ENVIRONMENTAL LABORATORY
ADDITIONAL ENVIRONMENTAL ANALYSES
INTRA-LABORATORY AND INTER-LABORATORY
BIAS AND PRECISION BY ANALYSIS TYPE
JANUARY - DECEMBER 2009

	Bias Criteria (1)		Precision Criteria (1), (2)	
	WITHIN CRITERIA	OUTSIDE CRITERIA	WITHIN CRITERIA	OUTSIDE CRITERIA
I. Am-241				
Filter	0	0	2	0
Soil	0	0	0	0
Water	0	0	4	0
II. C-14				
Soil	0	0	6	0
Water	3	0	0	0
III. Fe-55				
Water	3	0	5	0
IV. Ni-63				
Water	3	0	5	0
V. Pu-238				
Filter	0	0	2	0
Soil	0	0	0	0
Water	0	0	4	0
VI. Pu-239				
Filter	0	0	2	0
Soil	0	0	0	0
Water	0	0	4	0
VI. Ra-226				
Water	2	0	4	0
VII. Ra-228				
Water	2	0	4	0
VIII. Tc-99				
Water	0	0	2	0
IX. Th-230				
Water	1	1	4	0
X. U-234				
Water	2	0	6	0
XI. U-238				
Water	2	0	6	0
Total Number In Range:	**18**	**1**	**60**	**0**
Percentage of Total Processed	**94.7**	**5.3**	**100**	**0**
Sum of Analyses:	**19**		**60**	

(1) Bias and Precision as noted in Table 1. (2) Data includes intra-laboratory and Analytics cross-checks evaluated for accuracy and precision and MAPEP samples evaluated for precision only.

TABLE 8

AREVA NP ENVIRONMENTAL LABORATORY
ALL ENVIRONMENTAL ANALYSES
INTRA-LABORATORY AND INTER-LABORATORY
BIAS AND PRECISION BY ANALYSIS TYPE
JANUARY - DECEMBER 2009

	Bias Criteria (1)		Precision Criteria (1), (2)	
	WITHIN CRITERIA	OUTSIDE CRITERIA	WITHIN CRITERIA	OUTSIDE CRITERIA
I. Gross Alpha				
Air Filter	11	1	12	0
Water	14	4	20	0
II. Gross Beta				
Air Filter	267	0	12	0
Water	18	0	22	2
III. Gamma				
Air Filter	54	0	87	0
Charcoal-Quantitative	168	0	12	0
Food	0	0	16	0
Milk	120	0	120	0
Soil/Sediment	0	0	36	0
Vegetation	0	0	27	0
Water	144	2	205	3
IV. Iodine (LL)				
Milk	15	0	15	0
Vegetation	0	0	0	0
Water	12	0	12	2
V. Sr-89				
Milk	6	0	6	0
Water	12	0	12	0
VI. Sr-90				
Air Filter	0	0	2	0
Food	0	0	4	0
Milk	6	0	6	0
Soil/Sediment	0	0	5	0
Vegetation	0	0	3	0
Water	15	0	16	0
VII. Tritium				
Soil	0	0	6	0
Water	35	0	42	0

TABLE 8

AREVA NP ENVIRONMENTAL LABORATORY
ALL ENVIRONMENTAL ANALYSES
INTRA-LABORATORY AND INTER-LABORATORY
BIAS AND PRECISION BY ANALYSIS TYPE
JANUARY - DECEMBER 2009
Continued

	Bias Criteria (1)		Precision Criteria (1), (2)	
	WITHIN CRITERIA	OUTSIDE CRITERIA	WITHIN CRITERIA	OUTSIDE CRITERIA
VII. Am-241				
Filter	0	0	2	0
Soil	0	0	0	0
Water	0	0	4	0
IX. C-14				
Soil	0	0	6	0
Water	3	0	0	0
X. Fe-55				
Water	3	0	5	0
XI. Ni-63				
Water	3	0	5	0
XII. Pu-238				
Filter	0	0	2	0
Soil	0	0	0	0
Water	0	0	4	0
XIII. Pu-239				
Filter	0	0	2	0
Soil	0	0	0	0
Water	0	0	4	0
XIV. Ra-226				
Water	2	0	4	0
XV. Ra-228				
Water	2	0	4	0
XVI. Tc-99				
Water	0	0	2	0
XVII. Th-230				
Water	1	1	4	0
XVIII. U-234				
Water	2	0	6	0
XIX. U-238				
Water	2	0	6	0
Total Number In Range:	**915**	**8**	**758**	**7**
Percentage of Total Processed	**99.1**	**0.9**	**99.1**	**0.9**
Sum of Analyses:	**923**		**765**	

TABLE 9

AREVA NP ENVIRONMENTAL LABORATORY
ENVIRONMENTAL BIAS AND PRECISION BY YEAR

	Bias			Precision		
	Deviation from Known			Deviation from Mean		
	Bias Criteria (1)			Precision Criteria (2)		
Year	# Within Criteria	# Outside Criteria	% Within Criteria	# Within Criteria	# Outside Criteria	% Within Criteria
2009	915	8	**99.1**	758	7	**99.1**
2008	1125	41	**96.5**	841	15	**98.2**
2007	798	17	**97.9**	488	1	**99.8**
2006	689	5	**99.3**	589	2	**99.7**
2005	1069	3	**99.7**	507	0	**100.0**
2004	1294	10	**99.2**	862	2	**99.8**
2003	828	13	**98.5**	515	1	**99.8**
2002	863	7	**99.2**	471	3	**99.4**
2001	578	22	**96.3**	394	2	**99.5**
2000	574	18	**97.0**	448	1	**99.8**
1999	467	13	**97.3**	357	2	**99.4**
1998	496	7	**98.6**	432	4	**99.1**
1997	515	11	**97.9**	363	0	**100.0**
1996	907	24	**97.4**	800	3	**99.6**
1995	403	12	**97.1**	267	0	**100.0**
1994	529	14	**97.4**	336	1	**99.7**
1993	443	29	**93.9**	312	1	**99.7**
1992	728	21	**97.2**	797	1	**99.9**
1991	770	19	**97.6**	822	4	**99.5**
1990	728	34	**95.5**	761	2	**99.7**
1989	689	28	**96.1**	710	4	**99.4**
1988	632	22	**96.6**	632	1	**99.8**
1987	702	27	**96.3**	718	3	**99.6**
1986	813	27	**96.8**	815	0	**100.0**
1985	718	25	**96.6**	682	0	**100.0**
1984	837	31	**96.4**	850	0	**100.0**
1983	794	36	**95.7**	798	4	**99.5**
1982	585	30	**95.1**	743	12	**98.4**
1981	443	29	**93.9**	404	1	**99.8**
1980	442	37	**92.3**	490	1	**99.8**
1979	199	20	**90.9**	354	16	**95.7**
1978	242	20	**92.4**	361	14	**96.3**
1977	58	8	**87.9**	119	7	**94.4**
Total # in Range:	**21,873**	**668**	**97.0**	**18,796**	**115**	**99.4**
% in Range	**97.0**	**3.0**		**99.4**	**0.6**	
Total Number	**22,541**			**18,911**		

(1) Bias as noted in Table 1, (2) Precision as noted in Table 1.

TABLE 10

PERCENTAGE OF INDIVIDUAL DOSIMETERS THAT PASSED E-LAB INTERNAL CRITERIA JANUARY – DECEMBER 2009[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 2009[1], [2]

Dosimeter Type	Exposure Period	ANSI Category	% (Bias ± SD)*
Panasonic Environmental	FH 2009	II	8.1 +/- 2.0
	SH 2009	II	-1.8 +/- 2.5

[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 2009[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.

TABLE 13

AREVA NP ENVIRONMENTAL LABORATORY
CONDITION REPORT (CR) STATUS
JANUARY – DECEMBER 2009

CR #	(OPEN) INITIATION DATE	(CLOSED) CLOSE-OUT DATE	DESCRIPTION	STATUS AS OF 12/31/09
CR 08-01	23-Jan-08	23-Mar-09	3rd qtr. 2007 Analytics environmental cross check filters failed bias criteria for gross alpha	CLOSED-The paperwork was checked for errors, the sample was recounted, and a new alpha filter was used to calibrate the alpha/beta system. None of these actions produced a reason found for the failure. Two subsequent sets of Analytics filters were acceptable. Since the precision for the failed filters was < 5% over time and among different calibrations, it appears that variability in the preparation of the filters themselves may be the cause of the failures. Prior to 2003, the bias and precision acceptance criteria for gross alpha on a filter were +/- 25%. Assuming that variability in either the absorption or source distribution of the filters is responsible for the variation in the observed accuracy, LQARC approved a change in the criteria to +/- 25.
CR 08-09	07- Mar-08	19-May-09	Decay correction errors on past QC Summary Report.	CLOSED- Updated QC summary reports containing results with accurate decay corrections were sent to clients as required. E-Lab Procedure 790, Laboratory Batch Quality Control Handling, was created to formalize the required steps to create an accurate QC Summary Report. The signatures of the preparer and an independent reviewer are now required on QC Summary Reports.
CR 08-23	22-Jul-08	25-Mar-09	The mean of three consecutive charcoal PCs failed the accuracy criterion	CLOSED - These QC samples contain Ba-133 to approximate an energy close to I-131. The samples were counted on the manual germanium detectors instead of the automatic sample changer. The sample geometry on these detectors is more sensitive to summing than the changer. Ba-133 summing corrections have been determined for each manual detector. Charcoal cartridges containing Ba-133 and counted on the manual detectors have been corrected for summing. All Ba-133 corrected data is within the acceptance criteria. There is no effect on client charcoal cartridges which are analyzed for I-131 concentration.
CR 08-30	15-Oct-08	22-Apr-09	Zr-95 missing from analysis report	CLOSED - The gamma spectrometry analysis report was found to be missing the Zr-95 result when greater than 29 nuclides are reported. Sixty-nine reports for five clients were affected. Updated reports were sent to clients. A multi-page report was developed and approved for use on 04/14/2009.

TABLE 13

AREVA NP ENVIRONMENTAL LABORATORY
CONDITION REPORT (CR) STATUS
JANUARY – DECEMBER 2009 (Continued)

CR #	(OPEN) INITIATION DATE	(CLOSED) CLOSE-OUT DATE	DESCRIPTION	STATUS AS OF 12/31/09
CR 08-36	4-Nov-08	26-Mar-09	Gross beta analysis of a water sample failed the Manual 100 criteria for duplicates	CLOSED - The investigation indicated that either the duplicate was not the same sample as the original or that severe settling occurred in the sample container. The reason could not be verified since the original sample had been discarded. In the future, samples will be labeled to ensure that they are not discarded until the duplicate evaluation is complete. Also, because decay correction is not applied to gross beta analyses, duplicates for this analysis will be submitted simultaneously. Training was conducted and the entire laboratory staff was counseled to ensure that water samples are shaken vigorously and the analysis aliquot is taken immediately after shaking, and to ensure that sample labels are double-checked when retrieving samples for analysis.
CR 08-38	18-Nov-08	21-Dec-09	MAPEP Series 19 Pu-238 in water fell into the warning category with a -28.6% bias	CLOSED – All spectra associated with the two MAPEP water samples were reviewed, and no improvement was noted in the peak start/stop selection by the analyst. Multiple counts were performed using different detectors and were analyzed by different people. All of the stored spectra provide virtually identical results for Pu-238. The problem does not lie with the instrumentation or the analyst's selection of peak regions. Four sample aliquots were subsequently submitted for the MAPEP 21 water. The first two were processed using standard environmental methods the third and fourth were processed using a sample fusion preparatory step. This was performed to determine if the oxidation state of the plutonium provided by MAPEP was not being converted completely during the process. There appears to be no benefit in modifying the preparation method as the bias for all samples remains consistently at (-20-25%). MAPEP Series 21 samples contained both Am-241 and Pu-239/240 and were reported with -22.0% and -23.2% biases. Continued problems with environmental transuranic analysis required a new Condition Report. This CR was closed and further investigation into the negative bias will be documented in CR 09-33.

TABLE 13

AREVA NP ENVIRONMENTAL LABORATORY
CONDITION REPORT (CR) STATUS
JANUARY – DECEMBER 2009 (Continued)

CR #	(OPEN) INITIATION DATE	(CLOSED) CLOSE-OUT DATE	DESCRIPTION	STATUS AS OF 12/31/09
CR 08-39	18-Nov-08	26-Mar-09	MAPEP Series 19 Co-60 on a filter fell into the not acceptable category due to reporting a false positive result.	CLOSED - The MAPEP AP filter was counted 3 times on the same gamma detector. Background spectra, with and without a sample holder were reviewed and no Co-60 was detected. All 3 counts of the MAPEP filter identified the 1173 peak and 2 identified the 1332 peak. The root cause appears to be the low uncertainty reported by the E-LAB. Only one of 42 other Labs reported a lower uncertainty than AREVA, and this Lab also failed the test. The distribution of results reported by the various participants showed that ten Labs reported results between 0.02 and 0.03 Bq, the highest frequency. However, the uncertainties reported by these Labs were sufficiently large that they passed the false positive test. Since the distribution of reported results centers roughly around the value reported by the E-Lab, and since Co-57 was also present on the filter at a concentration of 1.5 Bq, it appears that the source of the Co-60 found on the filter could be a contaminant in the Co-57 source used rather than contamination obtained at the E-LAB.
CR 08-40	18-Nov-08	21-Dec-09	MAPEP Series 19 Sr-90 in soil was a false positive test. No result was reported by the AREVA Lab due to inconsistent results (positive and negative).	CLOSED - The root cause of this QC failure was not determined conclusively. It appears that a low-level contaminant bled through the separation columns on only one of the strontium-90 samples and due to the low activity level, cannot be positively identified. The second analysis result was within the acceptance criteria of the MAPEP program as a false positive check. However, due to the inconsistency, neither value could be reported. The previous MAPEP test, series 18, had a successful Sr-90 in soil test with a bias of -7.3% and the subsequent MAPEP test, series 20, had a bias of -2.7%.
CR 08-41	26-Nov-08	26-Mar-09	Gamma spectrometry results generated using incorrect efficiency files were reported to three customers.	CLOSED - A new chemist, recently trained to perform sample preparation did not specify the correct geometry in LIMS. This chemist also performed the gamma spectrometry analyses and did not identify the error. All affected results were updated and reissued. The chemist was counseled and retrained on proper geometry selection. Finally, the software was revised to make it easier for a reviewer to identify similar errors.
CR 08-42	17-Dec-08	26-Mar-09	One client AP sample was inadvertently thrown in the trash.	CLOSED - The filter was retrieved prior to disposal in its original bag which was inside a larger bag containing empty filter bags from another client. A designated storage area for air filters and other small samples separate from the sample preparation area was established. The sample control staff was counseled concerning proper sample handling.

TABLE 13

AREVA NP ENVIRONMENTAL LABORATORY
CONDITION REPORT (CR) STATUS
JANUARY – DECEMBER 2009 (Continued)

CR #	(OPEN) INITIATION DATE	(CLOSED) CLOSE-OUT DATE	DESCRIPTION	STATUS AS OF 12/31/09
CR 08-43	17-Dec-08	07-Jul-09	U-232 tracer verification, YA942324-A was outside the limits of Procedure 730.	CLOSED - The U-232 tracer was assigned the original certificate value, not the concentration obtained from the verification analysis. The LIMS data were reviewed to ensure that the correct tracer concentration was recorded. Procedures 720 and 730 were revised to allow for broader verification limits for tracers requiring radiochemical processing as part of the verification. No client results required updating since recalculation of analysis results for the change in the tracer known value would result in a change in the reported value of less than 1/3 of the acceptance criteria for the analysis. A similar situation for Th-229 tracer, discovered during the investigation of this CR was similarly corrected.
CR 09-02	20-Jan-09	07-Aug-09	Fourth Qtr 2008 P61 Fe-55 Process Checks failed Manual 100 criteria for precision	CLOSED – No errors were identified with either the chemistry data or the source certificates. The cause of the failure was investigated in conjunction with CR 09-04, which involved another process check failure for Fe-55. No definitive cause for the failures was determined. In order to ensure accuracy of client results, the senior radiochemist is performing Fe-55 analyses for all Part 50 and Part 61 samples. The process will be closely monitored to see if any procedural steps need enhancement. In addition, an Fe-55 spike will continue to be processed with each batch of samples.
CR 09-04	18-Feb-09	25-Aug-09	Q1-2009 Fe-55 P61 PC failed with high bias.	CLOSED - The samples were reprocessed from the container submitted for the process checks and from the master stock solution. Both sets passed the Manual 100 accuracy criterion. Corrective actions are the same as those documented for CR 09-02.
CR 09-06	24-Mar-09	14-Apr-09	The gross beta count rates for a few environmental water samples were measured to be higher than expected. Recounts of these samples over a 24 hour period showed a significant decrease in the gross beta count rates for some samples. A review of Procedure 320 revealed that Step B.2.g was not performed.	CLOSED - Based upon the analysis of six duplicate samples, the omission of Step B.2.g did not have a significant effect on the gross beta activity determination. Procedure 320 was revised to add a hold time between sample preparation and analysis and to clarify the use of a desiccator to store the samples. No change was made to the requirement to dry the samples in the oven (Step B.2.g). Analysts were retrained on Procedure 320 and the necessity of adhering to the written procedures.
CR 09-10	11-May-09	08-Jul-09	Ra-224 decay correction should use Th-228 from sample collection to radium separation step	CLOSED - The spreadsheet was revised, documented, and a V&V was performed, to allow for Ra-224 decay using this option. E-Lab radium procedures were revised to incorporate this Ra-224 decay correction, and worksheets were revised to allow chemists to record the radium separation time.

TABLE 13

AREVA NP ENVIRONMENTAL LABORATORY
CONDITION REPORT (CR) STATUS
JANUARY – DECEMBER 2009 (Continued)

CR #	(OPEN) INITIATION DATE	(CLOSED) CLOSE-OUT DATE	DESCRIPTION	STATUS AS OF 12/31/09
CR 09-11	22-May-09	07-Aug-09	Ra-228 samples have precipitate which may be causing unusual matrix spike results and incorrect recovery values	CLOSED - E-Lab Procedure 305 was revised to incorporate additional steps, if required, to allow the Chemist to perform and document changes or additional steps taken to dissolve the solids.
CR 09-12	08-Jun-09		MAPEP Series 20 Pu-238 and Pu-239/240 on a filter fell into the warning category with mean biases of -20.9% and -20.6%, respectively.	OPEN – The MAPEP Series 21 filter was processed by the Part61 chemist with acceptable results. The apparent cause of the Series 20 failure is a small container of tracer, stored in the environmental chemistry lab., that may have concentrated over time. To verify this, an aliquot of MAPEP 21 water (which also showed a low bias for Pu) is being reanalyzed in the environmental chemistry lab., using the Part 61 tracer. There is no impact on client results, as the E-Lab does not process any environmental samples for transuranic analysis.
CR 09-13	08-Jun-09		MAPEP Series 20 Am-241 in water fell into the warning category with a mean bias of -20.4%.	OPEN - The apparent cause of the Series 20 failure is a small container of tracer, stored in the environmental chemistry lab., that may have concentrated over time. To verify this, an aliquot of MAPEP 21 water (which also showed a low bias for Am-241) is being reanalyzed in the environmental chemistry lab., using the Part 61 tracer. There is no impact on client results, as the E-Lab does not process any environmental samples for transuranic analysis.
CR 09-14	08-Jun-09	03-Sep-09	MAPEP Series 20 Gamma in soil fell into the warning and "not acceptable" categories with mean biases for several nuclides ranging from +24% to +31%.	CLOSED - It was determined that, due to the extremely fine nature of the soil particles, the material settled over time to a more compact geometry than the calibration height. A recount of the sample with additional soil added to reach the calibrated geometry produced results that were within 10% of the MAPEP values for all nuclides. The sample preparation technician was trained on techniques specific to soil samples with very fine granules.
CR 09-15	09-Jun-09	01-JUL-09	Gamma spectrometry analysis reports sent out with incorrect sample receipt date.	CLOSED - Review of the analysis report code revealed that the sample receipt date on the report was pulled from the sample reference date field in the LIMS database. Further review confirmed that all other data was correct. This incorrect database link occurred during a revision to the report. The analysis report has been revised and all affected reports were updated and sent to clients. The QA officer counseled the programmer and the reviewer on the importance of verifying the accuracy of all data appearing on a report, form, or screen, whenever a change is made, in accordance with Procedure 600.

TABLE 13

AREVA NP ENVIRONMENTAL LABORATORY
CONDITION REPORT (CR) STATUS
JANUARY – DECEMBER 2009 (Continued)

CR #	(OPEN) INITIATION DATE	(CLOSED) CLOSE-OUT DATE	DESCRIPTION	STATUS AS OF 12/31/09
CR 09-18	30-Jun-09	21-Dec-09	Discrepancies in Procedure 365	CLOSED - Fe-55 and Ni-63 weight and recovery calculations were performed differently depending on whether the LIMS calculations were used or the worksheet was used. The discrepancy is a result of accounting for the recovery aliquot in two different, but equally valid ways. There is no impact on customer results since the final calculated concentrations of Fe-55 and Ni-63 are the same using both methods. For clarity, the calculations were removed from the worksheet.
CR 09-21	20-Jul-09	29-Dec-09	First Qtr 2009 Analytics environmental water cross-check failed Manual 100 accuracy criteria for gross alpha analysis.	CLOSED – The same chemist prepared the second quarter cross-check samples for gross alpha analysis while being observed by a senior chemist. The second quarter results were -3.2% from the known value. The senior chemist observed the processing chemist prepare another aliquot of the first qtr. cross-check water and also the third qtr. samples. The gross alpha reanalysis results showed biases within Manual 100 criteria. Corrective actions included instructing the processing chemist to take her time and increase the rinses and policing performed for gross alpha\beta analysis of water samples.
CR 09-22	23-Jul-09	17-Nov-09	Typographical error identified on environmental gamma spectrometry analysis report.	CLOSED - The "TPU 1-Sigma" heading on the report was inappropriately changed to "TPU 2-Sigma" for some clients during the last revision of the analysis report routine. The incorrect TPU header occurred because the programmer didn't realize that the analysis reports include the TPU results calculated at 1-sigma despite the counting uncertainty value requested by the customer. Originally, the V&V of the revision to the report did not consist of a test of all of the special cases of the report. All affected clients were contacted, and updated reports were issued. Procedure 600 was revised to require that all permutations of a revised software product are tested. In addition, the testing must be reviewed by two independent people who are knowledgeable of the required specifications.
CR 09-24	13-Aug-09		Corrective Actions from Internal Assessment 08-02, Source Preparation	OPEN – One action item resulting from Internal Assessment 08-02, on Source Preparation, remains open. The verification attempt on the Th-230 secondary standard 9414-C was outside the Procedure 720 criterion. A new standard was received from NIST and has been verified. The old standard was used only to prepare matrix spikes and control spikes for select clients. The impact of using this source after the verification due date is being evaluated.

