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Subject: Clinton Power Station 2011 Annual Radiological Environmental Operating Report

Exelon Generating Company, LLC (Exelon), Clinton Power Station, is submitting the 2011 Annual Radiological Environmental Operating Report. This report is submitted in accordance with Technical Specification requirement 5.6.2, "Annual Radiological Environmental Operating Report," and covers the period from January 1, 2011 through December 31, 2011.

This report provides the results for the Radiological Environmental Monitoring Program as specified in Section 5.0 and Section 7.1 of the Offsite Dose Calculation Manual.

Questions on this letter may be directed to Mr. Tom Veitch, Chemistry Manager, at 217-937-3200.

There are no commitments contained in this letter.

Respectfully,

William G. Noll
Site Vice President
Clinton Power Station

EET/blf

Attachment

cc: Regional Administrator - NRC Region III
NRC Senior Resident Inspector – Clinton Power Station
Office of Nuclear Facility Safety – Illinois Emergency Management Agency

IE25
NRR

Docket No: 50-461

CLINTON POWER STATION

Annual Radiological Environmental Operating Report

1 January Through 31 December 2011

Prepared By

Teledyne Brown Engineering
Environmental Services

Exelon
Nuclear

Clinton Power Station
Clinton, IL 61727

April 2012

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Appendices

I. Summary and Conclusions

This report on the Radiological Environmental Monitoring Program (REMP) conducted for the Clinton Power Station (CPS) by Exelon Generation Company, LLC (Exelon) covers the period 1 January 2011 through 31 December 2011. During that time period, 1,582 analyses were performed on 1,455 samples. In assessing all the data gathered for this report and comparing these results with preoperational data, it was concluded that the operation of CPS had no adverse radiological impact on the environment.

On March 11, 2011 an earthquake off the Japanese islands produced a massive tsunami that caused a nuclear accident at four of the six Fukushima Daiichi reactors. In planning for the potential radioactive plume reaching the United States, Exelon increased the sampling frequency and added additional analyses of select media from pathways that were expected to be the most sensitive to any increase in ambient radiation levels. Low level I-131 analyses and gamma spectroscopy analyses were performed on air particulates, air iodine, and milk, as appropriate.

The resulting radioactive plume was first detected in the environs of CPS on March 16, 2011. The final date of positive detection was April 13, 2011. The radionuclide identified was Iodine-131. Maximum activity levels found by media were 102 E-3 pCi/m^3 for air iodine and 2.8 pCi/L for milk. Samples collected were compared to offsite control locations to verify that these positive detections were not attributable to licensed activities. All other radionuclides analyzed for were below MDL (Minimum Detectable Level). All I-131 detected in 2011 is directly attributed to the Fukushima event in March of 2011.

The radioactive half-life of I-131 is about 8 days. This short half-life allowed the affects of this radioactive plume to subside over about 4 weeks. As of April 14, 2011 no further impacts from the Fukushima Daiichi accident was evident.

There were zero (0) radioactive liquid releases from CPS during 2011. Releases of gaseous radioactive materials were accurately measured in plant effluents. There were no gaseous effluent releases that approached the limits specified in the CPS Offsite Dose Calculation Manual (ODCM). The highest calculated offsite dose received by a member of the public due to the release of gaseous effluents from CPS was 2.92 E-02 or 0.0292 mRem.

Surface, drinking, and well water samples were analyzed for concentrations of tritium and gamma emitting nuclides. Drinking water samples were also analyzed for concentrations of gross beta and I-131. Naturally occurring K-40 was detected at levels consistent with those detected in previous years. No fission or activation products were detected. No tritium or gross beta activity was detected and the required lower limit of detection (LLD) was met.

Fish and shoreline sediment samples were analyzed for concentrations of gamma emitting nuclides. No fission or activation products were detected in fish

or shoreline sediment samples.

Air particulate samples were analyzed for concentrations of gross beta and gamma emitting nuclides. Cosmogenic Be-7 and naturally occurring K-40 were detected at levels consistent with those detected in previous years. No fission or activation products were detected.

High sensitivity I-131 analyses were performed on weekly air samples. All results were less than the minimum detectable concentration with the exception of 29 samples which were positive for I-131. These positive results are directly attributed to the Fukushima event in March of 2011.

Cow milk samples were analyzed for concentrations of I-131 and gamma emitting nuclides. All I-131 results were below the required LLDs, with the exception of one sample that was positive for I-131. This positive result is directly attributed to the Fukushima event in March of 2011. Concentrations of naturally occurring K-40 were consistent with those detected in previous years. No fission or activation products were found.

Food product samples were analyzed for concentrations of gamma emitting nuclides. Concentrations of Cosmogenic Be-7 and naturally occurring K-40 were consistent with those detected in previous years. No fission or activation products were detected.

Grass samples were analyzed for concentrations of gamma emitting nuclides. Concentrations of Cosmogenic Be-7 and naturally occurring K-40 were consistent with those detected in previous years. No fission or activation products were detected.

Environmental gamma radiation measurements were performed quarterly using thermoluminescent dosimeters. Levels detected were consistent with those observed in previous years.

II. Introduction

The Clinton Power Station (CPS), consisting of one approximately 1,140 MW gross electrical power output boiling water reactor is located in Harp Township, DeWitt County, Illinois. CPS is owned and operated by Exelon and became operational in 1987. Unit No. 1 went critical on 15 February 1987. The site encloses approximately 13,730 acres. This includes the 4,895 acre, man-made cooling lake and about 452 acres of property not owned by Exelon. The plant is situated on approximately 150 acres. The cooling water discharge flume – which discharges to the eastern arm of the lake – occupies an additional 130 acres. Although the nuclear reactor, supporting equipment and associated electrical generation and distribution equipment lie in Harp Township, portions of the aforementioned 13,730 acre plot reside within Wilson, Rutledge, DeWitt, Creek, Nixon and Santa Anna Townships.

A Radiological Environmental Monitoring Program (REMP) for CPS was initiated in 1987. The preoperational period for most media covers the periods May 1980 through 27 February 1987 and was summarized in a separate report. This report covers those analyses performed by Teledyne Brown Engineering (TBE) and Mirion Technologies on samples collected during the period 1 January 2011 through 31 December 2011.

A. Objectives of the REMP

The objectives of the REMP are to:

1. Provide data on measurable levels of radiation and radioactive materials in the site environs.

2. Evaluate the relationship between quantities of radioactive material released from the plant and resultant radiation doses to individuals from principal pathways of exposure.

B. Implementation of the Objectives

The implementation of the objectives is accomplished by:

1. Identifying significant exposure pathways.

2. Establishing baseline radiological data of media within those pathways.

3. Continuously monitoring those media before and during Station operation to assess Station radiological effects (if any) on man and the environment.

III. Program Description

A. Sample Collection

This section describes the general collection methods used by Environmental Inc. (Midwest Labs) to obtain environmental samples for the CPS REMP in 2011. Sample locations and descriptions can be found in Tables B–1 and B–2, and Figures B–1 through B–3, Appendix B. The sampling methods used by Environmental Inc. (Midwest Labs) are listed in Table B-2.

Aquatic Environment

The aquatic environment was evaluated by performing radiological analyses on samples of surface water, drinking water, well water, fish, and shoreline sediment. Two gallon water samples were collected monthly from continuous samplers located at three surface water locations (CL-90, CL-91 and CL-99) and one drinking water location (CL-14). A monthly grab sample was obtained from one surface water location (CL-13). Quarterly samples were obtained from two well water locations (CL-7D and CL-12). All samples were collected in new unused plastic bottles, which were rinsed at least twice with source water prior to collection. Fish samples comprising the flesh of largemouth bass, crappie, carp, bluegill and channel catfish are the species most commonly harvested from the lakes by sporting fishermen, were collected semiannually at two locations, CL-19 and CL-105 (control). Shoreline sediment samples composed of recently deposited substrate were collected at one location semiannually, CL-7B.

Atmospheric Environment

The atmospheric environment was evaluated by performing radiological analyses on samples of air particulate, airborne iodine, milk, food produce and grass. Airborne iodine and particulate samples were collected and analyzed weekly at ten locations (CL-1, CL-2, CL-3, CL-4, CL-6, CL-7, CL-8, CL-11, CL-15, and CL-94). The control location was CL-11. Airborne iodine and particulate samples were obtained at each location, using a vacuum pump with charcoal and glass fiber filters attached. The pumps were run continuously and sampled air at the rate of approximately one cubic foot per minute. The filters were replaced weekly and sent to the laboratory for analysis.

Milk samples were collected biweekly at one location (CL-116) from April through November, and monthly from December through March to coincide with the grazing season. All samples were collected in new

unused plastic bottles from the bulk tank at that location, preserved with sodium bisulfite, and shipped promptly to the laboratory.

Food products were collected once a month from June through September at four locations (CL-114, CL-115, CL-117 and CL-118). The control location was CL-114. Various broadleaf vegetable samples were collected and placed in new unused plastic bags, and sent to the laboratory for analysis.

Grass samples were collected biweekly at four locations (CL-1, CL-2, CL-8 and CL-116) from May through October. The control location was CL-116. All samples were collected in new unused plastic bags and sent to the laboratory for analysis.

Ambient Gamma Radiation

Direct radiation measurements were made using Panasonic 814 calcium sulfate ($CaSO_4$) thermoluminescent dosimeters (TLD). The TLD locations were placed around the CPS site as follows:

An inner ring consisting of 16 locations (CL-1, CL-5, CL-22, CL-23, CL-24, CL-34, CL-35, CL-36, CL-42 CL-43, CL-44, CL-45, CL-46, CL-47, CL-48 and CL-63). An additional three locations were installed as part of a volunteer comparison study near and within the site perimeter (CL-5MM, CL-46MM and CL-47MM).

An outer ring consisting of 16 locations (CL-51, CL-52, CL-53, CL-54, CL-55, CL-56, CL-57, CL-58, CL-60, CL-61, CL-76, CL-77, CL-78, CL-79, CL-80 and CL-81). CL-58MM was installed as part of a volunteer comparison study extending to approximately 5 miles from the site.

A special interest set consisting of seven locations (CL-37, CL-41, CL-49, CL-64, CL65, CL-74 and CL-75) representing special interest areas.

A supplemental set consisting of 14 locations (CL-2, CL-3, CL-4, CL-6, CL-7, CL-8, CL-15, CL-33, CL-84, CL-90, CL-91, CL-97, CL-99, and CL-114).

CL-11 represents the control location for all environmental TLDs.

The specific TLD locations were determined by the following criteria:

1. The presence of relatively dense population;

2. Site meteorological data taking into account distance and elevation

for each of the sixteen–22 1/2 degree sectors around the site, where estimated annual dose from CPS, if any, would be most significant;

3. On hills free from local obstructions and within sight of the vents (where practical);

4. And near the closest dwelling to the HVAC and VG stacks in the prevailing downwind direction.

Two TLDs – each composed of two $CaSO_4$ thermoluminescent phosphors enclosed in plastic – were placed at each location in a vented PVC conduit located approximately three feet above ground level. The TLDs were exchanged quarterly and sent to Mirion Technologies for analysis.

B. Sample Analysis

This section describes the general analytical methodologies used by TBE and Environmental Inc. (Midwest Labs) to analyze the environmental samples for radioactivity for the CPS REMP in 2011. The analytical procedures used by the laboratories are listed in Table B-2.

In order to achieve the stated objectives, the current program includes the following analyses:

1. Concentrations of beta emitters in drinking water and air particulates.

2. Concentrations of gamma emitters in surface, drinking and well water, air particulates, milk, fish, grass, sediment and vegetables.

3. Concentrations of tritium in surface, drinking and well water.

4. Concentrations of I-131 in air, milk, drinking water and surface water.

5. Ambient gamma radiation levels at various on-site and off-site environs.

C. Data Interpretation

The radiological and direct radiation data collected prior to CPS becoming operational was used as a baseline with which these operational data were compared. For the purpose of this report, CPS was considered operational at initial criticality. In addition, data were compared to

previous years' operational data for consistency and trending. Several factors were important in the interpretation of the data:

1. Lower Limit of Detection and Minimum Detectable Concentration

The lower limit of detection (LLD) was defined as the smallest concentration of radioactive material in a sample that would yield a net count (above background) that would be detected with only a 5% probability of falsely concluding that a blank observation represents a "real" signal. The LLD was intended as a before the fact estimate of a system (including instrumentation, procedure and sample type) and not as an after the fact criteria for the presence of activity. All analyses were designed to achieve the required CPS detection capabilities for environmental sample analysis.

2. Net Activity Calculation and Reporting of Results

Net activity for a sample was calculated by subtracting background activity from the sample activity. Since the REMP measures extremely small changes in radioactivity in the environment, background variations may result in sample activity being lower than the background activity resulting in a negative number. A minimum detectable concentration (MDC) was reported in all cases where positive activity was not detected.

Gamma spectroscopy results for each type of sample were grouped as follows:

For surface water, well water, fish, sediment, and milk 14 nuclides, Be-7, K-40, Mn-54, Co-58, Fe-59, Co-60, Zn-65, Nb-95, Zr-95, Cs-134, Cs-137, Ba-140, La-140, and Ce-144 were reported.

For drinking water, grass, and vegetation 15 nuclides, Be-7, K-40, Mn-54, Co-58, Fe-59, Co-60, Zn-65, Nb-95, Zr-95, I-131, Cs-134, Cs-137, Ba-140, La-140, and Ce-144 were reported.

For air particulate 11 nuclides, Be-7, K-40, Co-60, Nb-95, Zr-95, Ru-103, Ru-106, Cs-134, Cs-137, Ce-141 and Ce-144, were reported.

Means and standard deviations of the results were calculated. The standard deviations represent the variability of measured results for different samples rather than single analysis uncertainty.

D. Program Exceptions

The exceptions described below are those that are considered 'deviations' from the Radiological Environmental Monitoring Program as required by the Station's ODCM. By definition, 'deviations' are permitted as delineated within NUREG-0133, "Preparation of Radiological Effluent Technical Specifications for Nuclear Power Plants", October 1978, and within Radiological Assessment Branch Technical Position, Revision 1, November 1979, which states...."Deviations are permitted from the required sampling schedule if specimens are unobtainable due to hazardous conditions, seasonal unavailability, malfunction of automatic sampling equipment and other legitimate reasons"..... The below section addresses the reporting requirements found within Section 7.1 of the Station's ODCM.

January 19, 2011, IR #1164436

ODCM air sampler CL-3 was found not collecting due to a seized motor. The motor was replaced and the operability was restored. The sample timer indicated a sampling interruption of approximately 6 hours.

February 3, 2011, IR #1170672

Non-ODCM water compositor CL-99 was found unable to collect samples due to freezing of the North Fork Creek.

February 3, 2011, IR #1193979

ODCM air sampler CL-8 and non-ODCM air samplers CL-1 and CL-7 were found to have timer shortages ranging from 7 to 18 hours, indicating power outages at each location during the sampling period. The cause of the outages was most likely the local heavy snow event experienced during the collection period.

February 23, 2011, IR #1179038

Non-ODCM water compositor CL-99 was found unable to sample due to a dead battery module. A replacement compositor was installed at the location, but was found to be inoperable as well. The compositors were repaired by a third party vendor, and sampling capability was restored on April 22, 2011. Weekly grab samples were taken while the compositor was inoperable.

March 30, 2011, IR #1194782

ODCM water compositor CL-91 was found unable to collect due to an apparent issue with the sample line extending into Clinton Lake. Plant Maintenance personnel cleared the sample line and restored sampling capability on April 7, 2011. Weekly grab samples were taken while the compositor was inoperable.

April 20, 2011, IR #1205388

ODCM water compositor CL-91 was found unable to collect sample due to an apparent blockage of the sampling line. Plant Maintenance personnel determined that a faulty fitting connecting the sampling line to the peristaltic pump tubing was causing air in-leakage and loss of suction. The connection was repaired and functionality was restored.

May 25, 2011, IR #1220595

ODCM water compositor CL-91 was found without power to the sampling enclosure. When the compositor was checked later in the day, electrical service had been restored and the sampler was returned to operable condition. The cause of the outage was indeterminate.

June 29, 2011, IR #1236653

Non-ODCM air samplers CL-1, CL-4, and CL-6 showed low timer readings, indicating power outages at each location during the sampling period. Shortage durations were 4 to 12 hours. The outages were most likely due to electrical storms in the area during the collection period.

June 29, 2011, IR #1234631
July 27, 2011, IR #1244671
August 31, 2011, IR #1258061
September 28, 2011, IR #1269488

Due to extremely hot and dry environmental conditions, the June, July, August, and September vegetation samples from ODCM gardens CL-115 and CL-118 were supplemented with non-vegetable leaves from the vicinity of each garden. Cabbage, lettuce, swiss chard and spinach were planted in each garden at the beginning of the growing season. However, contrary to the requirement to collect three varieties of broadleaf vegetation from

each location, only cabbage grew in sufficient volume and for a sufficient time period to collect throughout the growing season. When volume was available, lettuce and spinach samples were collected. As required, vegetation samples were supplemented with corn and tree leaves. A vendor was contracted to water each location as needed, but the relief was not sufficient to prevent sampling exceptions for the less hearty plant varieties. Following the growing season, soil remediation was performed at CL-119 and CL-118 via deep tilling and addition of black soil.

August 10, 2011, IR #1249963
September 7, 2011, IR #1260383
November 2, 2011, IR #1285279

ODCM water compositor CL-91 was found on three occasions to be unable to sample because of lowering of Clinton Lake level below the sampling line elevation. Each time the sampling line was repositioned below the surface of the water (but off of the bottom of the lake to prevent debris from clogging the intake) and sampling capability was restored. On November 21, 2011, the sampling line was permanently extended by approximately 20' to permit continued sampling during historically low lake levels.

October 5, 2011, IR #1272939

ODCM water compositor CL-91 was found to have collected a much larger volume of water than was expected since the previous week's equipment check. A faulty piece of sample tubing had resulted in an error that caused the sampler to pump beyond the specified program time. The tubing issue was resolved, and the volume was adjusted to the expected delivery. Because the initial rate of sampling was not constant, the October sample did not meet the definition of a composite sample.

October 12, 2011, IR #1275688

Non-ODCM air sampler CL-1 showed a timer shortage of approximately 2 hours, indicating a power outage during the collection period. The cause of the outage was indeterminate.

November 9, 2011, IR #1289508

ODCM water compositor CL-14 was secured for approximately 22 hours in support of emergent maintenance to repair a downed power pole on site. The maintenance required isolation of the

power supply to the compositor.

November 16, 2011, IR #1291997

ODCM water compositor CL-90 was found to be unable to sample due to a sheared roller in the peristaltic pump. The roller was repaired and the compositor was returned to service.

November 16, 2011, IR #1291998

ODCM air sampler CL-6 showed a timer shortage of approximately 9 hours, indicating a power outage during the sampling period. Ameren was contacted for information regarding work that may have affected the instrument, but none was identified, and the cause of the outage was indeterminate.

November 23, 2011, IR #1294114

ODCM air sampler CL-6 showed a timer shortage of approximately 9 hours, indicating a power outage during the sampling period. Ameren was contacted for information regarding work that may have affected the instrument, but none was identified, and the cause of the outage was indeterminate.

Program exceptions were reviewed to understand the causes of the exception and to return to ODCM sample compliance before the next sampling frequency period.

The overall sample recovery rate indicates that the appropriate procedures and equipment are in place to assure reliable program implementation.

E. Program Changes

Starting in August, I-131 is now being analyzed in drinking water by the low level method to detect down to 1 pCi/L.

During a 2008 annual NRC ODCM REMP inspection, there was an enhancement. An Inspector observed the orientation of an environmental area TLD and as an enhancement, suggested that if relocated approximately sixty (60) feet closer towards the Station, would serve better as a direct line of sight in a cleared opening, unobstructed from tree branches and leaves.

Over the twenty (20) plus years of Unit Operation, the surrounding

environment consisting of tress and their branches have grown, thus challenging the guidance ANSI N545-1975, which requires TLDs should be moved as far as possible from large or dense objects that may cause directional anomalies or otherwise perturb the radiation field. Although historical reviews were performed that resulted in no anomalous data relative to the radiation field, as part of our extent of condition, all environmental TLDs were evaluated as to locations and their respective orientations with the following determination:

Completed:

- An extent of condition review examined all Environmental Area TLD locations and their respective orientations and identified three (3) additional locations as candidates for additional monitoring.
- Clinton Power Station has installed four (4) TLDs in close proximity to the original TLDs: CL-5MM, CL-46MM, CL-47MM and CL-58MM.
- These Environmental Area TLDs located within the same meteorological sector near the four (4) locations, were measured and studied for comparison (Table C-X.1).
    - TLDs CL-05MM and CL-47MM showed a slight increase in the third quarter of 2011 by a difference of 0.5 and 0.9 mRem respectively. The fourth quarter of 2011 showed less exposure than the originally installed locations.
    - TLD CL-46MM showed a slight increase for all four quarters of 2011, averaging 3.0 mRem higher than the originally installed location.
    - TLD CL-05MM and CL-58MM was slightly higher in the first quarter of 2011 by a difference of 0.4 and 0.3 mRem respectively.
    - TLDs CL-47MM and CL-58MM was slightly less during the second quarter of 2011 by a difference of 0.2 and 2.1 mRem.

Because the TLD results from this study are not part of the ODCM REMP averages, the results are for comparison purposes only.

In conclusion to the study, a review of all of the data collected from the voluntary dosimeter locations indicates one significant trend. The data from CL-46MM has consistently been higher than that measured at

location CL-46. Because of this trend, the permanent location for CL-46 has been moved to the previous location of CL-46MM as of the second quarter of 2012. Because no trends were identified at the other voluntary locations, none were relocated. The comparison study has been concluded and will not continue through 2012.

IV. Results and Discussion

A. Aquatic Environment

1. Surface Water

Samples were taken hourly, from a continuous compositor at three locations (CL-90, CL-91 and CL-99) on a monthly schedule and grab samples were taken monthly from one station (CL-13). The following analyses were performed:

Iodine-131

Monthly samples from location CL-90 were analyzed for I-131 activity (Table C-I.1, Appendix C). No I-131 was found and the required LLD was met.

Tritium

Monthly samples from all locations were composited quarterly and analyzed for tritium activity (Table C–I.2, Appendix C). No tritium was detected in any samples and the required LLD was met.

Gamma Spectrometry

Samples from all locations were analyzed for gamma emitting nuclides (Table C–I.3, Appendix C). Naturally occurring K-40 was found in one of 12 samples at location CL-91 at a concentration of 179 pCi/l. No other nuclides were detected and all required LLDs were met.

2. Drinking Water

Monthly samples were collected from a continuous compositor at one location (CL-14). The following analyses were performed:

Gross Beta

Monthly samples were analyzed for concentrations of gross beta (Tables C–II.1, Appendix C). Gross beta was not detected in any samples.

Tritium

Monthly samples were composited quarterly and analyzed for tritium activity (Table C–II.2, Appendix C). No tritium was detected in any samples and the required LLD was met.

Iodine-131

Starting in August, monthly samples from location CL-14 were analyzed for I-131 activity (Table C-II.3, Appendix C). No I-131 was found and the required LLD was met.

Gamma Spectrometry

Monthly samples were analyzed for gamma emitting nuclides (Table C–II.4, Appendix C). Naturally occurring K-40 was found in one sample at location CL-14. No other nuclides were detected and all required LLDs were met.

3. Well Water

Quarterly grab samples were collected at two locations (CL-7D and CL-12, consisting of CL-12R [a raw water sample from this well] and CL-12T [same well water, but after treatment and available for consumption]). The following analyses were performed:

Tritium

Samples from all locations were analyzed for tritium activity (Table C–III.1, Appendix C). No tritium was detected in any samples and the required LLD was met.

Gamma Spectrometry

Samples from all locations were analyzed for gamma emitting nuclides (Table C–III.2, Appendix C). Naturally occurring K-40 was found in one of four samples for locations CL-12R and CL-7D. The concentrations ranged from 32 to 33 pCi/l. No other nuclides were detected and all required LLDs were met.

4. Fish

Fish samples comprised of carp, largemouth bass, bluegill, crappie and channel catfish were collected at two locations (CL-19 and CL-105) semiannually. The following analysis was performed:

Gamma Spectrometry

The edible portion of fish samples from both locations was analyzed for gamma emitting nuclides (Table C–IV.1, Appendix C). Naturally occurring K-40 was found at both stations. No fission or activation products were found. No other nuclides were detected and the required LLDs were met.

5. Shoreline Sediment

Aquatic shoreline sediment samples were collected at CL-7B semiannually. The following analysis was performed:

Gamma Spectrometry

Shoreline sediment samples were analyzed for gamma emitting nuclides (Table C–V.1, Appendix C). Naturally occurring K-40 was detected in both samples. No fission or activation products were found. No other nuclides were detected and the required LLDs were met.

B. Atmospheric Environment

1. Airborne

a. Air Particulates

Continuous air particulate samples were collected from 10 locations on a weekly basis. The 10 locations were separated into three groups: Group I represents locations within one mile of the CPS site boundary (CL-2, CL-3, CL-4, CL-6, CL-15, and CL-94). Group II represents the locations at an intermediate distance within one to five miles of CPS (CL-1, CL-7, and CL-8), and Group III represents the control location greater than five miles from CPS (CL-11). The following analyses were performed:

Gross Beta

Weekly samples were analyzed for concentrations of beta emitters (Table C–VI.1 and C–VI.2 and Figure C–1, Appendix C).

Detectable gross beta activity was observed at all locations. Comparison of results among the three groups aid in determining the effects, if any, resulting from the operation of CPS. The results from the On-Site locations (Group I) ranged from 8 to 44 E–3 pCi/m^3 with a mean of 21 E–3 pCi/m^3. The results from the Intermediate Distance location (Group II) ranged from 7 to 47 E–3 pCi/m^3 with a mean of 20 E–3 pCi/m^3. The results from the Control locations (Group III) ranged from 10 to 47 E–3 pCi/m^3 with a mean of 22 E–3 pCi/m^3. Comparison of the 2011 air particulate data with previous years data indicate no effects from the operation of CPS (Figure C–5, Appendix C). In addition, a comparison of the weekly mean values for 2011 indicate no notable differences among the three groups.

Gamma Spectrometry

Weekly samples were composited quarterly and analyzed for gamma emitting nuclides (Table C–VI.3, Appendix C). Naturally occurring isotope Be-7 due to cosmic ray activity was detected in most samples. Naturally occurring K-40 was detected in three samples. No other nuclides were detected and all required LLDs were met. Additional sampling occurred in the weeks immediately following the Fukushima event in 2011. Naturally occurring Be-7 was detected in one sample. All other nuclides were less than the MDC.

b. Airborne Iodine

Continuous air samples were collected from 10 locations (CL-1, CL-2, CL-3, CL-4, CL-6, CL-7, CL-8, CL-11, CL-15 and CL-94) and analyzed weekly for I-131 (Table C-VII.1, Appendix C). All results were less than the MDC and the required LLD was met with the exception of 29 samples which were positive for I-131. These positive results are directly attributed to the Fukushima event in March of 2011.

2. Terrestrial

a. Milk

Samples were collected from CL-116 biweekly April through November and monthly December through March, to coincide with the grazing season. The following analyses were performed:

Iodine-131

Milk samples were analyzed for concentrations of I-131 (Table C–VIII.1, Appendix C). The required LLD was met with the exception of one milk sample which was positive for I-131 at a concentration of 2.8 pCi/l.. This positive result is directly attributed to the Fukushima event in March of 2011.

Gamma Spectrometry

Each milk sample was analyzed for concentrations of gamma emitting nuclides (Table C–VIII.2, Appendix C). Naturally occurring K-40 activity was found in all samples. No other nuclides were detected and all required LLDs were met.

b. Food Products

Broadleaf vegetation samples and substitutes as noted in exceptions were collected from four locations (CL-114, CL-115, CL-117 and CL-118) monthly June through September, to coincide with the harvest season. The following analyses were performed:

Gamma Spectrometry

Each food product sample and substitutions as noted earlier were analyzed for concentrations of gamma emitting nuclides (Table C–IX.1, Appendix C).

Naturally occurring Be–7 due to cosmic ray activity was detected in most samples. Naturally occurring K-40 activity was found in all samples. No other nuclides were detected and all required LLDs were met.

c. Grass

Samples were collected from four locations (CL-1, CL-2, CL-8, and CL-116) biweekly May through October. The following analyses were performed:

Gamma Spectrometry

Each grass sample was analyzed for concentrations of gamma emitting nuclides (Table C–IX.2, Appendix C).

