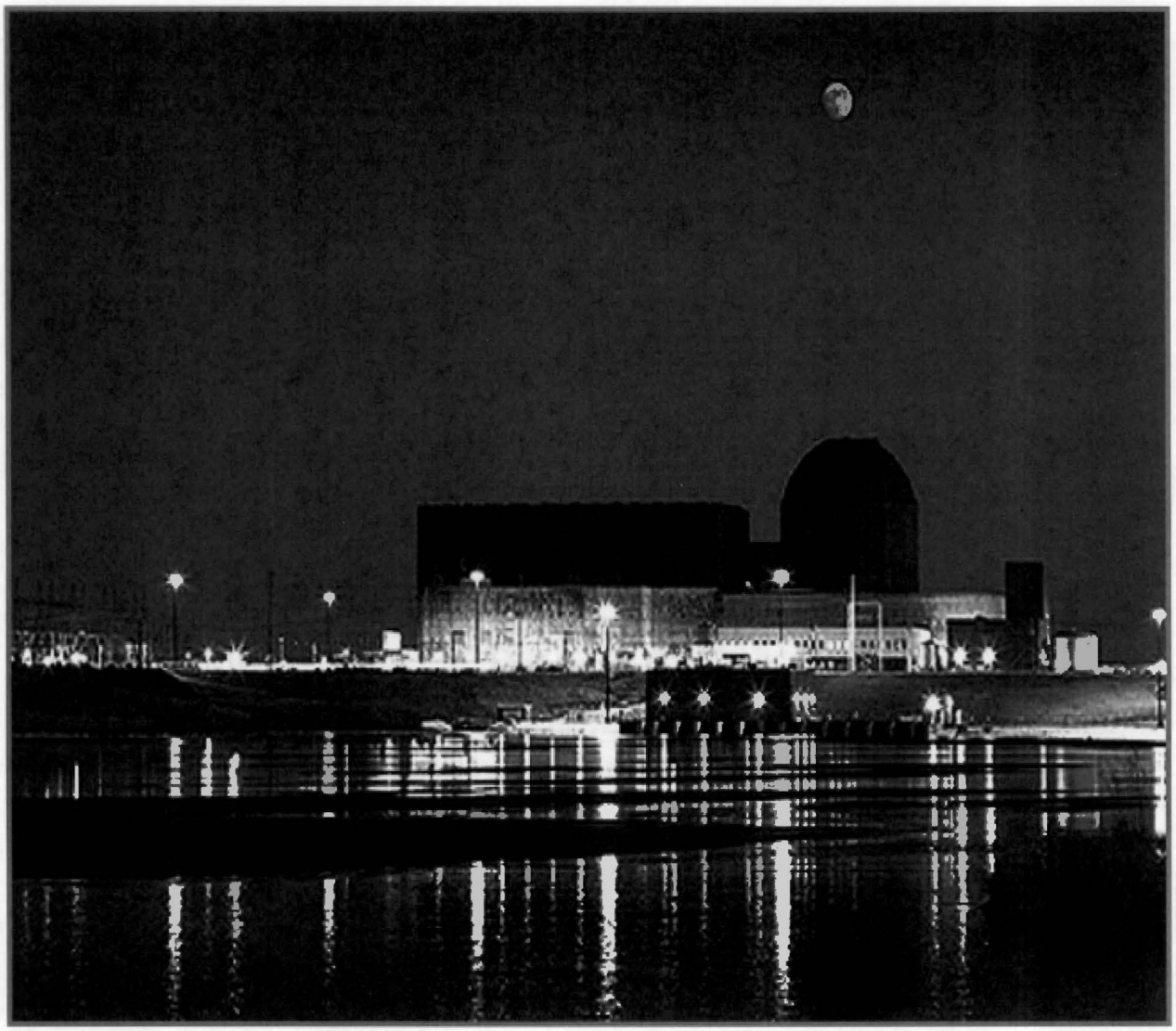

Constellation.

January 01, 2022 – December 31, 2022

ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

CLINTON POWER STATION – DOCKET NUMBER 50-461

Prepared by:

Teledyne Brown Engineering Environmental Services
April 2023

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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) which split to form Constellation during 1st quarter of 2022, covers the period January 1, 2022, through December 31, 2022. During that time period, 1,593 analyses were performed on 1,466 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.

There were zero (0) radioactive liquid releases from CPS during 2022. 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 in 2022 due to the release of gaseous effluents from CPS was 3.11E-01 mrem or 0.311 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 iodine-131 (I-131). 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. No fission or activation products were detected.

Iodine-131 analyses were performed on weekly air samples. All results were less than the lower limit of detection for I-131.

High sensitivity I-131 analyses and gamma analyses were performed on cow milk samples. All results were below the required LLDs for I-131. 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. No fission or activation products were detected.

Grass samples were analyzed for concentrations of gamma-emitting nuclides. No fission or activation products were detected.

Environmental gamma radiation measurements were performed quarterly using Dosimeters of Legal Record (DLR). Levels detected were consistent with those observed in previous years.

II. Introduction

The Clinton Power Station (CPS), consisting of one approximately 1,120 MW gross electrical power output boiling water reactor is located in Harp Township, DeWitt County, Illinois. CPS is owned and operated by Constellation and became operational in 1987. Unit No. 1 went critical on February 27, 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 Constellation. 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 February 27, 1987 and was summarized in a separate report. This report covers those analyses performed by Teledyne Brown Engineering (TBE) and Landauer on samples collected during the period January 1, 2022, through December 31, 2022.

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 (EIML) to obtain environmental samples for the CPS REMP in 2022. Sample locations and descriptions can be found in Tables B–1 and B–2, and Figures B–1 through B–4, 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 and quarterly from composite 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, channel catfish, bluegill, carp, white crappie and white bass, the species most commonly harvested from the lakes by sporting fishermen, were collected semiannually at two locations, CL-19 and CL-105. CL-105 was the control location, which is located about 50 miles upwind of the station. Shoreline sediment samples composed of recently deposited substrate were collected at two locations semiannually (CL-07B and CL-105 (control)).

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 and quarterly at ten locations (CL-1, CL-2, CL-3, CL-4, CL-6, CL-7, CL-8, CL-11, CL-15 and CL-94). CL-11 was the control location, which is located 16 miles upwind of the station. 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 an independent laboratory for analysis.

Milk samples were collected biweekly at one location (CL-116) from May through October to coincide with the grazing season, and monthly from November through April. All samples were collected in new unused plastic bottles from the bulk tank at the dairy farm, preserved with sodium bisulfite and shipped promptly to the laboratory.