TABLE 13

AREVA NP ENVIRONMENTAL LABORATORY
CONDITION REPORT (CR) STATUS
JANUARY – DECEMBER 2009 (Continued)

CR #	(OPEN) INITIATION DATE	(CLOSED) CLOSE-OUT DATE	DESCRIPTION	STATUS AS OF 12/31/09
CR 09-26	13-Aug-09		During the 2009 EXELON audit, the E-Lab file server directory containing E-Lab manuals and procedures did not have security controls	OPEN - The AREVA IS department immediately limited access to "read-only" for all but a limited number of employees designated by the Lab Manager. Procedure and manual files in the E-Lab library directory were compared to those stored in the corporate document storage system. All of the documents in the E-Lab library directory were identical to the controlled copies in the corporate system, for the items compared. Other directories requiring security controls were identified and set to "read-only". The E-Lab has monitored these directories to assure that controls remain in place, and will continue to monitor them quarterly. This CR is ready to close.
CR 09-28	02-Oct-09	22-Dec-09	The five-year review for Procedure 466 was missed and the Manual Index listed the wrong revision for Manual 100.	CLOSED - The root cause of the missed five-year review was that it was never added to the "Next Review Date" index for procedures. This is a second index maintained in addition to regular procedure index. The "Next Review Date" indices were eliminated, and the Procedure and Manual indices were revised to allow sorting by "Next Review Date". The project administrator was counseled on the requirement to make sure that all dates are updated when issuing a revised procedure or manual index. In addition, Procedure 010, was revised to incorporate all of the steps required to revise and issue a procedure or manual.
CR 09-29	22-Oct-09		First quarter Analytics environmental cross-check reference date was in error by one day.	OPEN – The reference date used to calculate the 1st Quarter Analytics Environmental cross-check samples was in error by one day. There is no impact on client results, as the changes in concentrations are not sufficient to cause any of the analyses to fail the Manual 100 accuracy criteria. All results are being updated, however, and are discussed in the 2009 annual quality assurance report.
CR 09-30	22-Oct-09		Client EDD file had incorrect sample receipt date	OPEN – The apparent causes were determined to be an unsatisfactory turnaround time for independent review of the completed receipt paperwork, and lack of management notification of the error so that it could be corrected on the analysis report and in the EDD. Corrective actions are pending.
CR 09-31	30-NOV-09		One of 5 gamma qualification samples failed Manual 100 accuracy criteria for all 3 nuclides	OPEN – A single spiked water sample, containing 3 radionuclides, was used as a gamma instrumentation qualification sample. The sample was counted five times, and the results of one count failed the Manual 100 accuracy criteria for all three nuclides. The reason for the failure is under investigation.
CR 09-33	21-Dec-09		H-3 MDC for one client sample not <400pCi/L	OPEN – The client sample in question was an analytical blank. A review of all projects requiring batch QC was performed. The required MDCs for the blanks were not listed on the analysis reports for all projects, however, the analysis reports do not need to be updated as the required MDCs were met for the blanks. Corrective actions are pending.

TABLE 14

UPDATED INSTRUMENTATION/ANALYTICAL PROCEDURES RELEVANT TO ENVIRONMENTAL SAMPLE ANALYSIS AND ENVIRONMENTAL DOSIMETRY ISSUED DURING JANUARY – DECEMBER 2009

PROCEDURE NUMBER	TITLE	REVISION NUMBER	EFFECTIVE DATE	SUMMARY OF REVISION
120	Sample Storage and Accountability	20	09/30/09	Updated disposal discussions to place Part 50 sample disposal under LIMS control. Added verification of disposal methods by CHO/Haz Waste personnel. Clarified storage of Part 50/61 liquid scintillation vials. Deleted sewerage disposal option. Added a reference.
305	Preparation of Environmental and Bioassay Media for Analysis of Gamma Ray Emitters	24	08/10/09	Minor editorial changes. Slight changes to order of steps for ease of processing. Eliminated duplication in several sections. Added a new 0.5 L Marinelli beaker geometry. Updated Ra-228 preparation and counting sections for CR 09-11.
320	Preparation and Analysis of Environmental Water and Soil/Sediment/Sludge Samples for Gross Alpha and/or Gross Beta Radioactivity	27	09/15/09	Minor editorial changes. Added ability to modify non-EPA drinking water hold times if a client requested it and management approved.
340	The Determination of Iodine-131 in Environmental Media Using Anion Exchange Chromatography	30	11/30/09	Minor editorial changes. Section A.1 Vegetation /Food Crops sample preparation steps were revised to incorporate enhancements made to the procedure.
365	The Determination of ^{55}Fe, ^{63}Ni, $^{89,90}Sr$, ^{241}Am, ^{242}Cm, $^{243/244}Cm$ and ^{238}Pu, $^{239/240}Pu$, ^{241}Pu in Environmental and Bioassay Matrices	16	11/25/09	Reagents section: 15. Nickel carrier - replaced "preparation of" with "commercially available solution". 24. Strontium tracer values were changed from "5,000 - 10,000 dpm/ml," to "5,000 - 20,000 dpm/mL". The sample fraction volume taken for ICP analysis was clarified for Fe-55 and Ni-63. Weight notations in the procedure and FORMS were deleted to conform to the LIMS process.

TABLE 14

UPDATED INSTRUMENTATION/ANALYTICAL PROCEDURES RELEVANT TO ENVIRONMENTAL SAMPLE ANALYSIS AND ENVIRONMENTAL DOSIMETRY ISSUED DURING JANUARY – DECEMBER 2009 (Continued)

PROCEDURE NUMBER	TITLE	REVISION NUMBER	EFFECTIVE DATE	SUMMARY OF REVISION
368	The Determination of Sr-89,90 in Environmental Media Via Cerenkov Counting	13	11/20/09	Changed 3M HN03 to 8M as necessary in various sections of the procedure. Changed the amount of 3% EDTA rinse solution to 1000mL for a 2000g milk sample. The soil method (Strong Acid Leach) section of the procedure was changed to reflect the method that elicits the best recovery for a majority of the soil samples routinely processed. The flow chart was corrected to reflect procedural changes.
382	The Determination of Radium Isotopes In Bioassay Matrices	5	07/10/09	Precaution number 5 in the previous revision erroneously stated that Ra-224 may be in equilibrium with Th232. This revision corrects "Th-232" to "Th-228" as this is the correct parent\daughter equilibrium condition for Ra-224. No changes were required of the software as the decay correction calculation correctly uses the Th-228 half-life.
385	The Determination of Radium Isotopes in Environmental Matrices by Alpha Spectrometry	8	07/10/09	Precaution number 5 in the previous revision erroneously stated that Ra-224 may be in equilibrium with Th232. This revision corrects "Th-232" to "Th-228" as this is the correct parent\daughter equilibrium condition for Ra-224. No changes were required of the software as the decay correction calculation correctly uses the Th-228 half-life.
395	The Sequential Determination of Isotopic Uranium, Thorium and Radium in Environmental Matrices by Alpha Spectrometry	5	07/10/09	Precaution number 5 in the previous revision erroneously stated that Ra-224 may be in equilibrium with Th232. This revision corrects "Th-232" to "Th-228" as this is the correct parent\daughter equilibrium condition for Ra-224. No changes were required of the software as the decay correction calculation correctly uses the Th-228 half-life.
430	Operation and Calibration of the Beta-Gamma Coincidence Units for I-131	15	05/25/09	Revised to add the correct AREVA NP Protection of Proprietary Information statement.
600	Development, Documentation, Verification, and Validation of	13	11/02/09	Step E.7 was revised to require the analyst to ensure that all possible permutations of the end product are tested, and to require that two

TABLE 14

UPDATED INSTRUMENTATION/ANALYTICAL PROCEDURES RELEVANT TO ENVIRONMENTAL SAMPLE ANALYSIS AND ENVIRONMENTAL DOSIMETRY ISSUED DURING JANUARY – DECEMBER 2009 (Continued)

PROCEDURE NUMBER	TITLE	REVISION NUMBER	EFFECTIVE DATE	SUMMARY OF REVISION
	Computer Software			independent people knowledgeable of the required specifications review the V&V. Quality impact: This change will significantly improve the V&V process.
692	Report Generation Using LIMS	4	09/29/09	Minor editorial changes. Added a reference. Added a description of sample disposal reports.
710	Quality Control of Laboratory Instrumentation	20	08/06/09	Modified the equipment history section to permit use of a FORM or logbook. Modified the FORM for ease of use. Added dosimetry references and descriptions of calibration, QC and maintenance. Updated the liquid scintillation background statements.
715	Preparation of Tolerance Charts	21	07/14/09	Reformatted the entire procedure for ease of use. Added a reference for Beta-Gamma counter QC. Modified the Beta-Gamma QC limit to 6% based on the newly added Reference. Specified that the 1-sigma value be compared to the 1% value for nuclear instruments.
720	Preparation of Radioactive Standards and Source Matrices	21	06/18/09	Verification criteria for radioactive standards and source matrices were revised. Source verification forms were added to enable better documentation of prepared sources. Process check solutions with the exception of C-14 shall be valid for two years. Quality impact: enhanced due to non-ambiguity and better documentation.
730	Preparation and Verification of Carriers and Radiotracers	23	06/15/09	Verification criteria for stable carriers and radiotracers were revised to ensure consistency with procedure 720.
755	Good Laboratory Practices	0	07/07/09	New procedure created.
765	Guidelines for Maintaining the ELGA MEDICA 15 Water Systems	4	05/18/09	Revised the procedure to reflect the new deionized water systems installed in the environmental & part 50/61 lab areas. Quality Impact: enhanced due to state of the art water quality.

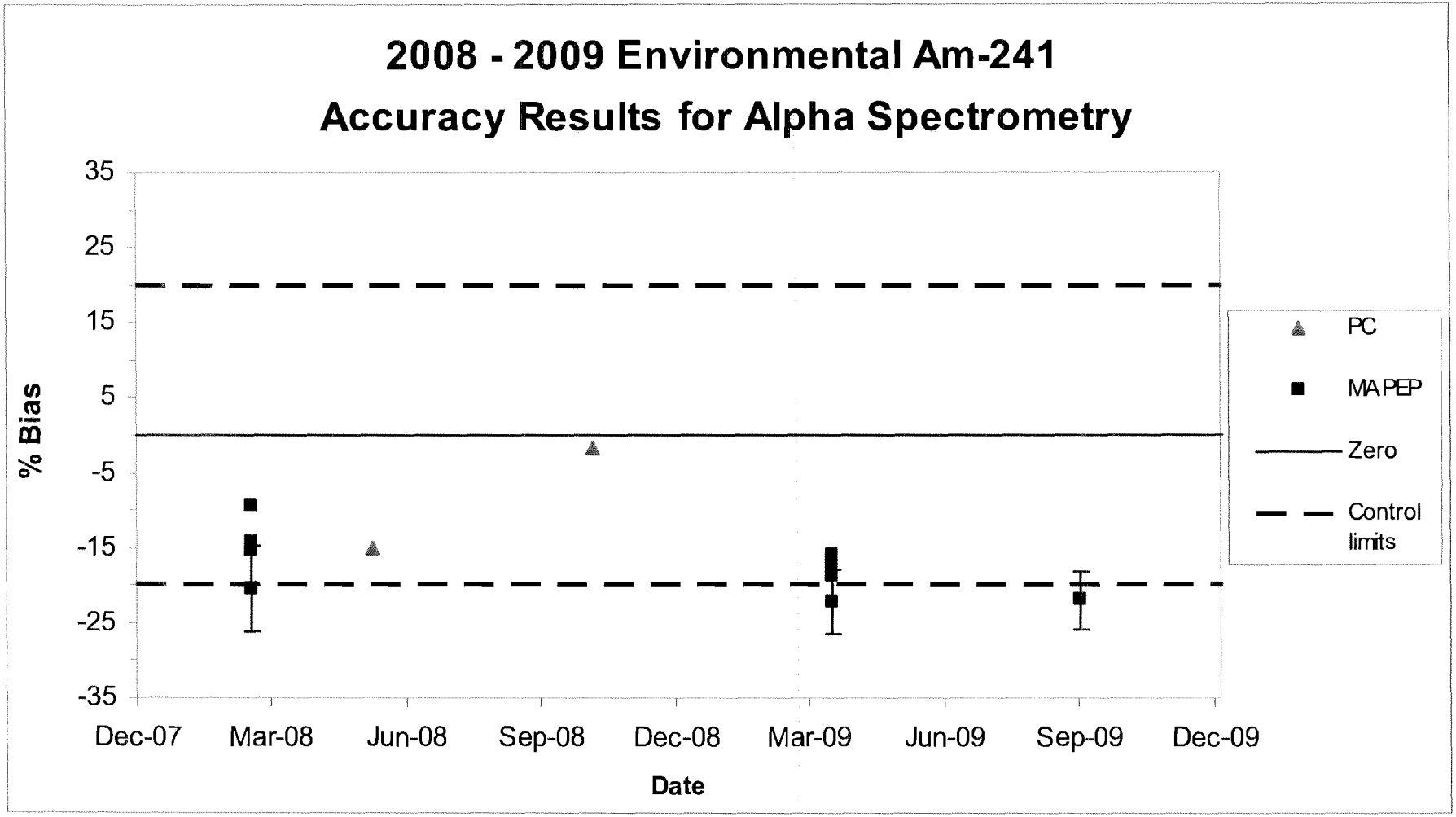
TABLE 14

UPDATED INSTRUMENTATION/ANALYTICAL PROCEDURES RELEVANT TO ENVIRONMENTAL SAMPLE ANALYSIS AND ENVIRONMENTAL DOSIMETRY ISSUED DURING JANUARY – DECEMBER 2009 (Continued)

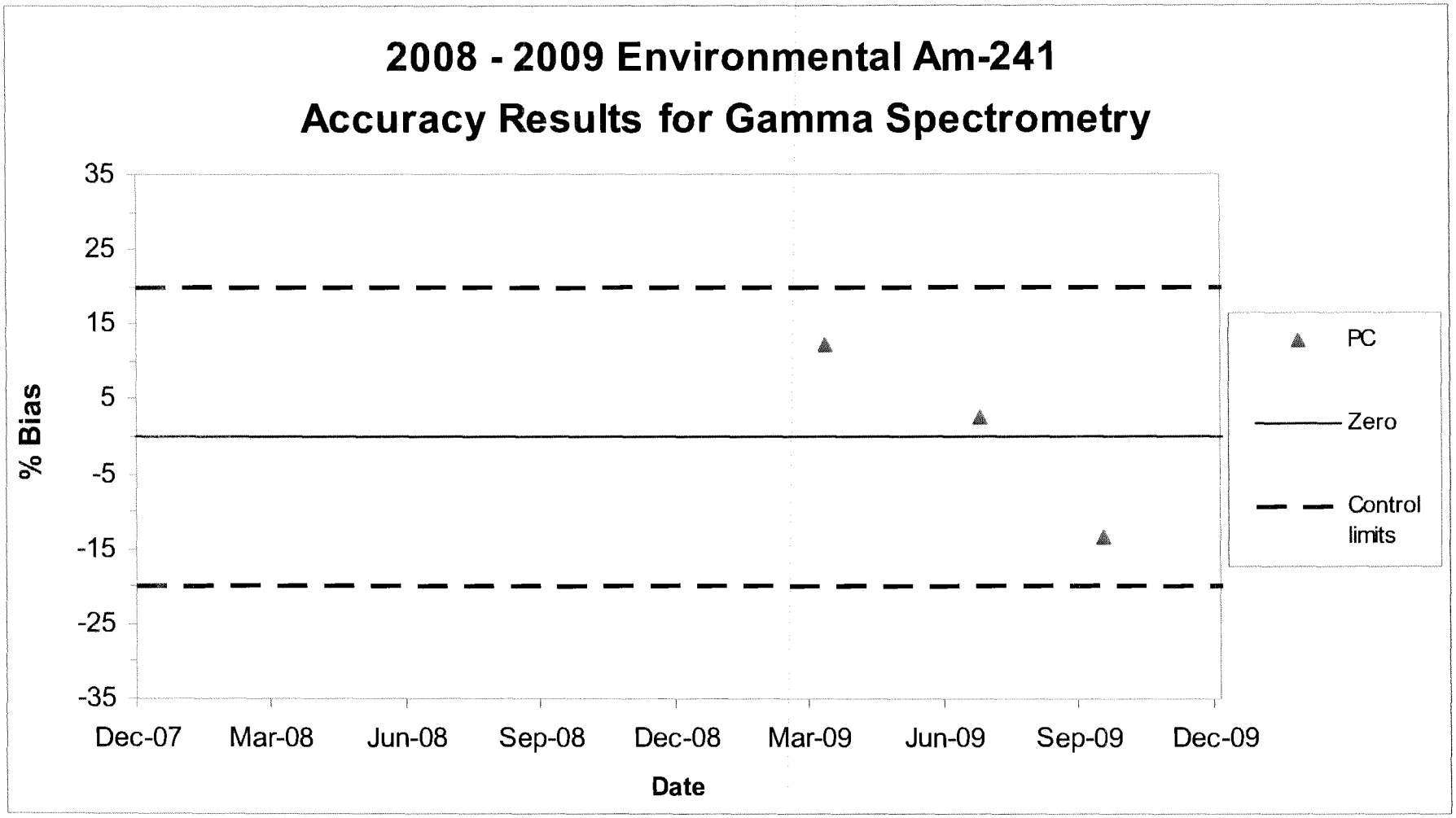
PROCEDURE NUMBER	TITLE	REVISION NUMBER	EFFECTIVE DATE	SUMMARY OF REVISION
770	Laboratory Quality Assurance and Control Programs	4	09/29/09	Duplicate sample submittal steps were added to indicate when duplicate samples should be analyzed at the same time as the reference samples. Sample preparation steps were added for MAPEP soil and vegetation samples. A step was added to require that internal assessment reports be issued within 30 days of completion of the assessment. A step was added to define internal assessment findings and recommendations and require that findings be documented in a Condition Report. Quality impact: Improved quality through timely documentation of assessment findings and recommendations.
790	Laboratory Batch Quality Control Handling	2	03/16/09	Several steps were added to make the procedure flow better. Flexibility to start sample analyses prior to creation of the batch QC samples, with management approval, was added. Unnecessary sections of FORM 790.2 were deleted.
1014	Calibration of the Panasonic UD-710A TLD Reader	12	11/03/09	A precaution was added to allow a grace period of +/-33% to the calibration periodicity requirement.
1030	Daily Quality Control Response Check of the Panasonic UD-710A TLD Reader	11	11/03/09	A step was added to require that the room temperature and humidity be recorded in the logbook each day the instrument is used.

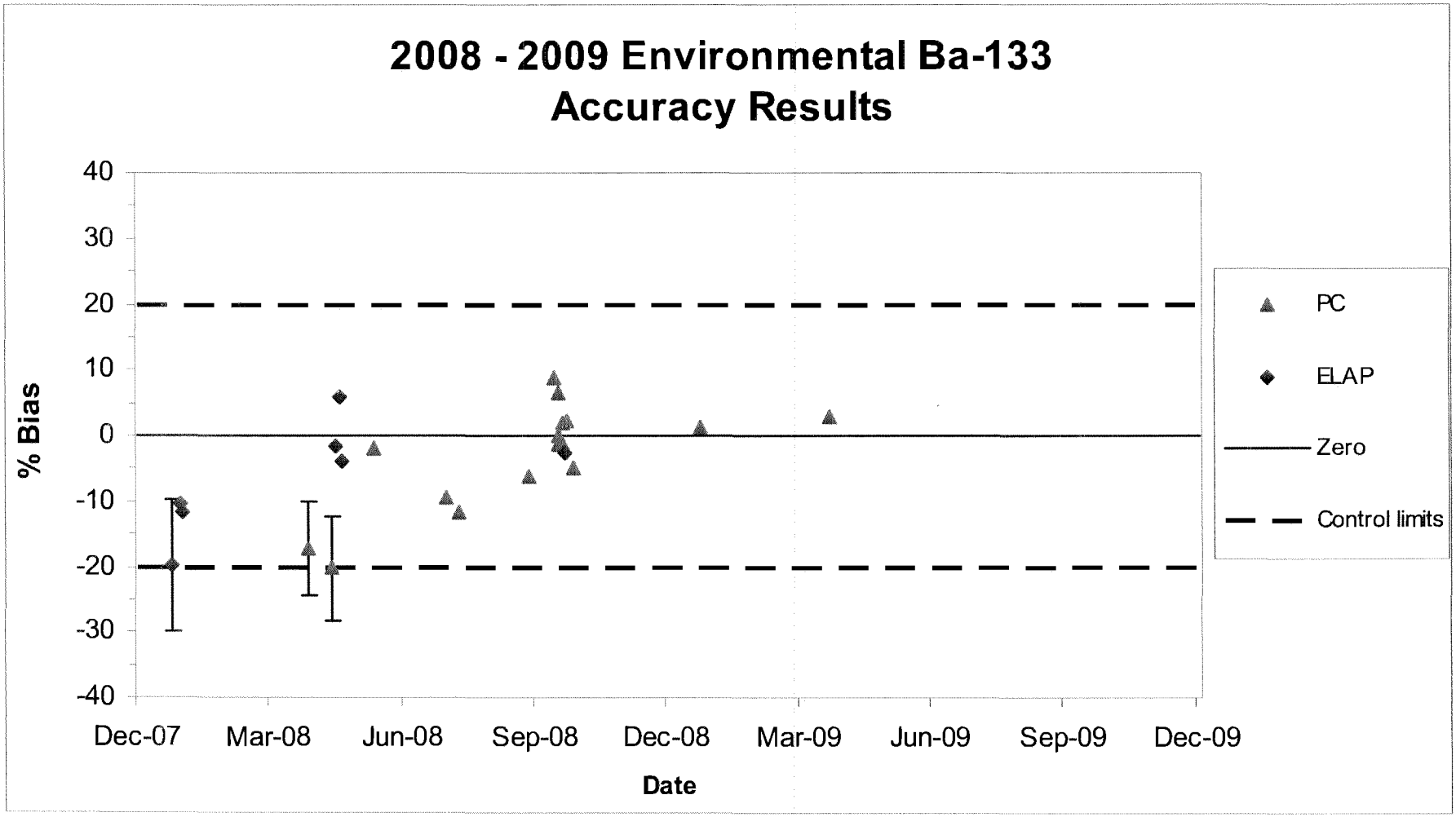
APPENDIX A

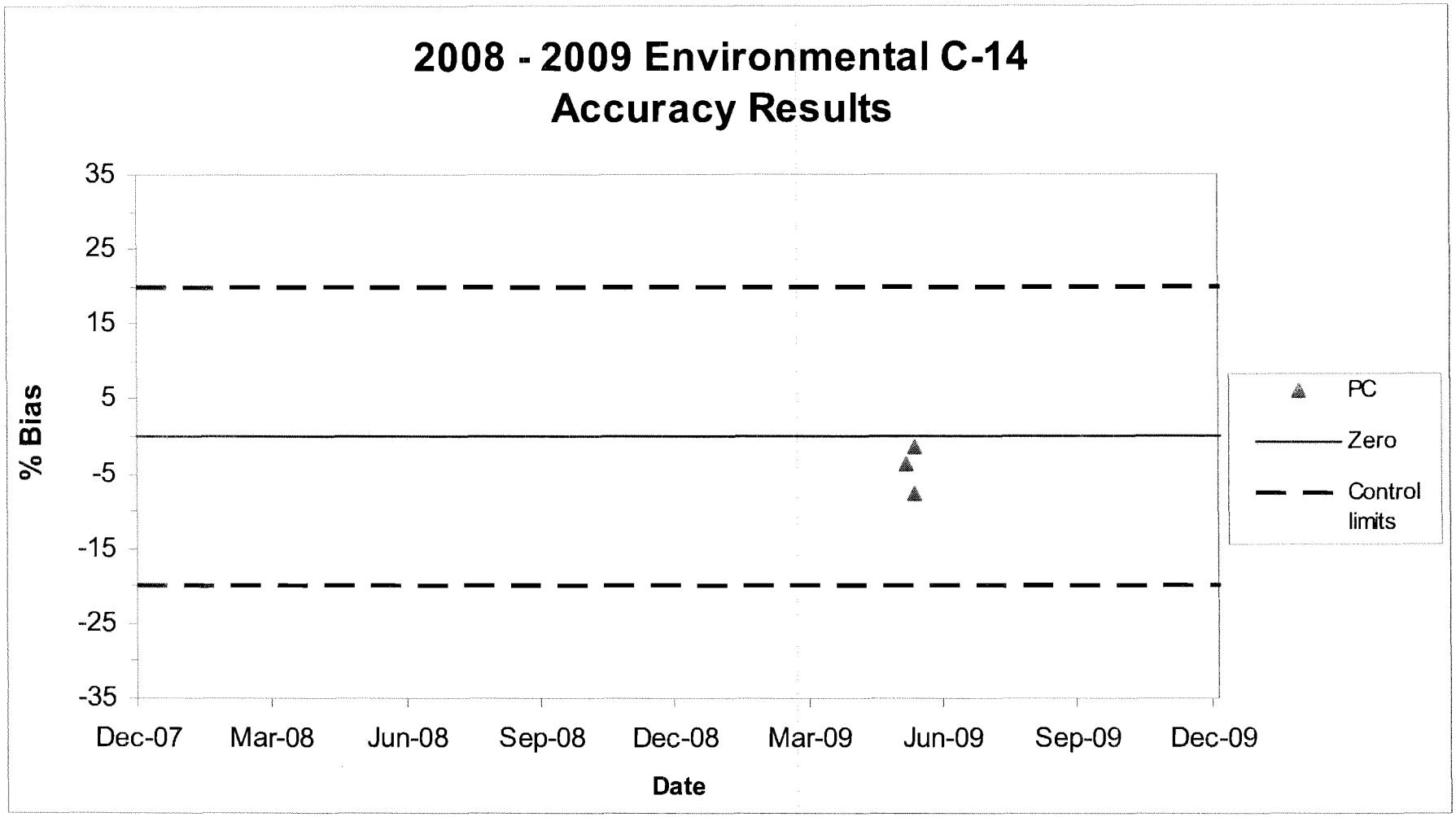
INTER/INTRA-LABORATORY, ENVIRONMENTAL MONITORING ANALYTICS, DOE, AND ERA/ELAP QUALITY CONTROL PROGRAM RESULTS