Naturally occurring Be–7 due to cosmic ray activity was detected in all samples. Naturally occurring K-40 activity was found in all samples. No other nuclides were detected and all required LLDs were met.

C. Ambient Gamma Radiation

Ambient gamma radiation levels were measured utilizing Panasonic 814 ($CaSO_4$) thermoluminescent dosimeters. Fifty-four TLD locations were established around the site. Results of TLD measurements are listed in Tables C–X.1 to C–X.3, Appendix C.

A total of 216 TLD measurements were made in 2011. The average dose from the inner ring was 19.0 mR/quarter. The average dose from the outer ring was 19.3 mR/quarter. The average dose from the special interest group was 19.0 mR/quarter. The average dose from the supplemental group was 18.1 mR/quarter. The quarterly measurements ranged from 15.2 to 22.6 mR/quarter.

The inner ring and outer ring measurements compared well to the Control Station, CL-11, which ranged from 17.1 mR/quarter to 19.5 mR/quarter with an average measurement of 17.8 mR/quarter. A comparison of the Inner Ring and Outer Ring data to the Control Location data indicate that the ambient gamma radiation levels from all the locations were comparable. The historical ambient gamma radiation data from the control location were plotted along with similar data from the Inner and Outer Ring Locations (Figure C–2, Appendix C).

D. Land Use Survey

A Land Use Survey conducted during the July through October 2011 growing season around the Clinton Power Station (CPS) was performed by Environmental Inc. (Midwest Labs) for Exelon to comply with Clinton's Offsite Dose Calculation Manual, section 5.2. The purpose of the survey

was to document the nearest resident, milk producing animal and garden of greater than 538 ft^2 in each of the sixteen 22 ½ degree sectors around the site. The distance and direction of all locations from the CPS Station HVAC vent stack were positioned using Global Positioning System (GPS) technology. There were no changes required to the CPS REMP, as a result of this survey. The results of this survey are summarized below.

Distance in Miles from the CPS Station HVAC Vent Stack			
Sector	Residence (km)	Garden (km)	Milk Farm (km)
1 N	1.5	1.5	1.5
2 NNE	1.5	4.8	3.8
3 NE	2.1	3.5	> 8
4 ENE	2.9	2.9	> 8
5 E	1.7	4	> 8
6 ESE	5.1	5.3	> 8
7 SE	3.9	7.1	> 8
8 SSE	2.9	4.5	4.5
9 S	4.8	6.6	> 8
10 SSW	4.7	> 8	> 8
11 SW	1.2	5.9	> 8
12 WSW	3.6	3.7	5.5
13 W	2	3.2	> 8
14 WNW	2.6	2.6	> 8
15 NW	2.7	> 8	> 8
16 NNW	2.1	2.1	2.1

E. Summary of Results – Inter-Laboratory Comparison Program

The primary laboratories analyzed Performance Evaluation (PE) samples of air particulate, air iodine, milk, soil, vegetation and water matrices for 19 analytes (Appendix D). The PE samples, supplied by Analytics Inc., Environmental Resource Associates (ERA) and DOE's Mixed Analyte Performance Evaluation Program (MAPEP), were evaluated against the following pre-set acceptance criteria:

1. Analytics Evaluation Criteria

   Analytics' evaluation report provides a ratio of TBE's result and Analytics' known value. Since flag values are not assigned by Analytics, TBE-ES evaluates the reported ratios based on internal QC requirements, which are based on the DOE MAPEP criteria.

2. ERA Evaluation Criteria

   ERA's evaluation report provides an acceptance range for control

and warning limits with associated flag values. ERA's acceptance limits are established per the USEPA, NELAC, state specific PT program requirements or ERA's SOP for the Generation of Performance Acceptance Limits, as applicable. The acceptance limits are either determined by a regression equation specific to each analyte or a fixed percentage limit promulgated under the appropriate regulatory document.

3. DOE Evaluation Criteria

   MAPEP's evaluation report provides an acceptance range with associated flag values.

   The MAPEP defines three levels of performance: Acceptable (flag = "A"), Acceptable with Warning (flag = "W"), and Not Acceptable (flag = "N"). Performance is considered acceptable when a mean result for the specified analyte is ± 20% of the reference value. Performance is acceptable with warning when a mean result falls in the range from ± 20% to ± 30% of the reference value (i.e., 20% < bias < 30%). If the bias is greater than 30%, the results are deemed not acceptable.

For the primary laboratory, 14 out of 18 analytes met the specified acceptance criteria. Four analytes did not meet the specified acceptance criteria for the following reason:

1. Teledyne Brown Engineering's Analytics March 2011 Cr-51 in milk result of 398 pCi/L was higher than the known value of 298 pCi/L, resulting in a found to known ratio of 1.34. NCR 11-13 was initiated to investigate this failure. There was a slightly high bias in all the gamma activities. The June gamma results in milk did not show a high bias. No further action was required.
2. Teledyne Brown Engineering's ERA May 2011 Gross Alpha in water result of 64.1 pCi/L was higher than the known value of 50.1 pCi/L, which exceeded the upper control limit of 62.9 pCi/L. NCR 11-08 was initiated to investigate this failure. The solids on the planchet exceeded 100 mg, which was beyond the range of the efficiency curve.

   Teledyne Brown Engineering's MAPEP March 2011 Gross Alpha in air particulate result of 0.101 Bq/sample was lower than the known value of 0.659 Bq/sample, which exceeded the lower control limit of 0.198 Bq/sample. NCR 11-11 was initiated to investigate this failure. The air particulate filter was counted on the wrong side.

3. Teledyne Brown Engineering's ERA November 2011 Sr-89 in water result of 81.0 pCi/L was higher than the known value of 69.7 pCi/L, which exceeded the upper control limit of 77.9 pCi/L. NCR 11-16 was initiated to investigate this failure. The TBE reported value to known ratio of 1.16 fell within the acceptable range of ± 20%, which TBE considers acceptable.

4. Teledyne Brown Engineering's MAPEP March 2011 Sr-90 in soil, air particulate and vegetation were non-reports that were evaluated as failed. NCR 11-11 was initiated to investigate these failures. MAPEP evaluated the non-reports as failed due to not reporting a previously reported analyte.

For the secondary laboratory, Environmental, Inc., 12 out of 14 analytes met the specified acceptance criteria.

1. Environmental Inc.'s ERA October 2011 Cs-134 in water result of 38.8 pCi/L was higher than the known value of 33.4 pCi/L, which exceeded the upper control limit of 36.7 pCi/L. The sample was reanalyzed. The reanalyzed result of 32.9 was acceptable.

2. Environmental Inc.'s MAPEP February 2011 Sr-90 in air particulate result of 1.89 Bq/sample was higher than the known value of 1.36 Bq/sample, which exceeded the upper control limit of 1.77 Bq/sample. No errors were found in the calculation or procedure. The reanalyzed result of 1.73 Bq/sample was acceptable.

3. Environmental Inc.'s MAPEP August 2011 Sr-90 in soil result of 219.4 Bq/kg, less than the known value of 320 Bq/kg, was below the lower control limit of 224 Bq/kg. The sample was reanalyzed in triplicate through a strontium column. The reanalyzed result of 304.2 Bq/kg was acceptable.

The Inter-Laboratory Comparison Program provides evidence of "in control" counting systems and methods, and that the laboratories are producing accurate and reliable data.

V. References

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8. International Commission on Radiation Protection, Publication No. 39 (1984), "Principles of Limiting Exposure to the Public to Natural Sources of Radiation".

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20. United States Nuclear Regulatory Commission, Regulatory Guide 4.15, "Quality Assurance for Radiological Monitoring Programs (Norm Operations) – Effluent Streams and the Environment," Revision 1, February 1979.

21. Technical Specifications, Clinton Power Station, Unit No. 1, Docket No. 50-461, Office of Nuclear Reactor Regulation, 1986. Facility Operating License Number NPF-62.

22. Clinton Power Station, Updated Safety Analysis Report.

23. Clinton Power Station, Unit 1, Off-Site Dose Calculation Manual.

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APPENDIX A

RADIOLOGICAL ENVIRONMENTAL MONITORING REPORT SUMMARY

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TABLE A-1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY FOR THE CLINTON POWER STATION, 2011

Name of Facility: CLINTON POWER STATION **DOCKET NUMBER:** 50-461
Location of Facility: DEWITT COUNTY IL **REPORTING PERIOD:** 2011

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPES OF ANALYSIS PERFORMED	NUMBER OF ANALYSIS PERFORMED	REQUIRED LOWER LIMIT OF DETECTION (LLD)	INDICATOR LOCATIONS MEAN (M) (F) RANGE	CONTROL LOCATION MEAN (M) (F) RANGE	LOCATION WITH HIGHEST ANNUAL MEAN (M) MEAN (M) (F) RANGE	STATION # NAME DISTANCE AND DIRECTION	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
SURFACE WATER (PCI/LITER)	I-131	12	1	<LLD	NA	-		0
	H-3	16	2000	<LLD	<LLD	-		0
	GAMMA	48						
	BE-7		NA	<LLD	<LLD	-		0
	K-40		NA	<LLD	48 (1/24)	48 (1/12)	CL-91 CONTROL PARNELL BOAT ACCESS 6.1 MILES ENE OF SITE	0
	MN-54		15	<LLD	<LLD	-		0
	CO-58		15	<LLD	<LLD	-		0
	FE-59		30	<LLD	<LLD	-		0
	CO-60		15	<LLD	<LLD	-		0

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FRACTION OF DETECTABLE MEASUREMENTS AT SPECIFIED LOCATIONS IS INDICATED IN PARENTHESES (F)

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SURFACE WATER (PCI/LITER)	ZN-65		30	<LLD	<LLD	-		0
	NB-95		15	<LLD	<LLD	-		0
	ZR-95		30	<LLD	<LLD	-		0
	CS-134		15	<LLD	<LLD	-		0
	CS-137		18	<LLD	<LLD	-		0
	BA-140		60	<LLD	<LLD	-		0
	LA-140		15	<LLD	<LLD	-		0
	CE-144		NA	<LLD	<LLD	-		0

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DRINKING WATER (PCI/LITER)	GR-B	12	4	<LLD	NA	-		0
	H-3	4	2000	<LLD	NA	-		0
	I-131	5	1	<LLD	NA	-		0
	GAMMA BE-7	12	NA	<LLD	NA	-		0
	K-40		NA	179 (1/12)	NA	179 (1/12)	CL-14 INDICATOR STATION PLANT SERVICE BLDG ONSITE	0
	MN-54		15	<LLD	NA	-		0
	CO-58		15	<LLD	NA	-		0
	FE-59		30	<LLD	NA	-		0

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DRINKING WATER (PCI/LITER)	CO-60		15	<LLD	NA	-		0
	ZN-65		30	<LLD	NA	-		0
	NB-95		15	<LLD	NA	-		0
	ZR-95		30	<LLD	NA	-		0
	I-131		15	<LLD	NA	-		0
	CS-134		15	<LLD	NA	-		0
	CS-137		18	<LLD	NA	-		0
	BA-140		60	<LLD	NA	-		0

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DRINKING WATER (PCI/LITER)	LA-140		15	<LLD	NA	-		0
	CE-144		NA	<LLD	NA	-		0
WELL WATER (PCI/LITER)	H-3	12	2000	<LLD	NA	-		0
	GAMMA BE-7	12	NA	<LLD	NA	-		0
	K-40		NA	33 (2/12) (32/33)	NA	33 (1/4)	CL-12R INDICATOR DEWITT PUMP HOUSE 1.6 MILES E OF SITE	0
	MN-54		15	<LLD	NA	-		0
	CO-58		15	<LLD	NA	-		0
	FE-59		30	<LLD	NA	-		0

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WELL WATER (PCI/LITER)	CO-60		15	<LLD	NA	-		0
	ZN-65		30	<LLD	NA	-		0
	NB-95		15	<LLD	NA	-		0
	ZR-95		30	<LLD	NA	-		0
	CS-134		15	<LLD	NA	-		0
	CS-137		18	<LLD	NA	-		0
	BA-140		60	<LLD	NA	-		0
	LA-140		15	<LLD	NA	-		0

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WELL WATER (PCI/LITER)	CE-144		NA	<LLD	NA	-		0
FISH (PCI/KG WET)	GAMMA	16						
	BE-7		NA	<LLD	<LLD	-		0
	K-40		NA	3025 (8/8) (2510/3440)	3113 (8/8) (2360/4380)	3113 (8/8) (2360/4380)	CL-105 CONTROL LAKE SHELBYVILLE 50 MILES S OF SITE	0
	MN-54		130	<LLD	<LLD	-		0
	CO-58		130	<LLD	<LLD	-		0
	FE-59		260	<LLD	<LLD	-		0
	CO-60		130	<LLD	<LLD	-		0
	ZN-65		260	<LLD	<LLD	-		0

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FISH (PCI/KG WET)	NB-95		NA	<LLD	<LLD	-		0
	ZR-95		NA	<LLD	<LLD	-		0
	CS-134		130	<LLD	<LLD	-		0
	CS-137		150	<LLD	<LLD	-		0
	BA-140		NA	<LLD	<LLD	-		0
	LA-140		NA	<LLD	<LLD	-		0
	CE-144		NA	<LLD	<LLD	-		0
SEDIMENT (PCI/KG DRY)	GAMMA	2						
	BE-7		NA	<LLD	NA	-		0

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SEDIMENT (PCI/KG DRY)	K-40		NA	6590 (2/2) (5830/7350)	NA	6590 (2/2) (5830/7350)	CL-07B INDICATOR CLINTON LAKE 2.1 MILES SE OF SITE	0
	MN-54		NA	<LLD	NA	-		0
	CO-58		NA	<LLD	NA	-		0
	FE-59		NA	<LLD	NA	-		0
	CO-60		NA	<LLD	NA	-		0
	ZN-65		NA	<LLD	NA	-		0
	NB-95		NA	<LLD	NA	-		0
	ZR-95		NA	<LLD	NA	-		0

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SEDIMENT (PCI/KG DRY)	CS-134		150	<LLD	NA	-		0
	CS-137		180	<LLD	NA	-		0
	BA-140		NA	<LLD	NA	-		0
	LA-140		NA	<LLD	NA	-		0
	CE-144		NA	<LLD	NA	-		0
AIR PARTICULATE (E-3 PCI/CU.METER)	GR-B	520	10	21 (467/468) (7/47)	22 (52/52) (10/47)	22 (52/52) (8/44)	CL-6 INDICATOR CLINTON'S RECREATION AREA 0.7 MILES WSW OF SITE	0
	GAMMA BE-7	40	NA	70 (35/36) (49/102)	72 (4/4) (64/86)	85 (4/4) (58/102)	CL-7 INDICATOR MASCOUTIN RECREATON AREA 2.3 MILES SE OF SITE	0
	K-40		NA	31 (2/36) (24/38)	19 (1/4)	31 (2/4) (24/38)	CL-15 INDICATOR RT. 900N RESIDENCE 0.9 MILES N OF SITE	0

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AIR PARTICULATE (E-3 PCI/CU.METER)	CO-60		NA	<LLD	<LLD	-		0
	NB-95		NA	<LLD	<LLD	-		0
	ZR-95		NA	<LLD	<LLD	-		0
	RU-103		NA	<LLD	<LLD	-		0
	RU-106		NA	<LLD	<LLD	-		0
	CS-134		50	<LLD	<LLD	-		0
	CS-137		60	<LLD	<LLD	-		0
	CE-141		NA	<LLD	<LLD	-		0

THE MEAN AND 2 STANDARD DEVIATION VALUES ARE CALCULATED USING THE POSITIVE VALUES
FRACTION OF DETECTABLE MEASUREMENTS AT SPECIFIED LOCATIONS IS INDICATED IN PARENTHESES (F)

TABLE A-1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY FOR THE CLINTON POWER STATION, 2011

Name of Facility: CLINTON POWER STATION **DOCKET NUMBER:** 50-461
Location of Facility: DEWITT COUNTY IL **REPORTING PERIOD:** 2011

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPES OF ANALYSIS PERFORMED	NUMBER OF ANALYSIS PERFORMED	REQUIRED LOWER LIMIT OF DETECTION (LLD)	INDICATOR LOCATIONS MEAN (M) (F) RANGE	CONTROL LOCATION MEAN (M) (F) RANGE	LOCATION WITH HIGHEST ANNUAL MEAN (M) MEAN (M) (F) RANGE	LOCATION WITH HIGHEST ANNUAL MEAN (M) STATION # NAME DISTANCE AND DIRECTION	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
AIR PARTICULATE (E-3 PCI/CU.METER)	CE-144		NA	<LLD	<LLD	-		0
AIR IODINE (E-3 PCI/CU.METER)	GAMMA I-131	520	70	54 (27/468) (29/102)	84 (2/52) (78/90)	84 (2/52) (78/90)	CL-11 CONTROL AMERENIP SUBSTATION 16 MILES S OF SITE	0
MILK (PCI/LITER)	I-131	21	1	NA	2.8 (1/21)	2.8 (1/21)	CL-116 CONTROL PASTURE IN RURAL KENNEY 14 MILES WSW OF SITE	0
	GAMMA BE-7	21	NA	NA	<LLD	-		0
	K-40		NA	NA	1242 (21/21) (1070/1400)	1242 (21/21) (1070/1400)	CL-116 CONTROL PASTURE IN RURAL KENNEY 14 MILES WSW OF SITE	0
	MN-54		NA	NA	<LLD	-		0
	CO-58		NA	NA	<LLD	-		0
	FE-59		NA	NA	<LLD	-		0

THE MEAN AND 2 STANDARD DEVIATION VALUES ARE CALCULATED USING THE POSITIVE VALUES
FRACTION OF DETECTABLE MEASUREMENTS AT SPECIFIED LOCATIONS IS INDICATED IN PARENTHESES (F)

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MILK (PCI/LITER)	CO-60		NA	NA	<LLD	-		0
	ZN-65		NA	NA	<LLD	-		0
	NB-95		NA	NA	<LLD	-		0
	ZR-95		NA	NA	<LLD	-		0
	CS-134		15	NA	<LLD	-		0
	CS-137		18	NA	<LLD	-		0
	BA-140		60	NA	<LLD	-		0
	LA-140		15	NA	<LLD	-		0

THE MEAN AND 2 STANDARD DEVIATION VALUES ARE CALCULATED USING THE POSITIVE VALUES
FRACTION OF DETECTABLE MEASUREMENTS AT SPECIFIED LOCATIONS IS INDICATED IN PARENTHESES (F)

TABLE A-1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY FOR THE CLINTON POWER STATION, 2011

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MILK (PCI/LITER)	CE-144		NA	NA	<LLD	-		0
VEGETATION (PCI/KG WET)	GAMMA	48						
	BE-7		NA	803 (33/36) (170/3070)	386 (11/12) (194/688)	1072 (11/12) (208/3070)	CL-115 INDICATOR SITE'S SECONDARY ACCESS ROAD 0.7 MILES NE OF SITE	0
	K-40		NA	5025 (36/36) (1620/13800)	6003 (12/12) (3280/9970)	6282 (12/12) (2470/13800)	CL-118 INDICATOR SITE'S MAIN ACCESS ROAD 0.7 MILES NNE OF SITE	0
	MN-54		NA	<LLD	<LLD	-		0
	CO-58		NA	<LLD	<LLD	-		0
	FE-59		NA	<LLD	<LLD	-		0
	CO-60		NA	<LLD	<LLD	-		0
	ZN-65		NA	<LLD	<LLD	-		0

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FRACTION OF DETECTABLE MEASUREMENTS AT SPECIFIED LOCATIONS IS INDICATED IN PARENTHESES (F)

TABLE A-1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY FOR THE CLINTON POWER STATION, 2011

Name of Facility: CLINTON POWER STATION **DOCKET NUMBER:** 50-461
Location of Facility: DEWITT COUNTY IL **REPORTING PERIOD:** 2011

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPES OF ANALYSIS PERFORMED	NUMBER OF ANALYSIS PERFORMED	REQUIRED LOWER LIMIT OF DETECTION (LLD)	INDICATOR LOCATIONS MEAN (M) (F) RANGE	CONTROL LOCATION MEAN (M) (F) RANGE	LOCATION WITH HIGHEST ANNUAL MEAN (M) MEAN (M) (F) RANGE	STATION # NAME DISTANCE AND DIRECTION	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
VEGETATION (PCI/KG WET)	NB-95		NA	<LLD	<LLD	-		0
	ZR-95		NA	<LLD	<LLD	-		0
	I-131		60	<LLD	<LLD	-		0
	CS-134		60	<LLD	<LLD	-		0
	CS-137		80	<LLD	<LLD	-		0
	BA-140		NA	<LLD	<LLD	-		0
	LA-140		NA	<LLD	<LLD	-		0
	CE-144		NA	<LLD	<LLD	-		0

THE MEAN AND 2 STANDARD DEVIATION VALUES ARE CALCULATED USING THE POSITIVE VALUES
FRACTION OF DETECTABLE MEASUREMENTS AT SPECIFIED LOCATIONS IS INDICATED IN PARENTHESES (F)

TABLE A-1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY FOR THE CLINTON POWER STATION, 2011

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MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPES OF ANALYSIS PERFORMED	NUMBER OF ANALYSIS PERFORMED	REQUIRED LOWER LIMIT OF DETECTION (LLD)	INDICATOR LOCATIONS MEAN (M) (F) RANGE	CONTROL LOCATION MEAN (M) (F) RANGE	LOCATION WITH HIGHEST ANNUAL MEAN (M) MEAN (M) (F) RANGE	LOCATION WITH HIGHEST ANNUAL MEAN (M) STATION # NAME DISTANCE AND DIRECTION	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
GRASS (PCI/KG WET)	GAMMA	52						
	BE-7		NA	1414 (39/39) (243/3283)	1784 (13/13) (1229/3001)	1784 (13/13) (1229/3001)	CL-116 CONTROL PASTURE IN RURAL KENNEY 14 MILES WSW OF SITE	0
	K-40		NA	5371 (39/39) (3424/7898)	5337 (13/13) (3728/7027)	5975 (13/13) (3586/7898)	CL-08 INDICATOR DEWITT CEMETERY 2.2 MILES E OF SITE	0
	MN-54		NA	<LLD	<LLD	-		0
	CO-58		NA	<LLD	<LLD	-		0
	FE-59		NA	<LLD	<LLD	-		0
	CO-60		NA	<LLD	<LLD	-		0
	ZN-65		NA	<LLD	<LLD	-		0
	NB-95		NA	<LLD	<LLD	-		0

THE MEAN AND 2 STANDARD DEVIATION VALUES ARE CALCULATED USING THE POSITIVE VALUES
FRACTION OF DETECTABLE MEASUREMENTS AT SPECIFIED LOCATIONS IS INDICATED IN PARENTHESES (F)

TABLE A-1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY FOR THE CLINTON POWER STATION, 2011

Name of Facility: CLINTON POWER STATION **DOCKET NUMBER:** 50-461
Location of Facility: DEWITT COUNTY IL **REPORTING PERIOD:** 2011

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPES OF ANALYSIS PERFORMED	NUMBER OF ANALYSIS PERFORMED	REQUIRED LOWER LIMIT OF DETECTION (LLD)	INDICATOR LOCATIONS MEAN (M) (F) RANGE	CONTROL LOCATION MEAN (M) (F) RANGE	LOCATION WITH HIGHEST ANNUAL MEAN (M) MEAN (M) (F) RANGE	STATION # NAME DISTANCE AND DIRECTION	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
GRASS (PCI/KG WET)	ZR-95		NA	<LLD	<LLD	-		0
	I-131		60	<LLD	<LLD	-		0
	CS-134		60	<LLD	<LLD	-		0
	CS-137		80	<LLD	<LLD	-		0
	BA-140		NA	<LLD	<LLD	-		0
	LA-140		NA	<LLD	<LLD	-		0
	CE-144		NA	<LLD	<LLD	-		0
DIRECT RADIATION (MILLI-ROENTGEN/QTR.)	TLD-QUARTERLY	216	NA	18.9 (212/212) (15.2/22.6)	17.8 (4/4) (17.1/19.5)	20.1 (4/4) (18.7/22.5)	CL-60 INDICATOR 4.5 MILES SW	0

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FRACTION OF DETECTABLE MEASUREMENTS AT SPECIFIED LOCATIONS IS INDICATED IN PARENTHESES (F)

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APPENDIX B

LOCATION DESIGNATION, DISTANCE & DIRECTION, AND SAMPLE COLLECTION & ANALYTICAL METHODS

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TABLE B-1: Radiological Environmental Monitoring Program - Sampling Locations, Distance and Direction, Clinton Power Station, 2011

Location	Location Description	Distance & Direction From Site
A. Surface Water		
CI-13	Salt Creek Bridge on Rt. 10 (indicator)	3.6 miles SW
CL-90	Discharge Flume (indicator)	0.4 miles SE
CL-91	Parnell Boat Access (control)	6.1 miles ENE
CL-99	North Fork Access (control)	3.5 miles NNE
B. Drinking (Potable) Water		
CL-14	Station Plant Service Bldg (indicator)	Onsite
C. Well Water		
CL-7D	Mascoutin Recreation Area (indicator)	2.3 miles ESE
CL-12T	DeWitt Pump House (indicator)	1.6 miles E
CL-12R	DeWitt Pump House (indicator)	1.6 miles E
D. Milk - bi-weekly / monthly		
CL-116	Dement Dairy (control)	14 miles WSW
E. Air Particulates / Air Iodine		
CL-1	Camp Quest	1.8 miles W
CL-2	Clinton's Main Access Road	0.7 miles NNE
CL-3	Clinton's Secondary Access Road	0.7 miles NE
CL-4	Residence Near Recreation Area	0.8 miles SW
CL-6	Clinton's Recreation Area	0.7 miles WSW
CL-7	Mascoutin Recreation Area	2.3 miles SE
CL-8	DeWitt Cemetery	2.2 miles E
CL-11	Illinois Power Substation (Control)	16 miles S
CL-15	Rt. 900N Residence	0.9 miles N
CL-94	Old Clinton Road	0.6 miles E
F. Fish		
CL-19	End of Discharge Flume (indicator)	3.4 miles E
CL-105	Lake Shelbyville (control)	50 miles S
G. Shoreline Sediment		
CL-7B	Clinton Lake (indicator)	2.1miles SE
H. Food Products		
CL-114	Cisco (Control)	12.5 miles SSE
CL-115	Site's Secondary Access Road	0.7 miles NE
CL-117	Residence North of Site	0.9 miles N
CL-118	Site's Main Access Road	0.7 miles NNE
I. Grass		
CL-1	Camp Quest	1.8 miles W
CL-2	Clinton's Main Access Road	0.7 miles NNE
CL-8	DeWitt Cemetery	2.2 miles E
CL-116	Pasture in Rural Kenney	14 miles WSW

TABLE B-1: Radiological Environmental Monitoring Program - Sampling Locations, Distance and Direction, Clinton Power Station, 2011

Location	Location Description	Distance & Direction From Site
J.	Environmental Dosimetry - TLD	
	Inner Ring	
CL-1		1.8 miles W
CL-5		0.7 miles NNE
CL-22		0.6 miles NE
CL-23		0.5 miles ENE
CL-24		0.5 miles E
CL-34		0.8 miles WNW
CL-35		0.7 miles NW
CL-36		0.6 miles N
CL-42		2.8 miles ESE
CL-43		2.8 miles SE
CL-44		2.3 miles SSE
CL-45		2.8 miles S
CL-46		2.8 miles SSW
CL-47		3.3 miles SW
CL-48		2.3 miles WSW
CL-63		1.3 miles NNW
	Outer Ring	
CL-51		4.4 miles NW
CL-52		4.3 miles NNW
CL-53		4.3 miles E
CL-54		4.6 miles ESE
CL-55		4.1 miles SE
CL-56		4.1 miles SSE
CL-57		4.6 miles S
CL-58		4.3 miles SSW
CL-60		4.5 miles SW
CL-61		4.5 miles WSW
CL-76		4.6 miles N
CL-77		4.5 miles NNE
CL-78		4.8 miles NE
CL-79		4.5 miles ENE
CL-80		4.1 miles W
CL-81		4.5 miles WNW

TABLE B-1: Radiological Environmental Monitoring Program - Sampling Locations, Distance and Direction, Clinton Power Station, 2011