Food products were collected once a month from June through September at three locations (CL-114, CL-115 and CL-118). The control location was CL-114, which is located 12.5 miles upwind of the station. 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-01, CL-02, CL-08 and CL-116) from May through October. CL-116 was the control location, which is located 14 miles WSW of the station. 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 DLRs. Each location consisted of 2 dosimeter sets in a vented PVC conduit located a few feet off the ground. The DLRs were exchanged quarterly and sent to Landauer for analysis. The DLR 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, CL-63).

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, CL-81).

A special interest set consisting of seven locations (CL-37, CL-41, CL-49, CL-64, CL-65, 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, CL-114).

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

The specific DLR 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 meteorological sectors around the site, where estimated annual dose from CPS, if detected, would be most significant;
3. On hills free from local obstructions and within sight of the HVAC and VG stacks (where practical);
4. And near the closest dwelling to the HVAC and VG stacks in the prevailing downwind direction.

B. Sample Analysis

This section describes the general analytical methodologies used by TBE and Environmental Inc. (Midwest Labs) to analyze and collect environmental samples for radioactivity for the CPS REMP in 2022. 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, air particulates and vegetables
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 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" value. 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, drinking water, well water, fish, and sediment: 12 nuclides, 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 milk: 13 nuclides, 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 grass and vegetation: 13 nuclides, 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: 9 nuclides, Co-60, Nb-95, Zr-95, Ru-103, Ru-106, Cs-134, Cs-137, Ce-141 and Ce-144 were reported

The mean and standard deviation of the results were calculated. The standard deviation represents the variability of measured results for different samples rather than single analysis uncertainty.

D. Program Exceptions

The exceptions (Issue Reports, IRs) 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-1302, "Offsite Dose Calculation Manual Guidance: Standard Radiological Effluent Controls for Boiling Water Reactors, Generic Letter 89-01, Supplement No. 1", April 1991, 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 6.0 of the Station's ODCM.

Exceptions/Anomalies

1. Air Particulate/Air Iodine Samples (IR 04551478, IR 04520264)
   a. During weekly ODCM air sampling surveillance on 03/23/22, the Environmental, Inc. vendor identified that compositors CL-2 and CL-3 had lower than expected timer readings indicating a power outage.
   b. During weekly ODCM air sampling surveillance on 08/31/22, the Environmental, Inc. vendor found non-ODCM air sampler CL-7 with no timer reading, indicating a power outage.

2. Drinking Water Compositor Repair (IR 04488545)

   On 03/30/22, ODCM water compositor CL-14 was secured due to a leak in the sink from which the sample is utilized. The 20-ml per hour sample could not be obtained and grab samples were obtained for the months of April and May 2022.

3. REMP Monitoring Sample Stations Damage (IR 04497692)

   During the routine weekly ODCM sampling surveillance on 05/04/22, the Environmental Inc. Sampling vendor identified non-ODCM air sample station CL-6 was non-functional due to damage to the power pole, leaving it located on the ground.

   Also, non-ODCM water compositor CL-99 was determined to be non-functional due to a loss of power. The outage lasted from May – November 2022 and grab samples were obtained during these months.

4. Insufficient Vegetation (IR 04669802)

   During the monthly vegetation sampling on 06/26/22 and 09/28/22, the Environmental, Inc. sampling vendor was not able to obtain sufficient vegetation. Substitutions were made for the June sampling to meet the required 3 types of vegetation being sampled. Substitutions were not able to be made for the September sampling and 2 types of vegetation were sampled.

Throughout 2022, IRs were generated to document program exceptions that were entered into the corrective action program for trending purposes.

Missed Samples

1. AP/AI Location CL-06 (01/05/22) (IR 04471146)

   During the weekly ODCM air sampling surveillance, the Environmental Inc. sampling vendor identified that the lock on the non-OCDM air sampler was frozen and no sample could be obtained. Multiple attempts to unfreeze the lock and obtain the sample but were unsuccessful.

2. OSLD Location CL-78 (07/18/22) (IR 04511798)

   The dosimeter could not be located after a search of the immediate area resulting in no measurement for CL-78 in the 2nd quarter.

3. AP/AI Locations CL-6, CL-7, CL-11 (08/24/22) (IR 04523810)

   The samples were damaged after receipt at the laboratory on 08/26/22 and results were invalid.

4. AP/AI Location CL-7 (08/31/22) (IR 04520264)

   During the weekly surveillance, the Environmental Inc. sampling vendor found the non-ODCM air sampler with no timer reading, indicating a power outage and a valid sample could not be attained.

5. Surface Water Location CL-13 (12/28/22) (IR 04545346)

   The sampling vendor was unable to take a grab sample at non-ODCM location CL-13 due to a frozen lake.

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

The location for site CL-114 was changed to 12.5 miles WSW. (IR 04521356)

There were no other program changes in 2022.

IV. Results and Discussion

A. Aquatic Environment

1. Surface Water

Composite samples were taken hourly at three locations (CL-90, CL-91 and CL-99) on a monthly schedule and grab samples were taken monthly from one location (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 detected in any samples 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). No plant-produced radionuclides were detected and all required LLDs were met.

2. Drinking Water

Monthly composite samples were taken hourly at one location (CL-14). The following analyses were performed:

Gross Beta

Monthly samples were analyzed for concentrations of gross beta. No gross beta was detected in any of the samples.
(Tables C–II.1, Appendix C)

Tritium

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

Iodine-131

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

Gamma Spectrometry

Monthly samples were analyzed for gamma-emitting nuclides. No plant-produced radionuclides were detected and all required LLDs were met. (Table C–II.4, Appendix C)

3. Well Water

Quarterly grab samples were collected at two locations (CL-07D 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. No tritium was detected in any samples and the required LLD was met. (Table C–III.1, Appendix C)

Gamma Spectrometry

Samples from all locations were analyzed for gamma-emitting nuclides. No plant-produced radionuclides were detected and all required LLDs were met. (Table C–III.2, Appendix C)

4. Fish

Fish samples comprised of largemouth bass, channel catfish, bluegill, carp, white crappie and white bass 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. No plant-produced radionuclides were detected and all required LLDs were met. (Table C–IV.1, Appendix C)

5. Shoreline Sediment

Aquatic shoreline sediment samples were collected at CL-07B and CL-105 semiannually. The following analysis was performed:

Gamma Spectrometry

Shoreline sediment samples were analyzed for gamma-emitting nuclides. No plant-produced radionuclides were detected and all required LLDs were met. (Table C–V.1, Appendix C)

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 43 E–3 pCi/m^3 with a mean of 20 E–3 pCi/m^3. The results from the Intermediate Distance location (Group II) ranged from 8 to 42 E–3 pCi/m^3 with a mean of 19 E–3 pCi/m^3. The results from the Control location (Group III) ranged from 12 to 43 E–3 pCi/m^3 with a mean of 22 E–3 pCi/m^3. Comparison of the 2022 air particulate data with previous years' data indicate no measurable impact from the operation of CPS. In addition, a comparison of the weekly mean values for 2022 indicate no notable differences among the three groups.