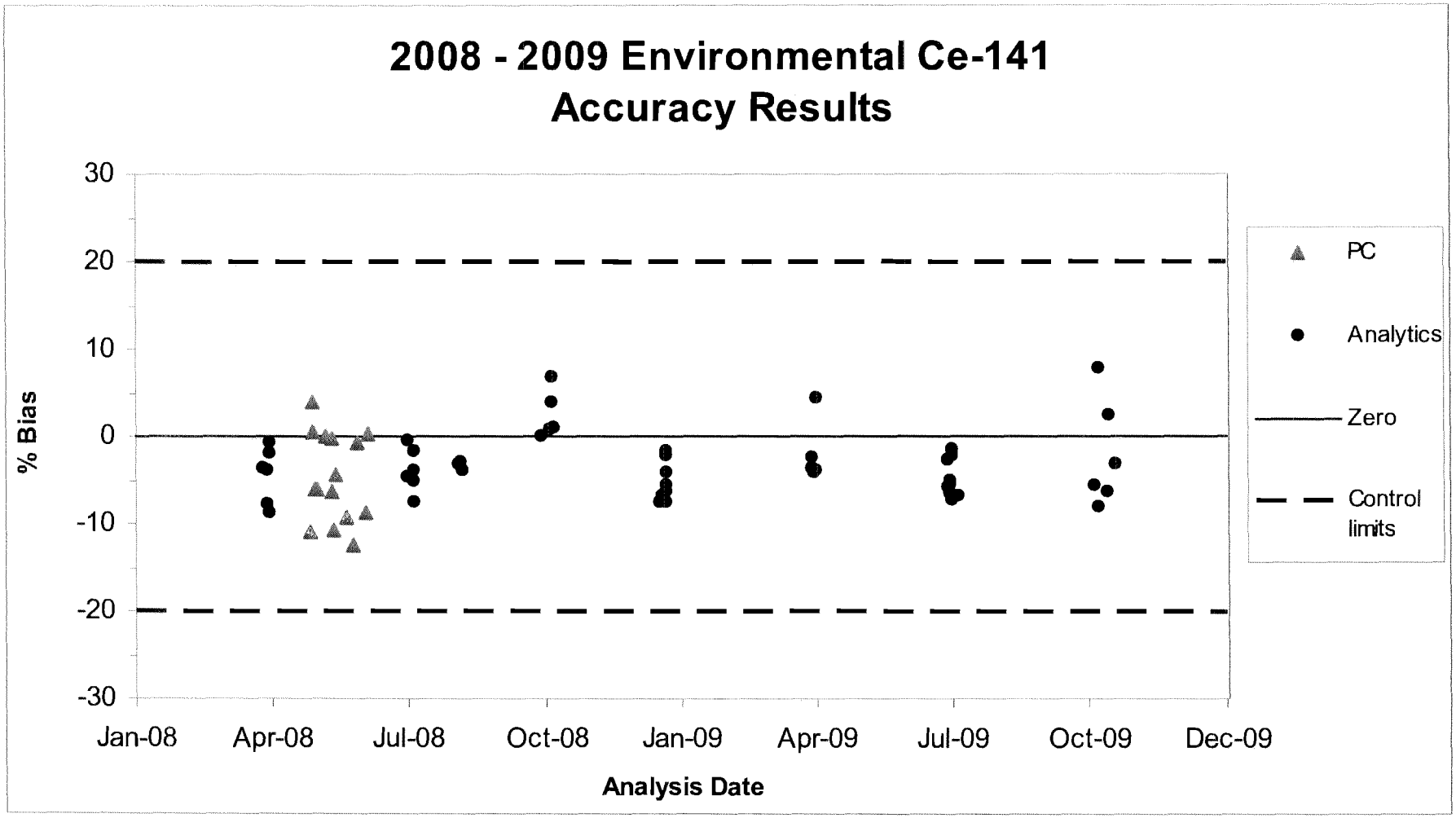


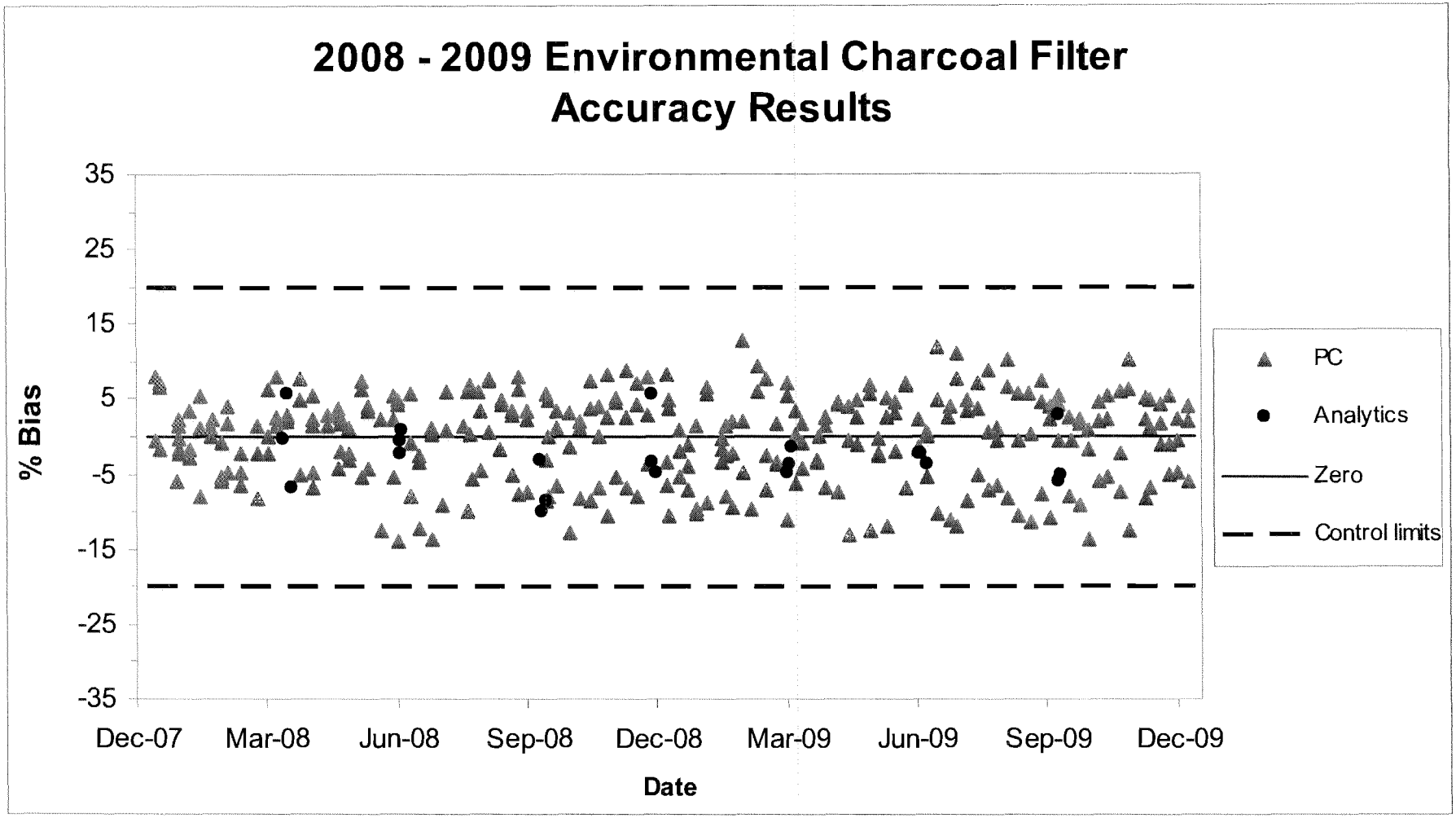
CR-09-13 was issued to investigate these negative biases.


2008 - 2009 Environmental Am-241
Accuracy Results for Gamma Spectrometry
% Bias
35
25
15
5
-5
-15
-25
-35
Dec-07
Mar-08
Jun-08
Sep-08
Dec-08
Mar-09
Jun-09
Sep-09
Dec-09
Date
PC
Zero
Control limits

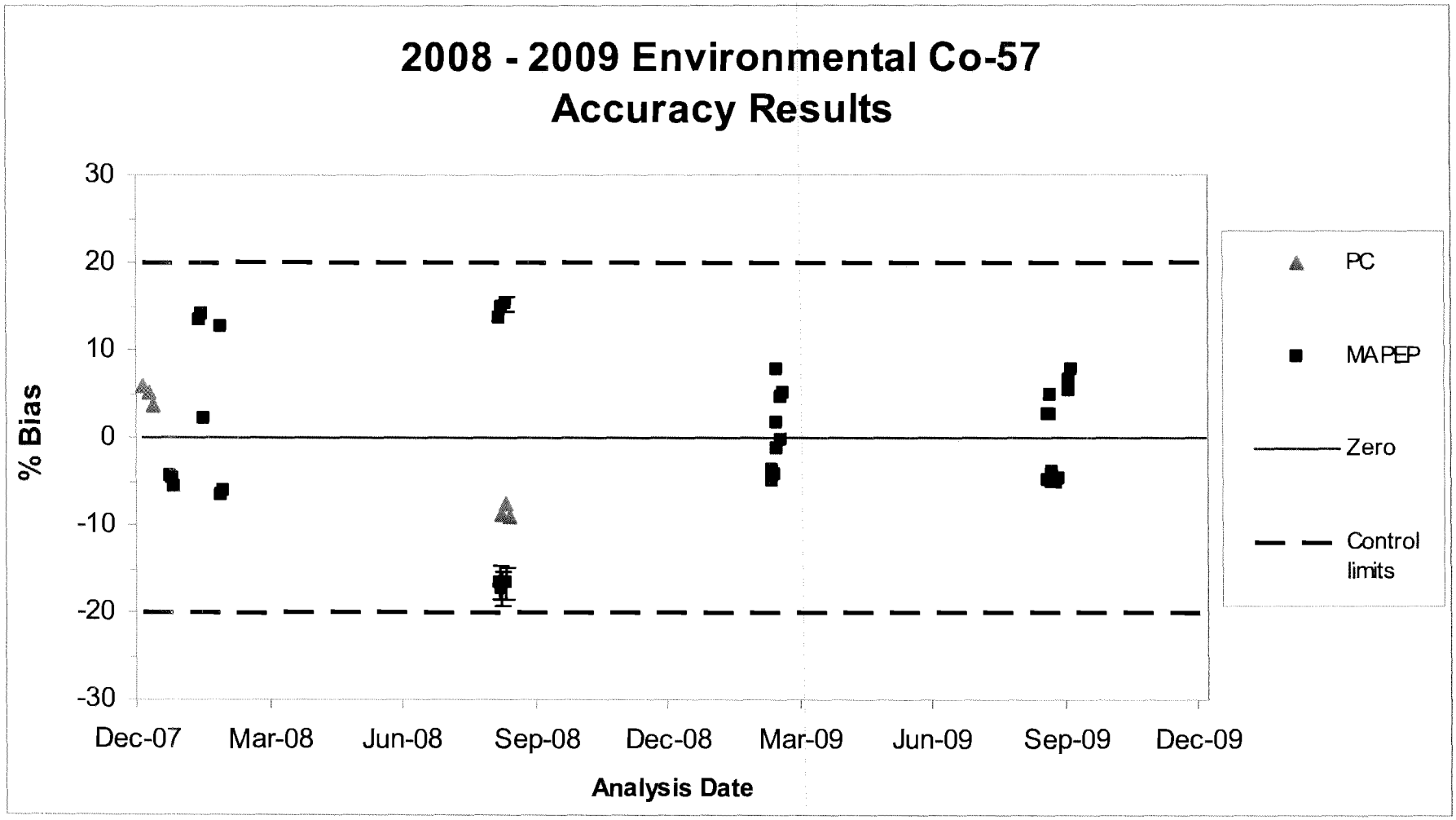

2008 - 2009 Environmental Ba-133
Accuracy Results
40
30
20
10
0
-10
-20
-30
-40
% Bias
Dec-07
Mar-08
Jun-08
Sep-08
Dec-08
Mar-09
Jun-09
Sep-09
Dec-09
Date
PC
ELAP
Zero
Control limits

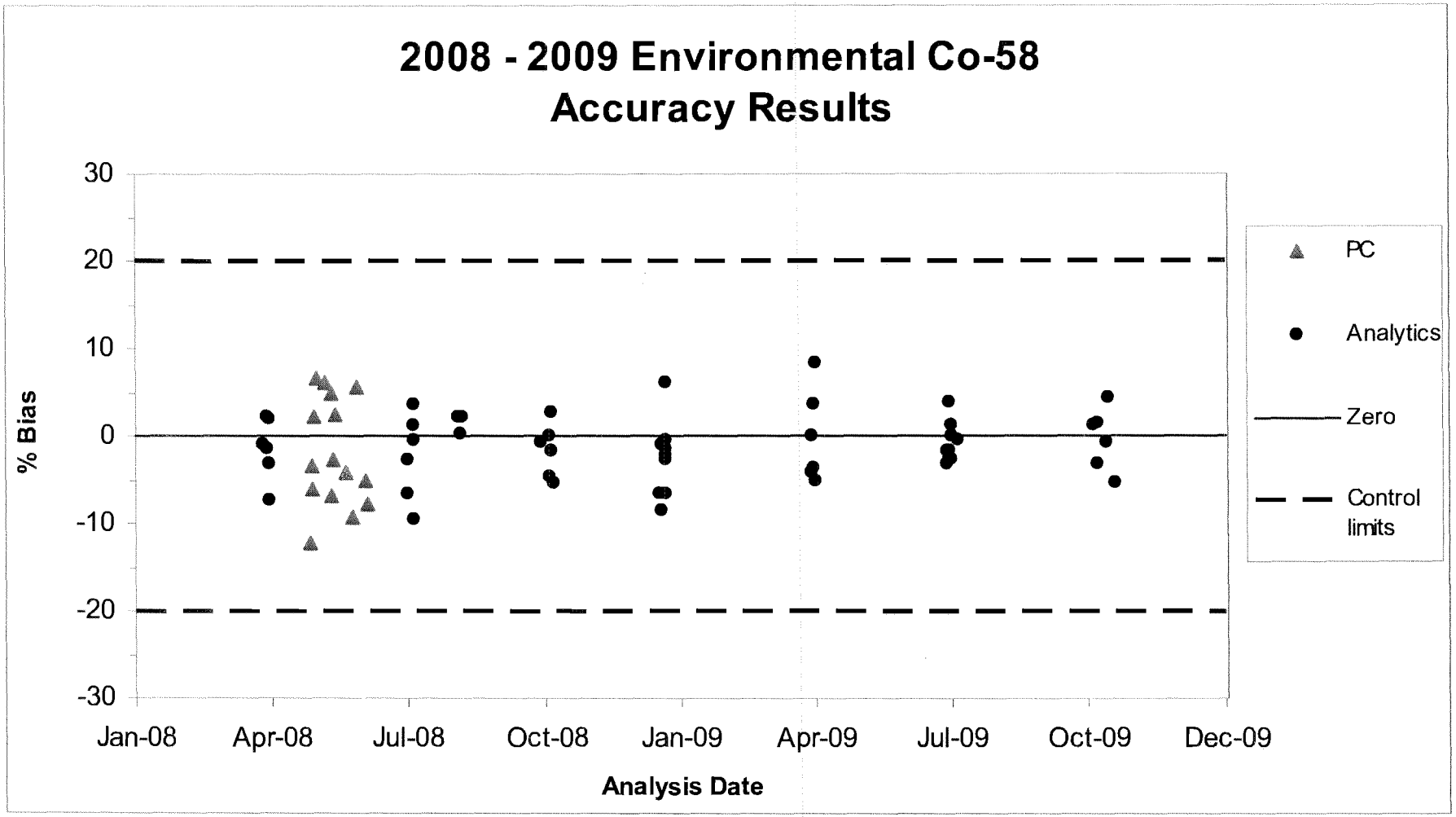

2008 - 2009 Environmental C-14
Accuracy Results
% Bias
35
25
15
5
-5
-15
-25
-35
Dec-07
Mar-08
Jun-08
Sep-08
Dec-08
Mar-09
Jun-09
Sep-09
Dec-09
Date
PC
Zero
Control limits

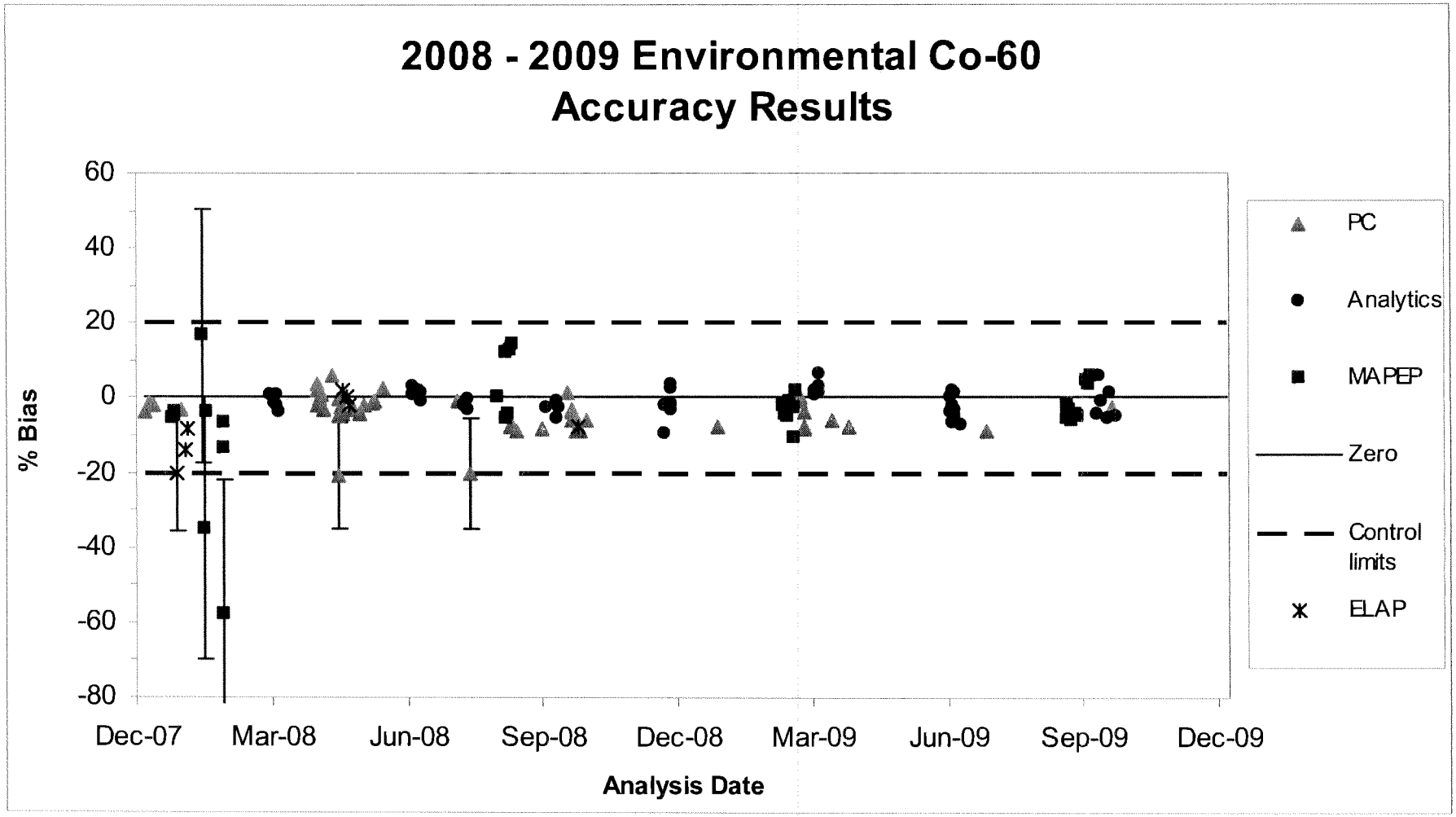

2008 - 2009 Environmental Ce-141
Accuracy Results
30
20
10
0
-10
-20
-30
% Bias
Jan-08
Apr-08
Jul-08
Oct-08
Jan-09
Apr-09
Jul-09
Oct-09
Dec-09
Analysis Date
PC
Analytics
Zero
Control limits