Location	Location Description	Distance & Direction From Site
J.	Environmental Dosimetry – TLD (cont.)	
Special Interest		
CL-37		3.4 miles N
CL-41		2.4 miles E
CL-49		3.5 miles W
CL-64		2.1 miles WNW
CL-65		2.6 miles ENE
CL-74		1.9 miles W
CL-75		0.9 miles N
Supplemental		
CL-2		0.7 miles NNE
CL-3		0.7 miles NE
CL-4		0.8 miles SW
CL-6		0.8 miles WSW
CL-7		2.3 miles SE
CL-8		2.2 miles E
CL-15		0.9 miles N
CL-33		11.7 miles SW
CL-84		0.6 miles E
CL-90		0.4 miles SE
CL-91		6.1 miles ENE
CL-97		10.3 miles SW
CL-99		3.5 miles NNE
CL-114		12.5 miles SE
Control		
CL-11		16 miles S

TABLE B-2: Radiological Environmental Monitoring Program – Summary of Sample Collection and Analytical Methods, Clinton Power Station, 2011

Sample Medium	Analysis	Sampling Method	Analytical Procedure Number
Surface Water	Gamma Spectroscopy	Monthly composite from a continuous water compositor.	TBE, TBE-2007 Gamma emitting radioisotope analysis Env. Inc., SPM-1 Sampling Procedure Manual
Surface Water	Tritium	Quarterly composite from a continuous water compositor.	TBE, TBE-2011 Tritium analysis in drinking water by liquid scintillation Env. Inc., SPM-1 Sampling Procedure Manual
Surface Water	I-131	Monthly composite from a continuous water compositor.	TBE, TBE-2012 Radioiodine in various matrices Env. Inc., SPM-1 Sampling Procedure Manual
Drinking Water	Gross Beta	Monthly composite from a continuous water compositor.	TBE, TBE-2008 Gross Alpha and/or gross beta activity in various matrices Env. Inc., SPM-1 Sampling Procedure Manual
Drinking Water	Gamma Spectroscopy	Monthly composite from a continuous water compositor.	TBE, TBE-2007 Gamma emitting radioisotope analysis Env. Inc., SPM-1 Sampling Procedure Manual
Drinking Water	Tritium	Quarterly composite from a continuous water compositor.	TBE, TBE-2011 Tritium analysis in drinking water by liquid scintillation Env. Inc., SPM-1 Sampling Procedure Manual
Drinking Water	I-131	Quarterly composite from a continuous water compositor.	TBE, TBE-2031 Radioactive Iodine in Drinking Water Env. Inc., SPM-1 Sampling Procedure Manual
Well Water	Gamma Spectroscopy	Quarterly composite from a continuous water compositor.	TBE, TBE-2007 Gamma emitting radioisotope analysis Env. Inc., SPM-1 Sampling Procedure Manual
Well Water	Tritium	Quarterly composite from a continuous water compositor.	TBE, TBE-2011 Tritium analysis in drinking water by liquid scintillation Env. Inc., SPM-1 Sampling Procedure Manual
Fish	Gamma Spectroscopy	Semi-annual samples collected via electroshocking or other techniques	TBE-2007 Gamma emitting radioisotope analysis Env. Inc., SPM-1 Sampling Procedure Manual
Air Particulates	Gross Beta	One-week composite of continuous air sampling through glass fiber filter paper	TBE, TBE-2008 Gross Alpha and/or gross beta activity in various matrices Env. Inc., SPM-1 Sampling Procedure Manual
Air Particulates	Gamma Spectroscopy	Quarterly composite of each station	TBE, TBE-2007 Gamma emitting radioisotope analysis Env. Inc., SPM-1 Sampling Procedure Manual
Air Iodine	Gamma Spectroscopy	One-week composite of continuous air sampling through charcoal filter	TBE, TBE-2007 Gamma emitting radioisotope analysis Env. Inc., SPM-1 Sampling Procedure Manual
Milk	I-131	Bi-weekly grab sample when cows are on pasture. Monthly all other times	TBE, TBE-2012 Radioiodine in various matrices Env. Inc., SPM-1 Sampling Procedure Manual

TABLE B-2: Radiological Environmental Monitoring Program – Summary of Sample Collection and Analytical Methods, Clinton Power Station, 2011

Sample Medium	Analysis	Sampling Method	Analytical Procedure Number
Food Products	Gross Beta	Monthly grab June through September	TBE, TBE-2008 Gross Alpha and/or gross beta activity in various matrices Env. Inc., SPM-1 Sampling Procedure Manual
Food Products	Gamma Spectroscopy	Monthly grab June through September	TBE, TBE-2007 Gamma emitting radioisotopes analysis Env. Inc., SPM-1 Sampling Procedure Manual
Grass	Gamma Spectroscopy	Biweekly May through October	TBE, TBE-2007 Gamma emitting radioisotopes analysis Env. Inc., SPM-1 Sampling Procedure Manual
TLD	Thermoluminescence Dosimetry	Quarterly TLDs comprised of two Mirion CaF_2 elements.	Mirion Technologies Quality Assurance Manual

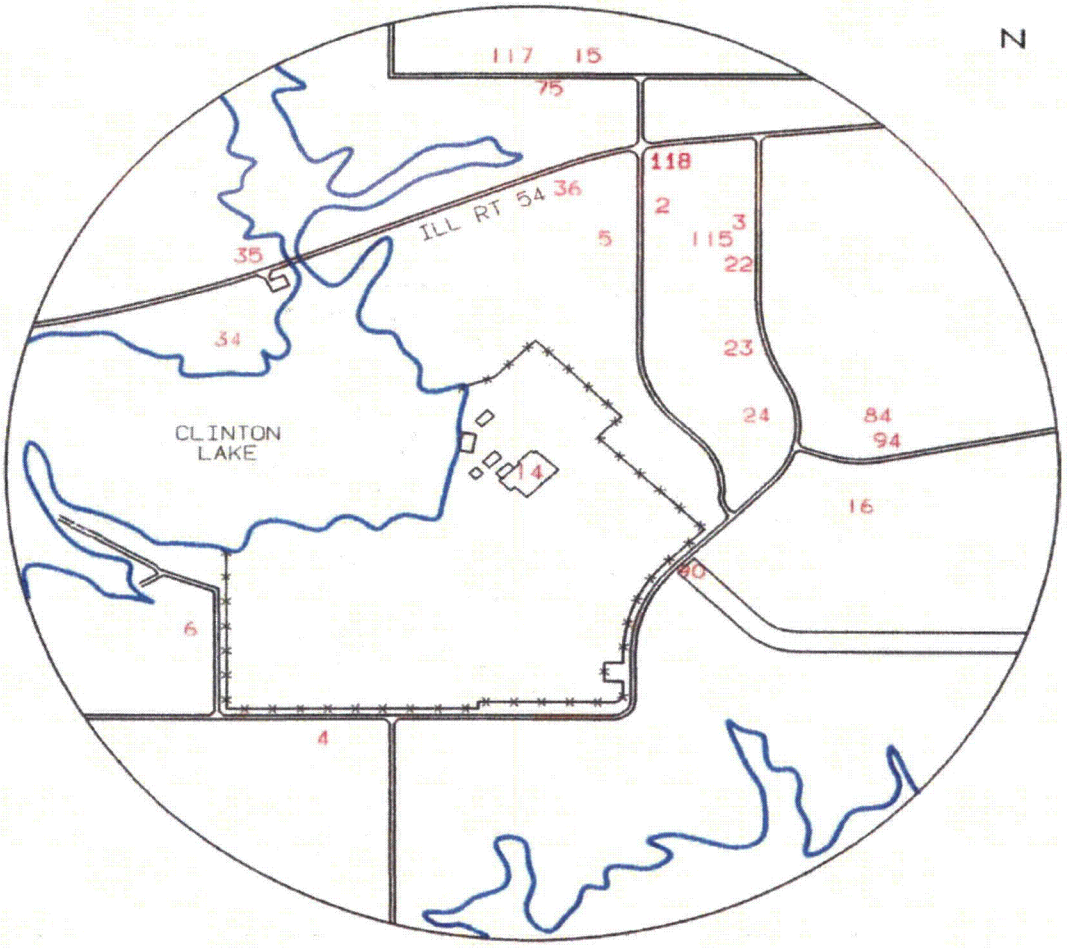

Figure B-1
Environmental Sampling Locations Within One
Mile of the Clinton Power Station, 2011

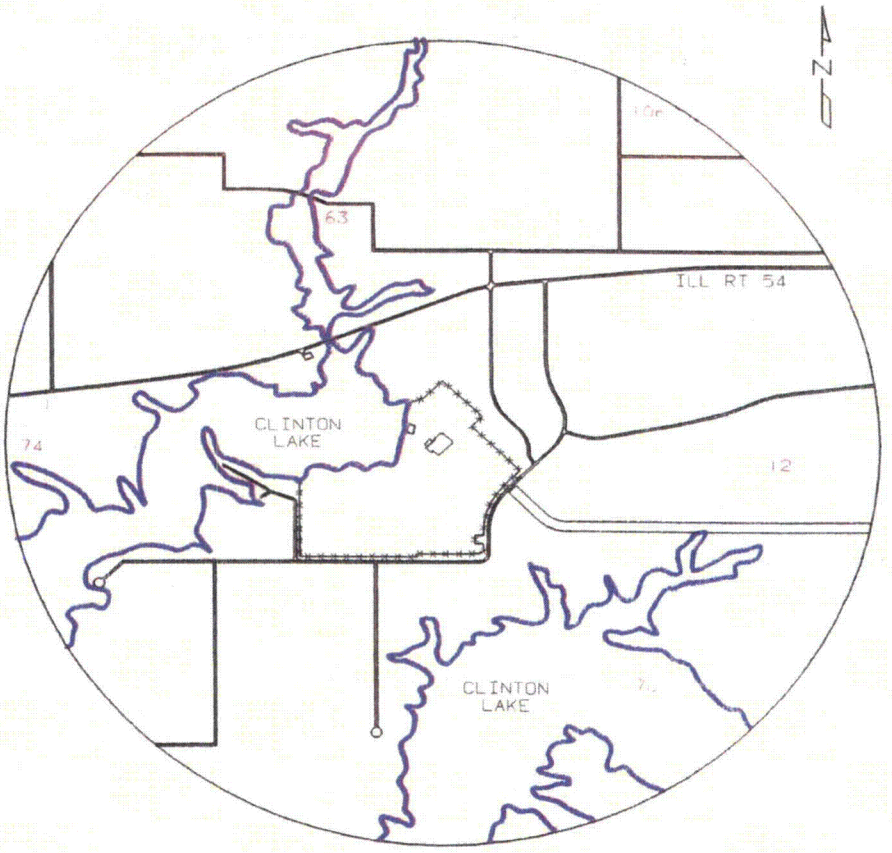

Figure B-2
Environmental Sampling Locations Between One and Two
Miles of the Clinton Power Station, 2011

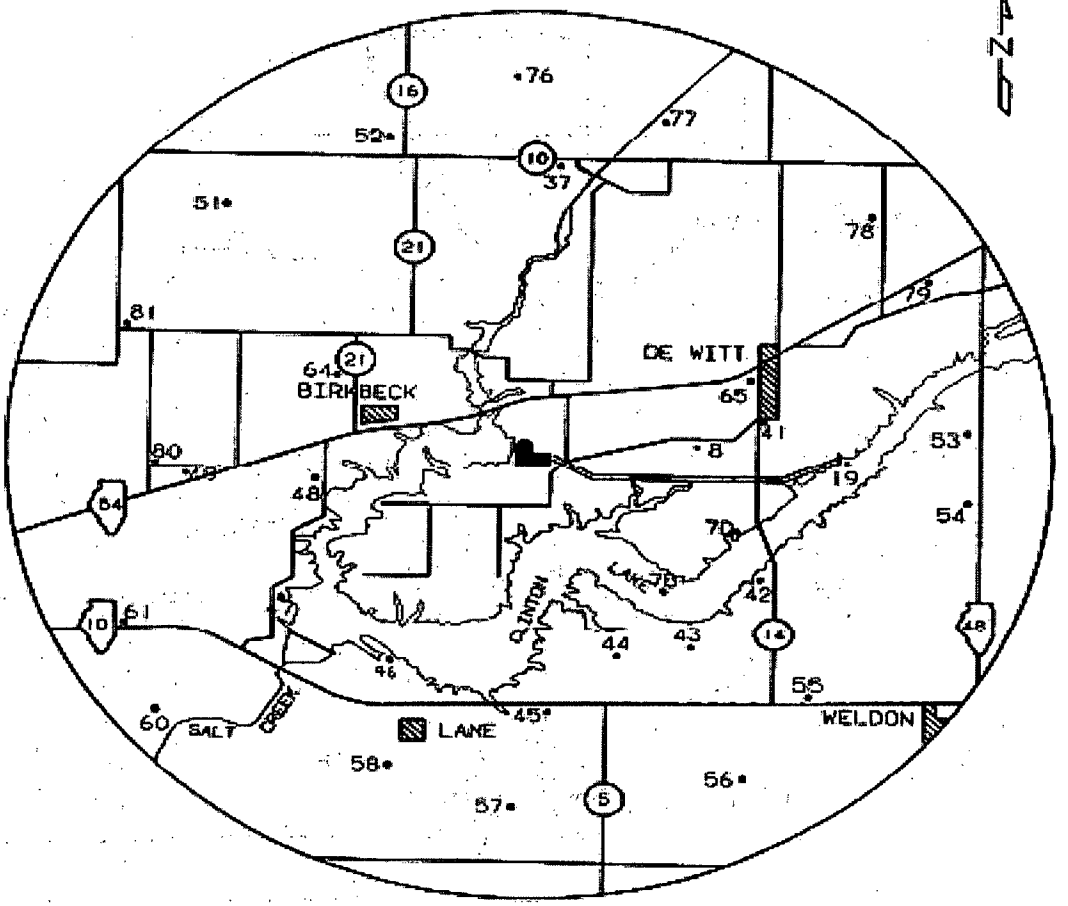

Figure B-3
Environmental Sampling Locations Between Two and Five Miles from the Clinton Power Station, 2011

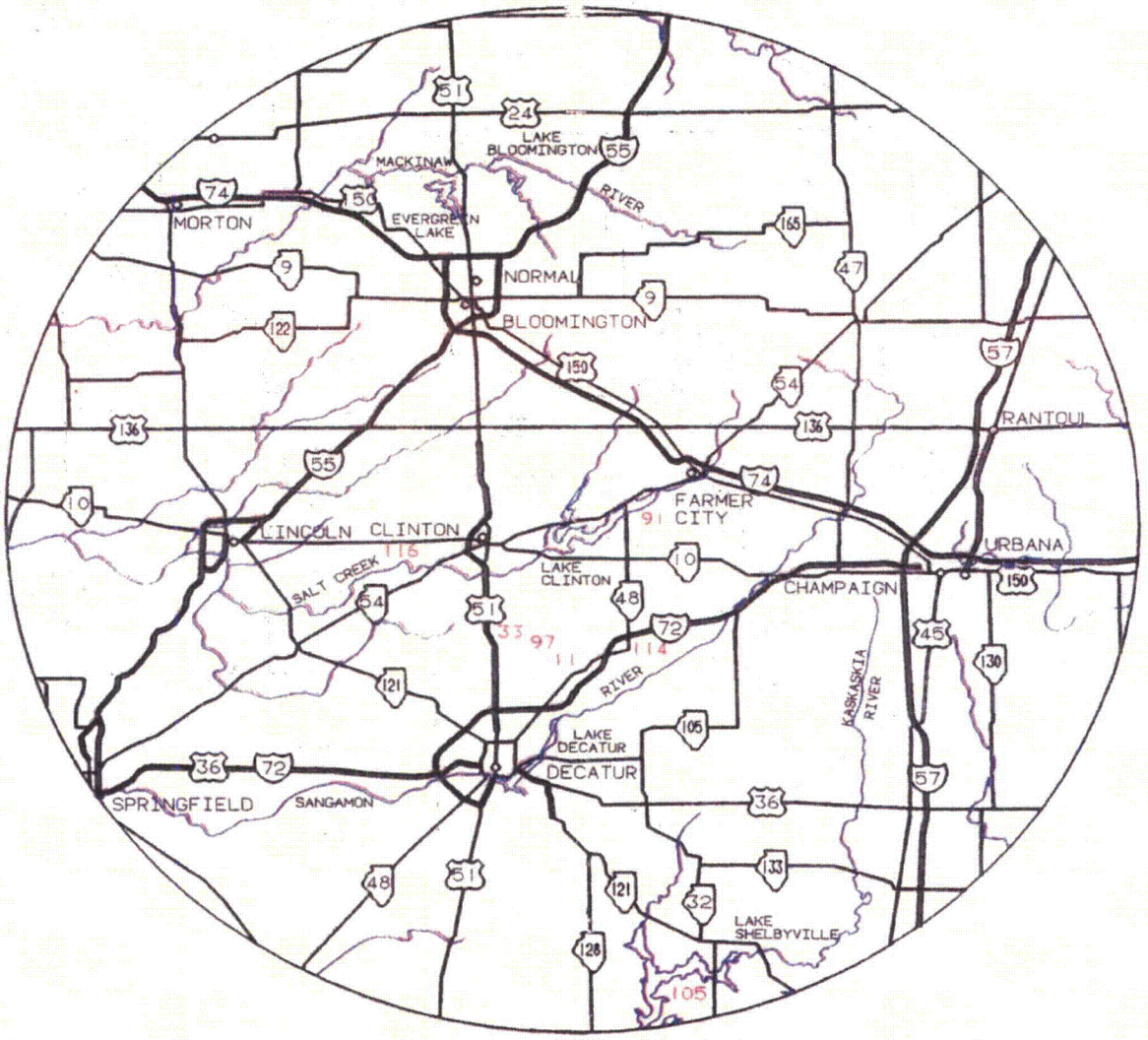

Figure B-4
Environmental Sampling Locations Greater Than Five Miles of the Clinton Power Station, 2011

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APPENDIX C

DATA TABLES AND FIGURES - PRIMARY LABORATORY

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TABLE C-I.1 **CONCENTRATIONS OF I-131 IN SURFACE WATER SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2011**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	CL-90
12/29/10 - 01/26/11	< 0.7
01/26/11 - 02/23/11	< 0.3
02/23/11 - 03/30/11	< 0.6
03/30/11 - 04/27/11	< 0.6
04/27/11 - 05/25/11	< 0.9
05/25/11 - 06/29/11	< 0.7
06/29/11 - 07/27/11	< 0.8
07/27/11 - 08/31/11	< 0.8
08/31/11 - 09/28/11	< 0.5
09/28/11 - 10/26/11	< 0.5
10/26/11 - 11/30/11 (1)	< 0.5
11/30/11 - 12/28/11	< 0.4
MEAN	-

TABLE C-I.2 **CONCENTRATIONS OF TRITIUM IN SURFACE WATER SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2011**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	CL-90	CL-13	CL-91	CL-99
12/29/10 - 03/30/11	< 175	< 175	< 177 (1)	< 175 (1)
03/30/11 - 06/29/11	< 175	< 177	< 175 (1)	< 176 (1)
07/27/11 - 09/28/11	< 189	< 194	< 191 (1)	< 186
10/26/11 - 12/28/11	< 179 (1)	< 184	< 176 (1)	< 184
MEAN	-	-	-	-

(1) SEE PROGRAM EXCEPTIONS SECTION FOR EXPLANATION

TABLE C-I.3

CONCENTRATIONS OF GAMMA EMITTERS IN SURFACE WATER SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2011

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION PERIOD	Be-7	K-40	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	Cs-134	Cs-137	Ba-140	La-140	Ce-144
CL-13	01/26/11 - 01/26/11	< 51	< 106	< 6	< 6	< 12	< 5	< 11	< 7	< 10	< 5	< 6	< 28	< 8	< 42
	02/23/11 - 02/23/11	< 36	< 71	< 4	< 5	< 10	< 4	< 8	< 5	< 8	< 4	< 4	< 29	< 9	< 34
	03/30/11 - 03/30/11	< 36	< 73	< 4	< 4	< 9	< 4	< 8	< 5	< 8	< 4	< 4	< 32	< 9	< 29
	04/27/11 - 04/27/11	< 39	< 86	< 4	< 4	< 10	< 4	< 8	< 6	< 8	< 4	< 4	< 29	< 10	< 31
	05/25/11 - 05/25/11	< 9	< 4	< 1	< 1	< 2	< 1	< 2	< 1	< 2	< 1	< 1	< 13	< 4	< 6
	06/29/11 - 06/29/11	< 40	< 50	< 4	< 4	< 9	< 3	< 8	< 5	< 9	< 4	< 4	< 26	< 10	< 39
	07/27/11 - 07/27/11	< 64	< 153	< 7	< 9	< 13	< 8	< 16	< 8	< 12	< 6	< 7	< 33	< 11	< 48
	08/31/11 - 08/31/11	< 43	< 53	< 5	< 5	< 9	< 5	< 9	< 5	< 8	< 4	< 5	< 25	< 9	< 31
	09/28/11 - 09/28/11	< 44	< 41	< 4	< 4	< 9	< 5	< 10	< 6	< 8	< 4	< 4	< 23	< 7	< 43
	10/26/11 - 10/26/11	< 66	< 121	< 8	< 7	< 15	< 7	< 10	< 6	< 11	< 6	< 8	< 32	< 11	< 51
	11/30/11 - 11/30/11	< 47	< 62	< 4	< 5	< 11	< 5	< 12	< 6	< 8	< 5	< 5	< 25	< 8	< 37
	12/28/11 - 12/28/11	< 54	< 52	< 6	< 6	< 13	< 6	< 12	< 6	< 11	< 6	< 7	< 25	< 9	< 40
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CL-90	12/29/10 - 01/26/11	< 35	< 39	< 4	< 4	< 10	< 4	< 9	< 4	< 7	< 4	< 5	< 19	< 4	< 28
	01/26/11 - 02/23/11	< 43	< 98	< 4	< 5	< 13	< 4	< 11	< 5	< 8	< 4	< 5	< 30	< 10	< 33
	02/23/11 - 03/30/11	< 32	< 60	< 3	< 4	< 8	< 4	< 7	< 5	< 7	< 3	< 3	< 27	< 8	< 28
	03/30/11 - 04/27/11	< 50	< 95	< 5	< 6	< 13	< 5	< 12	< 7	< 10	< 5	< 5	< 34	< 12	< 44
	04/27/11 - 05/25/11	< 11	< 33	< 1	< 1	< 3	< 1	< 2	< 1	< 2	< 1	< 1	< 12	< 4	< 7
	05/25/11 - 06/29/11	< 40	< 38	< 4	< 4	< 11	< 4	< 8	< 6	< 9	< 4	< 4	< 30	< 9	< 36
	06/29/11 - 07/27/11	< 55	< 55	< 5	< 6	< 14	< 4	< 13	< 8	< 11	< 6	< 7	< 32	< 10	< 50
	07/27/11 - 08/31/11	< 37	< 82	< 4	< 5	< 10	< 5	< 7	< 4	< 7	< 4	< 4	< 22	< 7	< 36
	08/31/11 - 09/28/11	< 44	< 68	< 5	< 5	< 10	< 6	< 10	< 5	< 8	< 5	< 5	< 22	< 8	< 39
	09/28/11 - 10/26/11	< 41	< 76	< 5	< 5	< 7	< 5	< 11	< 5	< 8	< 5	< 5	< 24	< 6	< 42
	10/26/11 - 11/30/11 (1)	< 60	< 122	< 6	< 7	< 17	< 7	< 14	< 5	< 13	< 6	< 7	< 33	< 9	< 52
	11/30/11 - 12/28/11	< 39	< 30	< 6	< 5	< 11	< 6	< 8	< 5	< 9	< 5	< 5	< 25	< 8	< 43
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-	-	-

(1) SEE PROGRAM EXCEPTIONS SECTION FOR EXPLANATION

TABLE C-I.3 **CONCENTRATIONS OF GAMMA EMITTERS IN SURFACE WATER SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2011**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION PERIOD	Be-7	K-40	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	Cs-134	Cs-137	Ba-140	La-140	Ce-144
CL-91	12/29/10 - 01/26/11	< 54	< 58	< 5	< 6	< 13	< 5	< 11	< 6	< 11	< 6	< 7	< 30	< 8	< 48
	01/26/11 - 02/23/11	< 52	< 97	< 4	< 5	< 10	< 5	< 11	< 5	< 10	< 5	< 5	< 32	< 5	< 38
	02/23/11 - 03/30/11 (1)	< 43	< 38	< 4	< 4	< 9	< 4	< 7	< 4	< 7	< 4	< 4	< 33	< 9	< 29
	03/30/11 - 04/27/11 (1)	< 35	48 ± 44	< 4	< 4	< 9	< 4	< 7	< 4	< 7	< 3	< 4	< 27	< 8	< 26
	04/27/11 - 05/25/11 (1)	< 12	< 26	< 1	< 1	< 2	< 1	< 2	< 1	< 2	< 1	< 1	< 17	< 5	< 8
	05/25/11 - 06/29/11	< 42	< 38	< 4	< 5	< 9	< 5	< 7	< 4	< 8	< 4	< 4	< 34	< 9	< 38
	06/29/11 - 07/27/11	< 44	< 92	< 4	< 6	< 11	< 5	< 10	< 5	< 8	< 4	< 5	< 23	< 5	< 42
	07/27/11 - 08/31/11 (1)	< 33	< 34	< 4	< 4	< 10	< 4	< 9	< 4	< 8	< 4	< 5	< 18	< 5	< 28
	09/07/11 - 09/28/11	< 63	< 138	< 6	< 7	< 12	< 6	< 15	< 6	< 10	< 6	< 7	< 36	< 9	< 51
	09/28/11 - 10/26/11 (1)	< 55	< 49	< 8	< 6	< 12	< 5	< 10	< 7	< 8	< 5	< 6	< 37	< 8	< 40
	10/26/11 - 11/30/11 (1)	< 62	< 49	< 7	< 5	< 12	< 6	< 15	< 6	< 11	< 7	< 7	< 27	< 8	< 52
	11/30/11 - 12/28/11	< 50	< 41	< 4	< 5	< 12	< 4	< 9	< 5	< 10	< 6	< 5	< 26	< 7	< 44
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CL-99	12/29/10 - 01/26/11	< 28	< 29	< 3	< 3	< 5	< 3	< 7	< 4	< 6	< 3	< 3	< 17	< 6	< 25
	02/16/11 - 02/23/11 (1)	< 47	< 35	< 5	< 4	< 10	< 4	< 8	< 5	< 9	< 5	< 6	< 35	< 10	< 36
	03/02/11 - 03/30/11 (1)	< 31	< 34	< 3	< 3	< 8	< 3	< 6	< 4	< 6	< 3	< 3	< 25	< 8	< 25
	04/06/11 - 04/27/11 (1)	< 35	< 74	< 3	< 4	< 9	< 3	< 7	< 4	< 6	< 3	< 4	< 25	< 7	< 28
	04/27/11 - 05/25/11	< 11	< 8	< 1	< 1	< 3	< 1	< 2	< 1	< 2	< 1	< 1	< 19	< 4	< 8
	05/25/11 - 06/29/11	< 39	< 71	< 5	< 4	< 10	< 3	< 8	< 5	< 8	< 4	< 4	< 28	< 7	< 37
	06/29/11 - 07/27/11	< 72	< 168	< 8	< 8	< 15	< 7	< 17	< 8	< 12	< 9	< 9	< 31	< 14	< 52
	07/27/11 - 08/31/11	< 44	< 54	< 5	< 5	< 10	< 5	< 8	< 5	< 9	< 5	< 5	< 24	< 8	< 38
	08/31/11 - 09/28/11	< 44	< 38	< 5	< 5	< 11	< 5	< 11	< 5	< 8	< 5	< 6	< 19	< 7	< 42
	09/28/11 - 10/26/11	< 48	< 47	< 6	< 6	< 13	< 6	< 12	< 6	< 8	< 6	< 6	< 35	< 13	< 59
	10/26/11 - 11/30/11	< 47	< 54	< 6	< 5	< 11	< 6	< 10	< 6	< 9	< 5	< 5	< 24	< 7	< 42
	11/30/11 - 12/28/11	< 37	< 34	< 5	< 5	< 11	< 4	< 10	< 5	< 8	< 4	< 5	< 21	< 9	< 33
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-	-	-

(1) SEE PROGRAM EXCEPTIONS SECTION FOR EXPLANATION

TABLE C-II.1 **CONCENTRATIONS OF GROSS BETA IN DRINKING WATER SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2011**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	CL-14
12/29/10 - 01/26/11	< 3.1
01/26/11 - 02/23/11	< 2.0
02/23/11 - 03/30/11	< 3.0
03/30/11 - 04/27/11	< 2.5
04/27/11 - 05/25/11	< 1.7
05/25/11 - 06/29/11	< 2.4
06/29/11 - 07/27/11	< 2.5
07/27/11 - 08/31/11	< 2.3
08/31/11 - 09/28/11	< 2.2
09/28/11 - 10/26/11	< 1.7
10/26/11 - 11/30/11	< 1.6 (1)
11/30/11 - 12/28/11	< 1.6
MEAN	-