Gamma Spectrometry

Weekly samples were composited quarterly and analyzed for gamma-emitting nuclides. No plant-produced radionuclides were detected and all required LLDs were met.
(Table C–VI.3, Appendix C)

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. All results were less than the MDC and the required LLD was met.
(Table C-VII.1, Appendix C)

2. Terrestrial

a. Milk

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

Iodine-131

Milk samples were analyzed for concentrations of I-131. Iodine-131 was not detected in any of the samples. The required LLD was met. (Table C–VIII.1, Appendix C).

Gamma Spectrometry

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

b. Food Products

Broadleaf vegetation samples were collected from three locations (CL-114, CL-115 and CL-118) monthly June through September to coincide with the harvest season. The following analysis was performed:

Gamma Spectrometry

Each food product sample was analyzed for concentrations of gamma-emitting nuclides. No plant-produced radionuclides were detected and all required LLDs were met.
(Table C–IX.1, Appendix C)

c. Grass

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

Gamma Spectrometry

Each grass sample was analyzed for concentrations of gamma-emitting nuclides. No plant-produced radionuclides were detected and all required LLDs were met.
(Table C–IX.2, Appendix C)

C. Ambient Gamma Radiation

Ambient gamma radiation levels were measured utilizing DLRs. Fifty-four DLR locations were established around the site. Results of DLR measurements are listed in Tables C–X.1, Appendix C.

A total of 215 OSLD measurements were made in 2022. The average dose from the inner ring was 18.7 mRem/quarter. The average dose from the outer ring was 19.0 mRem/quarter. The average dose from the special interest group was 18.7 mRem/quarter. The average dose from the supplemental group was 18.0 mRem/quarter. The quarterly measurements ranged from 14.3 to 22.8 mRem/quarter.

The inner ring and outer ring measurements compared well to the Control Station, CL-11, which ranged from 15.8 to 18.1 mRem/quarter with an average measurement of 16.9 mRem/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. Independent Spent Fuel Storage Installation (ISFSI)

Ambient gamma radiation levels were measured utilizing DLRs. Fifty-four DLR locations were established around the site, which encompasses the ISFSI pad. ISFSI dose contribution is in the form of direct radiation as no liquid or gas releases are expected to occur. Results of DLR measurements are listed in Table C-X.1, Appendix C.

E. Land Use Survey

The Annual Land Use Survey conducted during the growing season around the Clinton Power Station (CPS) was performed by Environmental Inc. (Midwest Labs) for Constellation to comply with Clinton's Offsite Dose Calculation Manual, section 8.0. The report to CPS was dated October 3, 2022. The purpose of the survey was to document the nearest resident, milk-producing animal and garden of greater than 50 m^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. The Sector location for site CL-114 was changed to WSW for the previous year's Land Use Census. There were no changes required to the CPS REMP as a result of the Land Use Survey. The results of this survey are summarized below:

Sector	Distance in Kilometers from the CPS Station HVAC Vent Stack		
	Residence (km)	Garden (km)	Milk Animal (km)
1 N	1.50	1.50	1.50
2 NNE	1.50	4.78	> 8
3 NE	2.07	> 8	> 8
4 ENE	2.86	4.35	> 8
5 E	1.67	1.67	> 8
6 ESE	5.14	> 8	> 8
7 SE	4.44	> 8	> 8
8 SSE	2.90	4.32	> 8
9 S	4.78	> 8	> 8
10 SSW	4.68	> 8	> 8
11 SW	1.17	5.61	> 8
12 WSW	3.62	3.66	4.32
13 W	1.95	> 8	> 8
14 WNW	2.63	2.63	> 8
15 NW	2.65	4.70	> 8
16 NNW	2.05	2.05	2.05

F. Errata Data

The highest calculated offsite dose was reported incorrectly in the 2021 AREOR. (See Appendix E for corrected information). (IR 04543917)

There was no other errata data for 2022.

G. Summary of Results – Inter-Laboratory Comparison Program

The TBE Laboratory analyzed Performance Evaluation (PE) samples of air particulate, air iodine, milk, soil, vegetation, and water matrices for various analytes. The PE samples supplied by Analytics Inc., Environmental Resource Associates (ERA) and Department of Energy (DOE) Mixed Analyte Performance Evaluation Program (MAPEP), were evaluated against the following pre-set acceptance criteria:

A. 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 evaluates the reported ratios based on internal QC requirements based on the DOE MAPEP criteria.

B. 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, National Environmental Laboratory Accreditation Conference (NELAC), state-specific Performance Testing (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.

C. DOE Evaluation Criteria

MAPEP's evaluation report provides an acceptance range with associated flag values. MAPEP defines three levels of performance:

- Acceptable (flag = "A") - result within ± 20% of the reference value
- Acceptable with Warning (flag = "W") - result falls in the ± 20% to ± 30% of the reference value
- Not Acceptable (flag = "N") – bias is greater than 30% of the reference value

Note: The Department of Energy (DOE) Mixed Analyte Performance Evaluation Program (MAPEP) samples are created to mimic conditions found at DOE sites which do not resemble typical environmental samples obtained at commercial nuclear power facilities.