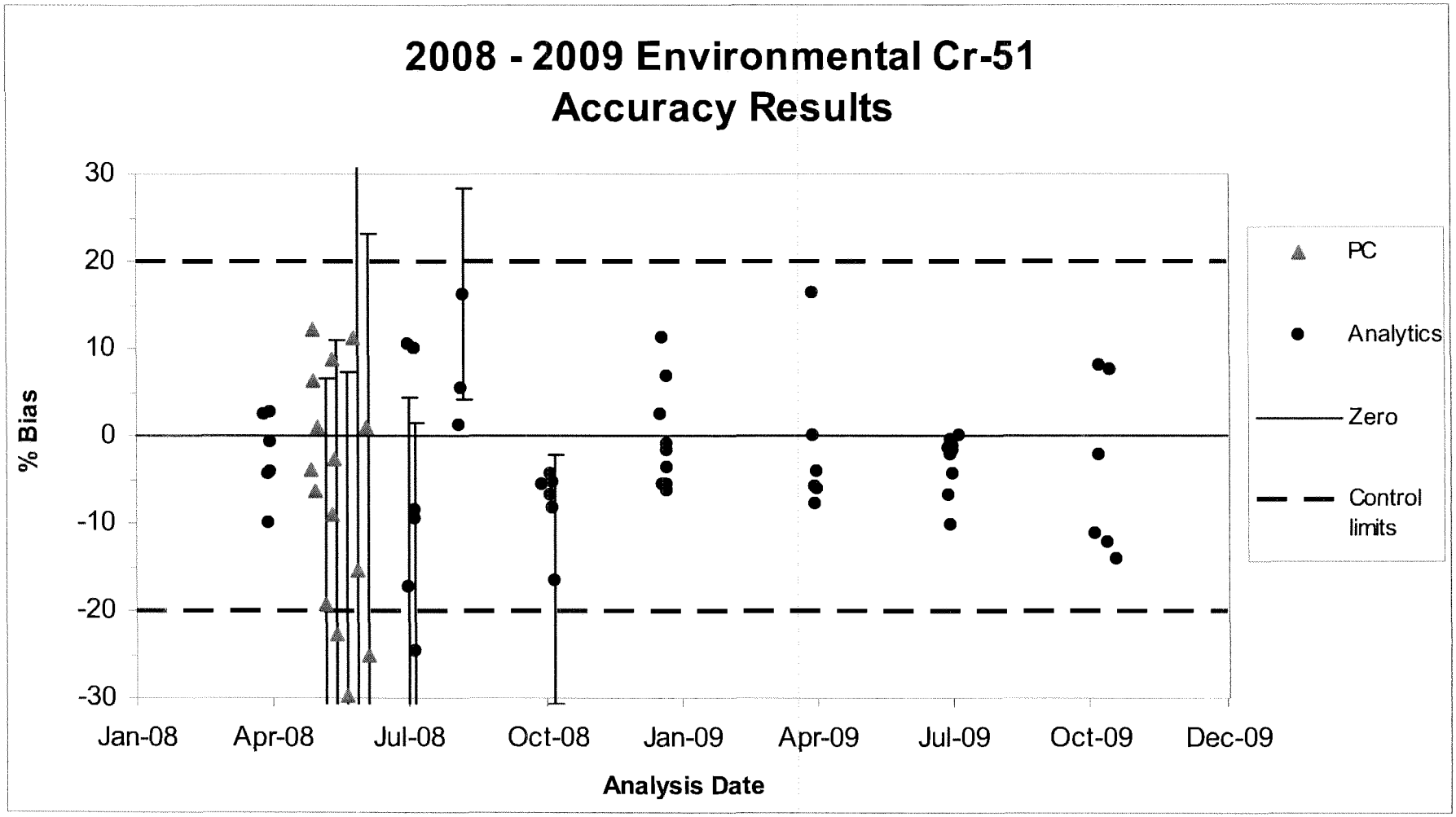


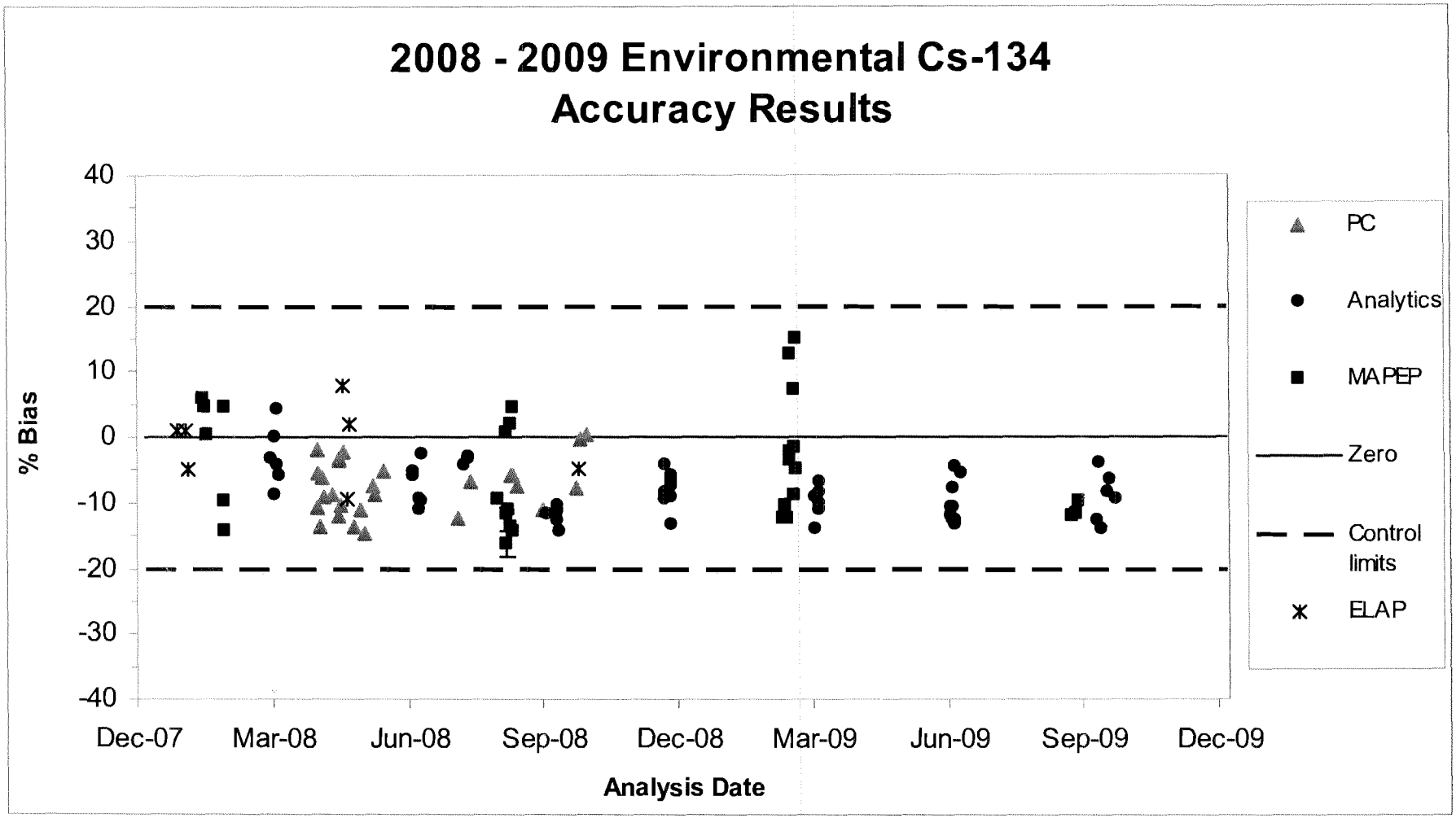
All 2008 charcoal results originally reported without the application of summing corrections were updated in accordance with CR 08-23. The graph reflects the updated data.

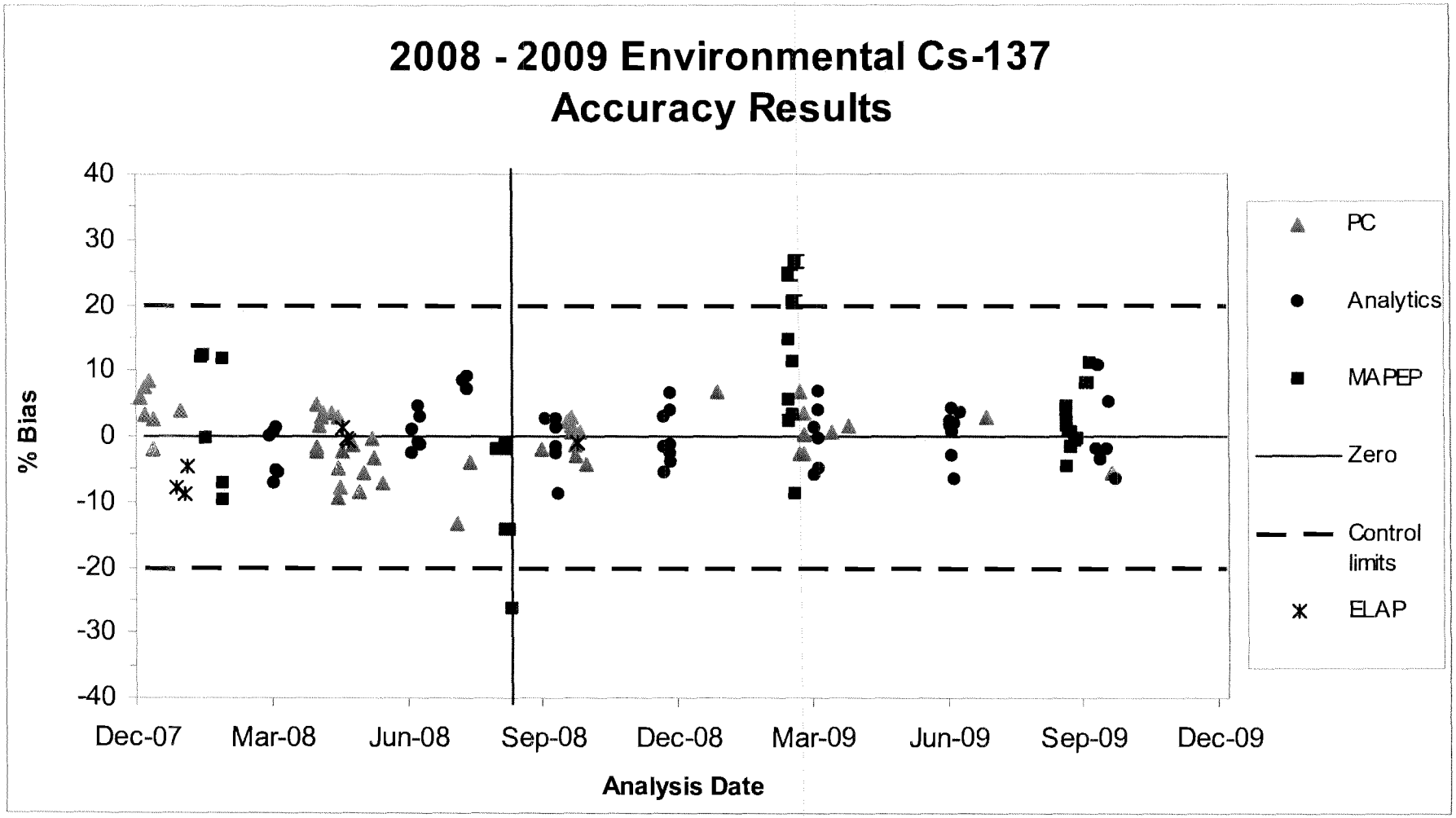

2008 - 2009 Environmental Co-57
Accuracy Results
30
20
10
0
-10
-20
-30
% Bias
Dec-07
Mar-08
Jun-08
Sep-08
Dec-08
Mar-09
Jun-09
Sep-09
Dec-09
Analysis Date
PC
MAPEP
Zero
Control limits


2008 - 2009 Environmental Co-58
Accuracy Results
30
20
10
0
-10
-20
-30
% Bias
Jan-08
Apr-08
Jul-08
Oct-08
Jan-09
Apr-09
Jul-09
Oct-09
Dec-09
Analysis Date
PC
Analytics
Zero
Control limits

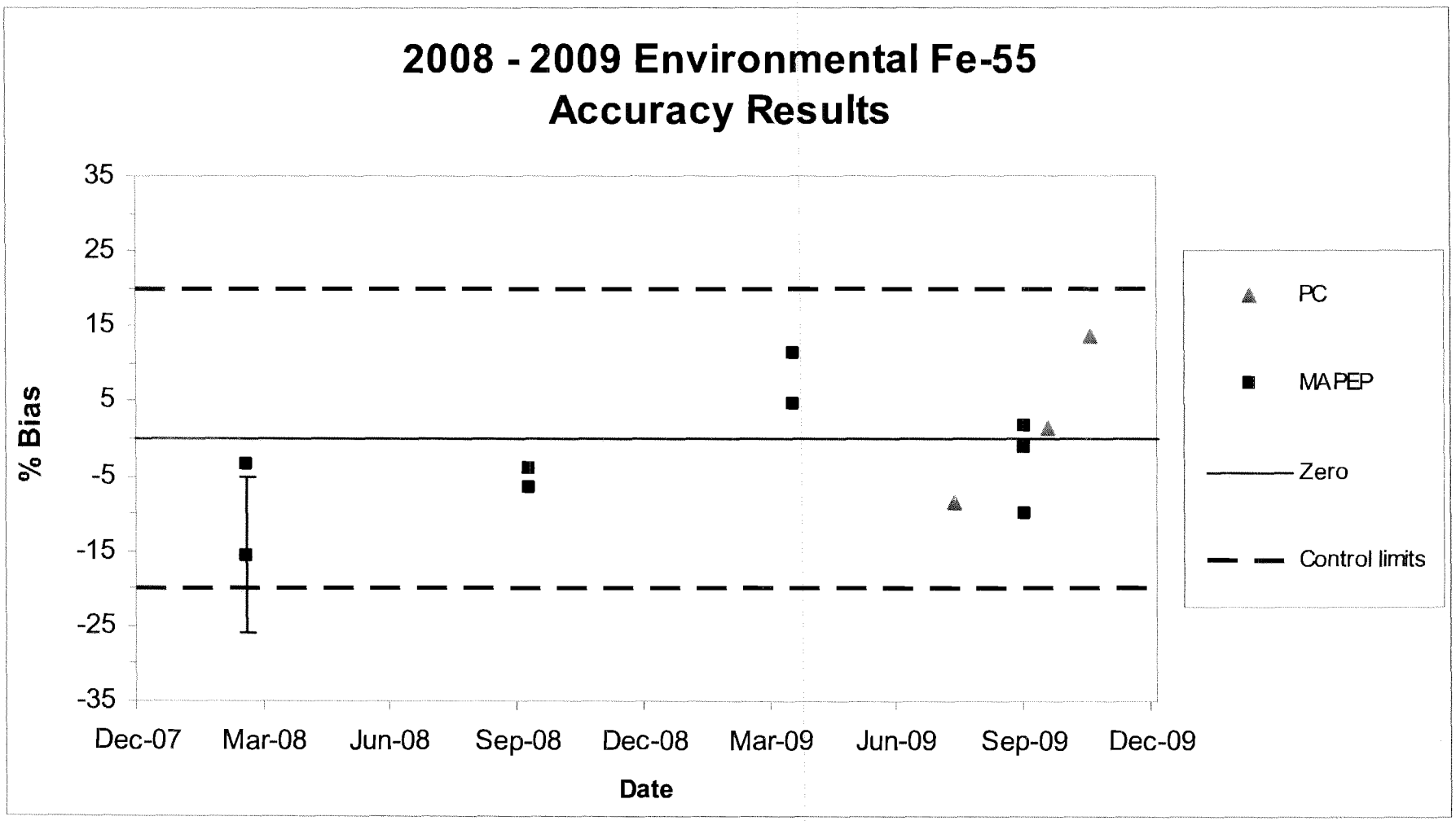

2008 - 2009 Environmental Co-60
Accuracy Results
60
40
20
0
-20
-40
-60
-80
% Bias
Dec-07
Mar-08
Jun-08
Sep-08
Dec-08
Mar-09
Jun-09
Sep-09
Dec-09
Analysis Date
PC
Analytics
MAPEP
Zero
Control limits
ELAP

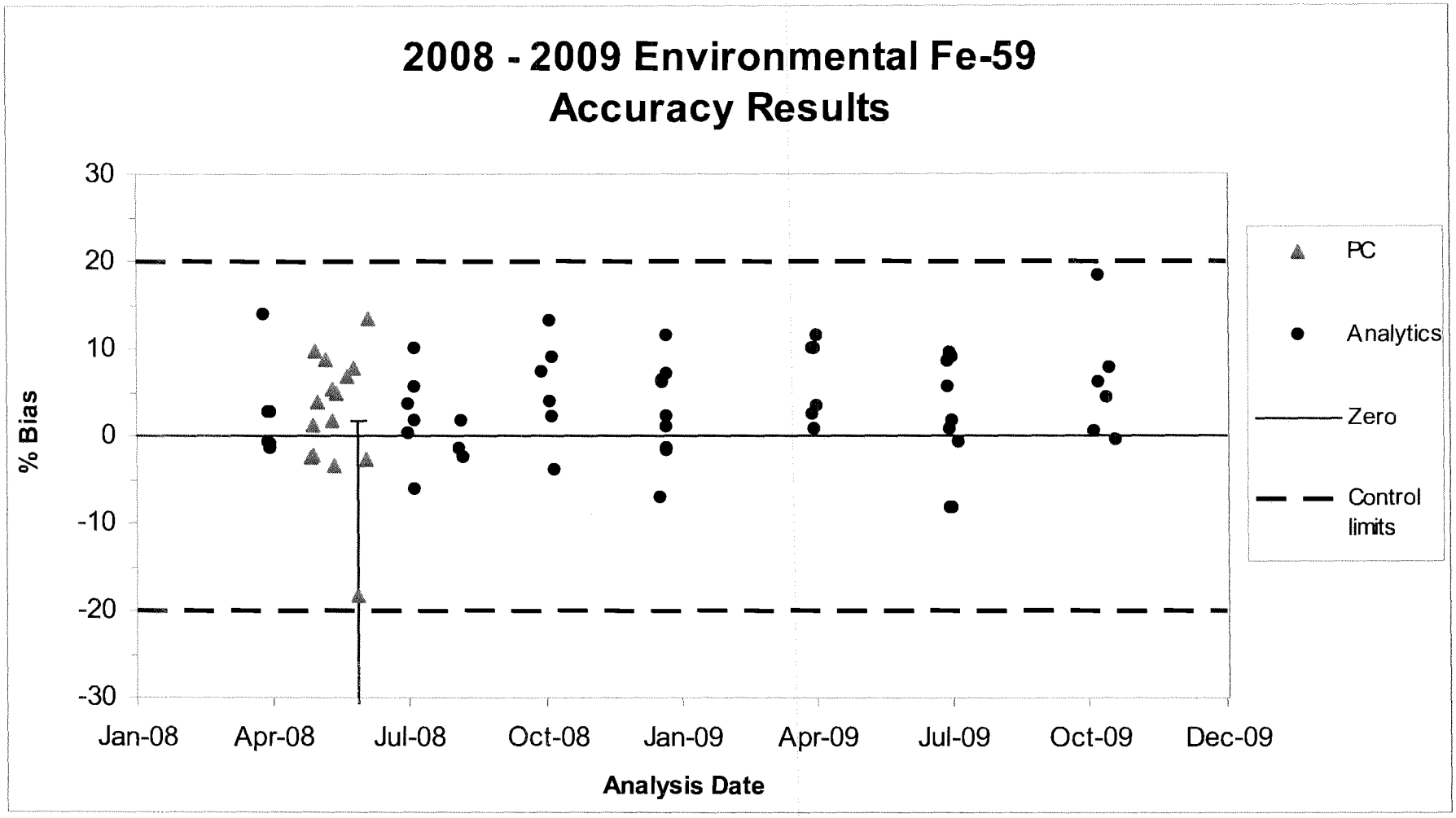

2008 - 2009 Environmental Cr-51
Accuracy Results
30
20
10
0
-10
-20
-30
% Bias
Jan-08
Apr-08
Jul-08
Oct-08
Jan-09
Apr-09
Jul-09
Oct-09
Dec-09
Analysis Date
PC
Analytics
Zero
Control limits

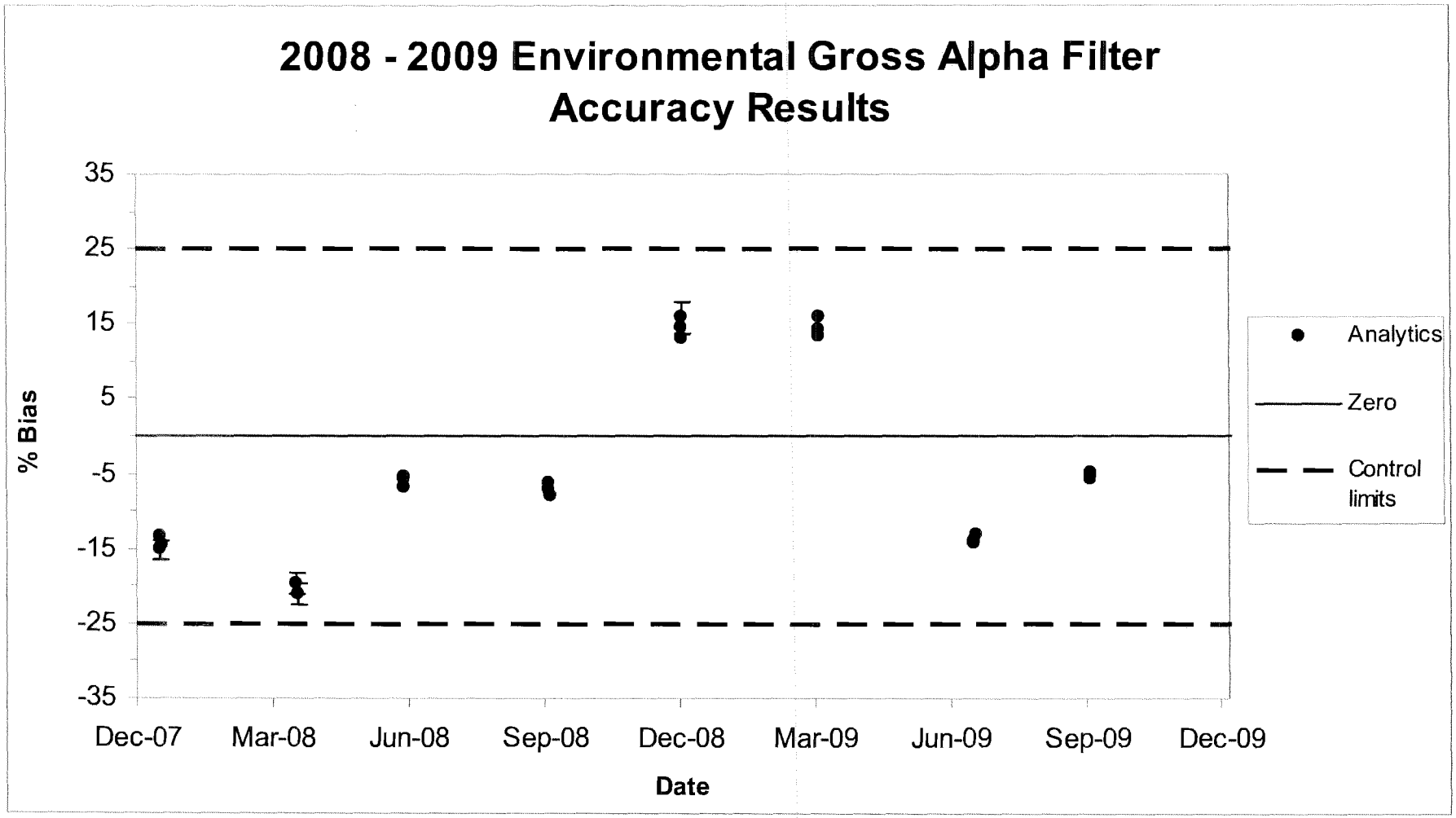

2008 - 2009 Environmental Cs-134
Accuracy Results
40
30
20
10
0
-10
-20
-30
-40
% Bias
Dec-07
Mar-08
Jun-08
Sep-08
Dec-08
Mar-09
Jun-09
Sep-09
Dec-09
Analysis Date
PC
Analytics
MAPEP
Zero
Control limits
ELAP

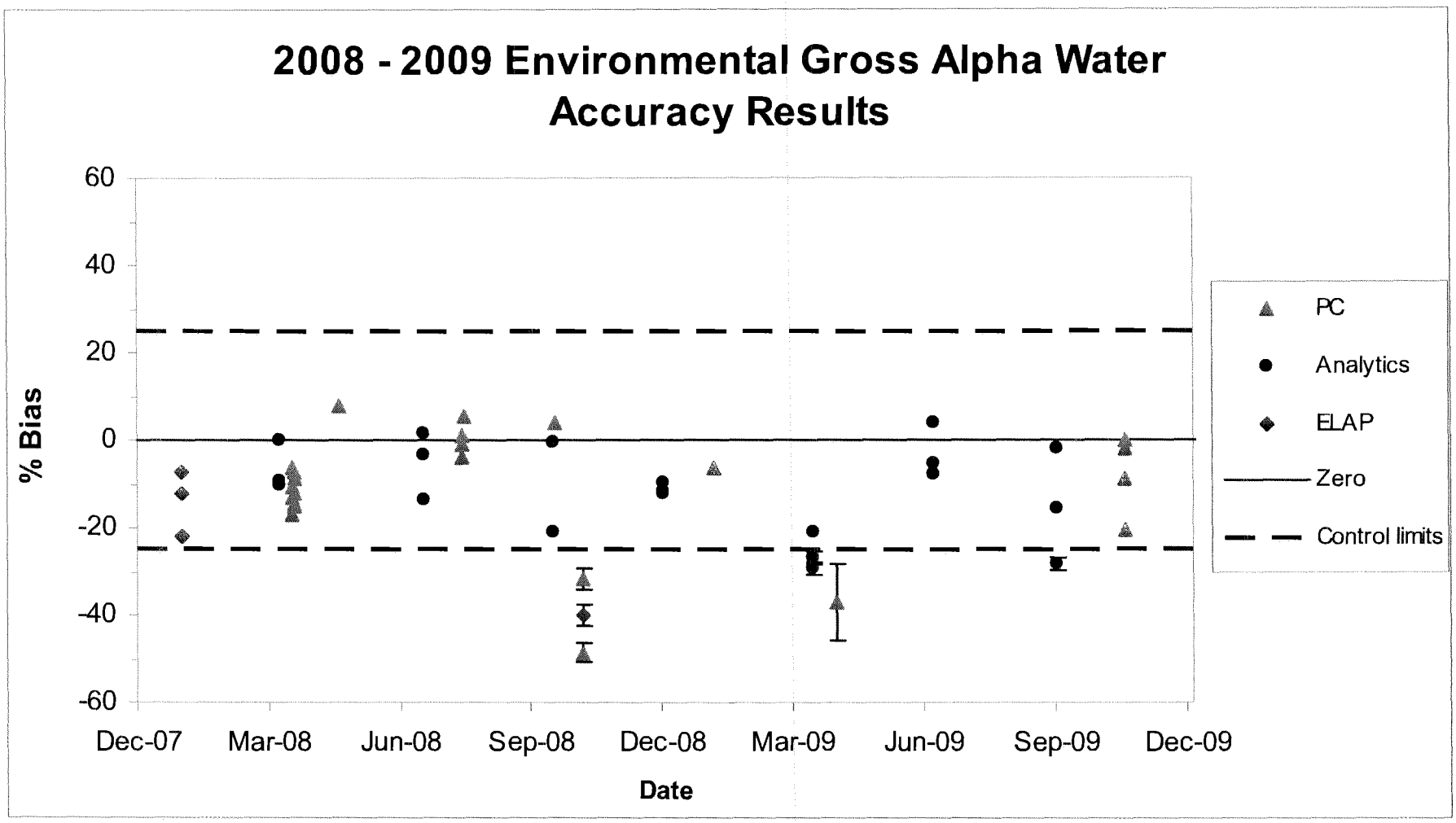


CR-09-14 was issued to investigate the positive biases in the MAPEP soil sample.