TABLE C-II.2 **CONCENTRATIONS OF TRITIUM IN DRINKING WATER SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2011**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	CL-14
12/29/10 - 03/30/11	< 175
03/30/11 - 06/29/11	< 166
06/29/11 - 09/28/11	< 187
09/28/11 - 12/28/11	< 183 (1)
MEAN	-

TABLE C-II.3 **CONCENTRATIONS OF I-131 IN DRINKING WATER SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2011**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	CL-14
07/27/11 - 08/31/11	< 0.8 (2)
08/31/11 - 09/28/11	< 0.6
09/28/11 - 10/26/11	< 0.7
10/26/11 - 11/30/11	< 0.5 (1)
11/30/11 - 12/28/11	< 0.5
MEAN	-

(1) SEE PROGRAM EXCEPTIONS SECTION FOR EXPLANATION
(2) SEE PROGRAM CHANGES SECTION FOR EXPLANATION

TABLE C-II.4 **CONCENTRATIONS OF GAMMA EMITTERS IN DRINKING WATER SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2011**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION PERIOD	Be-7	K-40	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	I-131	Cs-134	Cs-137	Ba-140	La-140	Ce-144
CL-14	12/29/10 - 01/26/11	< 54	< 49	< 5	< 6	< 10	< 5	< 10	< 6	< 7	< 11	< 5	< 4	< 24	< 9	< 42
	01/26/11 - 02/23/11	< 54	< 44	< 5	< 6	< 11	< 6	< 12	< 6	< 10	< 15	< 4	< 6	< 38	< 11	< 38
	02/23/11 - 03/30/11	< 35	< 56	< 3	< 3	< 8	< 4	< 7	< 4	< 7	< 13	< 3	< 4	< 28	< 7	< 25
	03/30/11 - 04/27/11	< 38	< 30	< 3	< 4	< 9	< 3	< 7	< 5	< 7	< 13	< 4	< 4	< 31	< 8	< 31
	04/27/11 - 05/25/11	< 10	< 25	< 1	< 1	< 2	< 1	< 2	< 1	< 2	< 9	< 1	< 1	< 13	< 4	< 7
	05/25/11 - 06/29/11	< 39	179 ± 58	< 4	< 4	< 8	< 4	< 7	< 5	< 8	< 14	< 4	< 4	< 27	< 8	< 55
	06/29/11 - 07/27/11	< 54	< 64	< 6	< 5	< 12	< 6	< 8	< 8	< 11	< 10	< 5	< 5	< 24	< 8	< 49
	07/27/11 - 08/31/11	< 47	< 134	< 6	< 7	< 14	< 7	< 12	< 6	< 12	< 10	< 6	< 8	< 31	< 12	< 41
	08/31/11 - 09/28/11	< 51	< 105	< 6	< 5	< 11	< 6	< 14	< 6	< 9	< 9	< 6	< 7	< 28	< 7	< 42
	09/28/11 - 10/26/11	< 41	< 82	< 4	< 4	< 10	< 5	< 10	< 5	< 10	< 10	< 4	< 5	< 24	< 8	< 37
	10/26/11 - 11/30/11 (1)	< 52	< 63	< 7	< 6	< 11	< 6	< 11	< 6	< 10	< 11	< 5	< 6	< 26	< 12	< 52
	11/30/11 - 12/28/11	< 41	< 97	< 5	< 5	< 10	< 4	< 9	< 5	< 8	< 8	< 4	< 5	< 24	< 6	< 35
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

(1) SEE PROGRAM EXCEPTIONS SECTION FOR EXPLANATION

TABLE C-III.1 **CONCENTRATIONS OF TRITIUM IN WELL WATER SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2011**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	CL-12R	CL-12T	CL-7D
03/30/11 - 03/30/11	< 147	< 145	< 149
06/29/11 - 06/29/11	< 177	< 175	< 175
09/28/11 - 09/28/11	< 189	< 187	< 189
12/28/11 - 12/28/11	< 177	< 176	< 181
MEAN	-	-	-

TABLE C-III.2 **CONCENTRATIONS OF GAMMA EMITTERS IN WELL WATER SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2011**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION PERIOD	Be-7	K-40	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	Cs-134	Cs-137	Ba-140	La-140	Ce-144
CL-12R	03/30/11	< 20	33 ± 32	< 2	< 2	< 5	< 2	< 4	< 2	< 4	< 2	< 2	< 19	< 6	< 16
	06/29/11	< 51	< 102	< 4	< 5	< 11	< 4	< 9	< 7	< 9	< 5	< 5	< 36	< 10	< 38
	09/28/11	< 38	< 68	< 4	< 4	< 9	< 6	< 9	< 4	< 6	< 4	< 5	< 17	< 6	< 27
	12/28/11	< 40	< 108	< 5	< 6	< 11	< 6	< 10	< 5	< 8	< 5	< 6	< 24	< 8	< 36
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CL-12T	03/30/11	< 20	< 18	< 2	< 2	< 5	< 2	< 4	< 2	< 4	< 2	< 2	< 18	< 6	< 16
	06/29/11	< 45	< 38	< 5	< 5	< 9	< 5	< 11	< 5	< 8	< 4	< 5	< 33	< 7	< 35
	09/28/11	< 38	< 43	< 4	< 4	< 9	< 5	< 8	< 5	< 7	< 4	< 4	< 18	< 6	< 33
	12/28/11	< 50	< 99	< 5	< 5	< 14	< 6	< 13	< 6	< 12	< 6	< 6	< 31	< 9	< 41
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CL-7D	03/30/11	< 22	32 ± 28	< 2	< 2	< 5	< 2	< 4	< 2	< 4	< 2	< 2	< 20	< 7	< 17
	06/29/11	< 47	< 37	< 5	< 4	< 10	< 4	< 10	< 6	< 8	< 4	< 5	< 33	< 10	< 38
	09/28/11	< 30	< 63	< 4	< 3	< 7	< 4	< 7	< 3	< 5	< 3	< 4	< 15	< 5	< 29
	12/28/11	< 42	< 90	< 6	< 4	< 11	< 6	< 11	< 6	< 8	< 5	< 6	< 24	< 9	< 37
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-	-	-

TABLE C-IV.1 **CONCENTRATIONS OF GAMMA EMITTERS IN FISH SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2011**

RESULTS IN UNITS OF PCI/KG WET ± 2 SIGMA

SITE	COLLECTION PERIOD	Be-7	K-40	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	Cs-134	Cs-137	Ba-140	La-140	Ce-144
CL-105															
Carp	4/20/2011	< 521	3190 ± 792	< 47	< 57	< 122	< 45	< 112	< 55	< 95	< 45	< 41	< 621	< 175	< 270
Largemouth Bass	4/20/2011	< 457	2800 ± 709	< 40	< 47	< 116	< 45	< 97	< 62	< 79	< 44	< 41	< 527	< 162	< 239
Crappie	4/20/2011	< 468	3150 ± 748	< 44	< 58	< 132	< 51	< 97	< 60	< 102	< 51	< 48	< 578	< 150	< 259
Bluegill	4/20/2011	< 641	2840 ± 794	< 59	< 49	< 132	< 45	< 106	< 81	< 104	< 55	< 54	< 861	< 201	< 313
Carp	10/4/2011	< 622	3430 ± 1130	< 90	< 69	< 167	< 66	< 156	< 78	< 153	< 86	< 71	< 443	< 145	< 419
Largemouth Bass	10/4/2011	< 656	2360 ± 1100	< 75	< 74	< 120	< 74	< 175	< 79	< 132	< 68	< 59	< 409	< 176	< 350
Crappie	10/4/2011	< 714	4380 ± 1220	< 80	< 75	< 192	< 91	< 134	< 76	< 116	< 73	< 72	< 530	< 111	< 434
Bluegill	10/4/2011	< 1010	2750 ± 1420	< 98	< 113	< 260	< 105	< 201	< 118	< 200	< 118	< 115	< 734	< 214	< 637
	MEAN	-	3113 ± 1215	-	-	-	-	-	-	-	-	-	-	-	-
CL-19															
Carp	4/20/2011	< 543	2510 ± 909	< 56	< 65	< 144	< 72	< 120	< 69	< 127	< 60	< 64	< 475	< 110	< 297
Bluegill	4/20/2011	< 622	2650 ± 940	< 56	< 91	< 126	< 73	< 134	< 76	< 108	< 55	< 59	< 586	< 115	< 367
Largemouth Bass	4/20/2011	< 492	3420 ± 780	< 46	< 52	< 140	< 43	< 119	< 56	< 100	< 50	< 48	< 470	< 136	< 255
Channel Catfish	4/20/2011	< 443	2870 ± 684	< 41	< 57	< 105	< 40	< 97	< 47	< 85	< 46	< 39	< 553	< 185	< 246
Carp	10/4/2011	< 523	2630 ± 996	< 48	< 56	< 113	< 56	< 122	< 66	< 127	< 57	< 67	< 404	< 92	< 318
Bluegill	10/4/2011	< 970	3420 ± 1210	< 107	< 114	< 227	< 98	< 155	< 107	< 204	< 104	< 105	< 622	< 132	< 652
Largemouth Bass	10/4/2011	< 567	3260 ± 1170	< 75	< 59	< 183	< 49	< 170	< 72	< 134	< 65	< 65	< 417	< 92	< 400
Channel Catfish	10/4/2011	< 647	3440 ± 1000	< 67	< 74	< 191	< 71	< 141	< 84	< 131	< 68	< 79	< 450	< 74	< 364
	MEAN	-	3025 ± 802	-	-	-	-	-	-	-	-	-	-	-	-

TABLE C-V.1 CONCENTRATIONS OF GAMMA EMITTERS IN SEDIMENT SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2011

RESULTS IN UNITS OF PCI/KG DRY ± 2 SIGMA

SITE	COLLECTION PERIOD	Be-7	K-40	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	Cs-134	Cs-137	Ba-140	La-140	Ce-144
CL-7B	4/20/2011	< 391	5830 ± 686	< 33	< 47	< 83	< 46	< 102	< 51	< 81	< 36	< 41	< 348	< 104	< 214
	10/4/2011	< 269	7350 ± 794	< 36	< 30	< 104	< 45	< 98	< 37	< 68	< 33	< 32	< 236	< 58	< 183
	MEAN	-	6590 ± 2150	-	-	-	-	-	-	-	-	-	-	-	-

TABLE C-VI.1 CONCENTRATIONS OF GROSS BETA IN AIR PARTICULATE SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2011

RESULTS IN UNITS OF E-3 PCI/CU METER ± 2 SIGMA

COLLECTION PERIOD	GROUP I					
	CL-02	CL-03	CL-04	CL-06	CL-15	CL-94
12/29/10 - 01/05/11	23 ± 5	27 ± 5	27 ± 5	25 ± 5	29 ± 5	27 ± 5
01/05/11 - 01/12/11	22 ± 4	24 ± 4	23 ± 4	26 ± 4	24 ± 4	22 ± 4
01/12/11 - 01/19/11	35 ± 5	37 ± 7 (1)	39 ± 6	40 ± 6	37 ± 6	39 ± 6
01/19/11 - 01/26/11	39 ± 6	43 ± 6	41 ± 6	35 ± 6	34 ± 5	39 ± 6
01/26/11 - 02/03/11	25 ± 3	24 ± 3	28 ± 3	23 ± 3	28 ± 3	24 ± 3
02/03/11 - 02/09/11	16 ± 5	19 ± 5	14 ± 5	20 ± 5	19 ± 5	17 ± 5
02/09/11 - 02/16/11	25 ± 5	21 ± 5	21 ± 5	21 ± 5	21 ± 5	23 ± 5
02/16/11 - 02/23/11	19 ± 4	12 ± 3	17 ± 4	18 ± 4	19 ± 4	23 ± 4
02/23/11 - 03/02/11	22 ± 5	23 ± 5	21 ± 5	26 ± 5	20 ± 5	24 ± 5
03/02/11 - 03/09/11	14 ± 5	14 ± 5	18 ± 5	16 ± 5	14 ± 5	17 ± 5
03/09/11 - 03/16/11	9 ± 4	15 ± 4	17 ± 4	15 ± 4	16 ± 4	14 ± 4
03/16/11 - 03/23/11	20 ± 5	23 ± 5	24 ± 5	26 ± 5	21 ± 5	22 ± 5
03/23/11 - 03/30/11	35 ± 5	36 ± 5	39 ± 6	44 ± 6	35 ± 5	41 ± 6
03/30/11 - 04/06/11	32 ± 5	33 ± 5	36 ± 5	29 ± 5	29 ± 5	31 ± 5
04/06/11 - 04/13/11	12 ± 5	18 ± 5	17 ± 5	16 ± 5	21 ± 5	17 ± 5
04/13/11 - 04/20/11	14 ± 4	14 ± 4	13 ± 4	20 ± 4	16 ± 4	12 ± 4
04/20/11 - 04/27/11	12 ± 5	11 ± 5	11 ± 5	9 ± 5	10 ± 5	12 ± 5
04/27/11 - 05/04/11	14 ± 4	10 ± 4	15 ± 4	8 ± 4	9 ± 4	15 ± 4
05/04/11 - 05/11/11	9 ± 4	12 ± 4	13 ± 4	13 ± 4	13 ± 4	18 ± 5
05/11/11 - 05/18/11	10 ± 4	11 ± 4	11 ± 4	11 ± 4	10 ± 4	9 ± 4
05/18/11 - 05/25/11	16 ± 4	13 ± 4	16 ± 4	13 ± 4	13 ± 4	13 ± 4
05/25/11 - 06/01/11	11 ± 4	11 ± 4	10 ± 4	12 ± 4	11 ± 4	14 ± 4
06/01/11 - 06/08/11	22 ± 5	25 ± 5	21 ± 5	22 ± 5	22 ± 5	24 ± 5
06/08/11 - 06/15/11	12 ± 4	10 ± 4	9 ± 4	11 ± 4	11 ± 4	9 ± 4
06/15/11 - 06/22/11	11 ± 4	9 ± 4	13 ± 4	12 ± 4	12 ± 4	10 ± 4
06/22/11 - 06/29/11	12 ± 4	10 ± 3	14 ± 4 (1)	15 ± 4 (1)	12 ± 3	13 ± 4
06/29/11 - 07/06/11	17 ± 4	21 ± 5	19 ± 4	22 ± 5	19 ± 5	23 ± 5
07/06/11 - 07/13/11	19 ± 4	24 ± 5	23 ± 5	21 ± 5	22 ± 5	22 ± 5
07/13/11 - 07/20/11	19 ± 4	17 ± 4	21 ± 4	20 ± 4	22 ± 5	21 ± 5
07/20/11 - 07/27/11	20 ± 5	24 ± 5	21 ± 5	23 ± 5	24 ± 5	21 ± 5
07/27/11 - 08/03/11	34 ± 6	32 ± 6	30 ± 6	31 ± 6	28 ± 6	26 ± 6
08/03/11 - 08/10/11	21 ± 5	19 ± 4	15 ± 4	21 ± 5	22 ± 5	23 ± 5
08/10/11 - 08/17/11	19 ± 4	17 ± 4	23 ± 5	21 ± 4	24 ± 5	28 ± 5
08/17/11 - 08/24/11	22 ± 4	33 ± 5	28 ± 5	27 ± 5	29 ± 5	32 ± 5
08/24/11 - 08/31/11	16 ± 4	18 ± 4	16 ± 4	18 ± 4	18 ± 4	22 ± 5
08/31/11 - 09/07/11	22 ± 5	25 ± 5	28 ± 5	26 ± 5	23 ± 5	26 ± 5
09/07/11 - 09/14/11	16 ± 5	18 ± 5	18 ± 5	20 ± 5	15 ± 5	21 ± 5
09/14/11 - 09/21/11	18 ± 4	19 ± 4	20 ± 5	20 ± 5	21 ± 5	20 ± 4
09/21/11 - 09/28/11	14 ± 4	17 ± 4	16 ± 4	20 ± 4	21 ± 5	21 ± 5
09/28/11 - 10/05/11	23 ± 4	22 ± 4	17 ± 4	22 ± 4	26 ± 5	20 ± 4
10/05/11 - 10/12/11	35 ± 6	25 ± 5	27 ± 5	43 ± 6	38 ± 6	37 ± 6
10/12/11 - 10/19/11	22 ± 5	24 ± 5	21 ± 4	19 ± 4	21 ± 4	24 ± 5
10/19/11 - 10/26/11	23 ± 5	27 ± 5	18 ± 5	26 ± 6	22 ± 5	24 ± 5
10/26/11 - 11/02/11	19 ± 5	21 ± 5	19 ± 5	24 ± 5	22 ± 5	21 ± 5
11/02/11 - 11/09/11	22 ± 5	21 ± 5	21 ± 5	21 ± 5	21 ± 5	20 ± 5
11/09/11 - 11/16/11	27 ± 6	25 ± 5	22 ± 5	31 ± 6 (1)	28 ± 6	25 ± 5
11/16/11 - 11/23/11	8 ± 5	9 ± 5	11 ± 5	10 ± 5 (1)	10 ± 4	8 ± 4
11/23/11 - 11/30/11	13 ± 4	17 ± 4	20 ± 4	15 ± 4	19 ± 5	12 ± 4
11/30/11 - 12/07/11	17 ± 4	20 ± 5	21 ± 5	20 ± 5	18 ± 4	18 ± 4
12/07/11 - 12/14/11	28 ± 5	27 ± 5	28 ± 5	28 ± 5	29 ± 5	30 ± 5
12/14/11 - 12/21/11	34 ± 5	37 ± 5	38 ± 5	42 ± 6	37 ± 5	36 ± 5
12/21/11 - 12/28/11	18 ± 4	15 ± 4	15 ± 4	19 ± 4	19 ± 4	17 ± 4
MEAN	20 ± 15	21 ± 16	21 ± 15	22 ± 17	21 ± 15	22 ± 16

* THE MEAN AND 2 STANDARD DEVIATION ARE CALCULATED USING THE POSITIVE VALUES
(1) SEE PROGRAM EXCEPTIONS SECTION FOR EXPLANATION

TABLE C-VI.1 CONCENTRATIONS OF GROSS BETA IN AIR PARTICULATE SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2011

RESULTS IN UNITS OF E-3 PCI/CU METER ± 2 SIGMA

COLLECTION PERIOD	GROUP II						GROUP III	
	CL-01		CL-07		CL-08		CL-11 **	
12/29/10 - 01/05/11	30 ± 5		31 ± 5		26 ± 5		28 ± 5	
01/05/11 - 01/12/11	23 ± 4		24 ± 4		23 ± 4		23 ± 4	
01/12/11 - 01/19/11	34 ± 5		36 ± 6		35 ± 5		39 ± 6	
01/19/11 - 01/26/11	34 ± 6		34 ± 5		32 ± 5		33 ± 6	
01/26/11 - 02/03/11	25 ± 3	(1)	23 ± 3	(1)	27 ± 4	(1)	33 ± 4	
02/03/11 - 02/09/11	18 ± 5		16 ± 5		14 ± 5		13 ± 5	
02/09/11 - 02/16/11	18 ± 4		21 ± 5		16 ± 4		21 ± 5	
02/16/11 - 02/23/11	16 ± 4		15 ± 4		16 ± 4		14 ± 4	
02/23/11 - 03/02/11	23 ± 5		21 ± 5		26 ± 5		20 ± 5	
03/02/11 - 03/09/11	16 ± 5		18 ± 5		18 ± 5		20 ± 5	
03/09/11 - 03/16/11	13 ± 4		14 ± 4		14 ± 4		13 ± 4	
03/16/11 - 03/23/11	22 ± 5		19 ± 5		18 ± 5		21 ± 5	
03/23/11 - 03/30/11	40 ± 6		37 ± 6		36 ± 5		47 ± 6	
03/30/11 - 04/06/11	32 ± 5		35 ± 5		32 ± 5		31 ± 5	
04/06/11 - 04/13/11	19 ± 5		19 ± 5		14 ± 5		17 ± 5	
04/13/11 - 04/20/11	14 ± 4		16 ± 4		16 ± 4		14 ± 4	
04/20/11 - 04/27/11	8 ± 4		11 ± 5		10 ± 5		10 ± 4	
04/27/11 - 05/04/11	14 ± 4		15 ± 4		11 ± 4		10 ± 4	
05/04/11 - 05/11/11	13 ± 4		14 ± 4		10 ± 4		11 ± 4	
05/11/11 - 05/18/11	11 ± 4		10 ± 4		10 ± 4		13 ± 4	
05/18/11 - 05/25/11	15 ± 4		12 ± 4		11 ± 4		12 ± 4	
05/25/11 - 06/01/11	12 ± 4		10 ± 4		11 ± 4		12 ± 4	
06/01/11 - 06/08/11	23 ± 5		25 ± 5		22 ± 5		23 ± 5	
06/08/11 - 06/15/11	< 5		11 ± 4		11 ± 4		12 ± 4	
06/15/11 - 06/22/11	12 ± 4		11 ± 4		8 ± 4		15 ± 4	
06/22/11 - 06/29/11	13 ± 4	(1)	13 ± 4		8 ± 3		11 ± 3	
06/29/11 - 07/06/11	21 ± 5		19 ± 5		19 ± 5		23 ± 5	
07/06/11 - 07/13/11	27 ± 5		19 ± 4		23 ± 5		27 ± 5	
07/13/11 - 07/20/11	19 ± 4		18 ± 4		18 ± 4		24 ± 5	
07/20/11 - 07/27/11	24 ± 5		21 ± 5		23 ± 5		24 ± 5	
07/27/11 - 08/03/11	28 ± 6		28 ± 6		28 ± 6		36 ± 6	
08/03/11 - 08/10/11	17 ± 4		19 ± 4		20 ± 4		19 ± 4	
08/10/11 - 08/17/11	19 ± 4		20 ± 4		25 ± 5		25 ± 5	
08/17/11 - 08/24/11	29 ± 5		28 ± 5		31 ± 5		32 ± 5	
08/24/11 - 08/31/11	18 ± 4		16 ± 4		19 ± 4		21 ± 5	
08/31/11 - 09/07/11	28 ± 5		23 ± 5		21 ± 5		25 ± 5	
09/07/11 - 09/14/11	19 ± 5		15 ± 5		13 ± 5		21 ± 5	
09/14/11 - 09/21/11	20 ± 5		19 ± 4		17 ± 4		18 ± 4	
09/21/11 - 09/28/11	21 ± 4		15 ± 4		20 ± 5		20 ± 4	
09/28/11 - 10/05/11	21 ± 4		23 ± 4		22 ± 4		30 ± 5	
10/05/11 - 10/12/11	27 ± 5	(1)	35 ± 5		42 ± 6		38 ± 6	
10/12/11 - 10/19/11	23 ± 4		18 ± 4		23 ± 4		24 ± 5	
10/19/11 - 10/26/11	19 ± 5		22 ± 5		23 ± 5		23 ± 5	
10/26/11 - 11/02/11	22 ± 5		21 ± 5		17 ± 5		19 ± 4	
11/02/11 - 11/09/11	25 ± 5		17 ± 5		26 ± 5		26 ± 5	
11/09/11 - 11/16/11	26 ± 6		24 ± 5		26 ± 5		21 ± 5	
11/16/11 - 11/23/11	7 ± 4		8 ± 5		8 ± 5		11 ± 5	
11/23/11 - 11/30/11	15 ± 4		15 ± 4		16 ± 4		15 ± 4	
11/30/11 - 12/07/11	17 ± 4		17 ± 5		17 ± 4		20 ± 5	
12/07/11 - 12/14/11	30 ± 5		29 ± 5		29 ± 5		26 ± 5	
12/14/11 - 12/21/11	35 ± 5		29 ± 5		47 ± 6		38 ± 6	
12/21/11 - 12/28/11	14 ± 4		14 ± 4		19 ± 4		15 ± 4	
MEAN	21 ± 15		20 ± 15		21 ± 17		22 ± 17	

* THE MEAN AND 2 STANDARD DEVIATION ARE CALCULATED USING THE POSITIVE VALUES

** INDICATES CONTROL LOCATION

(1) SEE PROGRAM EXCEPTIONS SECTION FOR EXPLANATION

TABLE C-VI.2 **MONTHLY AND YEARLY MEAN VALUES OF GROSS BETA CONCENTRATIONS IN AIR PARTICULATE SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2011**

RESULTS IN UNITS OF E-3 PCI/CU METER ± 2 SIGMA

GROUP I - ON-SITE LOCATIONS *				GROUP II - INTERMEDIATE DISTANCE LOCATIONS **				GROUP III - CONTROL LOCATIONS ***			
COLLECTION PERIOD	MIN	MAX	MEAN ± 2SD	COLLECTION PERIOD	MIN	MAX	MEAN ± 2SD	COLLECTION PERIOD	MIN	MAX	MEAN ± 2SD
12/29/10 - 02/03/11	22	43	30 ± 14	12/29/10 - 02/03/11	23	36	29 ± 10	12/29/10 - 02/03/11	23	39	31 ± 12
02/03/11 - 03/02/11	12	26	20 ± 7	02/03/11 - 03/02/11	14	26	18 ± 7	02/03/11 - 03/02/11	13	21	17 ± 8
03/02/11 - 03/30/11	9	44	23 ± 20	03/02/11 - 03/30/11	13	40	22 ± 19	03/02/11 - 03/30/11	13	47	25 ± 30
03/30/11 - 04/27/11	9	36	18 ± 17	03/30/11 - 04/27/11	8	35	19 ± 18	03/30/11 - 04/27/11	10	31	18 ± 19
04/27/11 - 06/01/11	8	18	12 ± 5	04/27/11 - 06/01/11	10	15	12 ± 4	04/27/11 - 06/01/11	10	13	12 ± 2
06/01/11 - 06/29/11	9	25	14 ± 10	06/01/11 - 06/29/11	8	25	14 ± 12	06/01/11 - 06/29/11	11	23	15 ± 11
06/29/11 - 08/03/11	17	34	23 ± 9	06/29/11 - 08/03/11	18	28	22 ± 8	06/29/11 - 08/03/11	23	36	27 ± 11
08/03/11 - 08/31/11	15	33	22 ± 10	08/03/11 - 08/31/11	16	31	22 ± 10	08/03/11 - 08/31/11	19	32	24 ± 12
08/31/11 - 09/28/11	14	28	20 ± 7	08/31/11 - 09/28/11	13	28	19 ± 8	08/31/11 - 09/28/11	18	25	21 ± 6
09/28/11 - 11/02/11	17	43	24 ± 12	09/28/11 - 11/02/11	17	42	24 ± 13	09/28/11 - 11/02/11	19	38	27 ± 15
11/02/11 - 11/30/11	8	31	18 ± 14	11/02/11 - 11/30/11	7	26	18 ± 15	11/02/11 - 11/30/11	11	26	18 ± 13
11/30/11 - 12/28/11	15	42	25 ± 17	11/30/11 - 12/28/11	14	47	25 ± 20	11/30/11 - 12/28/11	15	38	25 ± 20
12/29/10 - 12/28/11	8	44	21 ± 16	12/29/10 - 12/28/11	7	47	20 ± 15	12/29/10 - 12/28/11	10	47	22 ± 17

* GROUP I LOCATIONS WITHIN 1 MILES OF CPS

** GROUP II LOCATIONS WITHIN 1-5 MILES OF CPS

*** GROUP III LOCATIONS GREATER THAN 5 MILES OF CPS

**** THE MEAN AND 2 STANDARD DEVATION ARE CALCULATED USING THE POSITIVE VALUES

TABLE C-VI.3 **CONCENTRATIONS OF GAMMA EMITTERS IN AIR PARTICULATE SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2011**