For the TBE laboratory, 142 out of 150 analyses performed met the specified acceptance criteria. Eight analyses did not meet the specified acceptance criteria and were addressed through the TBE Corrective Action Program. *NOTE: Two analyses (soil for Tc-99 and U-238) that did not meet acceptance criteria was performed for TBE information and is not on the list of required ICP analyses.* A summary is found below:

1. The Analytics March 2022 AP Ce-141 result was evaluated as *Not Acceptable*. The reported value for Ce-141 was 60.9 pCi and the known result was 42.0 pCi/L (1.45 ratio of reported result vs. known; TBE's internal acceptance range is 0.70 - 1.30). This sample was used as the workgroup duplicate with a result of 45.7 (109% of known) and was also counted on a different detector with a result of 50.9 (121% of known). This was TBE's first failure for AP Ce-141. (NCR 22-04)

2. The MAPEP February 2022 Urine U-234 & U-238 results were evaluated as *Not Acceptable*. TBE's reported values of 0.142 and 0.0254 were above the known upper ranges of 0.0096 and 0.0134 respectively for U-234 and U-238. These spiked values were below TBE's typical MDC for urine client samples. The samples were re-prepped using a larger sample aliquot and counted for 60 hours as opposed to 48 hours. The recount results were 0.00732 for U-234 and 0.0119 for U-238 (both within acceptable range). MAPEP urine samples will be flagged to use a larger sample aliquot and counting time than typical client samples. MAPEP did not include any urine cross-check samples in August. (NCR 22-05)

3. The ERA MRAD September 2022 AP Pu-238 was evaluated as *Not Acceptable*. The reported value was 38.8 pCi and the known result was 29.9 (acceptance range 22.6 – 36.7). The AP filter was cut in half prior to digestion (shared with Fe-55) but should have been complete digested together and aliquotted afterwards like typical client samples. This is the first failure for AP Pu-238. (NCR 22-19)

4. The ERA October 2022 water Uranium result was evaluated as *Not Acceptable*. The reported value was 10.54 pCi/L and the known was 8.53 (acceptance range 6.60 – 9.88) or 124% of the known (acceptable for TBE QC). The 2-sigma error was 3.2, placing the reported result well within the acceptable range. This sample was used as the workgroup duplicate with a result of 8.2 +/- 2.9 pCi/L (also within the acceptable range). All other QA was reviewed with no anomalies. (NCR 22-20)

5. The Analytics AP Co-60 result was evaluated as *Not Acceptable*. The reported value was 207 pCi and the known was 147 (141% of the known). TBE's internal QC acceptance is 70 - 130%. All QA was reviewed with no anomalies. This sample was used as the workgroup duplicate and counted on a different detector with a result of 167 pCi (114% of the known). This is the first failure for AP Co-60 – average result ratio compared to the known is 109%. (NCR 22-21)

6. The MAPEP August 2022 water Tc-99 result was evaluated as *Not Acceptable*. The reported value was 1.86 +/- 0.414 Bq/L for this "false positive" test. The evaluation of the submitted result to the 3 times the uncertainty indicated a slight positive. This sample was used as the workgroup duplicate with a result of 0.88 +/- 0.374 Bq/L. All QC was reviewed, and no anomalies found. This is the first unacceptable since the resumption of reporting water Tc-99 for the 3rd quarter of 2020. TBE to known ratios have ranged from 94-109% during this time. (NCR 22-22)

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

1. American National Standards Institute, Inc., "Performance, Testing and Procedural Specifications for Thermoluminescent Dosimetry," ANSI N545-1975.

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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, 2022

NAME OF FACILITY:	CLINTON POWER STATION			DOCKET NUMBER:	50-461		
LOCATION OF FACILITY:	DEWITT COUNTY IL			REPORTING PERIOD:	2022		

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 (LOW LVL)**	12	1	<LLD	NA			0
	H-3	16	2000	<LLD	<LLD	-		0
	GAMMA	47						
	MN-54		15	<LLD	<LLD	-		0
	CO-58		15	<LLD	<LLD	-		0
	FE-59		30	<LLD	<LLD	-		0
	CO-60		15	<LLD	<LLD	-		0
	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
DRINKING WATER *(PCI/LITER)*	**GR-B**	12	4	<LLD	*NA*	-		0
	H-3	4	2000	<LLD	*NA*	-		0
	I-131 (LOW LVL)	12	1	<LLD	*NA*	-		0
	GAMMA	12						
	MN-54		15	<LLD	*NA*	-		0
	CO-58		15	<LLD	*NA*	-		0
	FE-59		30	<LLD	*NA*	-		0
	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
	CE-144		*NA*	<LLD	*NA*	-		0

(M) The Mean Values are calculated using the positive values. (F) Fraction of detectable measurement are indicated in parentheses.

TABLE A-1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY FOR THE CLINTON POWER STATION, 2022

NAME OF FACILITY:	CLINTON POWER STATION			DOCKET NUMBER:		50-461		
LOCATION OF FACILITY:	DEWITT COUNTY IL			REPORTING PERIOD:		2022		
				INDICATOR LOCATIONS	CONTROL LOCATION	LOCATION WITH HIGHEST ANNUAL MEAN (M)		
MEDIUM OR PATHWAY SAMPLED *(UNIT OF MEASUREMENT)*	TYPES OF ANALYSIS PERFORMED	NUMBER OF ANALYSIS PERFORMED	REQUIRED LOWER LIMIT OF DETECTION (LLD)	MEAN (M) (F) *RANGE*	MEAN (M) (F) *RANGE*	MEAN (M) (F) *RANGE*	STATION # NAME DISTANCE AND DIRECTION	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
WELL WATER *(PCI/LITER)*	H-3	12	2000	<LLD	*NA*	-		0
	GAMMA	12						
	MN-54		15	<LLD	*NA*	-		0
	CO-58		15	<LLD	*NA*	-		0
	FE-59		30	<LLD	*NA*	-		0
	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
	CE-144		*NA*	<LLD	*NA*	-		0
FISH *(PCI/KG WET)*	GAMMA	16						
	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
	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

(M) The Mean Values are calculated using the positive values. (F) Fraction of detectable measurement are indicated in parentheses.

TABLE A-1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY FOR THE CLINTON POWER STATION, 2022

NAME OF FACILITY:	CLINTON POWER STATION			DOCKET NUMBER:	50-461		
LOCATION OF FACILITY:	DEWITT COUNTY IL			REPORTING PERIOD:	2022		

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
SEDIMENT	**GAMMA**	4						
(PCI/KG DRY)	*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
	ZR-95		*NA*	<LLD	<LLD	-		0
	CS-134		**150**	<LLD	<LLD	-		0
	CS-137		**180**	<LLD	<LLD	-		0
	BA-140		*NA*	<LLD	<LLD	-		0
	LA-140		*NA*	<LLD	<LLD	-		0
	CE-144		*NA*	<LLD	<LLD	-		0
AIR PARTICULATE	**GR-B**	525	**10**	20 (473/473) *8 - 43*	22 (52/52) *12 - 43*	22 (52/52) *12 - 43*	CL-11 CONTROL ILLINOIS POWER SUBSTATION 16 MILES S OF SITE	0
	GAMMA	40						
	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
	CE-144		*NA*	<LLD	<LLD	-		0
AIR IODINE	**GAMMA**	528						
(E-3 PCI/CU.METER)	*I-131*		**70**	<LLD	<LLD	-		0

(M) The Mean Values are calculated using the positive values. (F) Fraction of detectable measurement are indicated in parentheses.