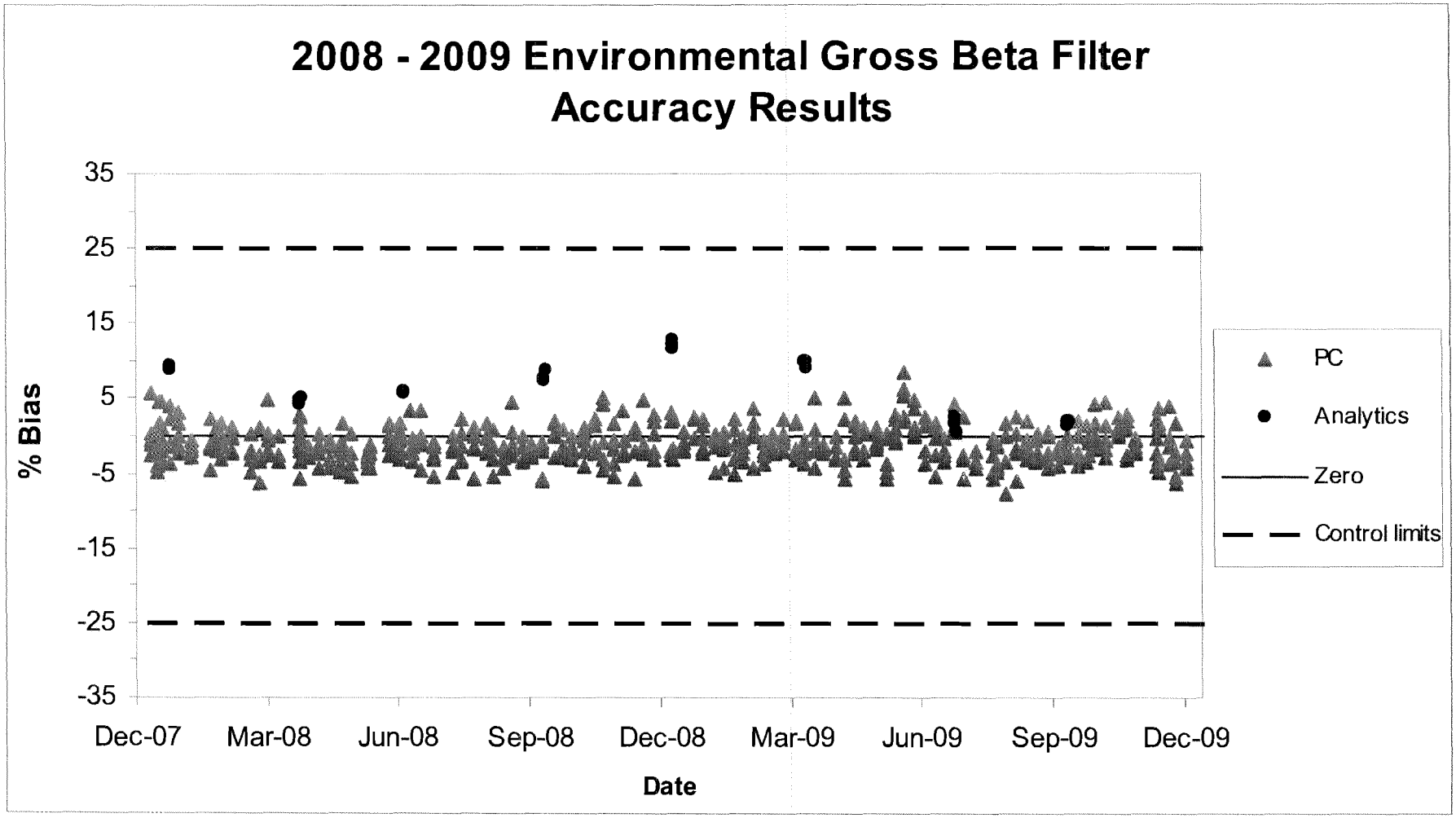

2008 - 2009 Environmental Fe-55
Accuracy Results
35
25
15
5
-5
-15
-25
-35
% Bias
Dec-07
Mar-08
Jun-08
Sep-08
Dec-08
Mar-09
Jun-09
Sep-09
Dec-09
Date
PC
MAPEP
Zero
Control limits

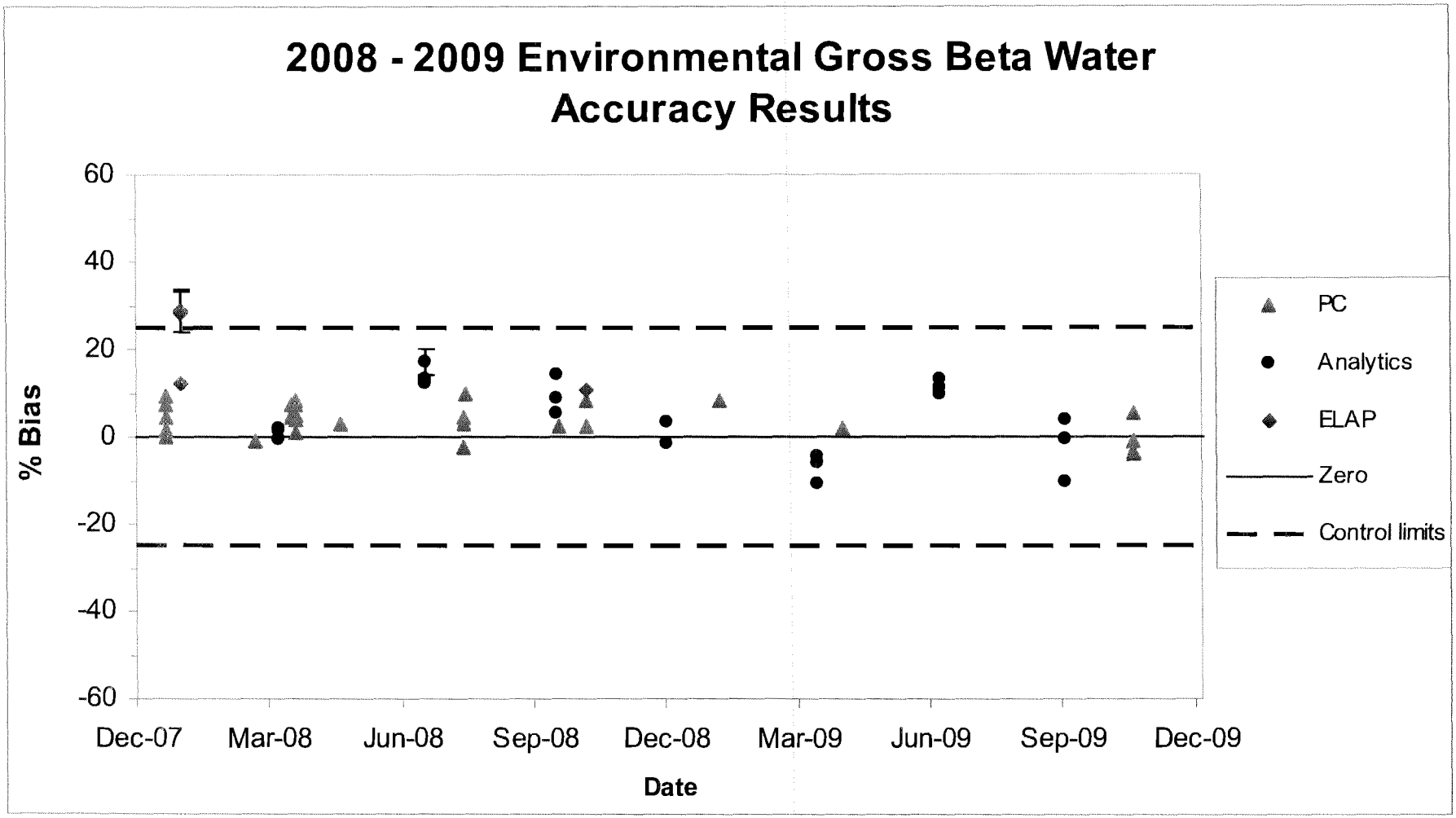

2008 - 2009 Environmental Fe-59
Accuracy Results
30
20
10
0
-10
-20
-30
% Bias
Jan-08
Apr-08
Jul-08
Oct-08
Jan-09
Apr-09
Jul-09
Oct-09
Dec-09
Analysis Date
PC
Analytics
Zero
Control limits

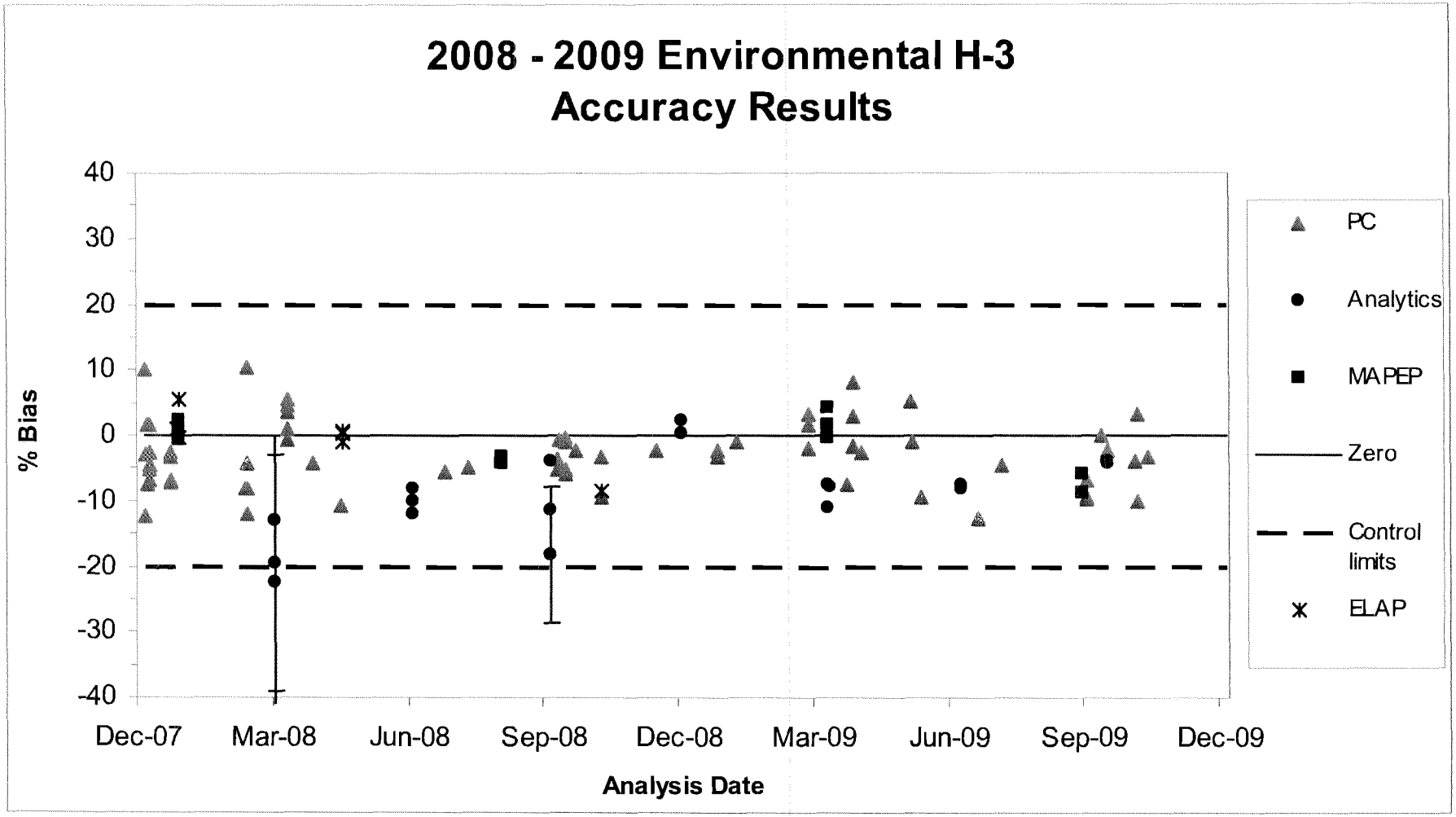

2008 - 2009 Environmental Gross Alpha Filter Accuracy Results
35
25
15
5
-5
-15
-25
-35
% Bias
Dec-07
Mar-08
Jun-08
Sep-08
Dec-08
Mar-09
Jun-09
Sep-09
Dec-09
Date
Analytics
Zero
Control limits

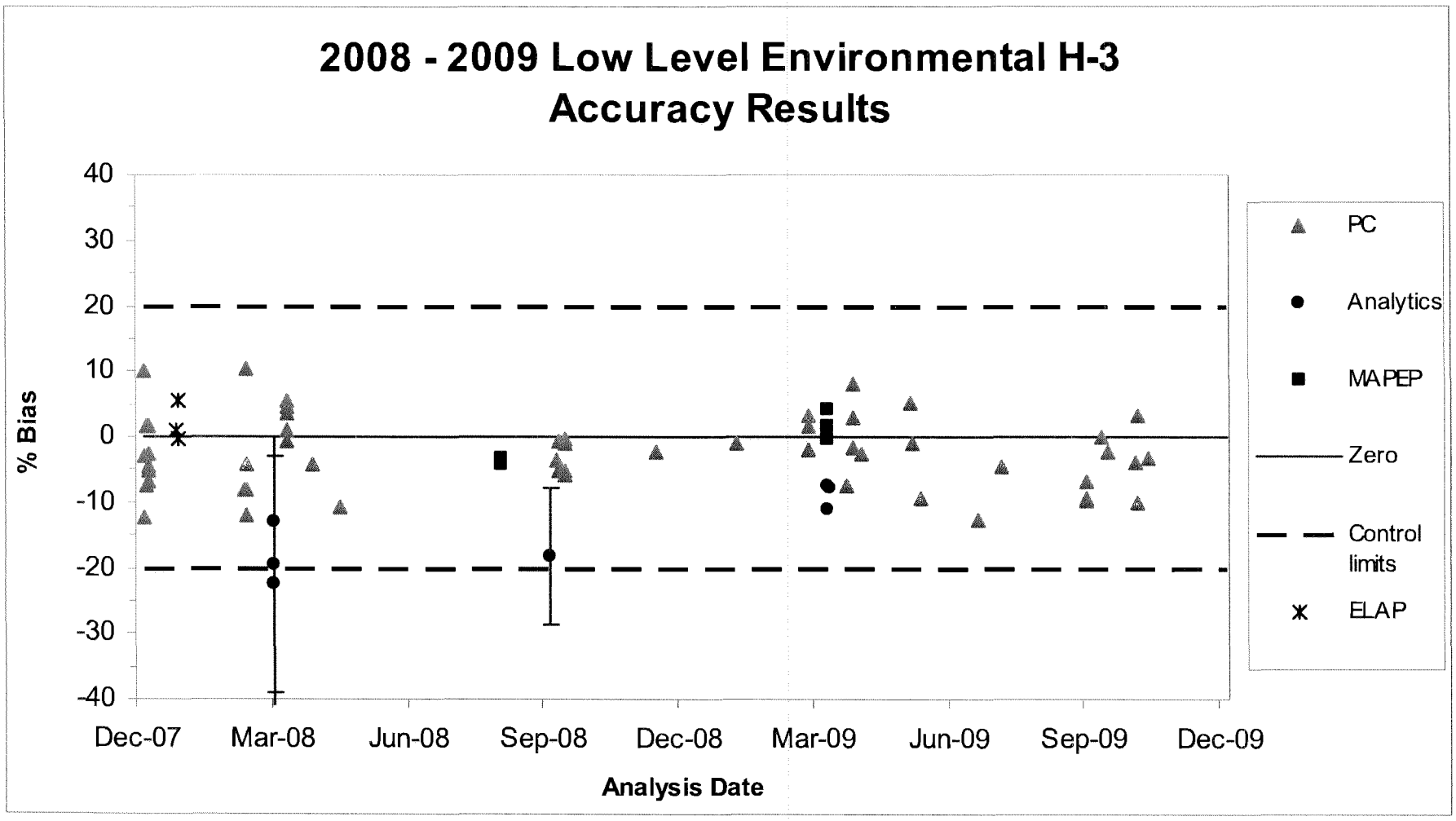


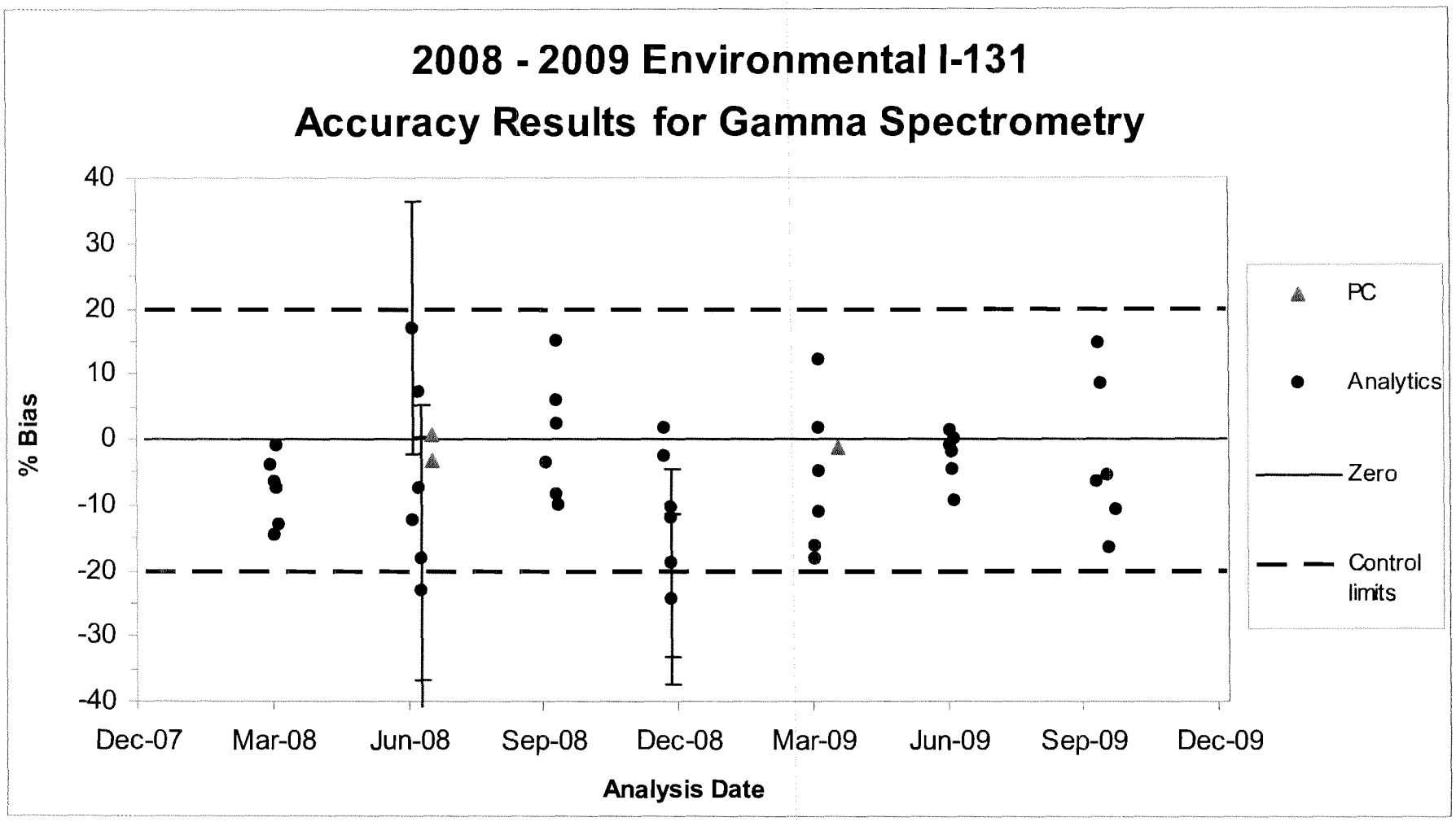
The percent difference of the mean value from the known value exceeded the Manual 100 criterion for accuracy for one set of Analytics samples. CR 09-21 was issued to investigate the failure.