RESULTS IN UNITS OF E-3 PCI/CU METER ± 2 SIGMA

SITE	COLLECTION PERIOD	Be-7	K-40	Co-60	Nb-95	Zr-95	Ru-103	Ru-106	Cs-134	Cs-137	Ce-141	Ce-144
CL-1	12/29/10 - 03/30/11 (1)	57 ± 32	< 51	< 3	< 3	< 6	< 4	< 24	< 3	< 3	< 6	< 12
	03/30/11 - 06/29/11 (1)	57 ± 26	< 30	< 2	< 3	< 4	< 4	< 20	< 2	< 2	< 6	< 9
	06/29/11 - 09/28/11	68 ± 28	< 49	< 3	< 4	< 7	< 5	< 26	< 4	< 3	< 7	< 14
	09/28/11 - 12/28/11 (1)	66 ± 21	< 45	< 3	< 3	< 5	< 3	< 21	< 3	< 3	< 3	< 8
	MEAN	62 ± 11	-	-	-	-	-	-	-	-	-	-
CL-11	**03/09/11 - 03/16/11**	**< 321**	**< 598**	**< 39**	**< 38**	**< 73**	**< 42**	**< 350**	**< 44**	**< 42**	**< 45**	**< 145**
	03/16/11 - 03/23/11	**< 270**	**< 320**	**< 34**	**< 22**	**< 40**	**< 28**	**< 217**	**< 23**	**< 30**	**< 28**	**< 123**
	03/23/11 - 03/30/11	**219 ± 143**	**< 322**	**< 25**	**< 23**	**< 34**	**< 21**	**< 230**	**< 28**	**< 26**	**< 31**	**< 94**
	03/30/11 - 04/06/11	**< 292**	**< 499**	**< 33**	**< 31**	**< 53**	**< 30**	**< 302**	**< 31**	**< 39**	**< 37**	**< 169**
	04/06/11 - 04/13/11	**< 236**	**< 611**	**< 36**	**< 33**	**< 55**	**< 30**	**< 238**	**< 28**	**< 30**	**< 32**	**< 138**
	12/29/10 - 03/30/11	64 ± 28	< 60	< 4	< 4	< 7	< 5	< 29	< 4	< 4	< 6	< 16
	03/30/11 - 06/29/11	74 ± 19	19 ± 17	< 2	< 4	< 5	< 3	< 15	< 2	< 2	< 5	< 8
	06/29/11 - 09/28/11	66 ± 31	< 32	< 3	< 3	< 6	< 4	< 23	< 3	< 3	< 5	< 10
	09/28/11 - 12/28/11	86 ± 23	< 57	< 2	< 3	< 7	< 4	< 33	< 4	< 4	< 6	< 17
	MEAN	102 ± 132	-	-	-	-	-	-	-	-	-	-
CL-15	12/29/10 - 03/30/11	77 ± 25	38 ± 27	< 4	< 4	< 7	< 5	< 27	< 3	< 3	< 6	< 11
	03/30/11 - 06/29/11	< 34	24 ± 22	< 3	< 4	< 8	< 6	< 25	< 3	< 3	< 7	< 10
	06/29/11 - 09/28/11	61 ± 23	< 9	< 2	< 3	< 5	< 3	< 14	< 3	< 2	< 4	< 9
	09/28/11 - 12/28/11	61 ± 23	< 23	< 3	< 3	< 5	< 3	< 25	< 3	< 3	< 4	< 13
	MEAN	66 ± 19	31 ± 19	-	-	-	-	-	-	-	-	-
CL-2	12/29/10 - 03/30/11	58 ± 30	< 49	< 3	< 4	< 6	< 4	< 30	< 3	< 3	< 5	< 12
	03/30/11 - 06/29/11	81 ± 37	< 24	< 3	< 4	< 7	< 7	< 26	< 3	< 3	< 9	< 13
	06/29/11 - 09/28/11	49 ± 19	< 38	< 2	< 3	< 5	< 3	< 15	< 2	< 2	< 5	< 8
	09/28/11 - 12/28/11	83 ± 22	< 52	< 2	< 3	< 5	< 3	< 19	< 2	< 3	< 4	< 10
	MEAN	68 ± 34	-	-	-	-	-	-	-	-	-	-

* THE MEAN AND 2 STANDARD DEVIATION ARE CALCULATED USING THE POSITIVE VALUES

(1) SEE PROGRAM EXCEPTIONS SECTION FOR EXPLANATION

BOLDED VALUES INDICATE ADDITIONAL SAMPLING DUE TO THE FUKUSHIMA EVENT

TABLE C-VI.3 **CONCENTRATIONS OF GAMMA EMITTERS IN AIR PARTICULATE SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2011**

RESULTS IN UNITS OF E-3 PCI/CU METER ± 2 SIGMA

SITE	COLLECTION PERIOD	Be-7	K-40	Co-60	Nb-95	Zr-95	Ru-103	Ru-106	Cs-134	Cs-137	Ce-141	Ce-144
CL-3	12/29/10 - 03/30/11 (1)	58 ± 23	< 15	< 2	< 3	< 5	< 4	< 16	< 2	< 3	< 5	< 12
	03/30/11 - 06/29/11	57 ± 31	< 32	< 2	< 2	< 4	< 4	< 18	< 2	< 2	< 5	< 8
	06/29/11 - 09/28/11	85 ± 26	< 21	< 3	< 3	< 6	< 5	< 27	< 3	< 3	< 8	< 15
	09/28/11 - 12/28/11	64 ± 18	< 33	< 2	< 3	< 4	< 2	< 15	< 2	< 2	< 3	< 8
	MEAN	66 ± 26	-	-	-	-	-	-	-	-	-	-
CL-4	12/29/10 - 03/30/11	59 ± 22	< 47	< 3	< 3	< 7	< 4	< 27	< 3	< 3	< 5	< 12
	03/30/11 - 06/29/11 (1)	85 ± 33	< 44	< 3	< 4	< 8	< 6	< 28	< 3	< 3	< 9	< 13
	06/29/11 - 09/28/11	72 ± 25	< 42	< 3	< 4	< 6	< 4	< 21	< 3	< 3	< 5	< 11
	09/28/11 - 12/28/11	85 ± 28	< 47	< 2	< 3	< 6	< 4	< 28	< 3	< 3	< 4	< 13
	MEAN	75 ± 25	-	-	-	-	-	-	-	-	-	-
CL-6	12/29/10 - 03/30/11	56 ± 27	< 47	< 3	< 3	< 4	< 3	< 21	< 2	< 2	< 5	< 12
	03/30/11 - 06/29/11 (1)	76 ± 32	< 39	< 3	< 3	< 6	< 5	< 22	< 3	< 2	< 7	< 11
	06/29/11 - 09/28/11	95 ± 26	< 33	< 3	< 4	< 7	< 5	< 29	< 4	< 2	< 5	< 11
	09/28/11 - 12/28/11 (1)	62 ± 25	< 36	< 3	< 3	< 5	< 3	< 25	< 3	< 2	< 3	< 8
	MEAN	72 ± 35	-	-	-	-	-	-	-	-	-	-
CL-7	12/29/10 - 03/30/11 (1)	102 ± 24	< 47	< 2	< 3	< 7	< 4	< 26	< 3	< 3	< 5	< 12
	03/30/11 - 06/29/11	95 ± 29	< 21	< 3	< 5	< 8	< 6	< 25	< 3	< 3	< 9	< 12
	06/29/11 - 09/28/11	58 ± 25	< 53	< 2	< 3	< 5	< 3	< 16	< 2	< 2	< 5	< 11
	09/28/11 - 12/28/11	86 ± 23	< 44	< 3	< 3	< 5	< 3	< 17	< 2	< 2	< 3	< 8
	MEAN	85 ± 39	-	-	-	-	-	-	-	-	-	-
CL-8	12/29/10 - 03/30/11 (1)	73 ± 33	< 59	< 4	< 5	< 10	< 4	< 28	< 4	< 3	< 6	< 13
	03/30/11 - 06/29/11	91 ± 22	< 38	< 2	< 3	< 6	< 4	< 17	< 2	< 2	< 7	< 10
	06/29/11 - 09/28/11	65 ± 28	< 38	< 2	< 3	< 4	< 4	< 17	< 3	< 2	< 4	< 11
	09/28/11 - 12/28/11	65 ± 21	< 57	< 3	< 2	< 6	< 3	< 24	< 3	< 3	< 4	< 11
	MEAN	73 ± 25	-	-	-	-	-	-	-	-	-	-

(1) SEE PROGRAM EXCEPTIONS SECTION FOR EXPLANATION

TABLE C-VI.3 **CONCENTRATIONS OF GAMMA EMITTERS IN AIR PARTICULATE SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2011**

RESULTS IN UNITS OF E-3 PCI/CU METER ± 2 SIGMA

SITE	COLLECTION PERIOD	Be-7	K-40	Co-60	Nb-95	Zr-95	Ru-103	Ru-106	Cs-134	Cs-137	Ce-141	Ce-144
CL-94	12/29/10 - 03/30/11	58 ± 21	< 37	< 2	< 3	< 4	< 4	< 19	< 2	< 2	< 5	< 11
	03/30/11 - 06/29/11	61 ± 22	< 6	< 2	< 2	< 4	< 3	< 15	< 2	< 1	< 6	< 9
	06/29/11 - 09/28/11	61 ± 23	< 44	< 3	< 3	< 6	< 4	< 25	< 3	< 2	< 5	< 11
	09/28/11 - 12/28/11	82 ± 18	< 28	< 2	< 2	< 4	< 2	< 17	< 2	< 1	< 3	< 8
	MEAN	65 ± 22	-	-	-	-	-	-	-	-	-	-

TABLE C-VII.1 CONCENTRATIONS OF I-131 IN AIR IODINE SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2011

RESULTS IN UNITS OF E-3 PCI/CU METER ± 2 SIGMA

COLLECTION PERIOD	GROUP I					
	CL-2	CL-3	CL-4	CL-6	CL-15	CL-94
12/29/10 - 01/05/11	< 42	< 40	< 40	< 41	< 42	< 42
01/05/11 - 01/12/11	< 26	< 34	< 34	< 34	< 41	< 42
01/12/11 - 01/19/11	< 23	< 29 (1)	< 23	< 12	< 36	< 16
01/19/11 - 01/26/11	< 14	< 8	< 14	< 14	< 16	< 16
01/26/11 - 02/03/11	< 31	< 31	< 30	< 30	< 48	< 51
02/03/11 - 02/09/11	< 51	< 49	< 27	< 49	< 39	< 40
02/09/11 - 02/16/11	< 26	< 25	< 25	< 25	< 34	< 35
02/16/11 - 02/23/11	< 33	< 33	< 33	< 18	< 41	< 42
02/23/11 - 03/02/11	< 46	< 46	< 46	< 45	< 55	< 55
03/02/11 - 03/09/11	< 46	< 44	< 45	< 44	< 51	< 53
03/09/11 - 03/16/11	< 36	< 36	< 36	< 36	< 43	< 43
03/16/11 - 03/23/11	32 ± 22 (2)	33 ± 22 (2)	32 ± 21 (2)	< 41	37 ± 22 (2)	46 ± 30 (2)
03/23/11 - 03/30/11	46 ± 30 (2)	35 ± 23 (2)	41 ± 27 (2)	49 ± 21 (2)	69 ± 28 (2)	52 ± 24 (2)
03/30/11 - 04/06/11	48 ± 29 (2)	102 ± 22 (2)	50 ± 26 (2)	64 ± 24 (2)	58 ± 24 (2)	85 ± 27 (2)
04/06/11 - 04/13/11	< 31	< 38	29 ± 23 (2)	< 28	32 ± 25 (2)	< 40
04/13/11 - 04/20/11	< 28	< 32	< 29	< 24	< 29	< 33
04/20/11 - 04/27/11	< 67	< 67	< 64	< 36	< 69	< 30
04/27/11 - 05/04/11	< 62	< 62	< 62	< 33	< 60	< 59
05/04/11 - 05/11/11	< 63	< 62	< 63	< 63	< 64	< 66
05/11/11 - 05/18/11	< 42	< 41	< 41	< 39	< 65	< 65
05/18/11 - 05/25/11	< 26	< 26	< 26	< 14	< 38	< 16
05/25/11 - 06/01/11	< 23	< 43	< 42	< 42	< 53	< 53
06/01/11 - 06/08/11	< 40	< 42	< 40	< 22	< 63	< 28
06/08/11 - 06/15/11	< 31	< 30	< 30	< 30	< 41	< 23
06/15/11 - 06/22/11	< 46	< 46	< 46	< 25	< 45	< 20
06/22/11 - 06/29/11	< 50	< 17	< 54	< 55	< 40	< 41
06/29/11 - 07/06/11	< 50	< 51	< 50	< 22	< 42	< 23
07/06/11 - 07/13/11	< 68	< 68	< 38	< 68	< 66	< 66
07/13/11 - 07/20/11	< 45	< 45	< 44	< 45	< 47	< 48
07/20/11 - 07/27/11	< 37	< 37	< 37	< 38	< 33	< 32
07/27/11 - 08/03/11	< 32	< 31	< 30	< 31	< 48	< 50
08/03/11 - 08/10/11	< 31	< 31	< 31	< 31	< 39	< 39
08/10/11 - 08/17/11	< 44	< 47	< 47	< 47	< 51	< 23
08/17/11 - 08/24/11	< 33	< 33	< 33	< 34	< 38	< 39
08/24/11 - 08/31/11	< 63	< 64	< 63	< 65	< 63	< 63
08/31/11 - 09/07/11	< 37	< 37	< 37	< 16	< 33	< 32
09/07/11 - 09/14/11	< 34	< 34	< 34	< 34	< 36	< 35
09/14/11 - 09/21/11	< 16	< 16	< 16	< 7	< 24	< 55
09/21/11 - 09/28/11	< 53	< 53	< 52	< 22	< 51	< 27
09/28/11 - 10/05/11	< 50	< 49	< 50	< 50	< 64	< 27
10/05/11 - 10/12/11	< 50	< 48	< 48	< 49	< 58	< 58
10/12/11 - 10/19/11	< 61	< 60	< 60	< 59	< 58	< 60
10/19/11 - 10/26/11	< 51	< 50	< 52	< 52	< 64	< 64
10/26/11 - 11/02/11	< 24	< 55	< 55	< 57	< 64	< 62
11/02/11 - 11/09/11	< 49	< 45	< 45	< 46	< 51	< 49
11/09/11 - 11/16/11	< 51	< 28	< 50	< 54 (1)	< 32	< 17
11/16/11 - 11/23/11	< 42	< 41	< 41	< 44 (1)	< 55	< 56
11/23/11 - 11/30/11	< 59	< 58	< 31	< 58	< 57	< 55
11/30/11 - 12/07/11	< 55	< 55	< 55	< 56	< 45	< 45
12/07/11 - 12/14/11	< 33	< 33	< 33	< 14	< 27	< 28
12/14/11 - 12/21/11	< 39	< 38	< 38	< 38	< 31	< 30
12/21/11 - 12/28/11	< 32	< 32	< 32	< 31	< 29	< 28
MEAN	42 ± 18	57 ± 79	36 ± 19	57 ± 22	45 ± 35	61 ± 41

* THE MEAN AND 2 STANDARD DEVIATION ARE CALCULATED USING THE POSITIVE VALUES

(1) SEE PROGRAM EXCEPTIONS SECTION FOR EXPLANATION

(2) SEE SUMMARY AND CONCLUSIONS SECTION REGARDING THE FUKUSHIMA EVENT

TABLE C-VII.1 CONCENTRATIONS OF I-131 IN AIR IODINE SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2011

RESULTS IN UNITS OF E-3 PCI/CU METER ± 2 SIGMA

COLLECTION PERIOD	GROUP II			GROUP III
	CL-01	CL-07	CL-08	CL-11 **
12/29/10 - 01/05/11	< 25	< 23	< 42	< 42
01/05/11 - 01/12/11	< 35	< 18	< 41	< 41
01/12/11 - 01/19/11	< 22	< 37	< 37	< 36
01/19/11 - 01/26/11	< 14	< 6	< 15	< 16
01/26/11 - 02/03/11	< 18 (1)	< 23 (1)	< 53 (1)	< 48
02/03/11 - 02/09/11	< 50	< 24	< 39	< 39
02/09/11 - 02/16/11	< 14	< 14	< 33	< 33
02/16/11 - 02/23/11	< 33	< 19	< 42	< 41
02/23/11 - 03/02/11	< 25	< 23	< 53	< 55
03/02/11 - 03/09/11	< 25	< 22	< 50	< 51
03/09/11 - 03/16/11	< 20	< 18	< 43	< 43
03/16/11 - 03/23/11	< 38	55 ± 20 (2)	34 ± 19 (2)	< 36
03/23/11 - 03/30/11	72 ± 20 (2)	42 ± 25 (2)	75 ± 29 (2)	78 ± 20 (2)
03/30/11 - 04/06/11	92 ± 34 (2)	62 ± 20 (2)	73 ± 21 (2)	90 ± 22 (2)
04/06/11 - 04/13/11	< 39	< 40	< 27	< 32
04/13/11 - 04/20/11	< 31	< 32	< 24	< 23
04/20/11 - 04/27/11	< 65	< 69	< 69	< 67
04/27/11 - 05/04/11	< 64	< 25	< 60	< 58
05/04/11 - 05/11/11	< 27	< 36	< 66	< 65
05/11/11 - 05/18/11	< 23	< 28	< 65	< 64
05/18/11 - 05/25/11	< 26	< 47	< 47	< 38
05/25/11 - 06/01/11	< 43	< 23	< 53	< 54
06/01/11 - 06/08/11	< 40	< 63	< 66	< 63
06/08/11 - 06/15/11	< 32	< 41	< 41	< 41
06/15/11 - 06/22/11	< 45	< 45	< 45	< 45
06/22/11 - 06/29/11	< 53 (1)	< 28	< 40	< 40
06/29/11 - 07/06/11	< 50	< 43	< 43	< 43
07/06/11 - 07/13/11	< 69	< 29	< 66	< 66
07/13/11 - 07/20/11	< 25	< 20	< 48	< 47
07/20/11 - 07/27/11	< 37	< 14	< 33	< 31
07/27/11 - 08/03/11	< 17	< 21	< 49	< 47
08/03/11 - 08/10/11	< 17	< 17	< 39	< 38
08/10/11 - 08/17/11	< 26	< 52	< 51	< 51
08/17/11 - 08/24/11	< 19	< 39	< 16	< 37
08/24/11 - 08/31/11	< 34	< 28	< 63	< 62
08/31/11 - 09/07/11	< 38	< 34	< 33	< 18
09/07/11 - 09/14/11	< 18	< 21	< 35	< 34
09/14/11 - 09/21/11	< 17	< 53	< 55	< 54
09/21/11 - 09/28/11	< 50	< 50	< 49	< 48
09/28/11 - 10/05/11	< 26	< 65	< 65	< 66
10/05/11 - 10/12/11	< 28 (1)	< 25	< 58	< 58
10/12/11 - 10/19/11	< 24	< 26	< 59	< 59
10/19/11 - 10/26/11	< 21	< 27	< 64	< 66
10/26/11 - 11/02/11	< 55	< 34	< 63	< 61
11/02/11 - 11/09/11	< 25	< 22	< 50	< 50
11/09/11 - 11/16/11	< 32	< 50	< 30	< 31
11/16/11 - 11/23/11	< 23	< 24	< 57	< 54
11/23/11 - 11/30/11	< 57	< 24	< 56	< 54
11/30/11 - 12/07/11	< 31	< 25	< 45	< 45
12/07/11 - 12/14/11	< 33	< 12	< 27	< 28
12/14/11 - 12/21/11	< 16	< 17	< 32	< 31
12/21/11 - 12/28/11	< 18	< 29	< 12	< 28
MEAN	82 ± 29	53 ± 20	61 ± 46	84 ± 18

* THE MEAN AND 2 STANDARD DEVIATION ARE CALCULATED USING THE POSITIVE VALUES.

** INDICATES CONTROL LOCATION

(1) SEE PROGRAM EXCEPTIONS SECTION FOR EXPLANATION

(2) SEE SUMMARY AND CONCLUSIONS SECTION REGARDING THE FUKUSHIMA EVENT

TABLE C-VIII.1 CONCENTRATIONS OF I-131 IN MILK SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2011

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	CONTROL FARM CL-116
01/26/11	< 0.8
02/23/11	< 0.2
03/30/11	2.8 ± 0.6 (1)
04/13/11	< 0.8
04/27/11	< 0.8
05/04/11	< 0.5
05/18/11	< 0.7
06/01/11	< 0.6
06/15/11	< 0.8
06/29/11	< 0.7
07/13/11	< 1.0
07/27/11	< 0.8
08/10/11	< 0.8
08/24/11	< 0.9
09/07/11	< 0.6
09/21/11	< 0.7
10/05/11	< 0.9
10/19/11	< 0.7
11/02/11	< 0.9
11/30/11	< 0.7
12/28/11	< 0.4
MEAN	-

(1) SEE SUMMARY AND CONCLUSIONS SECTION REGARIDNG FUKUSHIMA EVENT

TABLE C-VIII.2 CONCENTRATIONS OF GAMMA EMITTERS IN MILK SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2011

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION PERIOD	Be-7	K-40	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	Cs-134	Cs-137	Ba-140	La-140	Ce-144
CL-116	01/26/11	< 44	1350 ± 116	< 4	< 5	< 11	< 7	< 11	< 5	< 10	< 4	< 6	< 26	< 7	< 33
	02/23/11	< 56	1320 ± 132	< 6	< 6	< 15	< 7	< 12	< 8	< 12	< 5	< 6	< 42	< 10	< 45
	03/30/11	< 50	1170 ± 122	< 5	< 6	< 12	< 7	< 11	< 6	< 10	< 5	< 5	< 52	< 13	< 37
	04/13/11	< 21	1350 ± 56	< 2	< 2	< 6	< 3	< 5	< 3	< 5	< 2	< 3	< 15	< 5	< 16
	04/27/11	< 55	1170 ± 132	< 5	< 6	< 15	< 6	< 15	< 7	< 12	< 5	< 6	< 48	< 12	< 40
	05/04/11	< 42	1160 ± 119	< 5	< 6	< 12	< 6	< 11	< 5	< 9	< 4	< 5	< 29	< 8	< 34
	05/18/11	< 48	1180 ± 138	< 5	< 6	< 15	< 7	< 12	< 6	< 8	< 5	< 6	< 35	< 10	< 46
	06/01/11	< 52	1070 ± 143	< 5	< 5	< 15	< 7	< 13	< 5	< 9	< 5	< 5	< 47	< 14	< 42
	06/15/11	< 68	1180 ± 132	< 5	< 6	< 13	< 7	< 14	< 8	< 10	< 6	< 6	< 53	< 13	< 49
	06/29/11	< 50	1290 ± 135	< 7	< 7	< 15	< 6	< 13	< 7	< 12	< 5	< 7	< 42	< 14	< 40
	07/13/11	< 61	1130 ± 186	< 7	< 6	< 19	< 7	< 14	< 7	< 9	< 7	< 7	< 39	< 14	< 58
	07/27/11	< 49	1340 ± 157	< 6	< 7	< 16	< 8	< 15	< 7	< 10	< 6	< 6	< 30	< 8	< 45
	08/10/11	< 57	1350 ± 157	< 6	< 6	< 14	< 8	< 16	< 7	< 11	< 7	< 8	< 30	< 8	< 51
	08/24/11	< 48	1270 ± 160	< 6	< 7	< 16	< 7	< 19	< 8	< 15	< 5	< 7	< 31	< 9	< 43
	09/07/11	< 60	1400 ± 193	< 6	< 7	< 16	< 9	< 18	< 9	< 12	< 6	< 8	< 32	< 9	< 46
	09/21/11	< 61	1230 ± 183	< 9	< 7	< 17	< 13	< 15	< 9	< 12	< 7	< 9	< 44	< 7	< 63
	10/05/11	< 49	1110 ± 154	< 7	< 6	< 14	< 7	< 17	< 6	< 11	< 4	< 6	< 25	< 11	< 34
	10/19/11	< 67	1130 ± 186	< 8	< 11	< 19	< 12	< 19	< 8	< 13	< 8	< 11	< 45	< 13	< 62
	11/02/11	< 60	1390 ± 188	< 8	< 7	< 19	< 9	< 17	< 9	< 13	< 6	< 8	< 32	< 9	< 50
	11/30/11	< 58	1250 ± 197	< 6	< 8	< 17	< 10	< 17	< 10	< 14	< 7	< 8	< 31	< 13	< 49
	12/28/11	< 57	1250 ± 168	< 5	< 6	< 16	< 10	< 14	< 6	< 12	< 5	< 6	< 24	< 6	< 44
	MEAN	-	1242 ± 199	-	-	-	-	-	-	-	-	-	-	-	-

TABLE C-IX.1 **CONCENTRATIONS OF GAMMA EMITTERS IN VEGETATION SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2011**

RESULTS IN UNITS OF PCI/KG WET ± 2 SIGMA

SITE	COLLECTION PERIOD	Be-7	K-40	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	I-131	Cs-134	Cs-137	Ba-140	La-140	Ce-144
CL-114																
Cabbage	06/29/11	243 ± 134	4570 ± 346	< 13	< 14	< 28	< 16	< 37	< 12	< 27	< 41	< 11	< 14	< 88	< 28	< 101
Lettuce	06/29/11	391 ± 136	4250 ± 396	< 17	< 19	< 42	< 23	< 38	< 19	< 31	< 57	< 17	< 17	< 133	< 35	< 117
Swiss Chard	06/29/11	430 ± 165	7990 ± 510	< 17	< 19	< 51	< 22	< 38	< 20	< 30	< 54	< 15	< 18	< 124	< 25	< 121
Cabbage	07/27/11	< 167	3280 ± 443	< 20	< 16	< 47	< 18	< 42	< 19	< 32	< 33	< 17	< 18	< 87	< 20	< 115
Lettuce	07/27/11	320 ± 149	4970 ± 504	< 19	< 21	< 39	< 23	< 47	< 19	< 34	< 30	< 19	< 21	< 82	< 18	< 134
Swiss Chard	07/27/11	318 ± 163	7610 ± 576	< 17	< 23	< 44	< 29	< 51	< 20	< 32	< 32	< 21	< 22	< 88	< 25	< 123
Cabbage	08/31/11	280 ± 145	3930 ± 392	< 17	< 18	< 37	< 16	< 37	< 15	< 25	< 33	< 15	< 18	< 81	< 19	< 105
Spinach	08/31/11	194 ± 136	9970 ± 866	< 24	< 25	< 63	< 44	< 69	< 28	< 50	< 45	< 20	< 24	< 140	< 22	< 128
Swiss Chard	08/31/11	325 ± 141	7860 ± 625	< 17	< 19	< 45	< 28	< 48	< 17	< 27	< 33	< 17	< 19	< 83	< 27	< 96
Cabbage	09/28/11	382 ± 142	3500 ± 503	< 20	< 18	< 51	< 28	< 45	< 20	< 40	< 49	< 17	< 18	< 128	< 36	< 114
Spinach	09/28/11	688 ± 198	8010 ± 601	< 19	< 19	< 50	< 27	< 57	< 20	< 38	< 54	< 17	< 19	< 121	< 27	< 140
Swiss Chard	09/28/11	675 ± 187	6100 ± 617	< 18	< 20	< 59	< 31	< 41	< 22	< 28	< 42	< 16	< 19	< 126	< 29	< 108
	MEAN	386 ± 321	6003 ± 4428	-	-	-	-	-	-	-	-	-	-	-	-	-
CL-115																
Cabbage	06/29/11	751 ± 214	4870 ± 489	< 17	< 19	< 44	< 24	< 43	< 19	< 26	< 52	< 17	< 24	< 126	< 36	< 129
Corn Leaves	06/29/11 (1)	621 ± 262	3730 ± 440	< 17	< 19	< 44	< 20	< 36	< 18	< 30	< 59	< 18	< 17	< 128	< 38	< 122
Lettuce	06/29/11	433 ± 200	3760 ± 338	< 16	< 16	< 42	< 18	< 34	< 17	< 27	< 59	< 16	< 18	< 118	< 32	< 114
Cabbage	07/27/11	208 ± 143	2690 ± 428	< 17	< 17	< 45	< 25	< 50	< 22	< 34	< 35	< 17	< 21	< 99	< 28	< 117
Lettuce	07/27/11	270 ± 224	3460 ± 530	< 30	< 27	< 57	< 29	< 52	< 37	< 51	< 54	< 31	< 27	< 136	< 34	< 201
Corn Leaves	07/27/11 (1)	1580 ± 366	3860 ± 518	< 26	< 28	< 60	< 33	< 59	< 33	< 47	< 50	< 25	< 26	< 131	< 41	< 193
Cabbage	08/31/11	< 170	3740 ± 462	< 20	< 21	< 36	< 28	< 44	< 21	< 32	< 37	< 19	< 20	< 94	< 27	< 121
Corn Leaves	08/31/11 (1)	1730 ± 355	2250 ± 509	< 29	< 26	< 51	< 24	< 39	< 28	< 40	< 49	< 24	< 28	< 150	< 29	< 182
Tree Leaves	08/31/11 (1)	1470 ± 284	4900 ± 608	< 26	< 22	< 57	< 33	< 56	< 26	< 45	< 55	< 22	< 27	< 123	< 35	< 179
Cabbage	09/28/11	1320 ± 228	1620 ± 338	< 16	< 19	< 42	< 24	< 35	< 18	< 39	< 58	< 20	< 22	< 123	< 38	< 117
Corn Leaves	09/28/11 (1)	3070 ± 154	2670 ± 185	< 4	< 4	< 9	< 5	< 9	< 4	< 7	< 16	< 4	< 4	< 29	< 10	< 26
Tree Leaves	09/28/11 (1)	335 ± 185	2440 ± 333	< 17	< 16	< 39	< 18	< 33	< 20	< 30	< 55	< 15	< 17	< 124	< 28	< 115
	MEAN	1072 ± 1738	3333 ± 2034	-	-	-	-	-	-	-	-	-	-	-	-	-