TABLE A-1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY FOR THE CLINTON POWER STATION, 2022

NAME OF FACILITY:	**CLINTON POWER STATION**	**DOCKET NUMBER:**	**50-461**
LOCATION OF FACILITY:	**DEWITT COUNTY IL**	**REPORTING PERIOD:**	**2022**

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
MILK	**I-131 (LOW LVL)**	19	1	*NA*	<LLD	-		0
(PCI/LITER)								
	GAMMA	19						
	K-40		*NA*	*NA*	957 (19/19) *635 - 1200*	957 (19/19) *635 - 1200*	CL-116 CONTROL DEMENT DAIRY 14 MILES WSW OF SITE	0
	MN-54		*NA*	*NA*	<LLD	-		0
	CO-58		*NA*	*NA*	<LLD	-		0
	FE-59		*NA*	*NA*	<LLD	-		0
	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
	CE-144		*NA*	*NA*	<LLD	-		0
VEGETATION	**GAMMA**	36						
(PCI/KG WET)	*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
	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

(M) The Mean Values are calculated using the positive values. (F) Fraction of detectable measurement are indicated in parentheses.

TABLE A-1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY FOR THE CLINTON POWER STATION, 2022

NAME OF FACILITY:	CLINTON POWER STATION			DOCKET NUMBER:	50-461			
LOCATION OF FACILITY:	DEWITT COUNTY IL			REPORTING PERIOD:	2022			
				INDICATOR LOCATIONS	CONTROL LOCATION	LOCATION WITH HIGHEST ANNUAL MEAN (M)		
MEDIUM OR PATHWAY SAMPLED *(UNIT OF MEASUREMENT)*	TYPES OF ANALYSIS PERFORMED	NUMBER OF ANALYSIS PERFORMED	REQUIRED LOWER LIMIT OF DETECTION (LLD)	MEAN (M) (F) *RANGE*	MEAN (M) (F) *RANGE*	MEAN (M) (F) *RANGE*	**STATION # NAME** DISTANCE AND DIRECTION	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
GRASS	**GAMMA**	52						
(PCI/KG WET)	*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
	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	**OSLD-QUARTERLY**	215	*NA*	18.6	16.9	20.2	CL-49 INDICATOR	0
(MILLI-ROENTGEN/QTR.)				(211/211)	(4/4)	(4/4)		
				14.3 - 22.8	*15.8 - 18.1*	*17.7 - 22.1*	3.5 MILES W	

(M) The Mean Values are calculated using the positive values. (F) Fraction of detectable measurement are indicated in parentheses.

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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, 2022

Location	Location Description	Distance & Direction from Site
A. Surface Water		
CL-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)	2.1 miles SE
CL-105	Lake Shelbyville (control)	50 miles S
H. Food Products		
CL-114	Residence WSW of Site (control)	12.5 miles WSW
CL-115	Site's Secondary Access Road	0.7 miles NE
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 (control)	14 miles WSW

TABLE B-1: Radiological Environmental Monitoring Program - Sampling Locations, Distance and Direction
Clinton Power Station, 2022

Location	Location Description	Distance & Direction from Site
J.	Environmental Dosimetry - DLR	
	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
	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

TABLE B-1: Radiological Environmental Monitoring Program - Sampling Locations, Distance and Direction
Clinton Power Station, 2022

Location	Location Description	Distance & Direction from Site
J.	Environmental Dosimetry - DLR (cont'd)	
	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 WSW
	Control	
CL-11		16 miles S

TABLE B-2: Radiological Environmental Monitoring Program – Summary of Sample Collection and Analytical Methods, Clinton Power Station, 2022

Sample Medium	Analysis	Sampling Method	Analytical Procedure Number
Surface Water	Gamma Spectroscopy	Monthly grab and; 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	Monthly composite from a continuous water compositor	TBE, TBE-2012 Radioiodine in Various Matrices 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
Sediment	Gamma Spectroscopy	Semi-annual grab samples	TBE, 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
Milk	Gamma Spectroscopy	Bi-weekly grab sample when cows are on pasture. Monthly all other times	TBE-2007 Gamma-Emitting Radioisotope Analysis Env. Inc., SPM-1 Sampling Procedure Manual
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
DLR	Thermo-Luminescence Dosimetry	Quarterly DLRs comprised of two Al_2O_3:C Landauer Incorporated elements	Landauer Incorporated