2008 - 2009 Environmental Gross Beta Filter Accuracy Results
35
25
15
5
-5
-15
-25
-35
% Bias
Dec-07
Mar-08
Jun-08
Sep-08
Dec-08
Mar-09
Jun-09
Sep-09
Dec-09
Date
PC
Analytics
Zero
Control limits

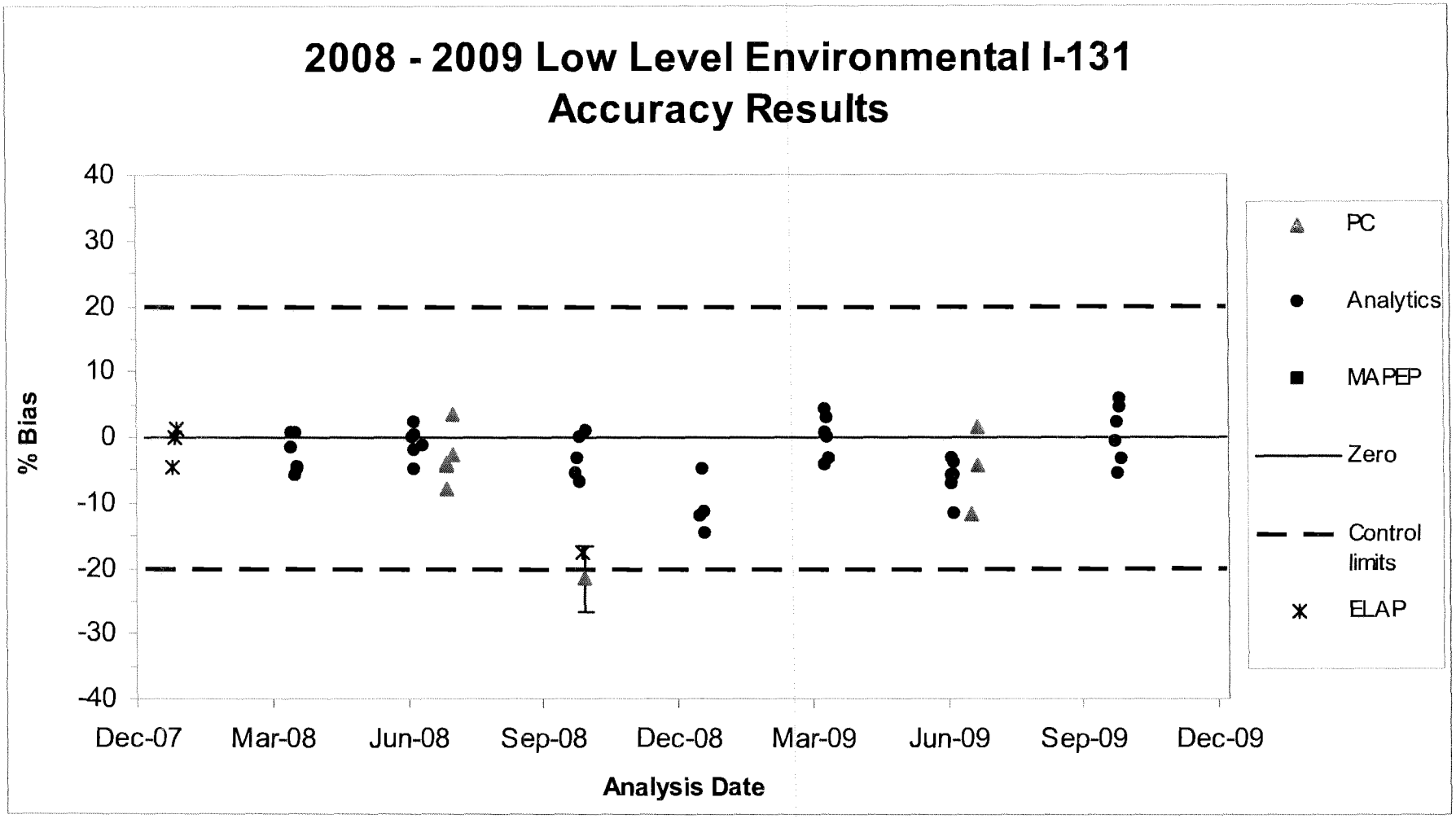

2008 - 2009 Environmental Gross Beta Water Accuracy Results
60
40
20
0
-20
-40
-60
% Bias
Dec-07
Mar-08
Jun-08
Sep-08
Dec-08
Mar-09
Jun-09
Sep-09
Dec-09
Date
PC
Analytics
ELAP
Zero
Control limits

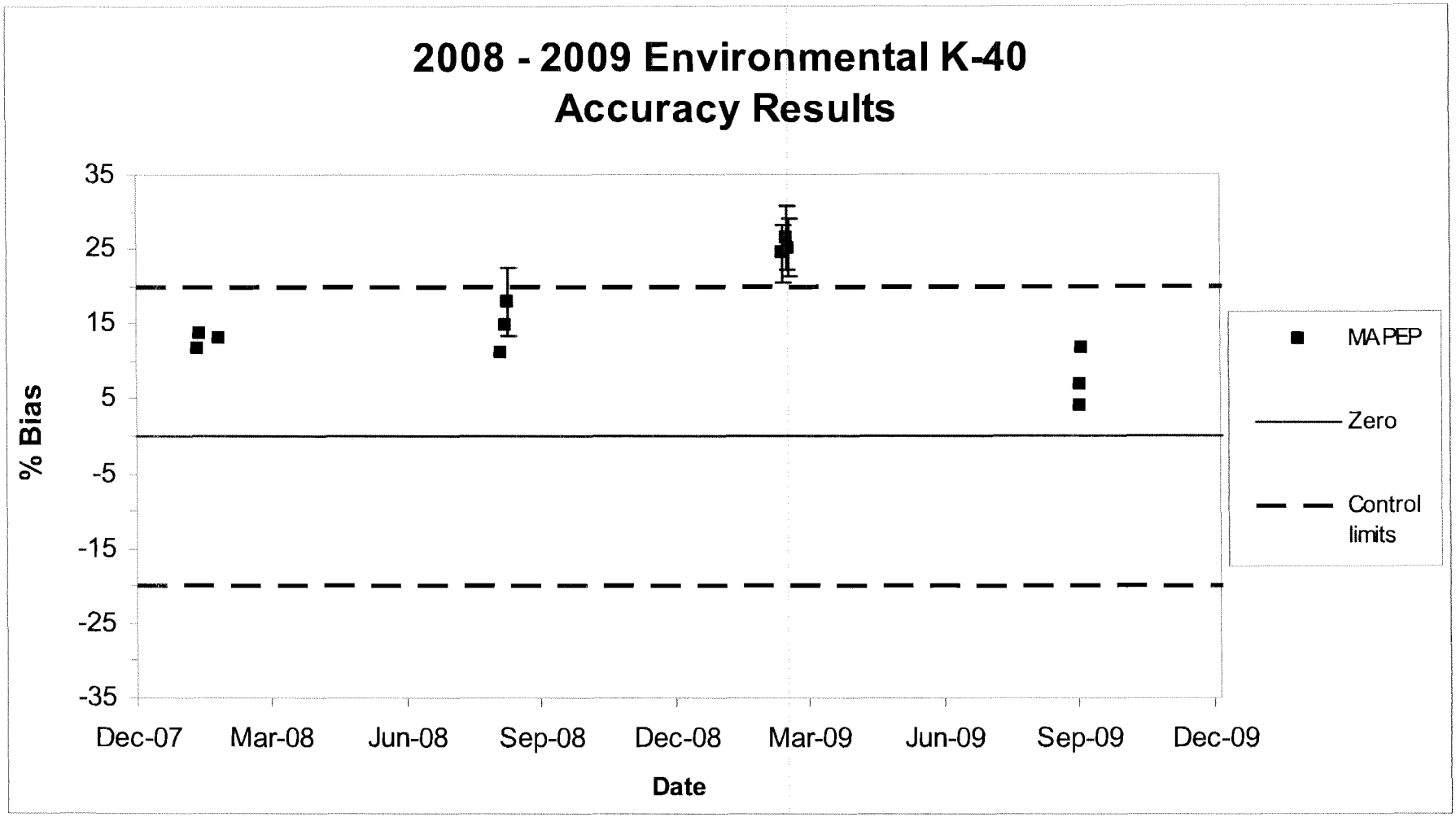

2008 - 2009 Environmental H-3
Accuracy Results
40
30
20
10
0
-10
-20
-30
-40
% Bias
Dec-07
Mar-08
Jun-08
Sep-08
Dec-08
Mar-09
Jun-09
Sep-09
Dec-09
Analysis Date
PC
Analytics
MAPEP
Zero
Control limits
ELAP


2008 - 2009 Low Level Environmental H-3
Accuracy Results
40
30
20
10
0
-10
-20
-30
-40
% Bias
Dec-07
Mar-08
Jun-08
Sep-08
Dec-08
Mar-09
Jun-09
Sep-09
Dec-09
Analysis Date
PC
Analytics
MAPEP
Zero
Control limits
ELAP

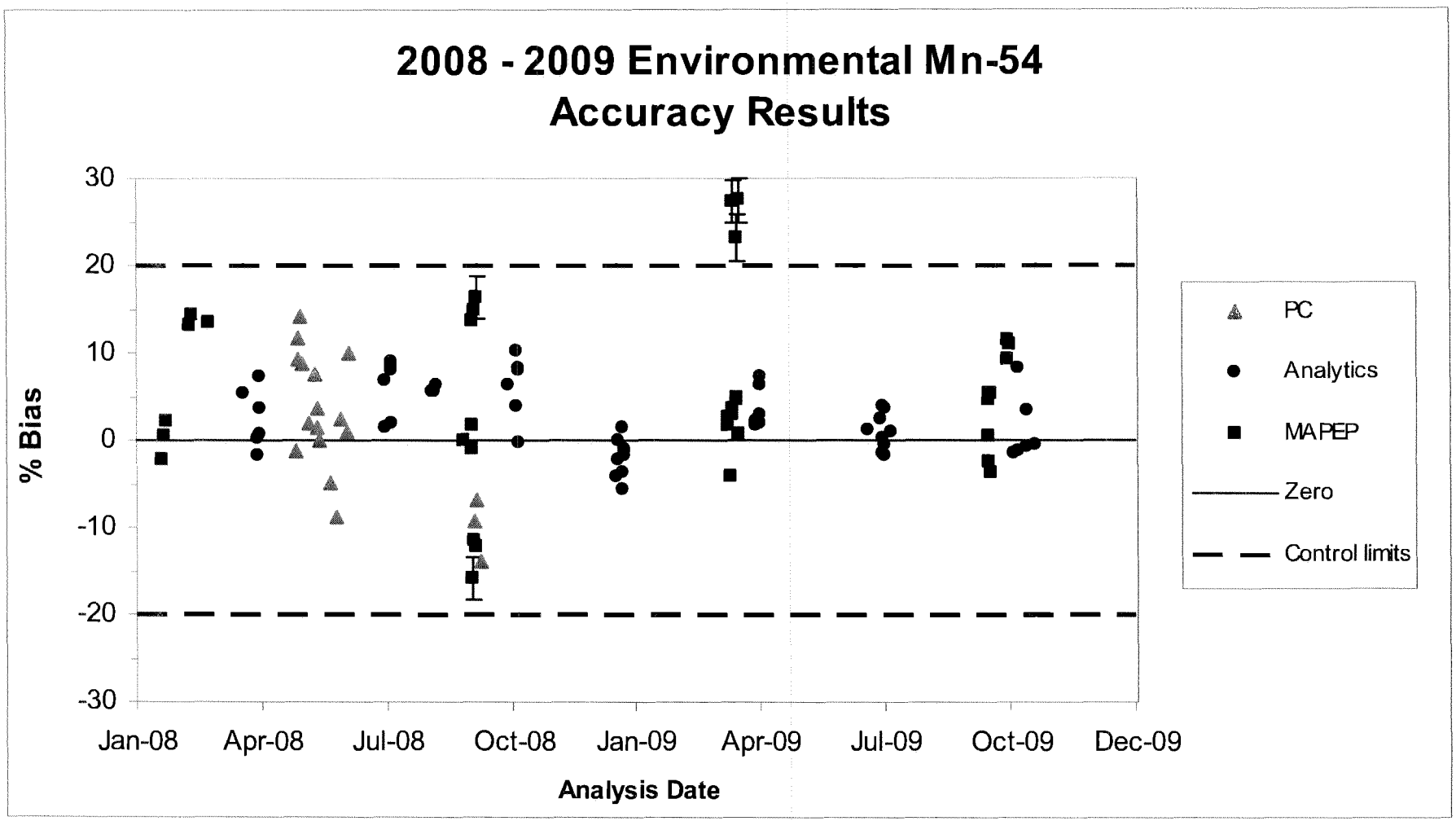


Two individual Analytics results fell outside the accuracy criterion. No investigation was necessary per Manual 100

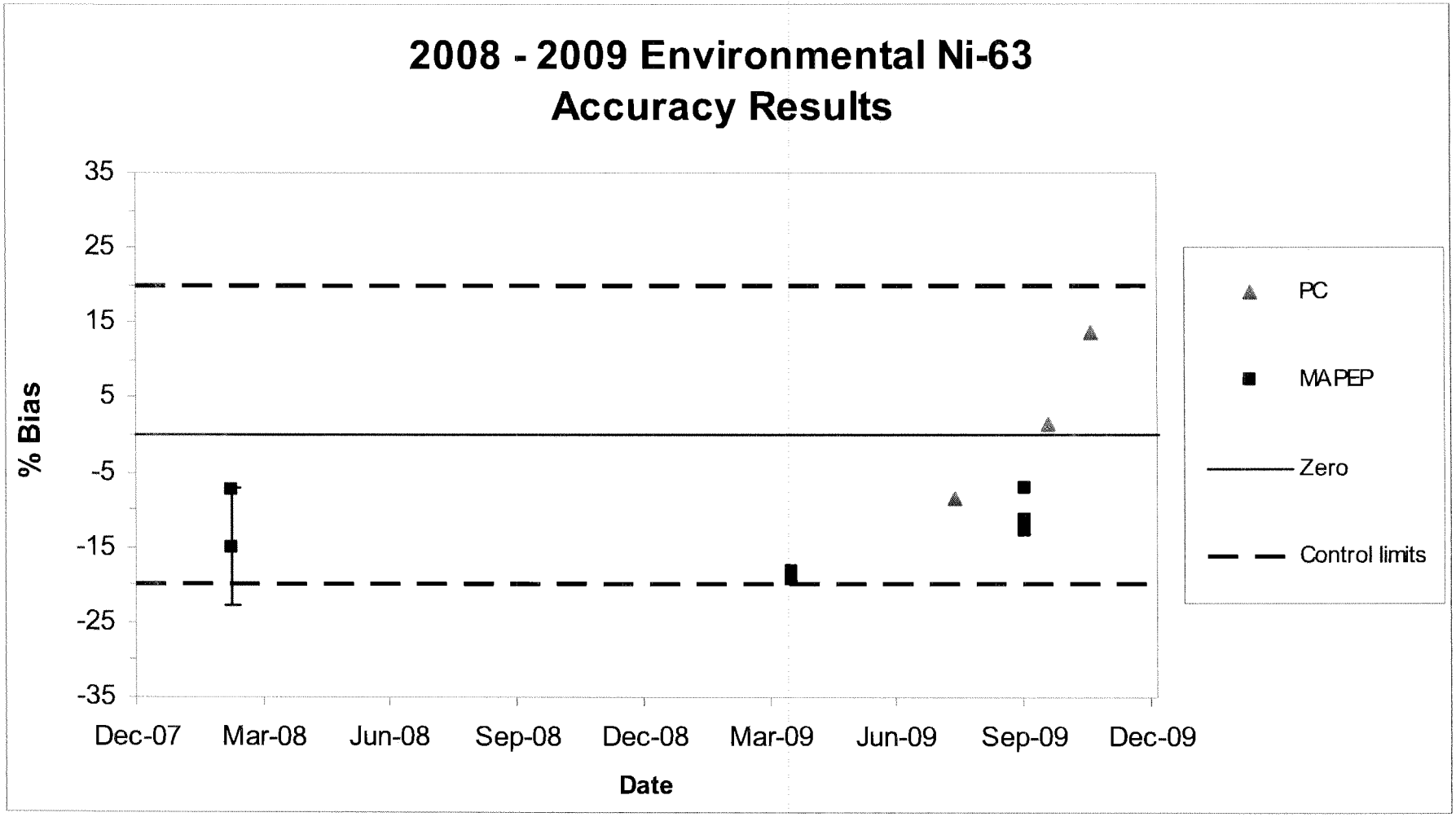

2008 - 2009 Low Level Environmental I-131
Accuracy Results
40
30
20
10
0
-10
-20
-30
-40
% Bias
Dec-07
Mar-08
Jun-08
Sep-08
Dec-08
Mar-09
Jun-09
Sep-09
Dec-09
Analysis Date
PC
Analytics
MAPEP
Zero
Control limits
ELAP

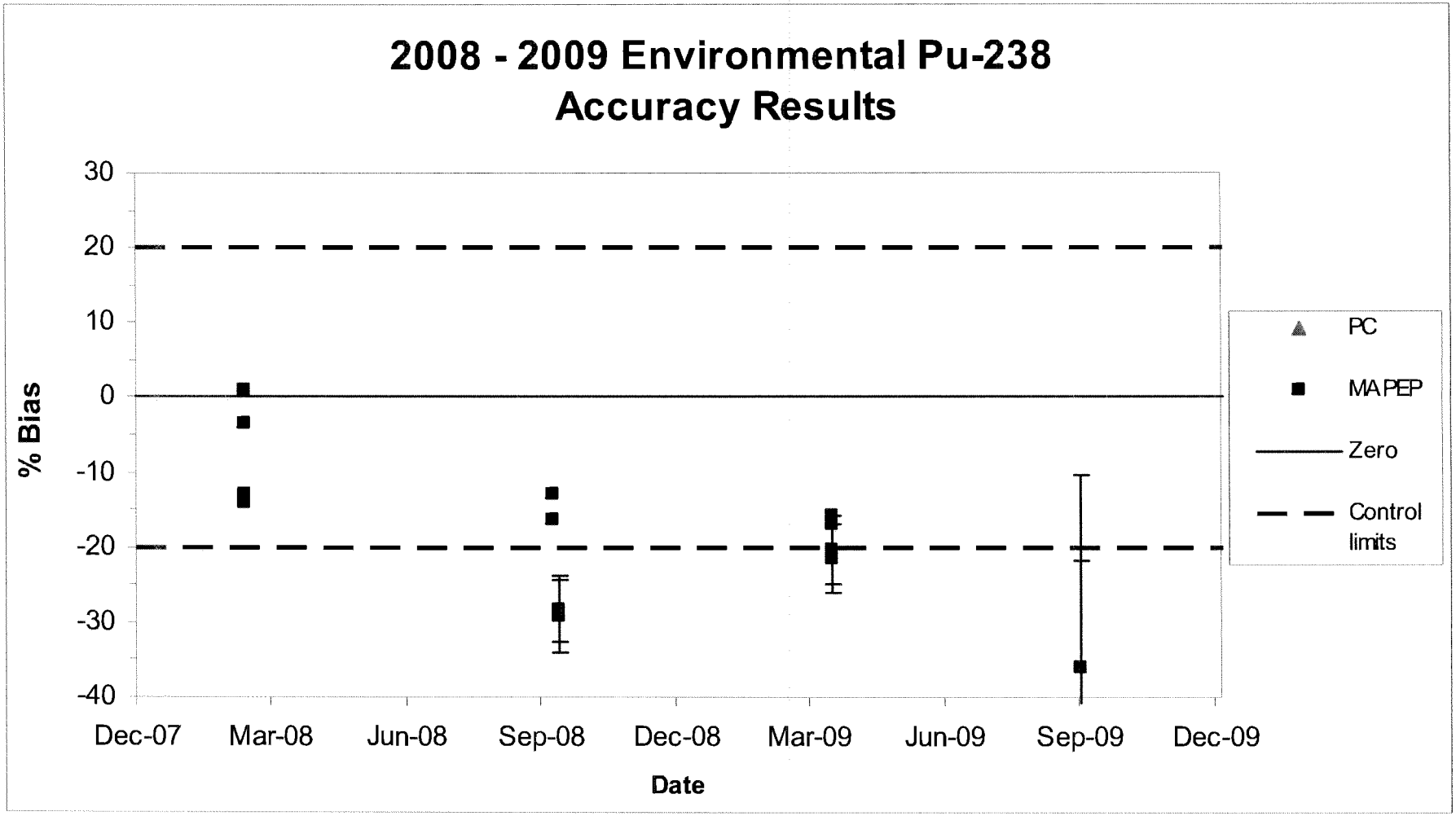


CR-09-14 was issued to investigate the positive biases in the MAPEP soil sample.

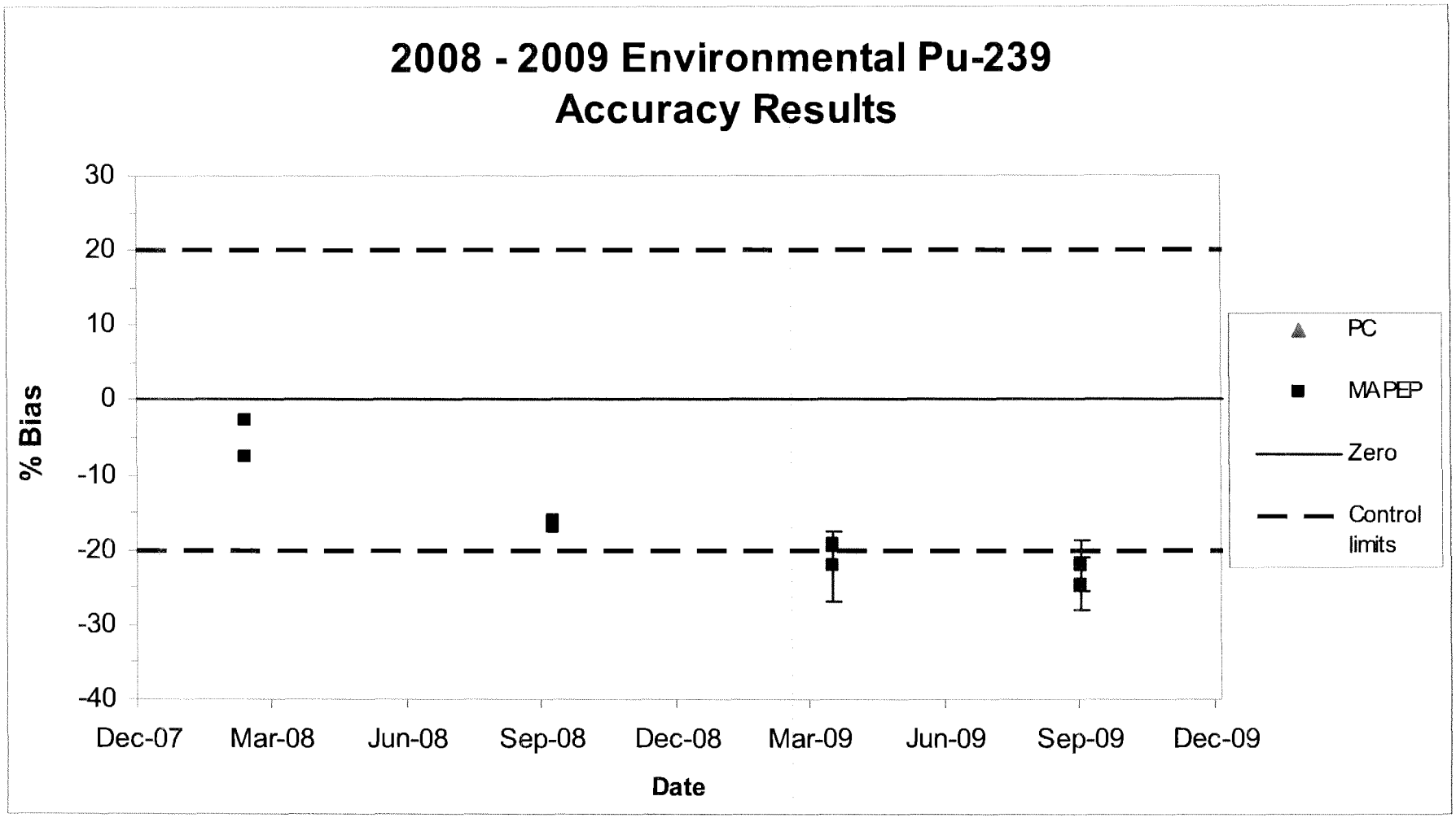


CR-09-14 was issued to investigate the positive biases in the MAPEP soil sample.