* THE MEAN AND TWO STANDARD DEVIATION ARE CALCULATED USING THE POSITIVE VALUES

(1) SEE PROGRAM EXCEPTIONS SECTION FOR EXPLANATION

TABLE C-IX.1 **CONCENTRATIONS OF GAMMA EMITTERS IN VEGETATION SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2011**

RESULTS IN UNITS OF PCI/KG WET ± 2 SIGMA

SITE	COLLECTION PERIOD	Be-7	K-40	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	I-131	Cs-134	Cs-137	Ba-140	La-140	Ce-144
CL-117																
Cabbage	06/29/11	338 ± 251	2760 ± 402	< 20	< 19	< 46	< 25	< 53	< 23	< 31	< 50	< 18	< 18	< 129	< 39	< 123
Lettuce	06/29/11	418 ± 180	4280 ± 414	< 16	< 17	< 43	< 23	< 32	< 18	< 27	< 48	< 12	< 17	< 115	< 37	< 104
Swiss Chard	06/29/11	249 ± 117	4140 ± 358	< 13	< 17	< 33	< 17	< 33	< 15	< 27	< 45	< 14	< 12	< 97	< 22	< 84
Cabbage	07/27/11	217 ± 116	3500 ± 378	< 15	< 12	< 28	< 19	< 39	< 15	< 28	< 26	< 13	< 13	< 75	< 21	< 96
Lettuce	07/27/11	350 ± 180	5650 ± 551	< 25	< 22	< 50	< 29	< 53	< 25	< 42	< 36	< 23	< 22	< 107	< 31	< 152
Swiss Chard	07/27/11	214 ± 170	7730 ± 586	< 19	< 23	< 53	< 29	< 41	< 22	< 38	< 32	< 18	< 18	< 87	< 20	< 140
Cabbage	08/31/11	170 ± 158	2890 ± 373	< 19	< 17	< 31	< 17	< 31	< 17	< 24	< 35	< 14	< 17	< 84	< 28	< 106
Lettuce	08/31/11	818 ± 82	11300 ± 268	< 9	< 9	< 22	< 12	< 22	< 10	< 15	< 18	< 8	< 9	< 47	< 11	< 59
Swiss Chard	08/31/11	< 198	6930 ± 618	< 18	< 20	< 38	< 23	< 43	< 15	< 34	< 33	< 14	< 16	< 91	< 21	< 81
Cabbage	09/28/11	310 ± 181	4050 ± 394	< 17	< 13	< 40	< 20	< 40	< 18	< 28	< 49	< 14	< 15	< 102	< 19	< 93
Spinach	09/28/11	492 ± 196	6760 ± 381	< 16	< 20	< 46	< 21	< 47	< 19	< 32	< 60	< 18	< 18	< 123	< 31	< 138
Swiss Chard	09/28/11	277 ± 137	5550 ± 490	< 15	< 20	< 40	< 22	< 39	< 17	< 29	< 50	< 15	< 15	< 119	< 32	< 106
	MEAN	350 ± 363	5462 ± 4899	-	-	-	-	-	-	-	-	-	-	-	-	-
CL-118																
Cabbage	06/29/11	233 ± 170	4610 ± 373	< 15	< 18	< 38	< 19	< 37	< 16	< 32	< 55	< 15	< 17	< 128	< 20	< 113
Lettuce	06/29/11	466 ± 163	5720 ± 460	< 15	< 17	< 50	< 23	< 40	< 23	< 30	< 59	< 14	< 18	< 115	< 35	< 108
Spinach	06/29/11	1160 ± 179	13800 ± 510	< 21	< 22	< 54	< 26	< 50	< 23	< 39	< 53	< 18	< 21	< 136	< 39	< 109
Cabbage	07/27/11	391 ± 272	7120 ± 647	< 31	< 27	< 49	< 30	< 56	< 27	< 51	< 42	< 25	< 28	< 121	< 34	< 181
Lettuce	07/27/11	< 225	6230 ± 578	< 22	< 23	< 48	< 32	< 51	< 25	< 40	< 37	< 22	< 25	< 120	< 33	< 142
Spinach/Maple Leaves	07/27/11 (1)	1460 ± 392	4610 ± 594	< 32	< 31	< 62	< 42	< 77	< 45	< 58	< 56	< 34	< 32	< 165	< 45	< 244
Cabbage	08/31/11	233 ± 149	6380 ± 468	< 21	< 21	< 44	< 26	< 47	< 22	< 36	< 54	< 18	< 20	< 131	< 31	< 136
Lettuce	08/31/11	614 ± 146	8280 ± 346	< 14	< 15	< 33	< 17	< 33	< 16	< 28	< 32	< 14	< 17	< 82	< 21	< 97
Tree leaves/Spinach	08/31/11 (1)	1510 ± 112	4510 ± 209	< 8	< 9	< 19	< 10	< 18	< 9	< 16	< 18	< 8	< 9	< 48	< 12	< 56
Cabbage	09/28/11	290 ± 142	4840 ± 438	< 18	< 19	< 46	< 23	< 45	< 19	< 34	< 40	< 15	< 17	< 110	< 27	< 114
Swiss Chard/Tree Leaves	09/28/11 (1)	2370 ± 200	6810 ± 383	< 15	< 18	< 37	< 17	< 35	< 18	< 29	< 56	< 16	< 17	< 105	< 31	< 107
Tree Leaves	09/28/11 (1)	2140 ± 247	2470 ± 297	< 17	< 19	< 43	< 17	< 34	< 19	< 31	< 57	< 16	< 18	< 131	< 28	< 104
	MEAN	988 ± 1569	6282 ± 5630	-	-	-	-	-	-	-	-	-	-	-	-	-

* THE MEAN AND TWO STANDARD DEVIATION ARE CALCULATED USING THE POSITIVE VALUES

(1) SEE PROGRAM EXCEPTIONS SECTION FOR EXPLANATION

TABLE C-IX.2 **CONCENTRATIONS OF GAMMA EMITTERS IN GRASS SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2011**

RESULTS IN UNITS OF PCI/KG WET ± 2 SIGMA

SITE	COLLECTION PERIOD	Be-7	K-40	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	I-131	Cs-134	Cs-137	Ba-140	La-140	Ce-144
CL-01	05/04/11	1042 ± 93	5305 ± 189	< 4	< 5	< 13	< 5	< 10	< 6	< 9	< 50	< 4	< 5	< 72	< 16	< 29
	05/18/11	1995 ± 98	5129 ± 137	< 4	< 4	< 10	< 4	< 8	< 5	< 7	< 43	< 3	< 3	< 56	< 14	< 27
	06/01/11	1479 ± 73	4810 ± 133	< 5	< 6	< 14	< 6	< 12	< 6	< 10	< 40	< 5	< 5	< 61	< 16	< 38
	06/15/11	1686 ± 182	4675 ± 327	< 14	< 15	< 36	< 15	< 29	< 15	< 27	< 46	< 13	< 13	< 102	< 20	< 94
	06/29/11	2569 ± 196	5313 ± 353	< 16	< 17	< 37	< 17	< 32	< 19	< 29	< 57	< 16	< 15	< 122	< 30	< 101
	07/13/11	2358 ± 361	4877 ± 691	< 29	< 40	< 86	< 34	< 93	< 34	< 55	< 45	< 29	< 33	< 150	< 50	< 193
	07/27/11	3283 ± 436	5825 ± 713	< 29	< 37	< 67	< 35	< 58	< 38	< 61	< 56	< 29	< 39	< 137	< 30	< 224
	08/10/11	2981 ± 377	5016 ± 572	< 25	< 31	< 58	< 30	< 61	< 36	< 46	< 57	< 26	< 26	< 153	< 33	< 199
	08/24/11	1023 ± 210	4963 ± 476	< 18	< 18	< 36	< 22	< 35	< 20	< 29	< 29	< 16	< 16	< 83	< 25	< 116
	09/07/11	380 ± 49	4565 ± 163	< 6	< 5	< 14	< 6	< 14	< 5	< 10	< 8	< 5	< 6	< 25	< 7	< 33
	09/21/11	1371 ± 252	5739 ± 536	< 17	< 20	< 47	< 25	< 44	< 23	< 30	< 33	< 18	< 19	< 86	< 24	< 127
	10/05/11	1432 ± 258	4679 ± 542	< 22	< 20	< 37	< 20	< 51	< 25	< 41	< 37	< 19	< 23	< 105	< 24	< 124
	10/19/11	990 ± 172	3796 ± 325	< 14	< 14	< 35	< 16	< 34	< 17	< 29	< 36	< 14	< 14	< 86	< 24	< 100
	MEAN	1738 ± 1710	4976 ± 1053	-	-	-	-	-	-	-	-	-	-	-	-	-
CL-02	05/04/11	1591 ± 129	5567 ± 228	< 5	< 5	< 12	< 5	< 9	< 5	< 9	< 50	< 4	< 4	< 61	< 15	< 32
	05/18/11	596 ± 71	5398 ± 178	< 4	< 5	< 13	< 6	< 9	< 5	< 8	< 41	< 3	< 4	< 65	< 19	< 21
	06/01/11	1843 ± 85	5820 ± 163	< 6	< 7	< 17	< 7	< 14	< 7	< 12	< 45	< 5	< 6	< 67	< 16	< 40
	06/15/11	930 ± 164	5035 ± 335	< 11	< 14	< 29	< 17	< 30	< 13	< 24	< 41	< 11	< 13	< 100	< 20	< 88
	06/29/11	1292 ± 209	5379 ± 439	< 17	< 17	< 48	< 22	< 34	< 20	< 30	< 52	< 15	< 17	< 121	< 23	< 98
	07/13/11	1175 ± 202	6069 ± 527	< 16	< 17	< 40	< 23	< 42	< 20	< 31	< 30	< 15	< 20	< 86	< 23	< 121
	07/27/11	398 ± 204	4511 ± 611	< 28	< 28	< 49	< 32	< 59	< 28	< 40	< 41	< 24	< 24	< 107	< 20	< 149
	08/10/11	243 ± 185	5500 ± 434	< 15	< 16	< 31	< 18	< 34	< 19	< 27	< 30	< 14	< 15	< 80	< 22	< 101
	08/24/11	646 ± 214	3903 ± 520	< 27	< 22	< 55	< 21	< 49	< 27	< 43	< 45	< 21	< 21	< 118	< 28	< 174
	09/07/11	656 ± 77	7024 ± 220	< 9	< 8	< 18	< 10	< 19	< 9	< 15	< 13	< 8	< 9	< 39	< 10	< 54
	09/21/11	781 ± 225	3424 ± 521	< 30	< 28	< 62	< 35	< 64	< 24	< 46	< 53	< 27	< 33	< 142	< 47	< 181
	10/05/11	1465 ± 421	4344 ± 739	< 28	< 32	< 77	< 38	< 86	< 38	< 61	< 58	< 37	< 36	< 160	< 52	< 236
	10/19/11	1394 ± 330	5132 ± 525	< 19	< 20	< 46	< 26	< 45	< 23	< 40	< 56	< 18	< 18	< 148	< 34	< 130
	MEAN	1001 ± 990	5162 ± 1899	-	-	-	-	-	-	-	-	-	-	-	-	-

TABLE C-IX.2 CONCENTRATIONS OF GAMMA EMITTERS IN GRASS SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2011

RESULTS IN UNITS OF PCI/KG WET ± 2 SIGMA

SITE	COLLECTION PERIOD	Be-7	K-40	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	I-131	Cs-134	Cs-137	Ba-140	La-140	Ce-144
CL-08	05/04/11	995 ± 93	5125 ± 168	< 4	< 4	< 12	< 5	< 9	< 5	< 8	< 47	< 4	< 4	< 63	< 16	< 25
	05/18/11	1085 ± 95	5372 ± 162	< 3	< 4	< 10	< 4	< 8	< 5	< 8	< 43	< 3	< 4	< 56	< 13	< 23
	06/01/11	716 ± 111	5790 ± 251	< 7	< 8	< 20	< 8	< 16	< 9	< 16	< 47	< 7	< 7	< 74	< 19	< 48
	06/15/11	2183 ± 233	5750 ± 412	< 15	< 19	< 43	< 21	< 37	< 19	< 31	< 52	< 16	< 18	< 126	< 34	< 112
	06/29/11	2064 ± 257	6236 ± 491	< 16	< 17	< 37	< 23	< 38	< 18	< 32	< 59	< 17	< 18	< 125	< 28	< 116
	07/13/11	1710 ± 362	5964 ± 744	< 22	< 29	< 50	< 29	< 66	< 23	< 49	< 55	< 28	< 28	< 122	< 31	< 204
	07/27/11	2611 ± 522	6102 ± 909	< 50	< 50	< 113	< 54	< 92	< 46	< 92	< 59	< 44	< 52	< 220	< 69	< 262
	08/10/11	1895 ± 357	7539 ± 675	< 26	< 28	< 65	< 34	< 74	< 29	< 49	< 55	< 27	< 24	< 137	< 36	< 182
	08/24/11	1393 ± 203	5757 ± 504	< 21	< 22	< 50	< 28	< 53	< 27	< 40	< 35	< 21	< 24	< 106	< 29	< 134
	09/07/11	561 ± 62	7898 ± 182	< 6	< 6	< 15	< 8	< 15	< 7	< 11	< 11	< 6	< 6	< 29	< 8	< 42
	09/21/11	1471 ± 207	5782 ± 442	< 18	< 16	< 43	< 21	< 33	< 19	< 31	< 31	< 16	< 16	< 92	< 17	< 109
	10/05/11	1507 ± 355	6768 ± 795	< 27	< 21	< 65	< 40	< 61	< 25	< 59	< 43	< 27	< 19	< 115	< 28	< 149
	10/19/11	1360 ± 255	3586 ± 452	< 19	< 21	< 46	< 22	< 42	< 23	< 34	< 57	< 17	< 22	< 147	< 31	< 118
	MEAN	1504 ± 1180	5975 ± 2146	-	-	-	-	-	-	-	-	-	-	-	-	-
CL-116	05/04/11	2321 ± 179	6157 ± 266	< 5	< 6	< 14	< 6	< 12	< 6	< 11	< 55	< 4	< 5	< 75	< 21	< 30
	05/18/11	1503 ± 94	5348 ± 165	< 4	< 4	< 10	< 4	< 8	< 4	< 7	< 44	< 3	< 4	< 62	< 14	< 22
	06/01/11	1229 ± 137	3728 ± 235	< 7	< 9	< 22	< 8	< 15	< 8	< 14	< 48	< 7	< 7	< 74	< 19	< 49
	06/15/11	2391 ± 222	4271 ± 385	< 15	< 14	< 36	< 19	< 29	< 18	< 32	< 54	< 16	< 17	< 118	< 20	< 108
	06/29/11	3001 ± 227	4709 ± 346	< 15	< 16	< 37	< 15	< 32	< 18	< 30	< 55	< 13	< 13	< 108	< 24	< 101
	07/13/11	1556 ± 247	4675 ± 514	< 21	< 21	< 55	< 31	< 60	< 21	< 37	< 31	< 19	< 24	< 99	< 24	< 139
	07/27/11	1612 ± 263	5337 ± 519	< 21	< 20	< 46	< 26	< 55	< 23	< 38	< 36	< 18	< 21	< 90	< 24	< 127
	08/10/11	1276 ± 198	5562 ± 412	< 17	< 16	< 34	< 19	< 35	< 19	< 29	< 32	< 14	< 16	< 83	< 20	< 117
	08/24/11	1455 ± 333	5983 ± 758	< 29	< 29	< 74	< 38	< 88	< 36	< 60	< 46	< 31	< 29	< 165	< 23	< 209
	09/07/11	1275 ± 101	7027 ± 243	< 8	< 8	< 20	< 11	< 20	< 9	< 15	< 14	< 8	< 8	< 41	< 10	< 53
	09/21/11	1440 ± 330	5532 ± 703	< 30	< 31	< 76	< 42	< 52	< 36	< 52	< 59	< 32	< 27	< 150	< 49	< 183
	10/05/11	2271 ± 402	6547 ± 638	< 32	< 34	< 78	< 36	< 67	< 34	< 55	< 55	< 34	< 34	< 145	< 39	< 255
	10/19/11	1855 ± 256	4506 ± 423	< 19	< 16	< 44	< 22	< 41	< 26	< 35	< 57	< 19	< 19	< 136	< 38	< 147
	MEAN	1783 ± 1094	5337 ± 1893	-	-	-	-	-	-	-	-	-	-	-	-	-

TABLE C-X.1 QUARTERLY TLD RESULTS FOR CLINTON POWER STATION, 2011

RESULTS IN UNITS OF MILLI-ROENTGEN/QUARTER ± 2 STANDARD DEVIATIONS

STATION CODE	MEAN ± 2 S.D.	JAN - MAR	APR - JUN	JUL - SEP	OCT - DEC
CL-01	18.8 ± 1.2	18.4 ± 2.2	18.2 ± 0.9	19.3 ± 1.2	19.3 ± 1.2
CL-02	19.1 ± 2.4	18.3 ± 1.2	18.3 ± 1.4	18.8 ± 2.1	20.8 ± 2.1
CL-03	19.2 ± 1.9	18.6 ± 1.3	18.6 ± 1.4	19.1 ± 0.5	20.6 ± 1.5
CL-04	18.6 ± 1.5	19.3 ± 2.6	17.7 ± 1.4	18.3 ± 0.8	19.2 ± 1.0
CL-05	19.3 ± 4.3	18.8 ± 2.6	18.1 ± 1.5	17.8 ± 1.0	22.5 ± 4.0
CL-06	16.7 ± 3.1	16.3 ± 0.8	16.0 ± 2.1	15.4 ± 1.0	18.9 ± 2.6
CL-07	18.0 ± 2.1	17.2 ± 2.4	17.7 ± 1.7	17.6 ± 0.8	19.6 ± 1.0
CL-08	18.2 ± 2.6	17.7 ± 1.1	16.9 ± 0.5	18.1 ± 1.2	20.0 ± 1.7
CL-11	17.8 ± 2.3	17.1 ± 1.0	17.3 ± 0.9	17.2 ± 1.1	19.5 ± 1.8
CL-15	17.1 ± 1.3	16.7 ± 0.8	17.2 ± 1.6	16.5 ± 1.1	18.0 ± 1.2
CL-22	19.3 ± 2.4	18.4 ± 1.9	18.4 ± 0.7	19.5 ± 1.4	20.9 ± 1.1
CL-23	19.6 ± 1.4	19.7 ± 1.8	19.0 ± 2.2	19.2 ± 0.5	20.6 ± 0.3
CL-24	20.0 ± 2.3	19.1 ± 1.7	20.2 ± 3.9	19.0 ± 1.1	21.5 ± 1.3
CL-33	19.4 ± 2.4	19.1 ± 1.6	17.9 ± 1.1	20.1 ± 3.0	20.6 ± 0.7
CL-34	19.7 ± 2.8	19.5 ± 1.8	18.4 ± 0.3	19.3 ± 2.2	21.7 ± 1.4
CL-35	18.4 ± 2.2	17.7 ± 1.6	17.8 ± 2.0	17.9 ± 1.3	20.0 ± 1.0
CL-36	19.1 ± 2.2	18.8 ± 0.6	17.9 ± 1.8	19.1 ± 1.7	20.5 ± 3.1
CL-37	18.3 ± 3.0	17.1 ± 1.6	18.6 ± 3.3	17.1 ± 0.8	20.2 ± 1.3
CL-41	20.0 ± 1.8	19.4 ± 1.0	19.2 ± 2.3	20.3 ± 1.6	21.1 ± 1.8
CL-42	19.0 ± 1.7	18.5 ± 1.1	18.4 ± 3.3	18.7 ± 1.2	20.2 ± 1.8
CL-43	19.9 ± 2.1	19.4 ± 1.0	19.4 ± 1.9	19.2 ± 1.3	21.4 ± 2.5
CL-44	19.1 ± 2.5	18.3 ± 0.9	18.7 ± 1.4	18.5 ± 1.4	21.0 ± 1.2
CL-45	19.8 ± 4.0	18.3 ± 1.1	18.5 ± 1.0	19.8 ± 2.2	22.6 ± 1.5
CL-46	16.7 ± 2.3	16.4 ± 1.7	16.2 ± 0.8	15.8 ± 0.7	18.4 ± 2.1
CL-47	19.5 ± 3.9	19.0 ± 1.0	18.6 ± 2.1	18.1 ± 0.8	22.4 ± 1.7
CL-48	18.6 ± 2.2	17.1 ± 0.8	18.7 ± 1.4	18.7 ± 1.6	19.7 ± 1.6
CL-49	19.8 ± 4.0	18.0 ± 1.2	18.9 ± 0.9	19.5 ± 2.8	22.6 ± 2.2
CL-51	19.7 ± 2.3	19.2 ± 1.4	18.9 ± 1.0	19.4 ± 3.0	21.4 ± 1.9
CL-52	19.2 ± 2.1	18.9 ± 1.4	18.4 ± 1.5	18.6 ± 1.0	20.7 ± 1.5
CL-53	18.8 ± 2.3	18.5 ± 2.5	17.6 ± 1.4	18.6 ± 1.3	20.3 ± 1.3
CL-54	18.9 ± 3.7	16.7 ± 4.2	18.1 ± 1.1	19.9 ± 1.6	20.8 ± 1.6
CL-55	19.5 ± 2.1	18.4 ± 0.8	19.0 ± 1.5	19.7 ± 1.6	20.9 ± 1.1
CL-56	19.6 ± 3.2	19.0 ± 2.6	18.7 ± 1.1	18.8 ± 0.7	22.0 ± 1.4
CL-57	20.0 ± 3.2	18.9 ± 1.1	18.6 ± 1.8	20.3 ± 1.7	22.1 ± 3.1
CL-58	19.8 ± 2.6	18.3 ± 0.4	19.7 ± 2.3	19.7 ± 2.3	21.5 ± 0.8
CL-60	20.1 ± 3.5	18.7 ± 0.6	19.0 ± 0.8	20.0 ± 0.7	22.5 ± 5.4
CL-61	19.2 ± 2.4	19.0 ± 2.3	18.1 ± 0.4	18.7 ± 0.4	20.9 ± 2.3
CL-63	17.8 ± 1.3	17.0 ± 1.4	18.3 ± 4.7	17.6 ± 1.2	18.4 ± 1.3
CL-64	18.9 ± 2.5	18.5 ± 1.1	17.8 ± 1.2	18.5 ± 1.6	20.7 ± 1.1
CL-65	19.7 ± 2.3	19.5 ± 1.8	18.4 ± 2.0	19.7 ± 1.9	21.2 ± 1.7
CL-74	17.5 ± 2.7	17.5 ± 1.3	16.4 ± 0.8	16.8 ± 1.7	19.4 ± 2.1
CL-75	18.9 ± 2.9	18.6 ± 1.0	18.3 ± 0.6	17.7 ± 1.1	21.0 ± 1.0
CL-76	19.7 ± 1.8	19.3 ± 2.1	18.6 ± 1.4	20.1 ± 2.0	20.7 ± 2.1
CL-77	18.5 ± 2.7	17.6 ± 1.5	18.1 ± 1.8	17.9 ± 1.2	20.5 ± 1.6
CL-78	18.6 ± 2.2	18.9 ± 1.7	18.0 ± 0.7	17.4 ± 0.8	19.9 ± 2.2
CL-79	19.4 ± 2.9	18.1 ± 1.4	18.6 ± 1.1	19.3 ± 0.9	21.4 ± 1.5
CL-80	19.1 ± 3.3	18.7 ± 1.6	17.7 ± 1.5	18.5 ± 2.4	21.5 ± 2.1
CL-81	19.2 ± 1.8	18.9 ± 1.2	18.7 ± 2.1	18.7 ± 0.8	20.6 ± 2.3
CL-84	18.9 ± 2.2	18.5 ± 1.1	18.4 ± 0.9	18.0 ± 1.1	20.5 ± 2.4
CL-90	16.5 ± 2.1	16.4 ± 0.6	15.2 ± 1.5	16.4 ± 1.4	17.8 ± 2.4
CL-91	17.4 ± 1.8	16.9 ± 0.5	16.8 ± 1.8	17.2 ± 1.9	18.7 ± 1.4
CL-97	19.4 ± 1.4	18.7 ± 1.5	19.0 ± 1.7	19.6 ± 3.6	20.3 ± 1.7
CL-99	16.7 ± 3.2	16.3 ± 1.1	15.8 ± 0.6	15.6 ± 1.1	19.0 ± 3.4
CL-114	18.3 ± 1.6	17.9 ± 1.1	17.5 ± 1.3	18.2 ± 1.7	19.4 ± 1.7

TABLE C-X.1 QUARTERLY TLD RESULTS FOR CLINTON POWER STATION, 2011

RESULTS IN UNITS OF MILLI-ROENTGEN/QUARTER ± 2 STANDARD DEVIATIONS

STATION CODE	MEAN ± 2 S.D.	JAN - MAR	APR - JUN	JUL - SEP	OCT - DEC
CL-05MM	19.0 ± 2.0	19.2 ± 2.3	18.1 ± 1.6	18.3 ± 2.8	20.3 ± 1.7
CL-46MM	19.7 ± 2.2	19.3 ± 1.3	18.8 ± 1.5	19.3 ± 2.6	21.3 ± 1.8
CL-47MM	19.1 ± 2.0	18.3 ± 1.8	18.4 ± 1.8	19.0 ± 2.3	20.5 ± 1.6
CL-58MM	18.7 ± 2.2	18.6 ± 0.6	17.6 ± 1.5	18.5 ± 0.7	20.2 ± 1.3

COMPARISON OF STATIONS CL-05, CL-46, CL-47 AND CL-58 AND CORRESPONDING MM SAMPLES

STATION CODE	MEAN ± 2 S.D.	JAN - MAR	APR - JUN	JUL - SEP	OCT - DEC
CL-05	19.3 ± 4.3	18.8 ± 2.6	18.1 ± 1.5	17.8 ± 1.0	22.5 ± 4.0
CL-05MM	19.0 ± 2.0	19.2 ± 2.3	18.1 ± 1.6	18.3 ± 2.8	20.3 ± 1.7
CL-46	16.7 ± 2.3	16.4 ± 1.7	16.2 ± 0.8	15.8 ± 0.7	18.4 ± 2.1
CL-46MM	19.7 ± 2.2	19.3 ± 1.3	18.8 ± 1.5	19.3 ± 2.6	21.3 ± 1.8
CL-47	19.5 ± 3.9	19.0 ± 1.0	18.6 ± 2.1	18.1 ± 0.8	22.4 ± 1.7
CL-47MM	19.1 ± 2.0	18.3 ± 1.8	18.4 ± 1.8	19.0 ± 2.3	20.5 ± 1.6
CL-58	19.8 ± 2.6	18.3 ± 0.4	19.7 ± 2.3	19.7 ± 2.3	21.5 ± 0.8
CL-58MM	18.7 ± 2.2	18.6 ± 0.6	17.6 ± 1.5	18.5 ± 0.7	20.2 ± 1.3

TABLE C-X.2 MEAN QUARTLY TLD RESULTS FOR THE INNER RING, OUTER RING, SPECIAL INTEREST, SUPPLEMENTAL AND CONTROL LOCATIONS FOR CLINTON POWER STATION, 2011

RESULTS IN UNITS OF MILLI-ROENTGEN/QUARTER ± 2 STANDARD DEVIATIONS OF THE STATION DATA

COLLECTION PERIOD	INNER RING ± 2 S.D.	OUTER RING	SPECIAL INTEREST	SUPPLEMENTAL	CONTROL
JAN-MAR	18.4 ± 1.9	18.6 ± 1.3	18.4 ± 1.8	17.7 ± 2.1	17.1 ± 0.0
APR-JUN	18.4 ± 1.7	18.5 ± 1.1	18.2 ± 1.8	17.4 ± 2.2	17.3 ± 0.0
JUL-SEP	18.6 ± 2.0	19.1 ± 1.7	18.5 ± 2.7	17.8 ± 2.9	17.2 ± 0.0
OCT-DEC	20.7 ± 2.6	21.1 ± 1.4	20.9 ± 2.0	19.5 ± 2.0	19.5 ± 0.0

TABLE C-X.3 SUMMARY OF THE AMBIENT DOSIMETRY PROGRAM FOR CLINTON POWER STATION, 2011

RESULTS IN UNITS OF MILLI-ROENTGEN/QUARTER

LOCATION	SAMPLES ANALYZED	PERIOD MINIMUM	PERIOD MAXIMUM	PERIOD MEAN ± 2 S.D.	PRE-OP MEAN, ± 2 S.D., ALL LOCATIONS
INNER RING	64	15.8	22.6	19.0 ± 2.8	
OUTER RING	64	16.7	22.5	19.3 ± 2.5	18 ± 2.4
SPECIAL INTEREST	28	16.4	22.6	19.0 ± 3.0	
SUPPLEMENTAL	56	15.2	20.8	18.1 ± 2.8	
CONTROL	4	17.1	19.5	17.8 ± 2.3	

INNER RING STATIONS - CL-01, CL-05, CL-22, CL-23, CL-24, CL-34, CL-35, CL-36, CL-42, CL-43, CL-44, CL-45, CL-46, CL-47, CL-48, CL-63

OUTER RING STATIONS - CL-51, CL-52, CL-53, CL-54, CL-55, CL-56, CL-57, CL-58, CL-60, CL-61, CL-76, CL-77, CL-78, CL-79, CL-80, CL-81

SPECIAL INTEREST STATIONS - CL-37, CL-41, CL-49, CL-64, CL-65, CL-74, CL-75

SUPPLEMENTAL STATIONS - CL-02, CL-03, CL-04, CL-06, CL-07, CL-08, CL-114, CL-15, CL-33, CL-84, CL-90, CL-91, CL-97, CL-99

CONTROL STATIONS - CL-11

* THE RESULTS FOR TLDs CL-05MM, CL-47MM, CL-58MM ARE NOT PART OF THE REMP AVERAGES. THEY ARE USED FOR COMPARISON PURPOSES ONLY.