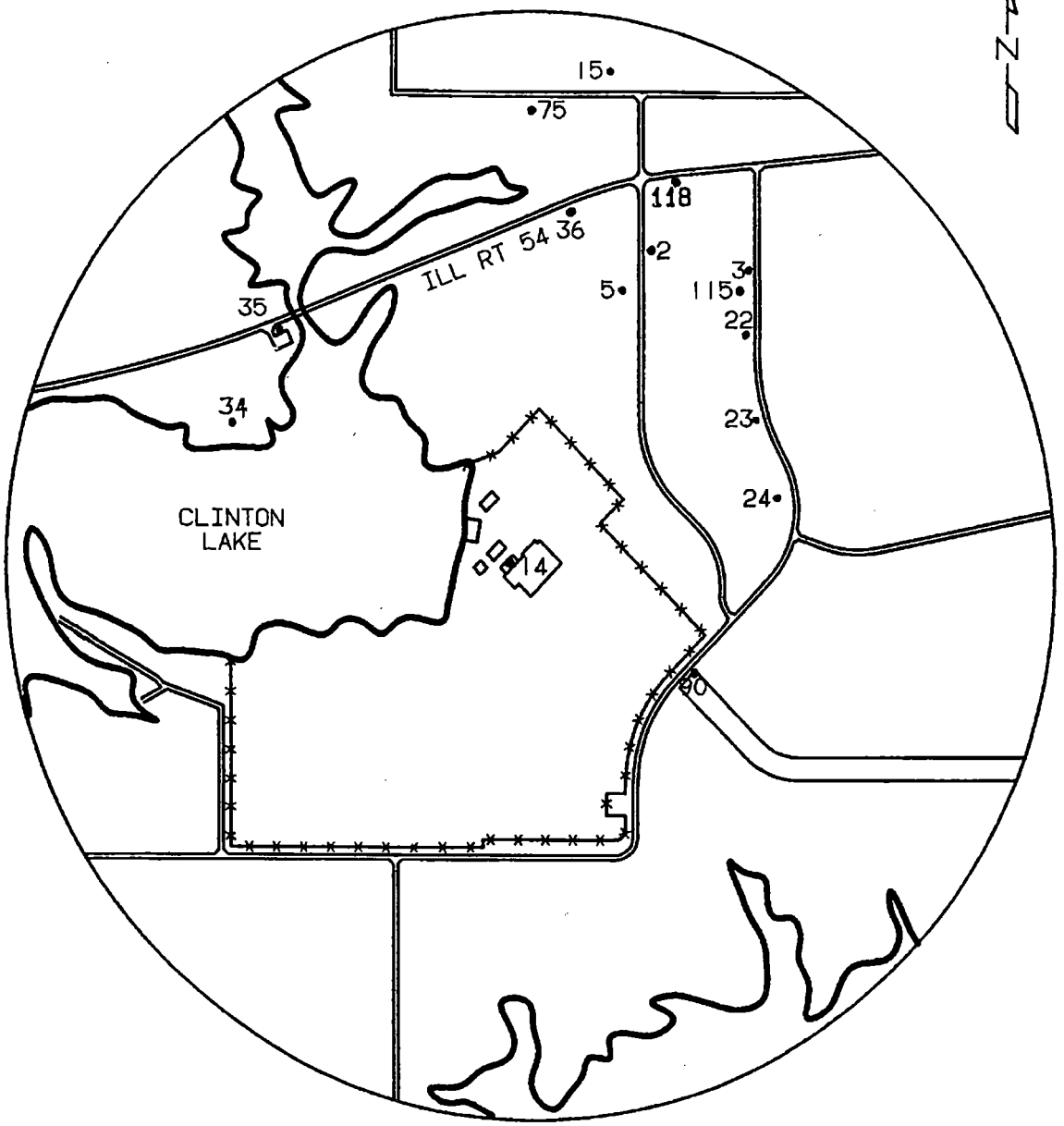

Figure B-1
Environmental Sampling Locations Within One
Mile of the Clinton Power Station, 2022

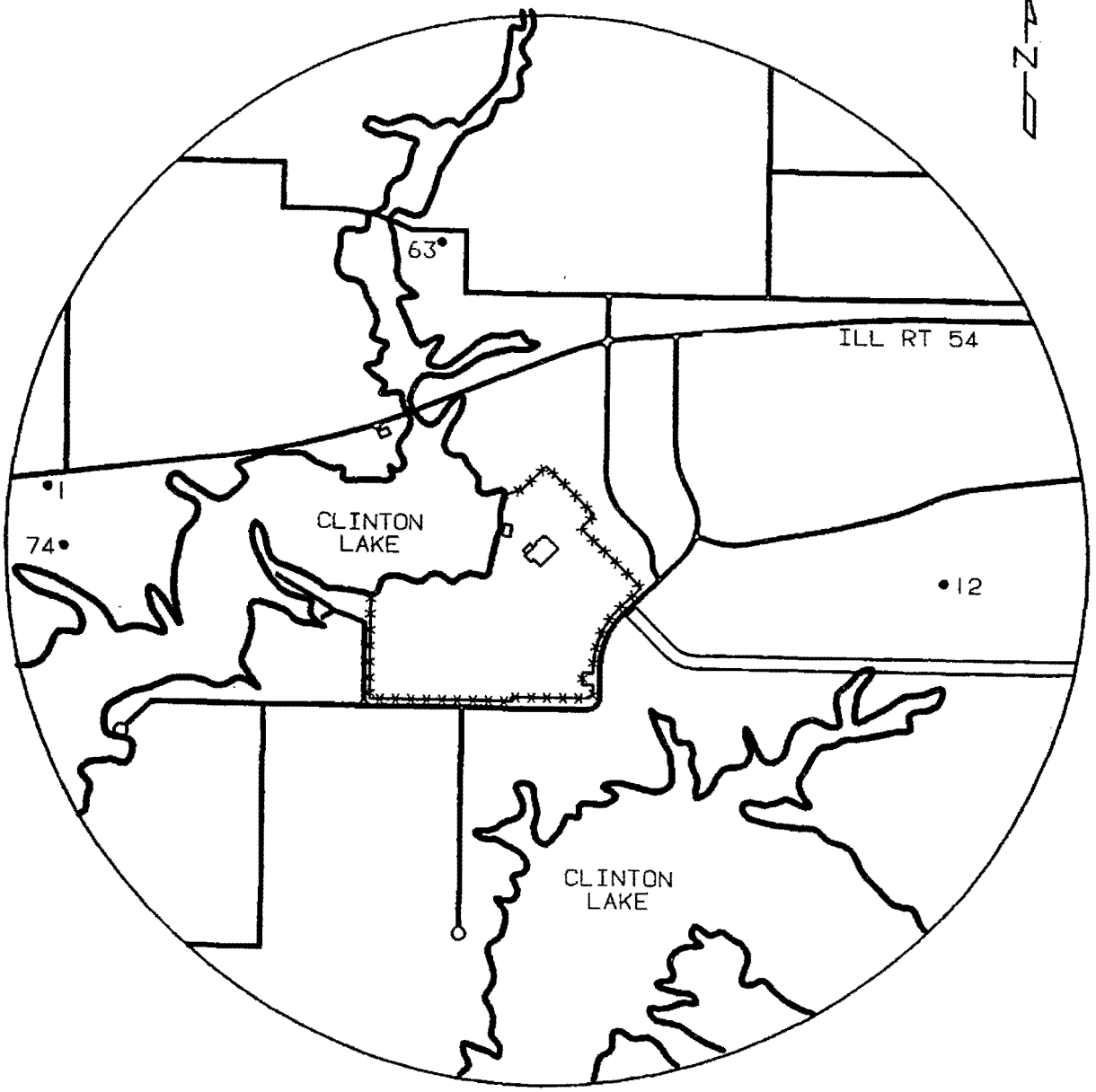

Figure B-2
Environmental Sampling Locations Between One and Two
Miles of the Clinton Power Station, 2022