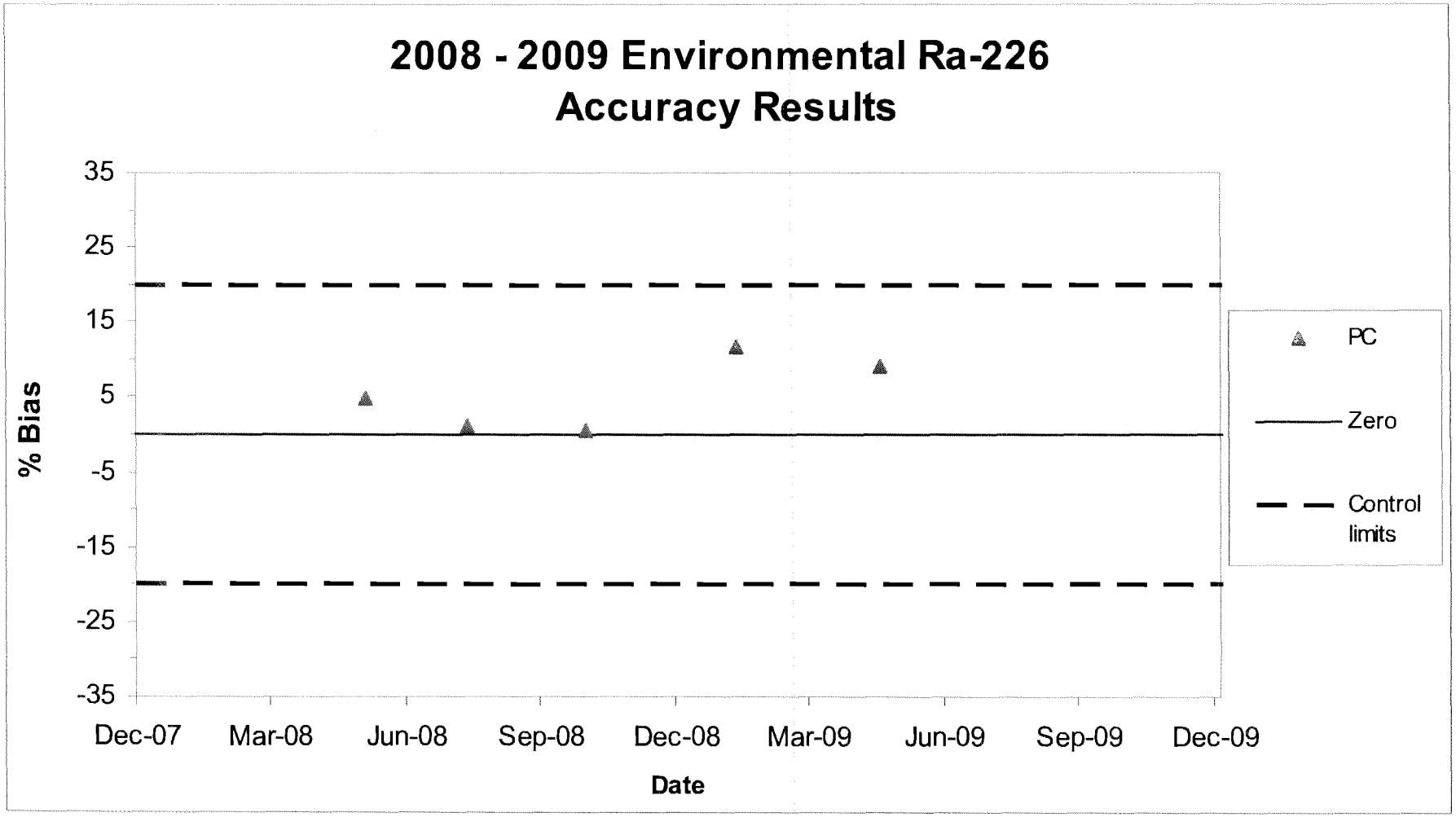

2008 - 2009 Environmental Ni-63
Accuracy Results
% Bias
35
25
15
5
-5
-15
-25
-35
Dec-07
Mar-08
Jun-08
Sep-08
Dec-08
Mar-09
Jun-09
Sep-09
Dec-09
Date
PC
MAPEP
Zero
Control limits

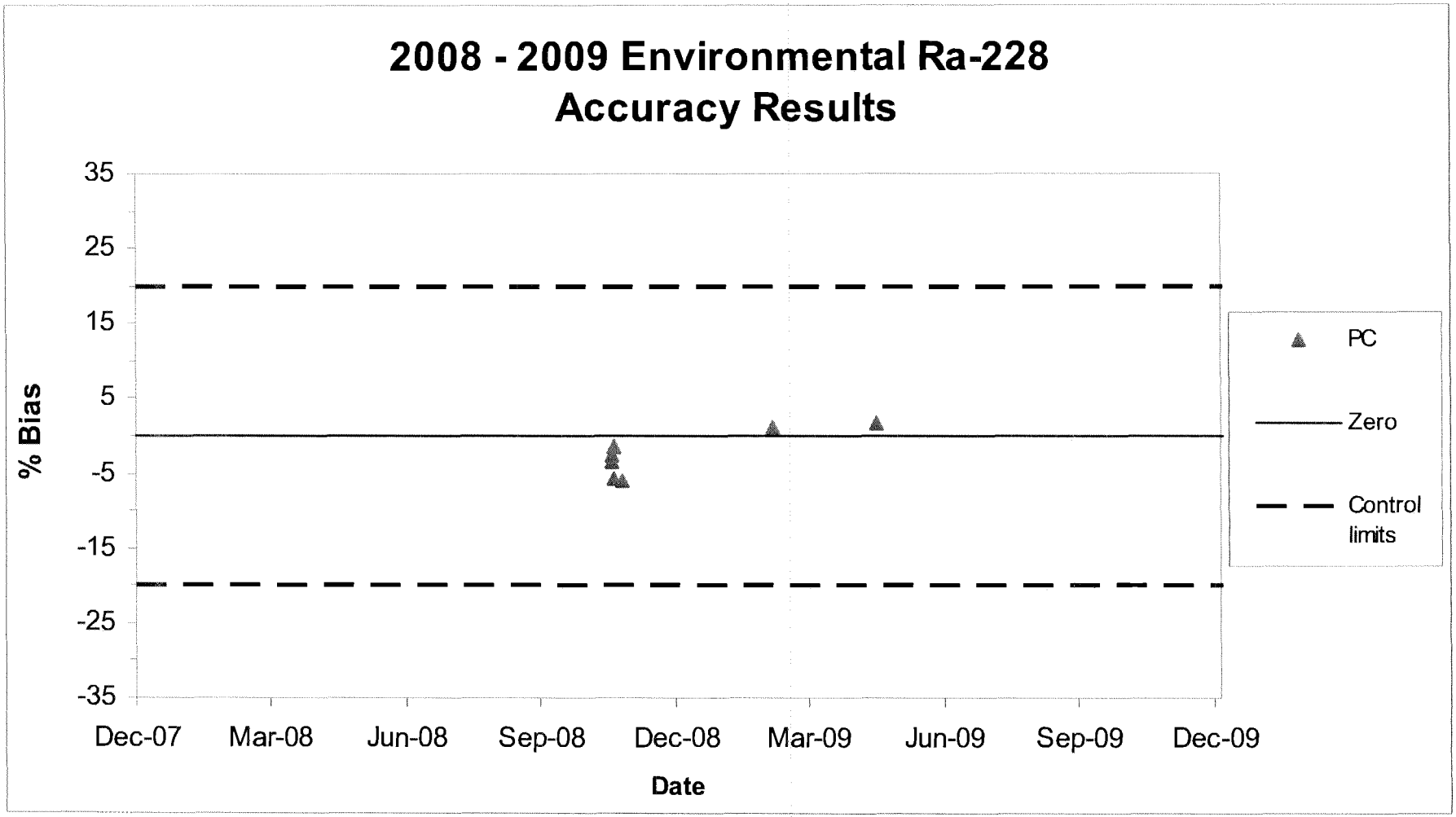


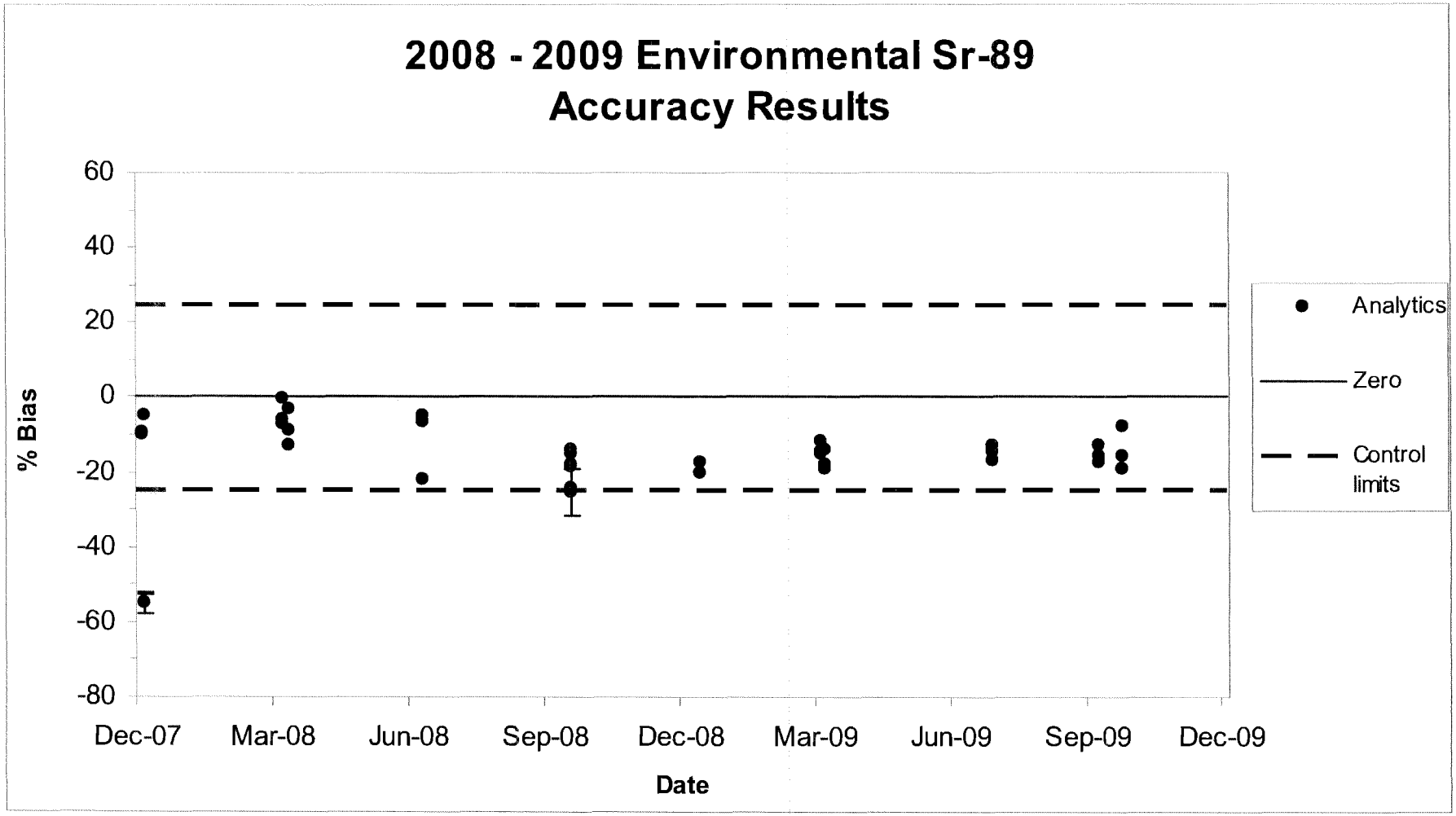
CR-09-12 was issued to investigate these negative biases.

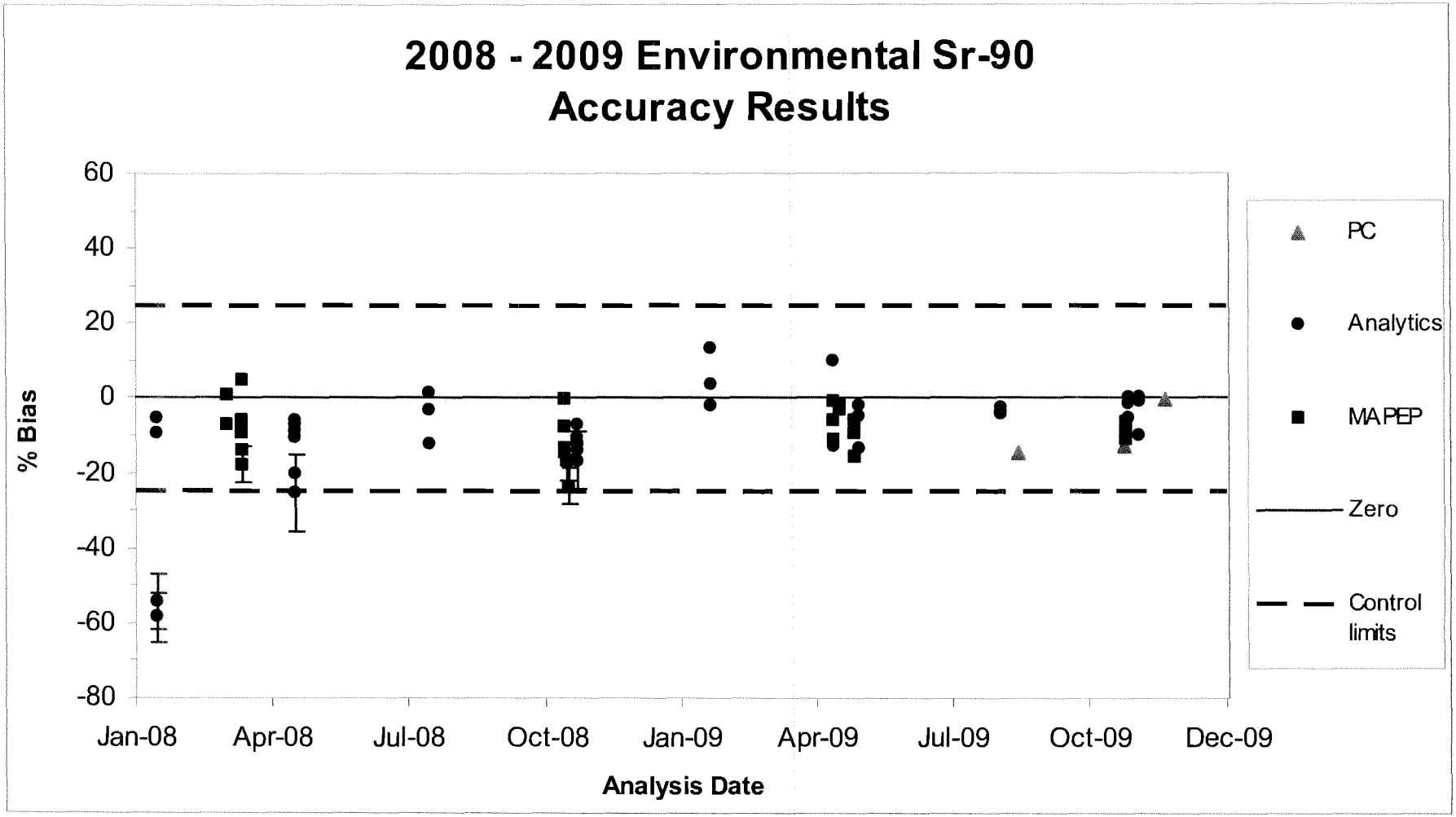


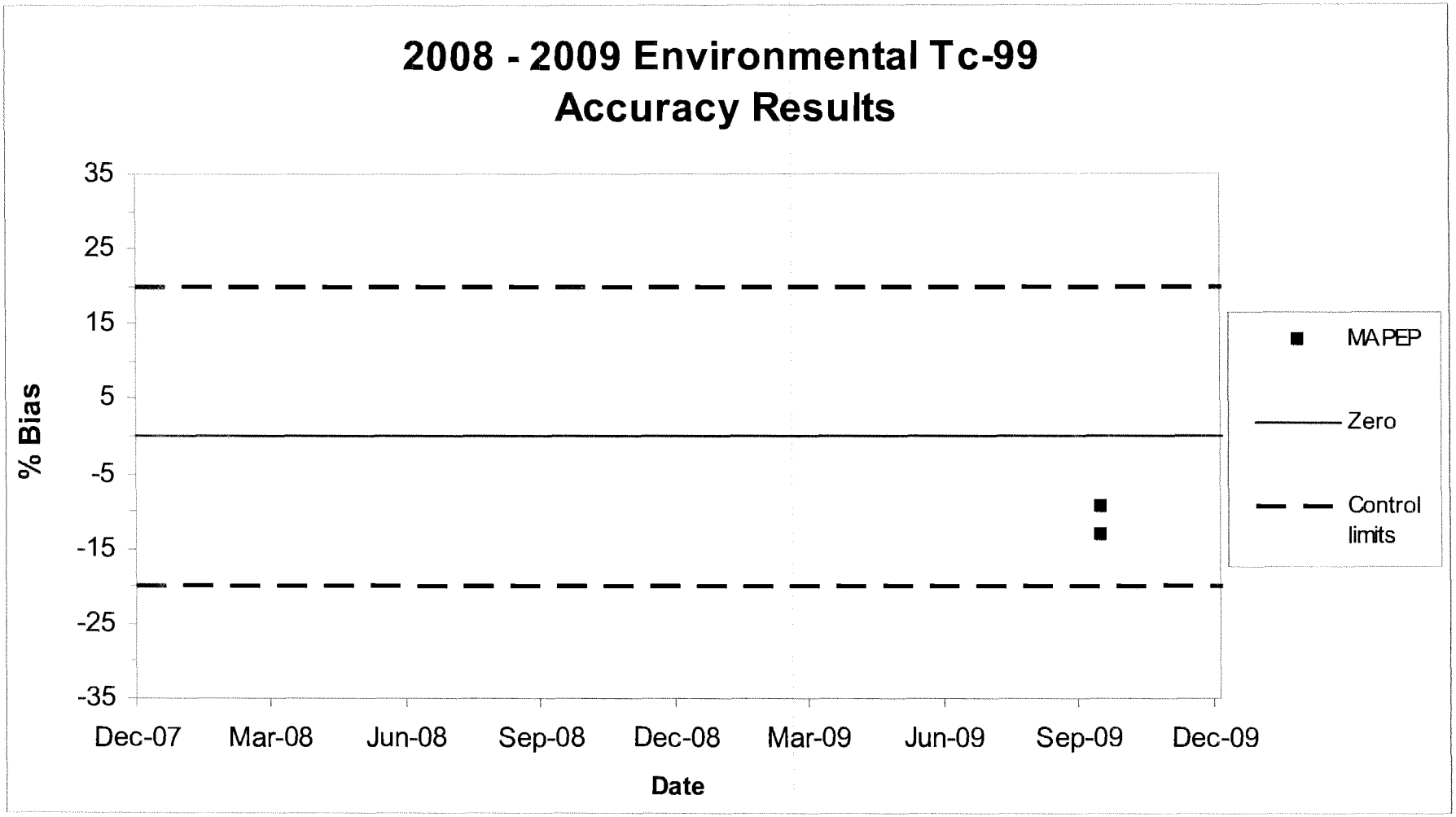
CR-09-12 was issued to investigate these negative biases.

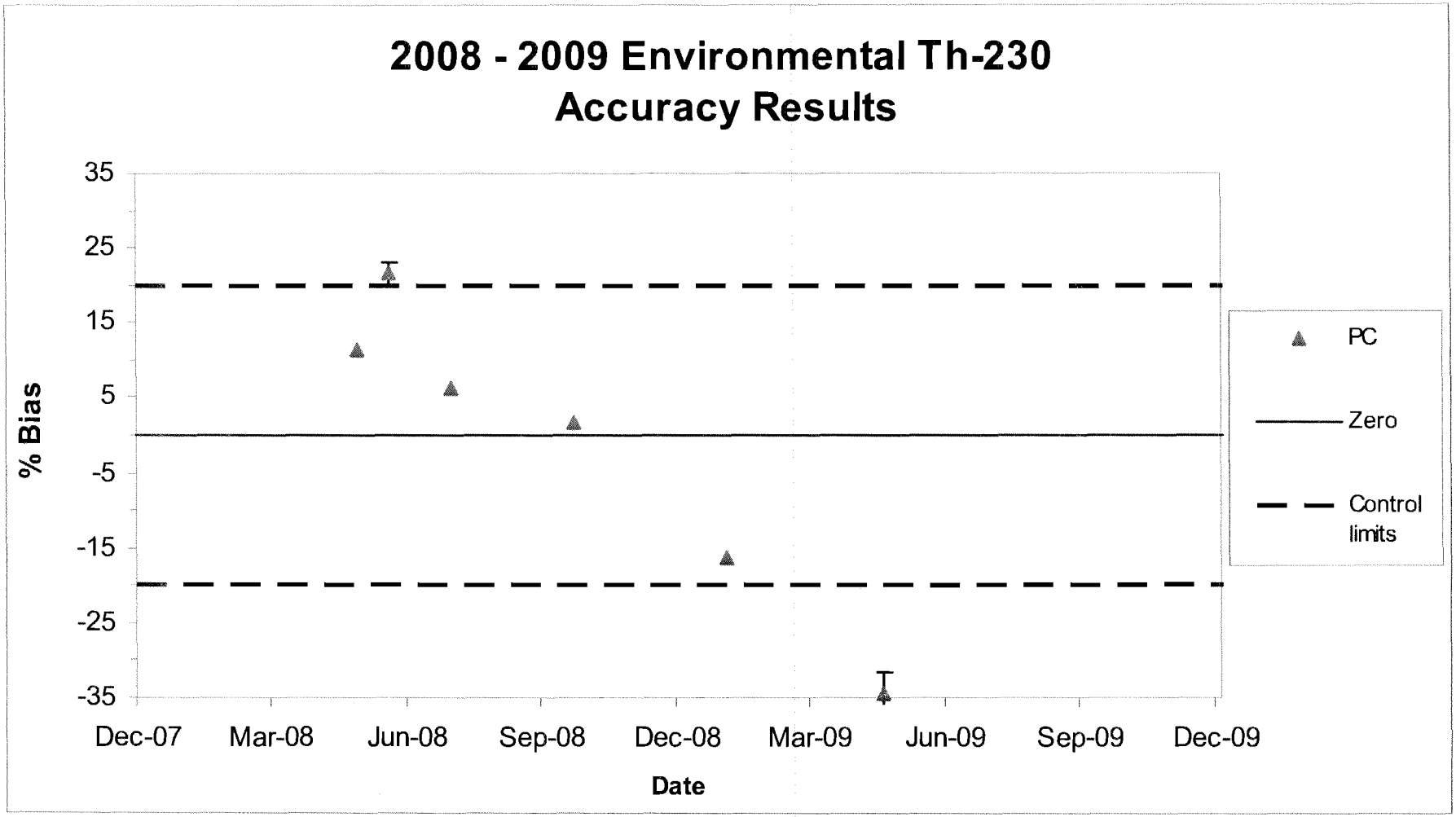

2008 - 2009 Environmental Ra-226
Accuracy Results
% Bias
35
25
15
5
-5
-15
-25
-35
Dec-07
Mar-08
Jun-08
Sep-08
Dec-08
Mar-09
Jun-09
Sep-09
Dec-09
Date
PC
Zero
Control limits