FIGURE C-1
MEAN MONTHLY GROSS BETA CONCENTRATION IN AIR PARTICULATE SAMPLES COLLECTED IN THE VICINITY OF CPS, 2011

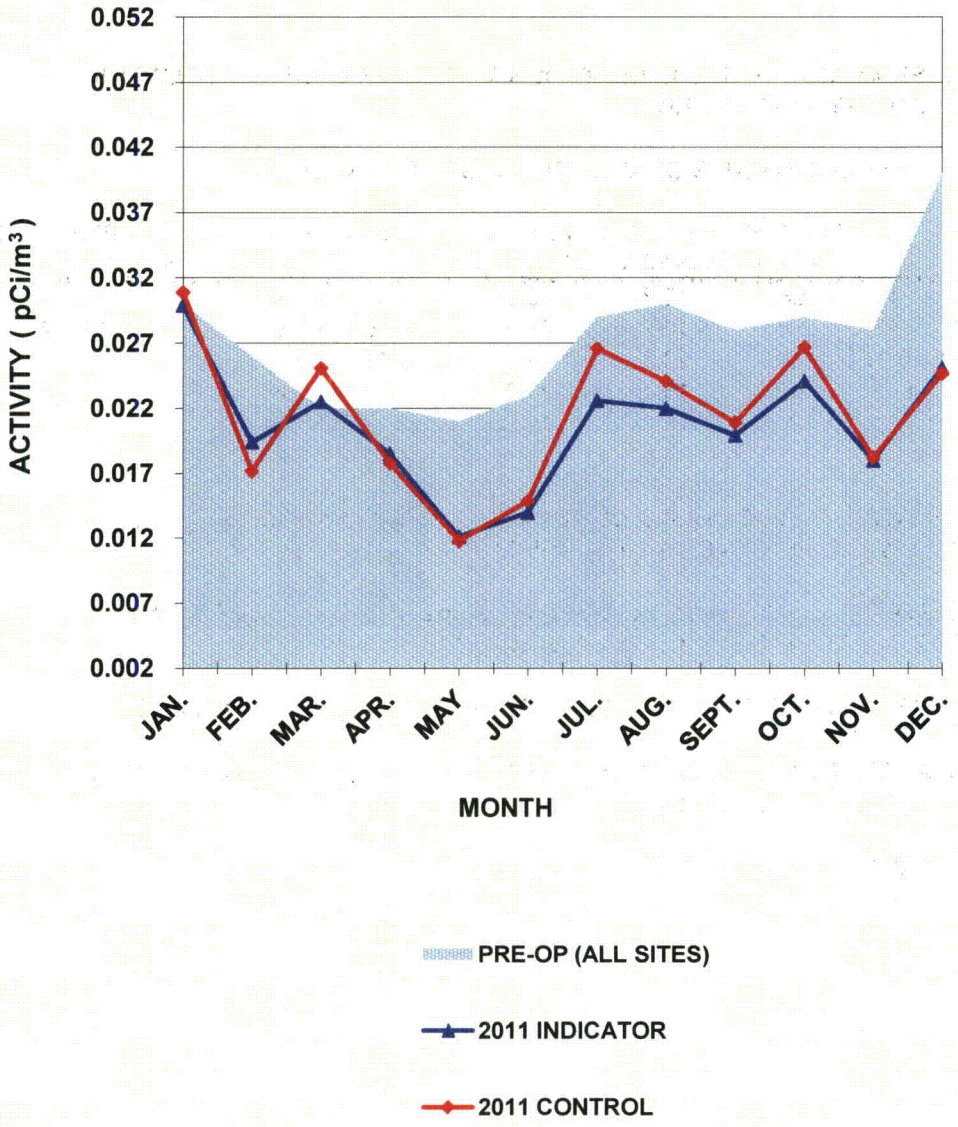
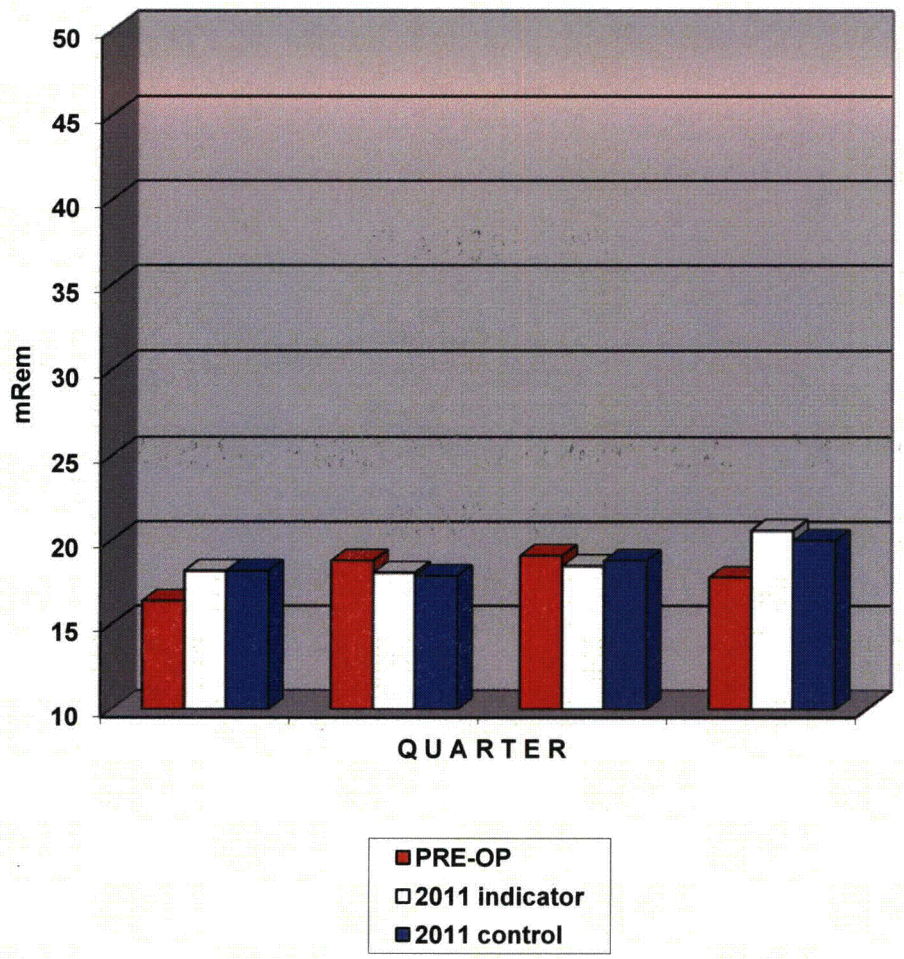


FIGURE C-2
MEAN QUARTERLY AMBIENT GAMMA RADIATION LEVELS (TLD) IN THE VICINITY OF CPS, 2011



APPENDIX D

INTER-LABORATORY COMPARISON PROGRAM

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TABLE D-1 ANALYTICS ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM
TELEDYNE BROWN ENGINEERING, 2011
(PAGE 1 OF 3)

Month/Year	Identification Number	Matrix	Nuclide	Units	Reported Value (a)	Known Value (b)	Ratio (c) TBE/Analytics	Evaluation (d)
March 2011	E7460-396	Milk	Sr-89	pCi/L	98.8	97.4	1.01	A
			Sr-90	pCi/L	15.2	15.8	0.96	A
	E7461-396	Milk	I-131	pCi/L	92.9	96.9	0.96	A
			Ce-141	pCi/L	not provided by Analytics for this study			
			Cr-51	pCi/L	398	298	1.34	N (1)
			Cs-134	pCi/L	130	130	1.00	A
			Cs-137	pCi/L	232	205	1.13	A
			Co-58	pCi/L	121	113	1.07	A
			Mn-54	pCi/L	289	266	1.09	A
			Fe-59	pCi/L	201	175	1.15	A
			Zn-65	pCi/L	287	261	1.10	A
			Co-60	pCi/L	186	172	1.08	A
	E7463-396	AP	Ce-141	pCi	not provided by Analytics for this study			
			Cr-51	pCi	243	215	1.13	A
			Cs-134	pCi	85.0	94.2	0.90	A
			Cs-137	pCi	168	148	1.14	A
			Co-58	pCi	89.2	81.8	1.09	A
			Mn-54	pCi	171	192	0.89	A
			Fe-59	pCi	129	126	1.02	A
			Zn-65	pCi	159	189	0.84	A
			Co-60	pCi	132	124	1.06	A
	E7462-396	Charcoal	I-131	pCi	96.5	96.3	1.00	A
June 2011	E7851-396	Milk	Sr-89	pCi/L	96.7	103	0.94	A
			Sr-90	pCi/L	13.8	15.6	0.88	A
	E7852-396	Milk	I-131	pCi/L	110	103.0	1.07	A
			Ce-141	pCi/L	68.1	79.9	0.85	A
			Cr-51	pCi/L	186	206	0.90	A
			Cs-134	pCi/L	164	190	0.86	A
			Cs-137	pCi/L	140	138	1.01	A
			Co-58	pCi/L	141	152	0.93	A
			Mn-54	pCi/L	136	138	0.99	A
			Fe-59	pCi/L	128	123	1.04	A
			Zn-65	pCi/L	263	261	1.01	A
			Co-60	pCi/L	189	195	0.97	A
	E7854-396	AP	Ce-141	pCi	49.9	42.9	1.16	A
			Cr-51	pCi	95.6	110	0.87	A
			Cs-134	pCi	104	102	1.02	A
			Cs-137	pCi	83.8	74.0	1.13	A
			Co-58	pCi	90.7	81.3	1.12	A
			Mn-54	pCi	74.5	73.9	1.01	A
			Fe-59	pCi	62.0	66.1	0.94	A
			Zn-65	pCi	140	140	1.00	A
			Co-60	pCi	119	104	1.14	A
	E7853-396	Charcoal	I-131	pCi	76.2	86.1	0.89	A

TABLE D-1 ANALYTICS ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM
TELEDYNE BROWN ENGINEERING, 2011
(PAGE 2 OF 3)

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

TABLE D-1 ANALYTICS ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM
TELEDYNE BROWN ENGINEERING, 2011

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

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

(a) Teledyne Brown Engineering reported result.

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

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

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

TABLE D-2 ERA ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM
TELEDYNE BROWN ENGINEERING, 2011
(PAGE 1 OF 1)

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

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

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

(a) Teledyne Brown Engineering reported result.

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

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

TABLE D-3 DOE'S MIXED ANALYTE PERFORMANCE EVALUATION PROGRAM (MAPEP)
TELEDYNE BROWN ENGINEERING, 2011
(PAGE 1 OF 2)

Month/Year	Identification Number	Media	Nuclide	Units	Reported Value (a)	Known Value (b)	Acceptance Range	Evaluation (c)
March 2011	11-MaW24	Water	Cs-134	Bq/L	19.1	21.5	15.1 - 28.0	A
			Cs-137	Bq/L	29.0	29.4	20.6 - 38.2	A
			Co-57	Bq/L	0.139		(1)	A
			Co-60	Bq/L	23.9	24.6	17.2 - 32.0	A
			H-3	Bq/L	265	243	170 - 316	A
			Mn-54	Bq/L	31.8	31.6	22.1 - 41.1	A
			K-40	Bq/L	94.8	91	64 - 118	A
			Sr-90	Bq/L	9.64	8.72	6.10 - 11.34	A
			Zn-65	Bq/L	-0.142		(1)	A
	11-GrW24	Water	Gr-A	Bq/L	0.767	1.136	0.341 - 1.931	A
			Gr-B	Bq/L	3.43	2.96	1.48 - 4.44	A
	11-MaS24	Soil	Cs-134	Bq/kg	612	680	476 - 884	A
			Cs-137	Bq/kg	772	758	531 - 985	A
			Co-57	Bq/kg	910	927	649 - 1205	A
			Co-60	Bq/kg	500	482	337 - 627	A
			Mn-54	Bq/kg	0.607		(1)	A
			K-40	Bq/kg	569	540	378 - 702	A
			Sr-90	Bq/kg	NR	160	112 - 208	N (2)
			Zn-65	Bq/kg	1497	1359	951 - 1767	A
	11-RdF24	AP	Cs-134	Bq/sample	3.26	3.49	2.44 - 4.54	A
			Cs-137	Bq/sample	2.36	2.28	1.60 - 2.96	A
			Co-57	Bq/sample	3.30	3.33	2.33 - 4.33	A
			Co-60	Bq/sample	0.0765		(1)	A
			Mn-54	Bq/sample	2.84	2.64	1.85 - 3.43	A
			Sr-90	Bq/sample	NR	1.36	0.95 - 1.77	N (2)
			Zn-65	Bq/sample	3.30	3.18	2.23 - 4.13	A
	11-GrF24	AP	Gr-A	Bq/sample	0.101	0.659	0.198 - 1.120	N (3)
			Gr-B	Bq/sample	1.23	1.323	0.662 - 1.985	A
	11-RdV24	Vegetation	Cs-134	Bq/sample	4.97	5.50	3.85 - 7.15	A
			Cs-137	Bq/sample	0.0356		(1)	A
			Co-57	Bq/sample	10.8	9.94	6.96 - 12.92	A
			Co-60	Bq/sample	4.89	4.91	3.44 - 6.38	A
			Mn-54	Bq/sample	6.42	6.40	4.48 - 8.32	A
			Sr-90	Bq/sample	NR	2.46	1.72 - 3.20	N (2)
			Zn-65	Bq/sample	3.07	2.99	2.09 - 3.89	A
September 2011	11-MaW25	Water	Cs-134	Bq/L	16.0	19.1	13.4 - 24.8	A
			Cs-137	Bq/L	0.0043		(1)	A
			Co-57	Bq/L	33.1	36.6	25.6 - 47.6	A
			Co-60	Bq/L	26.9	29.3	20.5 - 38.1	A
			H-3	Bq/L	1011	1014	710 - 1318	A
			Mn-54	Bq/L	23.2	25.0	17.5 - 32.5	A
			K-40	Bq/L	147	156	109 - 203	A
			Sr-90	Bq/L	15.8	14.2	9.9 - 18.5	A
			Zn-65	Bq/L	27.3	28.5	20.0 - 37.1	A

TABLE D-3 DOE'S MIXED ANALYTE PERFORMANCE EVALUATION PROGRAM (MAPEP)
TELEDYNE BROWN ENGINEERING, 2011
(PAGE 2 OF 2)

Month/Year	Identification Number	Media	Nuclide	Units	Reported Value (a)	Known Value (b)	Acceptance Range	Evaluation (c)
September 2011	11-GrW25	Water	Gr-A	Bq/L	0.894	0.866	0.260 - 1.472	A
			Gr-B	Bq/L	5.87	4.81	2.41 - 7.22	A
	11-MaS25	Soil	Cs-134	Bq/kg	-0.213		(1)	A
			Cs-137	Bq/kg	1110	979	685 - 1273	A
			Co-57	Bq/kg	1290	1180	826 - 1534	A
			Co-60	Bq/kg	731	644	451 - 837	A
			Mn-54	Bq/kg	987	848	594 - 1102	A
			K-40	Bq/kg	753	625	438 - 813	W
			Sr-90	Bq/kg	276	320	224 - 416	A
			Zn-65	Bq/kg	1870	1560	1092 - 2028	A
September 2011	11-RdF25	AP	Cs-134	Bq/sample	-0.043		(1)	A
			Cs-137	Bq/sample	3.09	2.60	1.82 - 3.38	A
			Co-57	Bq/sample	5.36	5.09	3.56 - 6.62	A
			Co-60	Bq/sample	3.41	3.20	2.24 - 4.16	A
			Mn-54	Bq/sample	0.067		(1)	A
			Sr-90	Bq/sample	1.84	1.67	1.17 - 2.17	A
			Zn-65	Bq/sample	5.17	4.11	2.88 - 5.34	W
	11-GrF25	AP	Gr-A	Bq/sample	0.0058		(1)	A
			Gr-B	Bq/sample	-0.01		(1)	A
	11-RdV25	Vegetation	Cs-134	Bq/sample	0.0081		(1)	A
			Cs-137	Bq/sample	4.94	4.71	3.30 - 6.12	A
			Co-57	Bq/sample	0.0639		(1)	A
			Co-60	Bq/sample	3.36	3.38	2.37 - 4.39	A
			Mn-54	Bq/sample	5.89	5.71	4.00 - 7.42	A
			Sr-90	Bq/sample	1.31	1.26	0.88 - 1.64	A
			Zn-65	Bq/sample	6.54	6.39	4.47 - 8.31	A

(1) False positive test.

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

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

(a) Teledyne Brown Engineering reported result.

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

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

APPENDIX E

ANNUAL RADIOLOGICAL GROUNDWATER PROTECTION PROGRAM REPORT (ARGPPR)

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Docket No: 50-461

CLINTON POWER STATION

Annual Radiological Groundwater Protection Program Report

1 January through 31 December 2011

Prepared By

Teledyne Brown Engineering
Environmental Services

Exelon SM
Nuclear

Clinton Power Station
Clinton, IL 61727

April 2012

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Appendices

I. Summary and Conclusions

In 2006, Exelon instituted a comprehensive program to evaluate the impact of station operations on groundwater and surface water in the vicinity of Clinton Power Station (CPS). This evaluation involved numerous station personnel and contractor support personnel. This report covers groundwater and surface water samples, collected outside of the Licensee required Off-Site Dose Calculation Manual (ODCM) requirements, both on and off station property in 2011. During that time period, 223 analyses were performed on 96 samples from 34 locations. The monitoring was conducted in two phases.

In assessing all the data gathered for this report, it was concluded that the operation of CPS had no adverse radiological impact on the environment, and there are no known active releases into the groundwater or surface water at CPS. No program changes occurred during the sampling year of 2011. New corporate procedures were implemented in late 2010 and early 2011, with compliance to begin in the first quarter of 2011.

Gamma-emitting radionuclides associated with licensed plant operations were not detected at concentrations greater than their respective Lower Limits of Detection (LLDs) as specified in NUREG-1302 in any of the groundwater or surface water samples. In the case of tritium, Exelon specified that the independent laboratory achieve a lower limit of detection 10 times lower than that required by the United States Environmental Protection Agency (USEPA) regulation.

Strontium-90 was not detected in any samples above the LLD of 1 pCi/L.

Tritium was not detected in any of the groundwater or surface water samples at concentrations greater than the United States Environmental Protection Agency (USEPA) drinking water standard (and the Nuclear Regulatory Commission Reporting Limit) of 20,000 pCi/L. Background levels of tritium were detected at concentrations greater than the self-imposed LLD of 200 pCi/L in three of 17 groundwater monitoring locations. The tritium concentrations ranged from 232 ± 120 pCi/L to 451 ± 147 pCi/L.

Gross Alpha and Gross Beta analyses in the dissolved and suspended fractions performed on groundwater samples during the third quarter sampling in 2011. Gross Alpha (dissolved) was not detected at any of the groundwater locations. Gross Alpha (suspended) was not detected at any of the groundwater locations. Gross Beta (dissolved) was detected in 15 of 17 groundwater locations. The concentrations ranged from 1.5 to 10.7 pCi/L. Gross Beta (suspended) was detected in 1 of 17 groundwater locations at a concentration of 1.8 pCi/L.

Hard-To-Detect analyses were performed on one groundwater location to establish background levels. The analyses included Fe-55, Ni-63, Am-241, Cm-242, Cm-243/244, Pu-238, Pu-239/240, U-234, U-235 and U-238. All hard-to-detect nuclides were not detected at concentrations greater than their respective MDCs.

II. Introduction

The Clinton Power Station (CPS), consisting of one approximately 1,140 MW gross electrical power output boiling water reactor is located in Harp Township, DeWitt County, Illinois. CPS is owned and operated by Exelon and became operational in 1987. Unit No. 1 went critical on 15 February 1987. The site encloses approximately 13,730 acres. This includes the 4,895 acre, man-made cooling lake and about 452 acres of property not owned by Exelon. The plant is situated on approximately 150 acres. The cooling water discharge flume – which discharges to the eastern arm of the lake – occupies an additional 130 acres. Although the nuclear reactor, supporting equipment and associated electrical generation and distribution equipment lie in Harp Township, portions of the aforementioned 13,730 acre plot reside within Wilson, Rutledge, DeWitt, Creek, Nixon and Santa Anna Townships.

This report covers those analyses performed by Teledyne Brown Engineering (TBE) on samples collected in 2011.

A. Objectives of the Radiological Groundwater Protection Program (RGPP)

The long-term objectives of the RGPP are as follows:

1. Identify suitable locations to monitor and evaluate potential impacts from station operations before significant radiological impact to the environment and potential drinking water sources.

2. Understand the local hydrogeologic regime in the vicinity of the station and maintain up-to-date knowledge of flow patterns on the surface and shallow subsurface.

3. Perform routine water sampling and radiological analysis of water from selected locations.

4. Report new leaks, spills, or other detections with potential radiological significance to stakeholders in a timely manner.

5. Regularly assess analytical results to identify adverse trends.

6. Take necessary corrective actions to protect groundwater resources.

B. Implementation of the Objectives

The objectives identified have been implemented at Clinton Power Station as discussed below:

1. Exelon and its consultant identified locations as described in the Phase 1 study. Phase 1 studies were conducted by Connestoga Rovers and Associates (CRA) and the results and conclusions were made available to state and federal regulators as well as the public in station specific reports.

2. The Clinton Power Station reports describe the local hydrogeologic regime. Periodically, the flow patterns on the surface and shallow subsurface are updated based on ongoing measurements.

3. Clinton Power Station will continue to perform routine sampling and radiological analysis of water from selected locations.

4. Clinton Power Station has implemented new procedures to identify and report new leaks, spills, or other detections with potential radiological significance in a timely manner.

5. Clinton Power Station staff and consulting hydrogeologist assess analytical results on an ongoing basis to identify adverse trends.

C. Program Description

1. Sample Collection

Sample locations can be found in Table A–1 and Figures A–1 and A–2, Appendix A.

Groundwater and Surface Water

Samples of water are collected, managed, transported and analyzed in accordance with approved procedures following regulatory methods. Both groundwater and surface water are collected. Sample locations, sample collection frequencies and analytical frequencies are controlled in accordance with approved station procedures. Contractor and/or station personnel are trained in the collection, preservation management, and shipment of samples, as well as in documentation of sampling events. Analytical laboratories are subject to internal quality assurance programs, inter-laboratory cross-check programs, as well as nuclear industry audits. Station personnel review and evaluate all analytical data deliverables after initial review by the contractor.

Analytical data results are reviewed by both station personnel and an independent hydrogeologist for adverse trends or changes to hydrogeologic conditions.

D. Characteristics of Tritium (H-3)

Tritium (chemical symbol H-3) is a radioactive isotope of hydrogen. The most common form of tritium is tritium oxide, which is also called "tritiated water." The chemical properties of tritium are essentially those of ordinary hydrogen.

Tritiated water behaves the same as ordinary water in both the environment and the body. Tritium can be taken into the body by drinking water, breathing air, eating food, or absorption through skin. Once tritium enters the body, it disperses quickly and is uniformly distributed throughout the body. Tritium is excreted primarily through urine with a clearance rate characterized by an effective biological half-life of about 14 days. Within one month or so after ingestion, essentially all tritium is cleared. Organically bound tritium (tritium that is incorporated in organic compounds) can remain in the body for a longer period.

Tritium is produced naturally in the upper atmosphere when cosmic rays strike air molecules. Tritium is also produced during nuclear weapons explosions, as a by-product in reactors producing electricity, and in special production reactors, where the isotopes lithium-7 and/or boron-10 are activated to produce tritium. Like normal water, tritiated water is colorless and odorless. Tritiated water behaves chemically and physically like non-tritiated water in the subsurface, and therefore tritiated water will travel at the same velocity as the average groundwater velocity.

Tritium has a half-life of approximately 12.3 years. It decays spontaneously to helium-3 (3He). This radioactive decay releases a beta particle (low-energy electron). The radioactive decay of tritium is the source of the health risk from exposure to tritium. Tritium is one of the least dangerous radionuclides because it emits very weak beta radiation and leaves the body relatively quickly. Since tritium is almost always found as water, it goes directly into soft tissues and organs. The associated dose to these tissues is generally uniform and is dependent on the water content of the specific tissue.

III. Program Description

A. Sample Analysis

This section describes the general analytical methodologies used by TBE and EIML to analyze the environmental samples for radioactivity for the Clinton Power Station RGPP in 2011.

In order to achieve the stated objectives, the current program includes the following analyses:

1. Concentrations of gamma emitters in groundwater and surface water.
2. Concentrations of strontium in groundwater and surface water.
3. Concentrations of tritium in groundwater and surface water.
4. Concentrations of gross alpha and gross beta in groundwater.
5. Concentrations of Am-241 in groundwater.
6. Concentrations of Cm-242 and Cm-243/244 in groundwater.
7. Concentrations of Pu-238 and Pu-239/240 in groundwater.
8. Concentrations of U-234, U-235 and U-238 in groundwater.
9. Concentrations of Fe-55 in groundwater.
10. Concentrations of Ni-63 in groundwater.

B. Data Interpretation

The radiological data collected prior to Clinton Power Station becoming operational were used as a baseline with which these operational data were compared. For the purpose of this report, Clinton Power Station was considered operational at initial criticality. Several factors were important in the interpretation of the data:

1. Lower Limit of Detection and Minimum Detectable Concentration

The lower limit of detection (LLD) is specified by federal regulation as a minimum sensitivity value that must be achieved routinely by the analytical parameter.

2. Laboratory Measurements Uncertainty

The estimated uncertainty in measurement of tritium in environmental samples is frequently on the order of 50% of the measurement value.

Statistically, the exact value of a measurement is expressed as a

range with a stated level of confidence. The convention is to report results with a 95% level of confidence. The uncertainty comes from calibration standards, sample volume or weight measurements, sampling uncertainty and other factors. Exelon reports the uncertainty of a measurement created by statistical process (counting error) as well as all sources of error (Total Propagated Uncertainty or TPU). Each result has two values calculated. Exelon reports the TPU by following the result with plus or minus ± the estimated sample standard deviation, as TPU, that is obtained by propagating all sources of analytical uncertainty in measurements.

Analytical uncertainties are reported at the 95% confidence level in this report for reporting consistency with the AREOR. Gamma spectroscopy results for each type of sample were grouped as follows:

For groundwater and surface water 13 nuclides, Be-7, K-40, Mn-54, Co-58, Fe-59, Co-60, Zn-65, Nb-95, Zr-95, Cs-134, Cs-137, Ba-140 and La-140 were reported.