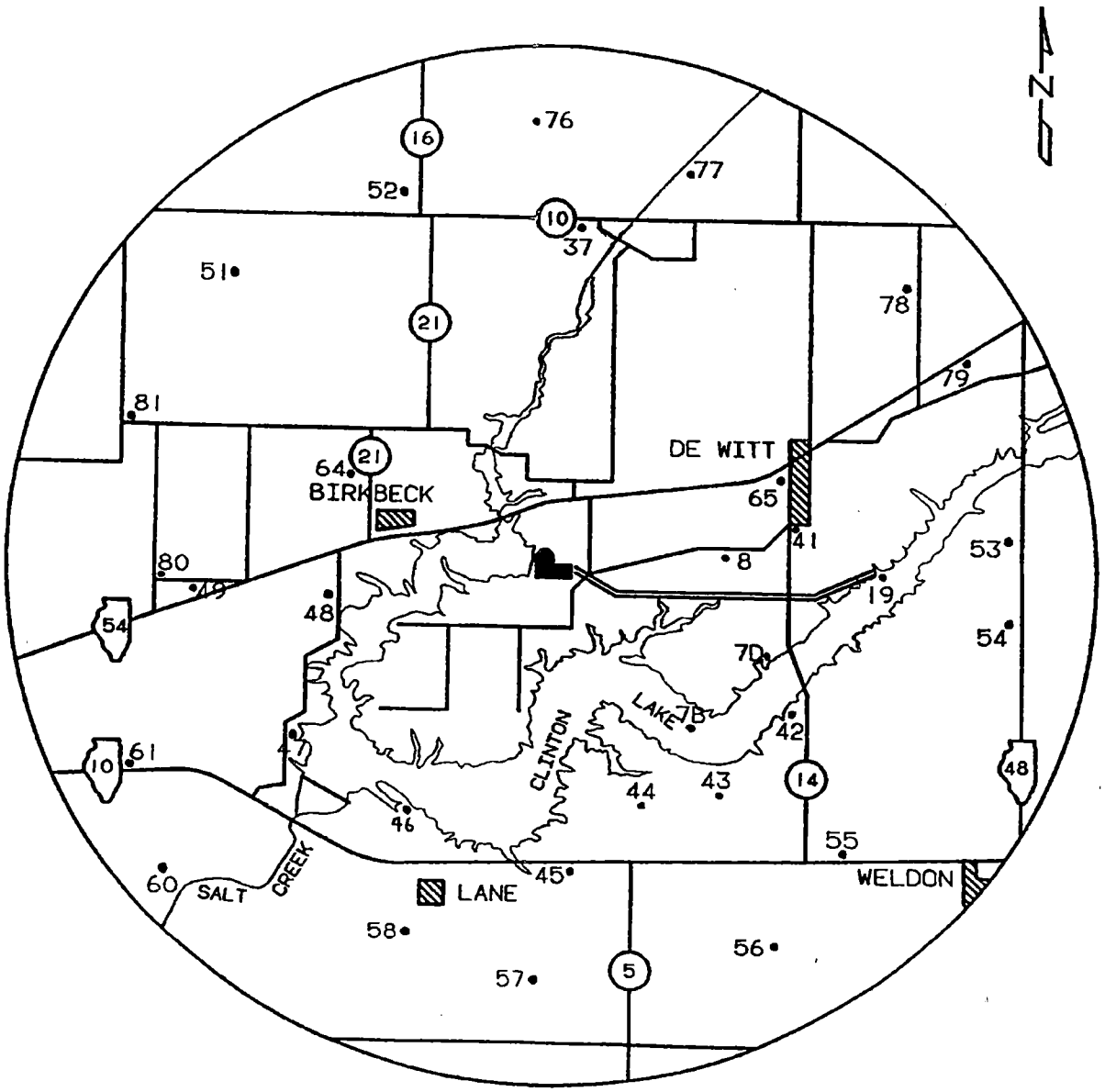

Figure B-3
Environmental Sampling Locations Between Two and Five
Miles of the Clinton Power Station, 2010