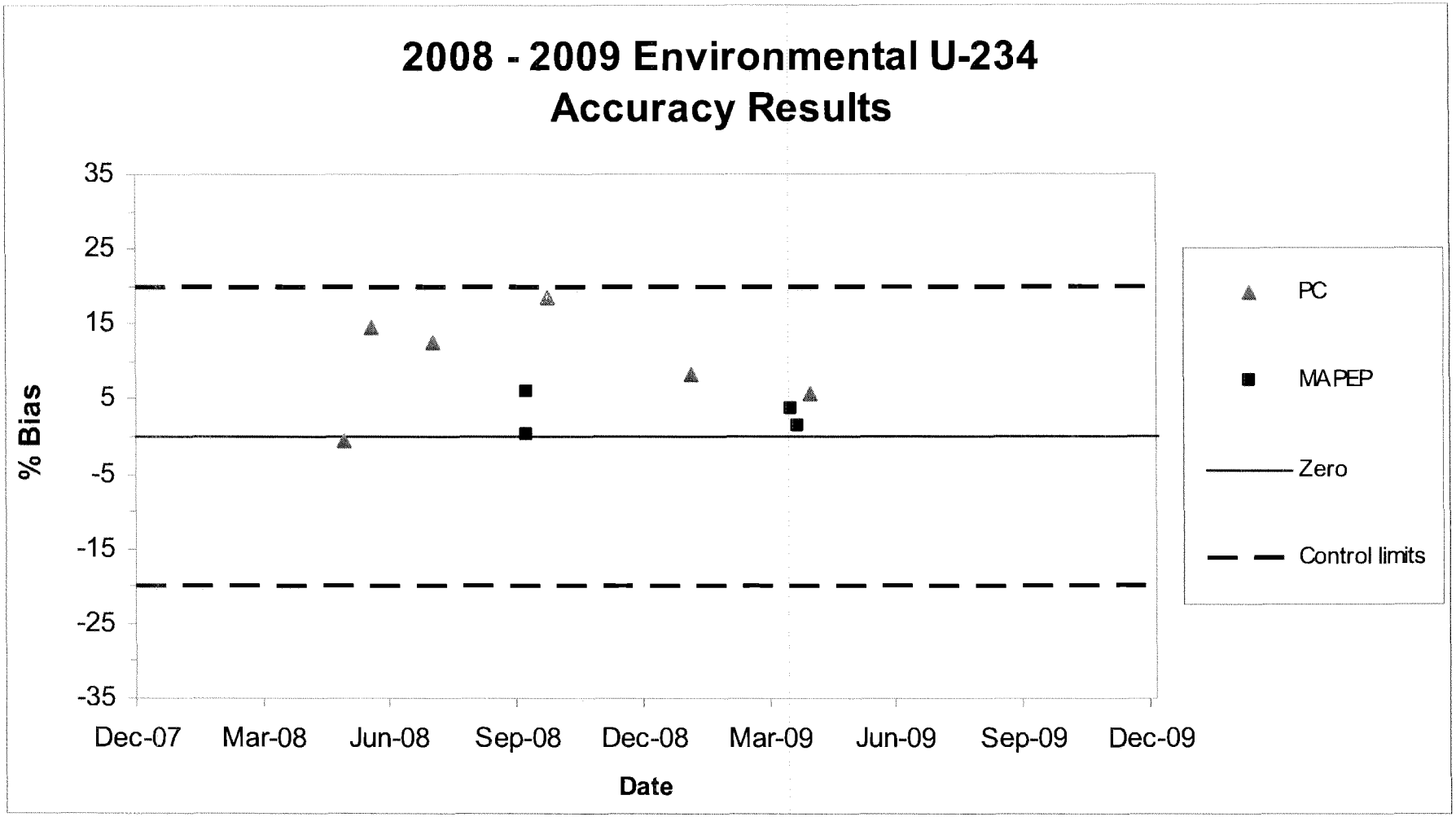

2008 - 2009 Environmental Ra-228
Accuracy Results
% Bias
35
25
15
5
-5
-15
-25
-35
Dec-07
Mar-08
Jun-08
Sep-08
Dec-08
Mar-09
Jun-09
Sep-09
Dec-09
Date
PC
Zero
Control limits

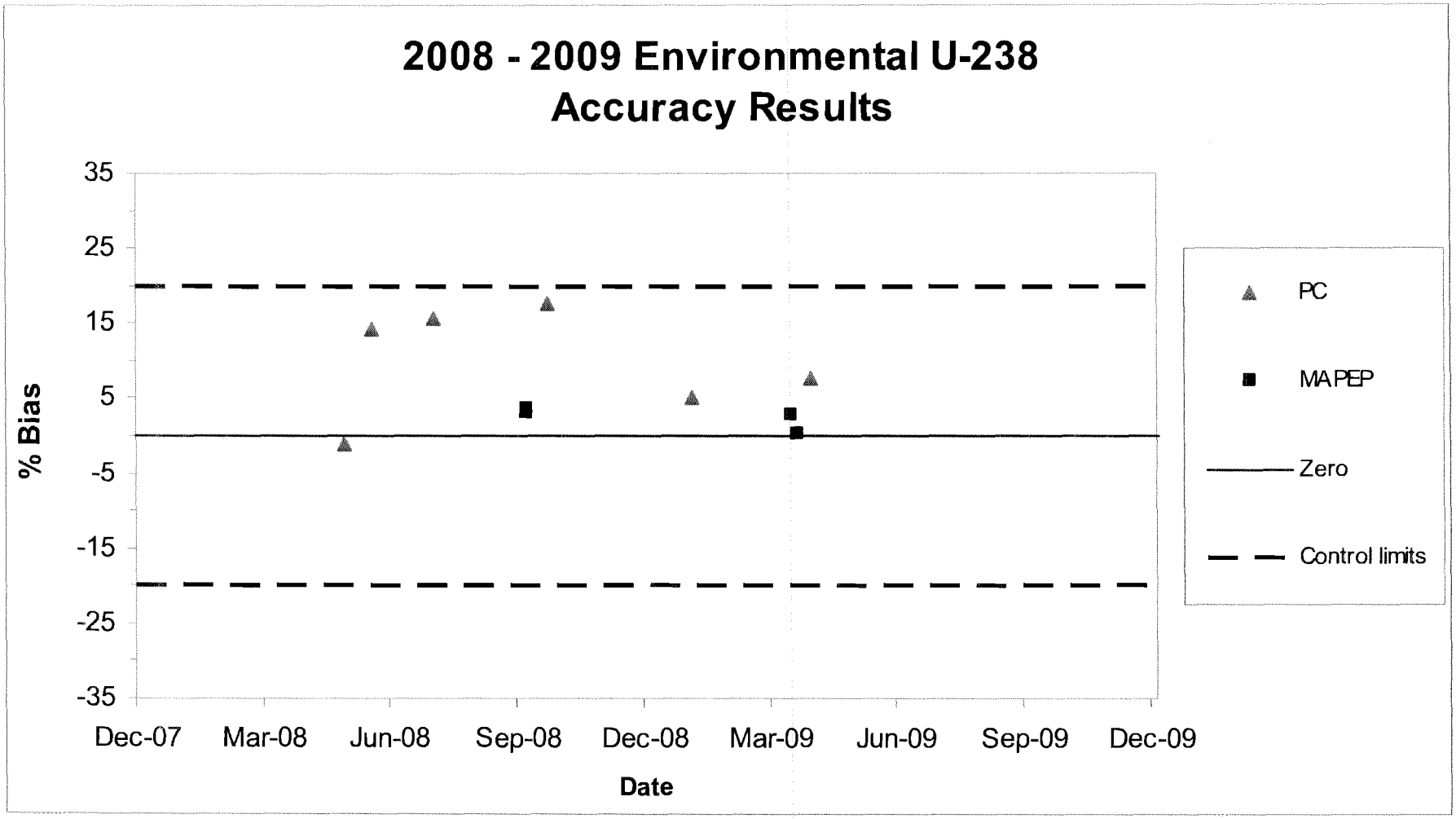

2008 - 2009 Environmental Sr-89
Accuracy Results
60
40
20
0
-20
-40
-60
-80
% Bias
Dec-07
Mar-08
Jun-08
Sep-08
Dec-08
Mar-09
Jun-09
Sep-09
Dec-09
Date
Analytics
Zero
Control limits

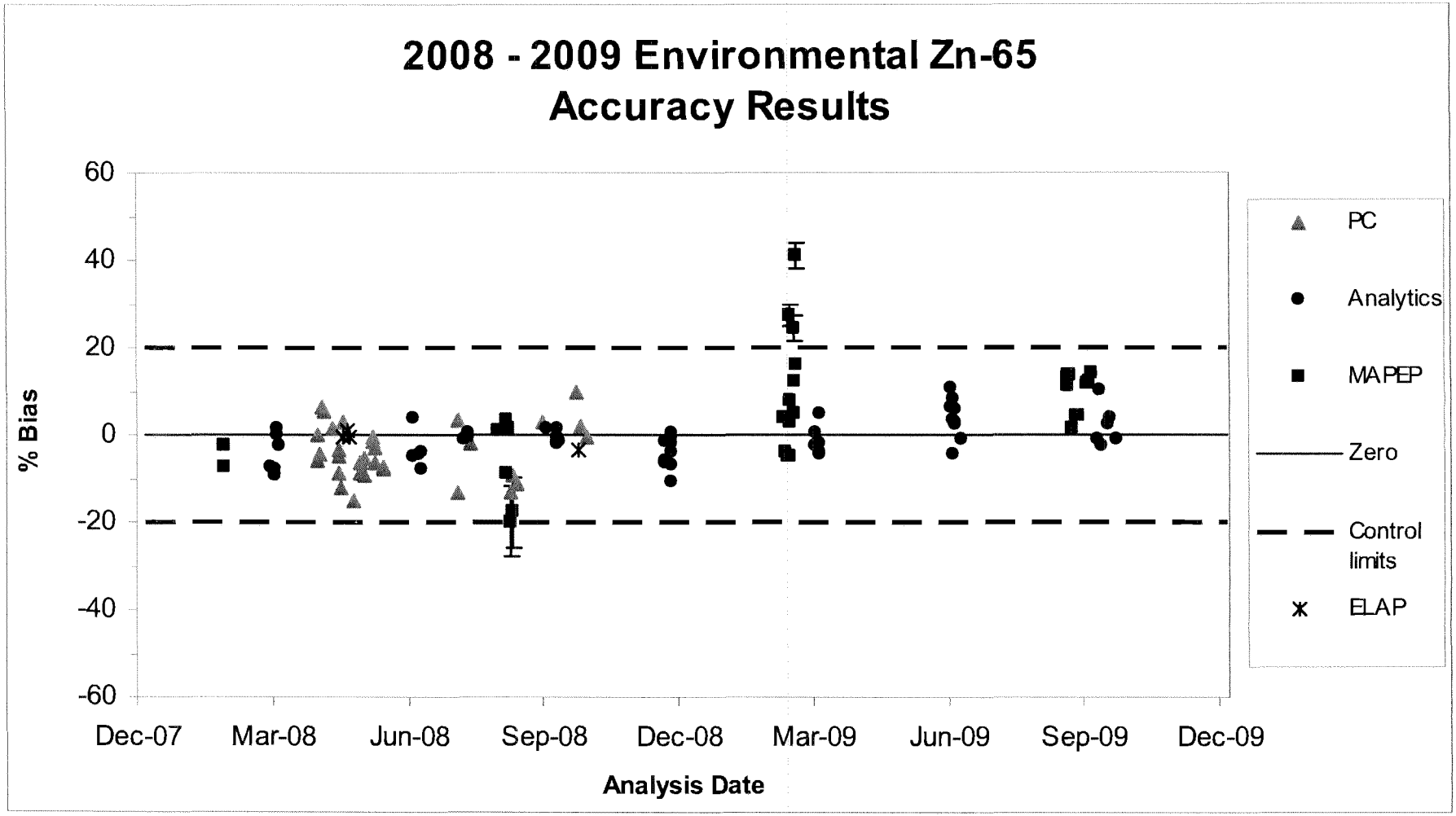

2008 - 2009 Environmental Sr-90
Accuracy Results
60
40
20
0
-20
-40
-60
-80
% Bias
Jan-08
Apr-08
Jul-08
Oct-08
Jan-09
Apr-09
Jul-09
Oct-09
Dec-09
Analysis Date
PC
Analytics
MAPEP
Zero
Control limits


2008 - 2009 Environmental Tc-99
Accuracy Results
% Bias
35
25
15
5
-5
-15
-25
-35
Dec-07
Mar-08
Jun-08
Sep-08
Dec-08
Mar-09
Jun-09
Sep-09
Dec-09
Date
MAPEP
Zero
Control limits


2008 - 2009 Environmental Th-230
Accuracy Results
% Bias
35
25
15
5
-5
-15
-25
-35
Dec-07
Mar-08
Jun-08
Sep-08
Dec-08
Mar-09
Jun-09
Sep-09
Dec-09
Date
PC
Zero
Control limits


2008 - 2009 Environmental U-234
Accuracy Results
35
25
15
5
-5
-15
-25
-35
% Bias
Dec-07
Mar-08
Jun-08
Sep-08
Dec-08
Mar-09
Jun-09
Sep-09
Dec-09
Date
PC
MAPEP
Zero
Control limits

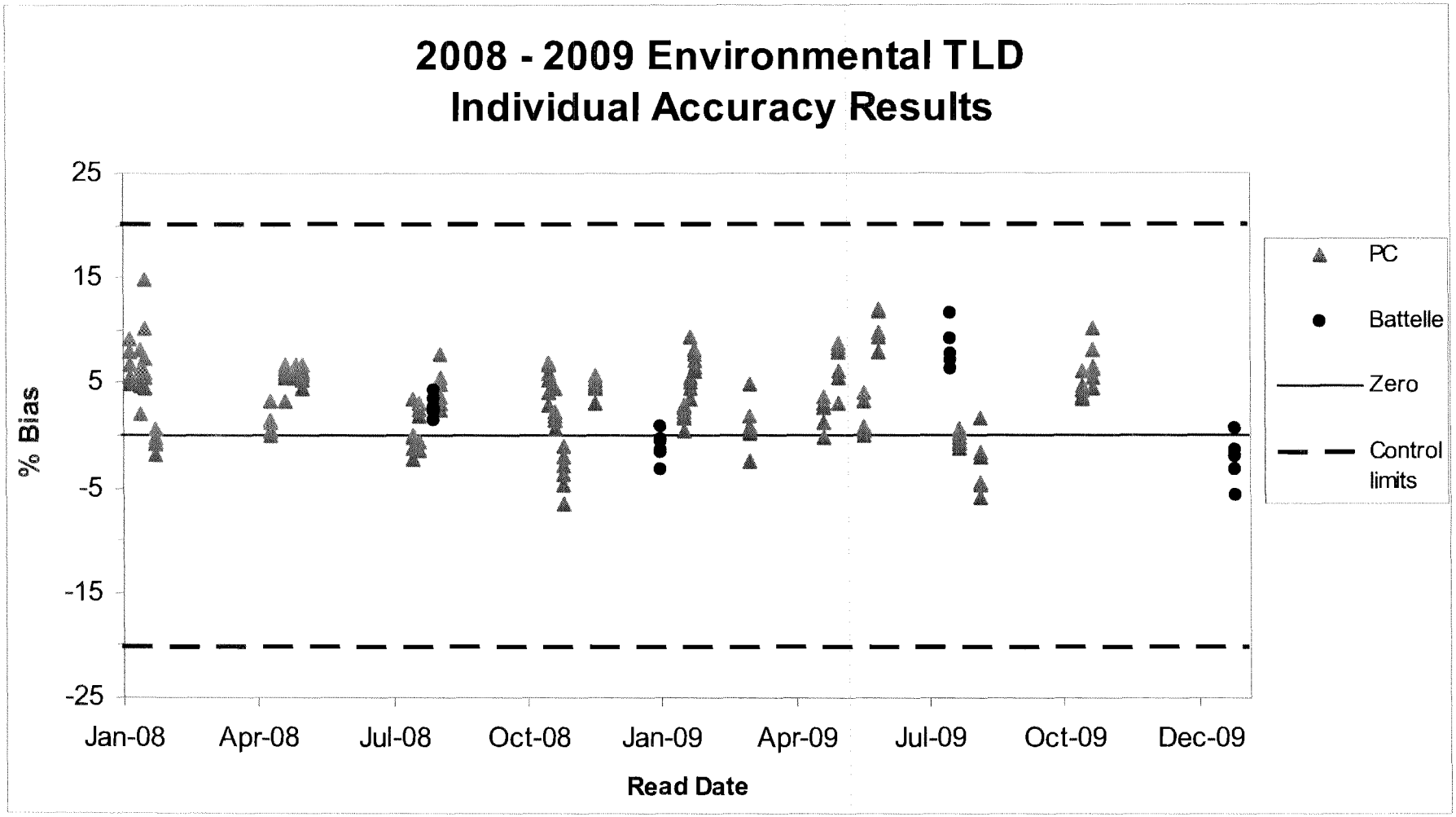

2008 - 2009 Environmental U-238
Accuracy Results
% Bias
35
25
15
5
-5
-15
-25
-35
Dec-07
Mar-08
Jun-08
Sep-08
Dec-08
Mar-09
Jun-09
Sep-09
Dec-09
Date
PC
MAPEP
Zero
Control limits

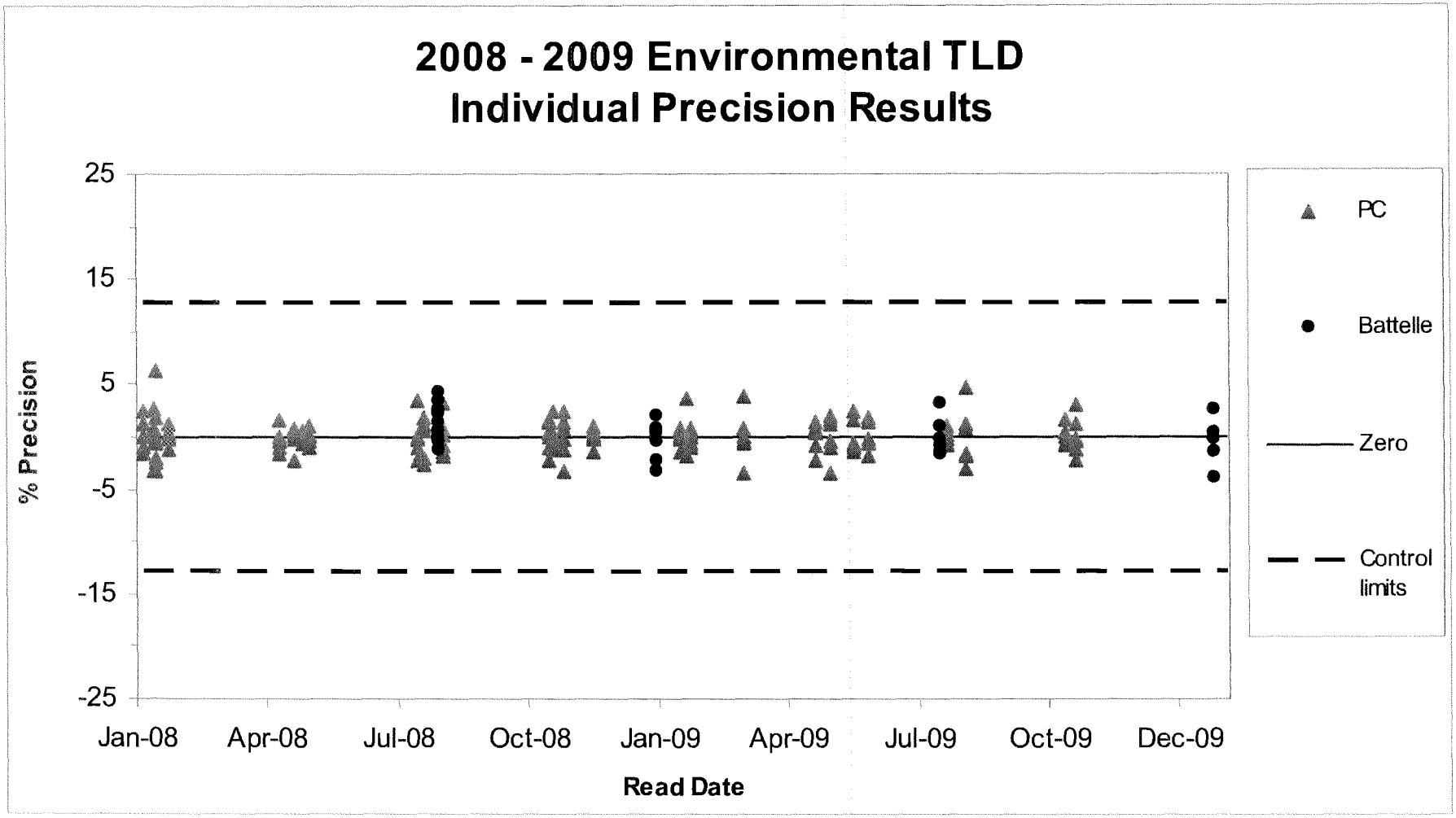


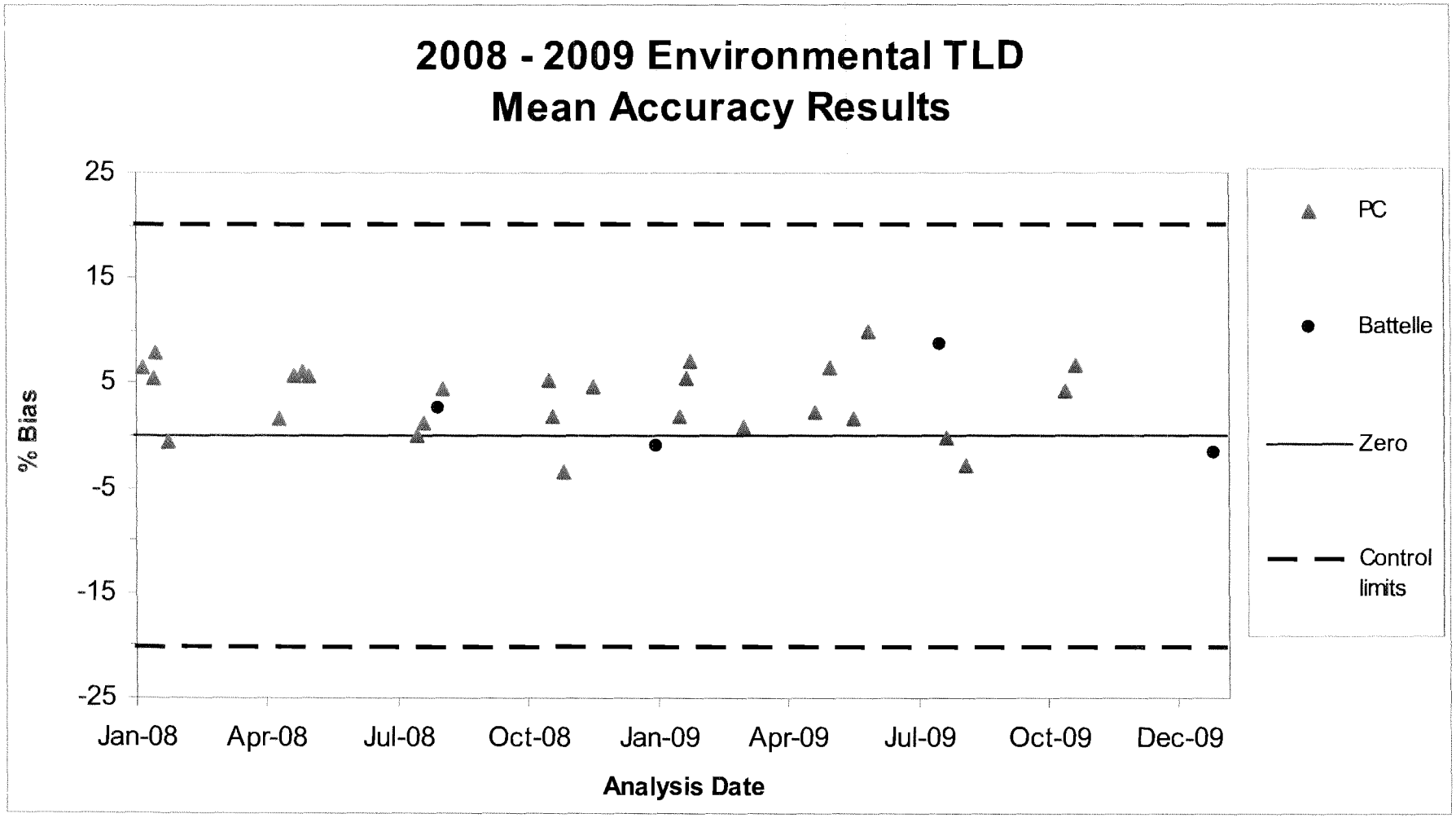
CR-09-14 was issued to investigate the positive biases in the MAPEP soil sample.

APPENDIX B

ENVIRONMENTAL DOSIMETRY QUALITY CONTROL PROGRAM RESULTS


2008 - 2009 Environmental TLD
Individual Accuracy Results
25
15
5
-5
-15
-25
% Bias
Jan-08
Apr-08
Jul-08
Oct-08
Jan-09
Apr-09
Jul-09
Oct-09
Dec-09
Read Date
PC
Battelle
Zero
Control limits


2008 - 2009 Environmental TLD
Individual Precision Results
25
15
5
-5
-15
-25
% Precision
Jan-08
Apr-08
Jul-08
Oct-08
Jan-09
Apr-09
Jul-09
Oct-09
Dec-09
Read Date
PC
Battelle
Zero
Control limits


2008 - 2009 Environmental TLD
Mean Accuracy Results
25
15
5
-5
-15
-25
% Bias
Jan-08
Apr-08
Jul-08
Oct-08
Jan-09
Apr-09
Jul-09
Oct-09
Dec-09
Analysis Date
PC
Battelle
Zero
Control limits