C. Background Analysis

A pre-operational radiological environmental monitoring program (pre-operational REMP) was conducted to establish background radioactivity levels prior to operation of the Station. The environmental media sampled and analyzed during the pre-operational REMP were atmospheric radiation, fall-out, domestic water, surface water, marine life, milk, and vegetation. The results of the monitoring were detailed in the report entitled, Environmental Radiological Monitoring for Clinton Power Nuclear Power Station, Illinois Power Company, Annual Report 1987, May 1988.

The pre-operational REMP contained analytical results from samples collected from the surface water and groundwater.

1. Background Concentrations of Tritium

The purpose of the following discussion is to summarize background measurements of tritium in various media performed by others.

a. Tritium Production

Tritium is created in the environment from naturally occurring processes both cosmic and subterranean, as well as from

anthropogenic (i.e., man-made) sources. In the upper atmosphere, "Cosmogenic" tritium is produced from the bombardment of stable nuclides and combines with oxygen to form tritiated water, which will then enter the hydrologic cycle. Below ground, "lithogenic" tritium is produced by the bombardment of natural lithium present in crystalline rocks by neutrons produced by the radioactive decay of naturally abundant uranium and thorium. Lithogenic production of tritium is usually negligible compared to other sources due to the limited abundance of lithium in rock. The lithogenic tritium is introduced directly to groundwater.
A major anthropogenic source of tritium and strontium-90 comes from the former atmospheric testing of thermonuclear weapons. Levels of tritium in precipitation increased significantly during the 1950s and early 1960s, and later with additional testing, resulting in the release of significant amounts of tritium to the atmosphere. The Canadian heavy water nuclear power reactors, other commercial power reactors, nuclear research and weapons production continue to influence tritium concentrations in the environment.

b. Precipitation Data

Precipitation samples are routinely collected at stations around the world for the analysis of tritium and other radionuclides. Two publicly available databases that provide tritium concentrations in precipitation are Global Network of Isotopes in Precipitation (GNIP) and USEPA's RadNet database. GNIP provides tritium precipitation concentration data for samples collected world wide from 1960 to 2006. RadNet provides tritium precipitation concentration data for samples collected at stations through out the U.S. from 1960 up to and including 2006. Based on GNIP data for sample stations located in the U.S. Midwest, tritium concentrations peaked around 1963. This peak, which approached 10,000 pCi/L for some stations, coincided with the atmospheric testing of thermonuclear weapons. Tritium concentrations in surface water showed a sharp decline up until 1975, followed by a gradual decline since that time. Tritium concentrations in Midwest precipitation have typically been below 100 pCi/L since around 1980. Tritium concentrations in wells may still be above the 200 pCi/L detection limit from the external causes described above.

c. Surface Water Data

Tritium concentrations are routinely measured in Clinton Lake.

According to the USEPA, surface water data typically has an uncertainty ± 70 to 100 pCi/L 95% confidence bound on each given measurement. Therefore, the typical background data provided may be subject to measurement uncertainty of approximately ± 70 to 100 pCi/L.

The radio-analytical laboratory is counting tritium results to an Exelon specified LLD of 200 pCi/L. Typically, the lowest positive measurement will be reported within a range of 40 – 240 pCi/L or 140 ± 100 pCi/L. Clearly, these sample results cannot be distinguished as different from background at this concentration.

IV. Results and Discussion

A. Groundwater Results

Groundwater

Baseline samples were collected from on an off-site wells during four (4) phases at the station. Analytical results are discussed below. No anomalies were noted during the year.

Tritium

Samples from 17 locations were analyzed for tritium activity (Table B–I.1 Appendix B). Tritium values ranged from below the Exelon imposed LLD of 200 pico-curies per liter to 451 pCi/l.

Strontium

Strontium was not detected in any of the 17 samples analyzed and the required LLD of 1 pCi/L was met (Table B–I.1 Appendix B).

Gross Alpha and Gross Beta (dissolved and suspended)

Gross Alpha and Gross Beta analyses in the dissolved and suspended fractions were performed on groundwater samples during the third sampling in 2011. Gross Alpha (dissolved) was not

detected at any of the groundwater locations. Gross Alpha (suspended) was not detected at any of the groundwater locations. Gross Beta (dissolved) was detected in 15 of 17 groundwater locations. The concentrations ranged from 1.5 to 10.7 pCi/L. Gross Beta (suspended) was detected in 1 of 17 groundwater locations at a concentration of 1.8 pCi/L (Table B–I.1 Appendix B).

Gamma Emitters

No gamma emitting nuclides were detected (Table B–I.2, Appendix B).

Hard-To-Detect

Hard-To-Detect analyses were performed on one groundwater location to establish background levels. The analyses included Fe-55, Ni-63, Am-241, Cm-242, Cm-243/244, Pu-238, Pu-239/240, U-234, U-235 and U-238. All hard-to-detect nuclides were not detected at concentrations greater than their respective MDCs (Table B–I.3 Appendix B).

B. Surface Water Results

Surface Water

Baseline samples were collected from on-site surface waters during four (4) phases at the station. Analytical results are discussed below. No anomalies were noted during the year.

Analytical results are discussed below. No anomalies were noted during the year.

Tritium

Samples from seven locations were analyzed for tritium activity (Table B–II.1 Appendix B). Tritium was not detected at concentrations greater than the LLD.

Strontium

Strontium was not detected in any of the 7 samples analyzed and the required LLD of 1 pCi/L was met (Table B–II.1 Appendix B).

Gamma Emitters

No gamma emitting nuclides were detected (Table B–II.2, Appendix B).

C. Recapture

Clinton Power Station conducted recapture precipitation sampling and analysis per the Radiological Groundwater Protection Program. No consistent indication of recapture was identified.

D. Summary of Results – Inter-Laboratory Comparison Program

Inter-Laboratory Comparison Program results for TBE are presented in the Annual Radiological Environmental Operating Report.

E. Leaks, Spills, and Releases

No leaks, spills or releases were identified during the year.

F. Trends

An increasing trend was identified in the tritium activity measured in monitoring well MW-CL-14S (reference IR 1323927). Tritium samples from CL-14S from the 2nd, 3rd, and 4th quarters of 2011 showed detectable values for tritium (320 pCi/L, 321 pCi/L, and 399 pCi/L, respectively). Historically, well MW-CL-14S has shown detectable levels of tritium in the 2nd quarter of 2006 (201 pCi/L), the 2nd quarter of 2009 (230 pCi/L), and the 2nd quarter of 2010 (216 pCi/L), but never consistently, as observed in 2011.

The activity seen in MW-CL-14S is believed to be due to the natural migration of the only known tritium plume at Clinton Power Station. Clinton Power Station has historically seen consistently positive tritium analysis results in only one well, MW-CL-21S. This activity is attributed to historical maintenance practices regarding the Cycled Condensate storage tank. MW-CL-14S is the closest well to, and down-gradient from MW-CL-21S. The tritium concentration in MW-CL-21S has shown an overall downward trend since 2008, when the activity peaked at 901 pCi/L. The uptrend in MW-CL-14S appears to be due to this plume migrating with the natural flow of groundwater. Concurrence with this evaluation was obtained from AMO Environmental Decisions, a vendor that compiles and evaluates RGPP ground water data for the Exelon fleet.The trend in MW-CL-14S tritium activity does not require any action, and will continue to be monitored as dictated by the RGPP.

G. Investigations

Currently no investigations are on-going.

H. Actions Taken

1. Compensatory Actions

   There have been no station events requiring compensatory actions at the Clinton Power Station in 2011.

2. Installation of Monitoring Wells

   No new wells were installed during the 2011.

3. Actions to Recover/Reverse Plumes

   No actions were required to recover or reverse groundwater plumes.

APPENDIX A

LOCATION DESIGNATION OF THE ANNUAL RADIOLOGICAL GROUNDWATER PROTECTION PROGRAM REPORT (ARGPPR)

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TABLE A-1: Radiological Groundwater Protection Program - Sampling Locations, Clinton Power Station, 2011

Site	Site Type
B-3	Monitoring Well
MW-CL-1	Monitoring Well
MW-CL-2	Monitoring Well
MW-CL-12I	Monitoring Well
MW-CL-13I	Monitoring Well
MW-CL-13S	Monitoring Well
MW-CL-14S	Monitoring Well
MW-CL-15I	Monitoring Well
MW-CL-15S	Monitoring Well
MW-CL-16S	Monitoring Well
MW-CL-17S	Monitoring Well
MW-CL-18I	Monitoring Well
MW-CL-18S	Monitoring Well
MW-CL-19S	Monitoring Well
MW-CL-20S	Monitoring Well
MW-CL-21S	Monitoring Well
MW-CL-22S	Monitoring Well
Sewage Treatment Plant	Surface water
SW-CL-1	Surface Water
SW-CL-2	Surface Water
SW-CL-4	Surface Water
SW-CL-5	Surface Water
SW-CL-6	Surface Water
SW-CL-7	Surface Water

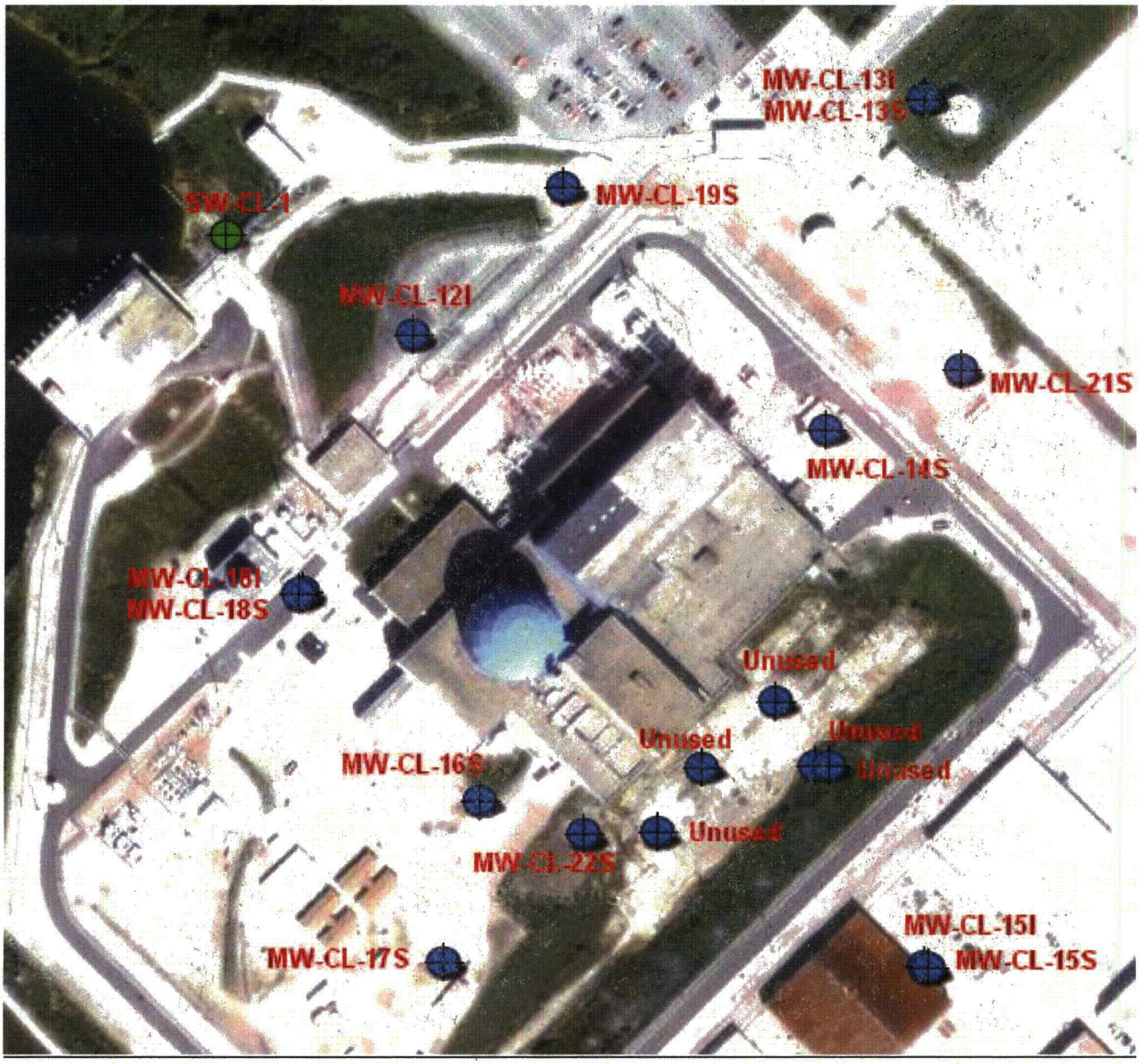

Figure A – 1
Onsite Sampling Locations at Clinton Power Station

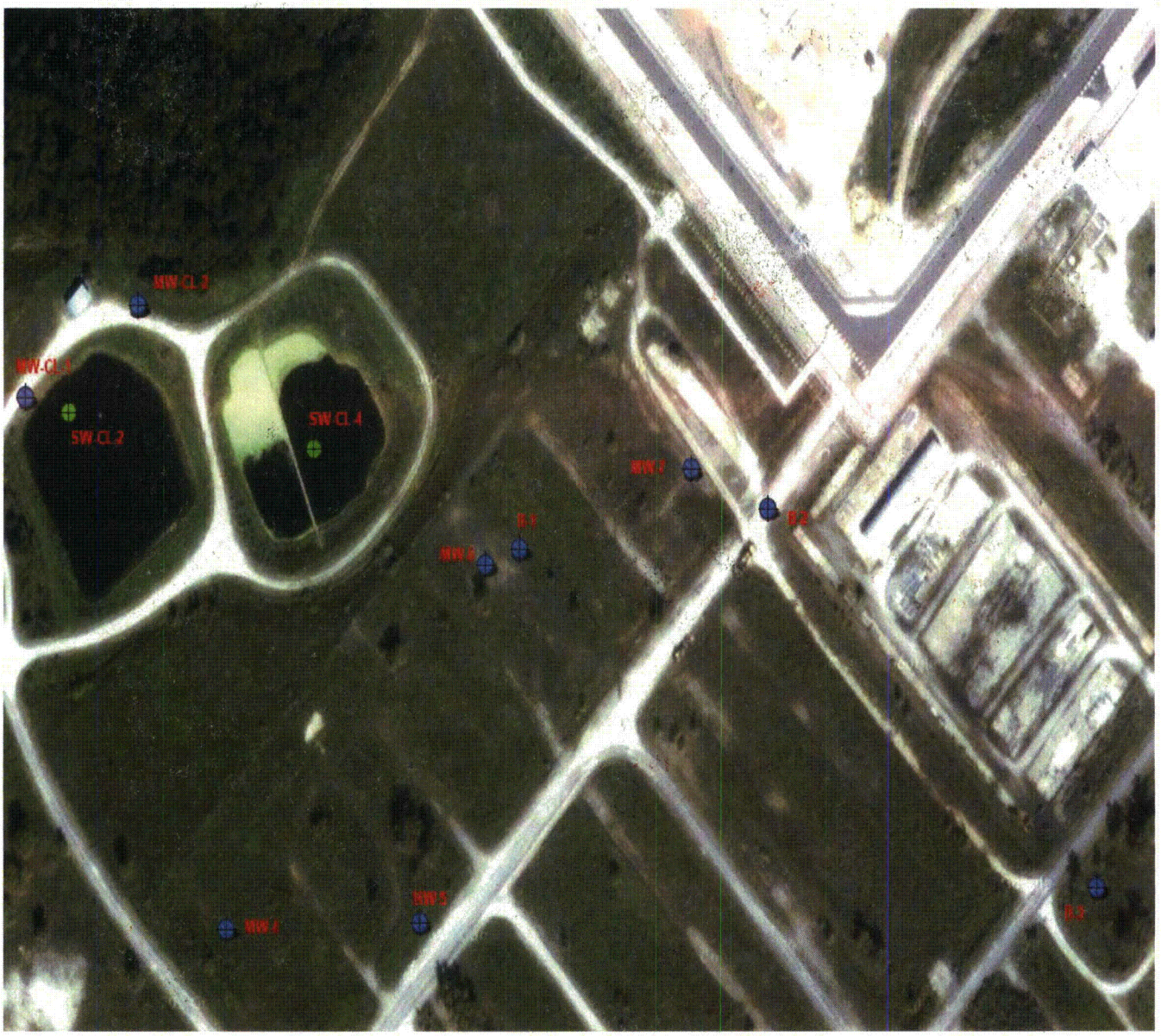

Figure A – 2
Sampling Locations South of Clinton Power Station

Figure A – 3
Sampling Locations East of Clinton Power Station

APPENDIX B

DATA TABLES OF THE ANNUAL RADIOLOGICAL GROUNDWATER PROTECTION PROGRAM REPORT (ARGPPR)

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TABLE B-I.1 CONCENTRATIONS OF TRITIUM, STRONTIUM, GROSS ALPHA, AND GROSS BETA IN GROUNDWATER SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2011

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION DATE	H-3	SR-90	GR-A (DIS)	GR-A (SUS)	GR-B (DIS)	GR-B (SUS)
B-3	03/14/11	< 191					
B-3	05/16/11	< 192					
B-3	07/26/11	< 176	< 0.7	< 1.2	< 0.8	1.9 ± 1.0	< 1.5
B-3	10/24/11	< 177					
MW-CL-1	03/14/11	< 192					
MW-CL-1	05/16/11	< 192					
MW-CL-1	07/26/11	< 176	< 0.6	< 1.2	< 0.8	3.1 ± 1.1	< 1.5
MW-CL-1	10/24/11	< 175					
MW-CL-12I	03/14/11	< 187					
MW-CL-12I	05/16/11	< 193					
MW-CL-12I	07/26/11	< 174	< 0.6	< 1.9	< 0.8	5.0 ± 1.3	< 1.5
MW-CL-12I	10/24/11	< 175					
MW-CL-13I	03/14/11	< 190					
MW-CL-13I	05/16/11	< 189					
MW-CL-13I	07/26/11	< 173	< 0.7	< 0.8	< 0.6	2.8 ± 1.1	< 1.5
MW-CL-13I	10/24/11	< 176					
MW-CL-13S	03/14/11	< 191					
MW-CL-13S	05/16/11	< 194					
MW-CL-13S	07/26/11	232 ± 120	< 0.7	< 0.8	< 0.6	2.4 ± 1.0	< 1.5
MW-CL-13S	10/24/11	< 176					
MW-CL-14S	03/15/11	< 189					
MW-CL-14S	05/17/11	320 ± 136					
MW-CL-14S	07/27/11	321 ± 123	< 0.7	< 1.2	< 0.6	7.4 ± 1.3	< 1.5
MW-CL-14S	10/25/11	399 ± 130					
MW-CL-15I	03/14/11	< 193					
MW-CL-15I	05/16/11	< 190					
MW-CL-15I	07/26/11	< 196	< 0.7	< 0.4	< 0.6	2.8 ± 0.7	1.8 ± 1.1
MW-CL-15I	10/24/11	< 177					
MW-CL-15S	03/14/11	< 194					
MW-CL-15S	05/16/11	< 187					
MW-CL-15S	07/26/11	< 177	< 0.8	< 0.9	< 0.5	1.5 ± 0.8	< 1.8
MW-CL-15S	10/24/11	< 178					
MW-CL-16S	03/15/11	< 190					
MW-CL-16S	05/17/11	< 190					
MW-CL-16S	07/27/11	< 181	< 0.7	< 2.3	< 0.5	7.1 ± 1.4	< 1.8
MW-CL-16S	10/25/11	< 178					
MW-CL-17S	03/15/11	< 191					
MW-CL-17S	05/17/11	< 200					
MW-CL-17S	07/27/11	< 179	< 0.8	< 2.9	< 0.7	2.4 ± 1.4	< 2.0
MW-CL-17S	10/25/11	< 174					
MW-CL-18I	03/15/11	< 192					
MW-CL-18I	05/17/11	< 200					
MW-CL-18I	07/27/11	< 183	< 0.7	< 1.4	< 0.5	< 1.7	< 1.8
MW-CL-18I	10/25/11	< 193					
MW-CL-18S	03/15/11	< 191					
MW-CL-18S	05/17/11	< 195					
MW-CL-18S	07/27/11	< 173	< 0.7	< 2.8	< 0.5	5.8 ± 1.4	< 1.6
MW-CL-18S	10/25/11	< 191					
MW-CL-19S	03/14/11	< 193					

TABLE B-I.1 CONCENTRATIONS OF TRITIUM, STRONTIUM, GROSS ALPHA, AND GROSS BETA IN GROUNDWATER SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2011

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION DATE	H-3	SR-90	GR-A (DIS)	GR-A (SUS)	GR-B (DIS)	GR-B (SUS)
MW-CL-19S	05/16/11	< 164					
MW-CL-19S	07/26/11	< 184	< 0.6	< 2.6	< 0.5	2.8 ± 1.3	< 1.6
MW-CL-19S	10/24/11	< 195					
MW-CL-2	03/14/11	< 194					
MW-CL-2	05/16/11	< 188					
MW-CL-2	07/26/11	< 172	< 0.9	< 1.4	< 0.8	2.1 ± 1.1	< 1.5
MW-CL-2	10/24/11	< 176					
MW-CL-20S	03/14/11	< 193					
MW-CL-20S	05/16/11	< 194					
MW-CL-20S	07/26/11	< 182	< 0.7	< 1.6	< 0.5	3.3 ± 1.2	< 1.6
MW-CL-20S	10/24/11	< 191					
MW-CL-21S	03/14/11	307 ± 130					
MW-CL-21S	05/16/11	451 ± 147					
MW-CL-21S	07/26/11	430 ± 134	< 0.6	< 1.5	< 0.5	< 1.7	< 1.6
MW-CL-21S	10/24/11	389 ± 139					
MW-CL-22S	03/15/11	< 188					
MW-CL-22S	05/17/11	< 193					
MW-CL-22S	07/27/11	< 183	< 0.6	< 2.4	< 0.5	10.7 ± 1.5	< 1.6
MW-CL-22S	10/25/11	< 187					

TABLE B-I.2 **CONCENTRATIONS OF GAMMA EMITTERS IN GROUNDWATER SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2011**

RESULTS IN UNITS OF PCI/LITER ± SIGMA

SITE	COLLECTION DATE	Be-7	K-40	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	Cs-134	Cs-137	Ba-140	La-140
B-3	07/26/11	< 38	< 74	< 4	< 5	< 8	< 5	< 7	< 5	< 7	< 4	< 5	< 28	< 9
MW-CL-1	07/26/11	< 39	< 62	< 4	< 5	< 8	< 5	< 9	< 5	< 8	< 4	< 4	< 27	< 9
MW-CL-12I	07/26/11	< 47	< 93	< 6	< 5	< 12	< 5	< 11	< 5	< 9	< 5	< 5	< 34	< 11
MW-CL-13I	07/26/11	< 46	< 77	< 4	< 5	< 11	< 4	< 9	< 5	< 8	< 4	< 5	< 29	< 9
MW-CL-13S	07/26/11	< 41	< 42	< 4	< 3	< 10	< 5	< 10	< 4	< 8	< 4	< 4	< 27	< 9
MW-CL-14S	07/27/11	< 33	< 58	< 4	< 3	< 9	< 3	< 6	< 4	< 7	< 4	< 4	< 24	< 7
MW-CL-15I	07/26/11	< 42	< 49	< 4	< 5	< 11	< 6	< 7	< 5	< 10	< 4	< 4	< 27	< 9
MW-CL-15S	07/26/11	< 43	< 86	< 4	< 4	< 10	< 5	< 9	< 5	< 9	< 4	< 5	< 31	< 9
MW-CL-16S	07/27/11	< 50	< 104	< 5	< 6	< 12	< 7	< 12	< 7	< 11	< 6	< 5	< 37	< 14
MW-CL-17S	07/27/11	< 48	< 41	< 5	< 5	< 9	< 5	< 9	< 5	< 8	< 4	< 5	< 29	< 10
MW-CL-18I	07/27/11	< 41	< 41	< 4	< 4	< 8	< 5	< 7	< 4	< 8	< 5	< 4	< 28	< 9
MW-CL-18S	07/27/11	< 51	< 103	< 5	< 5	< 12	< 5	< 9	< 5	< 9	< 5	< 5	< 31	< 11
MW-CL-19S	07/26/11	< 49	< 97	< 3	< 4	< 8	< 3	< 10	< 5	< 9	< 4	< 5	< 29	< 10
MW-CL-2	07/26/11	< 38	< 80	< 4	< 4	< 9	< 5	< 8	< 5	< 7	< 4	< 4	< 29	< 9
MW-CL-20S	07/26/11	< 42	< 45	< 5	< 6	< 10	< 4	< 8	< 5	< 8	< 4	< 5	< 33	< 11
MW-CL-21S	07/26/11	< 29	< 71	< 3	< 3	< 6	< 4	< 7	< 2	< 3	< 3	< 4	< 22	< 7
MW-CL-21S	05/16/11	< 10	< 8	< 1	< 1	< 2	< 1	< 2	< 1	< 2	< 1	< 1	< 17	< 5
MW-CL-22S	07/27/11	< 45	< 85	< 4	< 5	< 11	< 5	< 10	< 6	< 8	< 4	< 5	< 31	< 10

TABLE B-I.3 **CONCENTRATIONS OF HARD TO DETECTS IN GROUNDWATER SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2011**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION DATE	AM-241	CM-242	CM-243/244	PU-238	PU-239/240	U-234	U-235	U-238	FE-55	NI-63
MW-CL-21S	07/26/11	< 0.02	< 0.02	< 0.02	< 0.09	< 0.07	< 0.14	< 0.05	< 0.15	< 59.7	< 4.00

TABLE B-II.1 **CONCENTRATIONS OF TRITIUM AND STRONTIUM IN SURFACE WATER SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2011**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION DATE	H-3	SR-90
SW-CL-1	03/14/11	< 193	
SW-CL-1	05/16/11	< 192	
SW-CL-1	07/26/11	< 179	< 0.8
SW-CL-1	10/24/11	< 191	
SW-CL-2	03/14/11	< 164	
SW-CL-2	05/16/11	< 192	
SW-CL-2	07/26/11	< 180	< 0.8
SW-CL-2	10/24/11	< 190	
SW-CL-4	03/14/11	< 164	
SW-CL-4	05/16/11	< 196	
SW-CL-4	07/26/11	< 184	< 0.7
SW-CL-4	10/24/11	< 191	
SW-CL-5	03/14/11	< 164	
SW-CL-5	05/16/11	< 193	
SW-CL-5	07/26/11	< 177	< 0.6
SW-CL-5	10/24/11	< 197	
SW-CL-6	03/14/11	< 167	
SW-CL-6	05/16/11	< 199	
SW-CL-6	07/26/11	< 179	< 0.6
SW-CL-6	10/24/11	< 190	
SW-CL-7	03/14/11	< 164	
SW-CL-7	05/16/11	< 158	
SW-CL-7	07/26/11	< 179	< 0.9
SW-CL-7	10/24/11	< 199	
SEWAGE TREATMENT PLANT	03/14/11	< 166	
SEWAGE TREATMENT PLANT	05/16/11	< 160	
SEWAGE TREATMENT PLANT	07/26/11	< 175	< 0.5
SEWAGE TREATMENT PLANT	10/24/11	< 193	

TABLE B-II.2

CONCENTRATIONS OF GAMMA EMITTERS IN SURFACE WATER SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2011

RESULTS IN UNITS OF PCI/LITER ± SIGMA

SITE	COLLECTION DATE	Be-7	K-40	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	Cs-134	Cs-137	Ba-140	La-140
SW-CL-1	07/26/11	< 40	< 105	< 5	< 6	< 11	< 5	< 10	< 5	< 9	< 5	< 5	< 33	< 14
SW-CL-2	07/26/11	< 44	< 13	< 4	< 4	< 10	< 4	< 9	< 5	< 6	< 4	< 4	< 31	< 9
SW-CL-4	07/26/11	< 52	< 53	< 4	< 5	< 12	< 5	< 9	< 4	< 10	< 5	< 5	< 34	< 12
SW-CL-5	07/26/11	< 35	< 34	< 4	< 5	< 8	< 5	< 8	< 5	< 7	< 4	< 5	< 26	< 9
SW-CL-6	07/26/11	< 39	< 50	< 3	< 5	< 9	< 6	< 11	< 5	< 9	< 4	< 5	< 34	< 10
SW-CL-7	07/26/11	< 49	< 89	< 4	< 5	< 11	< 4	< 10	< 5	< 9	< 4	< 5	< 33	< 10
SEWAGE TREATMENT PLANT	07/26/11	< 41	< 86	< 4	< 4	< 9	< 4	< 9	< 5	< 7	< 4	< 5	< 32	< 9