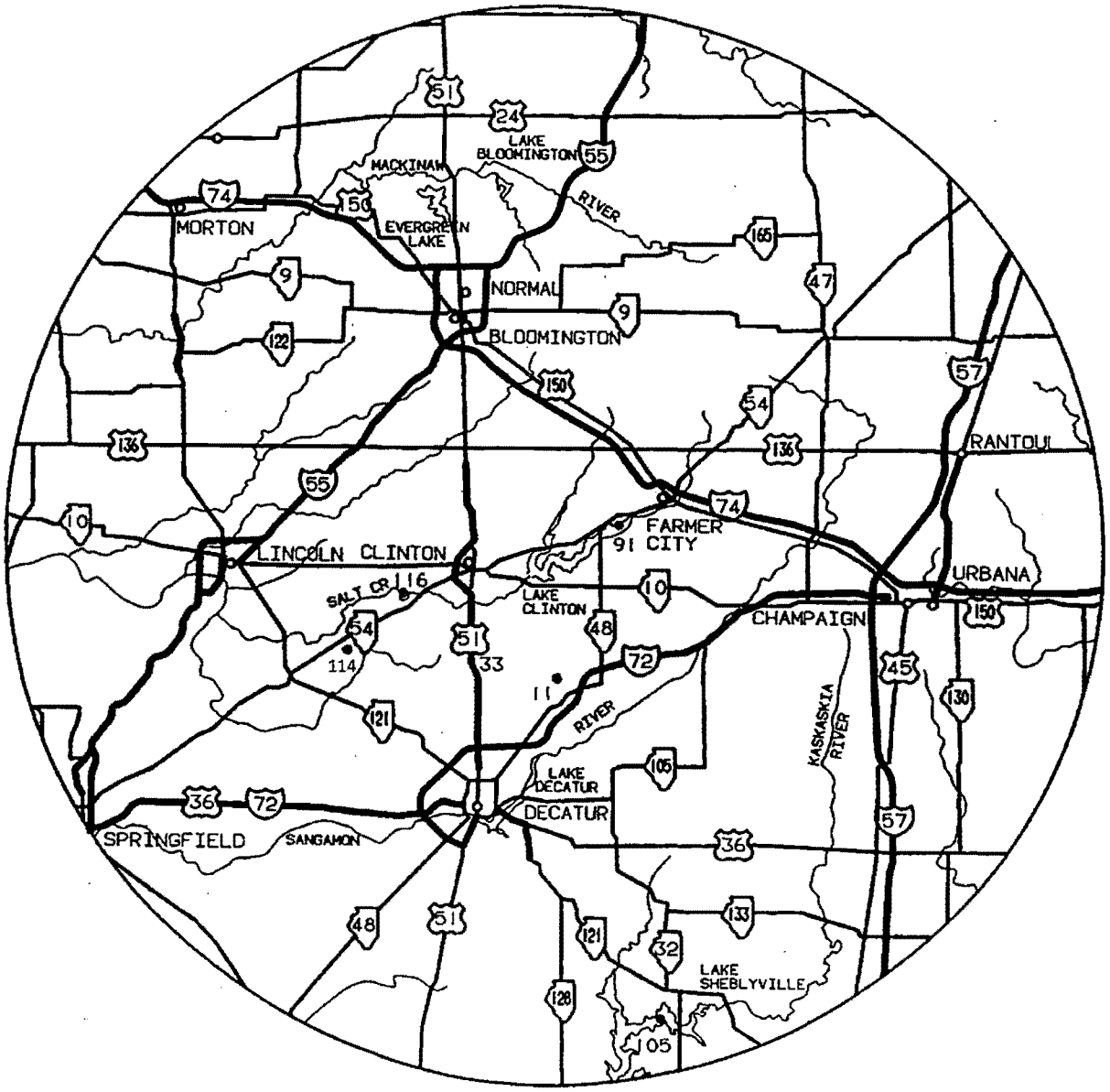

Figure B-4
Environmental Sampling Locations Greater Than Five Miles of the Clinton Power Station, 2022

APPENDIX C

DATA TABLES AND FIGURES

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Table C-I.1 **CONCENTRATIONS OF I-131 IN SURFACE WATER SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2022**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	CL-90
12/29/21 - 01/26/22	< 0.4
01/26/22 - 02/23/22	< 0.9
02/23/22 - 03/30/22	< 0.8
03/30/22 - 04/27/22	< 1.0
04/27/22 - 05/25/22	< 0.6
05/25/22 - 06/29/22	< 0.8
06/29/22 - 07/27/22	< 0.9
07/27/22 - 08/31/22	< 0.9
08/31/22 - 09/28/22	< 0.7
09/28/22 - 10/26/22	< 0.8
10/26/22 - 11/30/22	< 0.6
11/30/22 - 12/28/22	< 0.9
MEAN	-

Table C-I.2 **CONCENTRATIONS OF TRITIUM IN SURFACE WATER SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2022**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	CL-90	CL-13	CL-91	CL-99
12/29/21 - 03/30/22	< 195	< 181	< 185	< 170
03/30/22 - 06/29/22	< 184	< 187	< 168	< 167
06/29/22 - 09/28/22	< 199	< 191	< 190	< 194
09/28/22 - 12/28/22	< 181	< 188	< 180	< 180
MEAN	-	-	-	-

Table C-I.3

CONCENTRATIONS OF GAMMA EMITTERS IN SURFACE WATER SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2022

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION PERIOD	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	01/26/22 - 01/26/22	< 5	< 5	< 7	< 6	< 11	< 5	< 8	< 5	< 4	< 15	< 7	< 31
	02/23/22 - 02/23/22	< 7	< 5	< 11	< 9	< 14	< 6	< 11	< 7	< 7	< 31	< 6	< 39
	03/30/22 - 03/30/22	< 6	< 7	< 9	< 10	< 10	< 5	< 14	< 8	< 8	< 31	< 12	< 43
	04/27/22 - 04/27/22	< 4	< 4	< 8	< 4	< 7	< 5	< 7	< 5	< 4	< 17	< 6	< 32
	05/25/22 - 05/25/22	< 5	< 5	< 11	< 6	< 11	< 6	< 8	< 6	< 6	< 23	< 8	< 34
	06/29/22 - 06/29/22	< 7	< 8	< 14	< 8	< 16	< 7	< 14	< 7	< 6	< 35	< 12	< 35
	07/27/22 - 07/27/22	< 6	< 4	< 12	< 6	< 13	< 5	< 10	< 5	< 5	< 24	< 8	< 34
	08/31/22 - 08/31/22	< 5	< 8	< 11	< 9	< 13	< 8	< 12	< 7	< 6	< 35	< 13	< 42
	09/28/22 - 09/28/22	< 7	< 7	< 11	< 10	< 16	< 8	< 9	< 9	< 7	< 29	< 12	< 44
	10/26/22 - 10/26/22	< 7	< 6	< 15	< 6	< 14	< 7	< 11	< 6	< 6	< 25	< 7	< 45
	11/30/22 - 11/30/22	< 4	< 5	< 8	< 4	< 8	< 5	< 7	< 4	< 4	< 19	< 7	< 31
	12/28/22 - 12/28/22 *(1)*												
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-
CL-90	12/29/21 - 01/26/22	< 4	< 4	< 7	< 4	< 8	< 4	< 8	< 5	< 5	< 16	< 3	< 27
	01/26/22 - 02/23/22	< 5	< 6	< 13	< 7	< 15	< 8	< 11	< 6	< 6	< 30	< 9	< 48
	02/23/22 - 03/30/22	< 6	< 6	< 9	< 6	< 14	< 6	< 11	< 7	< 6	< 32	< 14	< 50
	03/30/22 - 04/27/22	< 4	< 5	< 12	< 5	< 11	< 5	< 9	< 5	< 5	< 20	< 6	< 30
	04/27/22 - 05/25/22	< 5	< 8	< 12	< 7	< 13	< 7	< 9	< 6	< 6	< 27	< 9	< 40
	05/25/22 - 06/29/22	< 6	< 5	< 14	< 6	< 14	< 5	< 11	< 7	< 7	< 34	< 9	< 50
	06/29/22 - 07/27/22	< 5	< 4	< 9	< 5	< 10	< 6	< 11	< 6	< 5	< 24	< 9	< 36
	07/27/22 - 08/31/22	< 5	< 6	< 10	< 6	< 11	< 5	< 10	< 5	< 5	< 26	< 10	< 42
	08/31/22 - 09/28/22	< 7	< 6	< 12	< 8	< 13	< 6	< 12	< 7	< 6	< 35	< 8	< 38
	09/28/22 - 10/26/22	< 6	< 6	< 12	< 6	< 12	< 5	< 8	< 6	< 5	< 27	< 6	< 47
	10/26/22 - 11/30/22	< 5	< 5	< 10	< 6	< 12	< 5	< 7	< 5	< 4	< 23	< 8	< 37
	11/30/22 - 12/28/22	< 7	< 6	< 16	< 7	< 15	< 8	< 11	< 9	< 7	< 41	< 9	< 52
	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, 2022**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION PERIOD	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	12/29/21 - 01/26/22	< 5	< 4	< 9	< 5	< 11	< 5	< 8	< 5	< 5	< 16	< 5	< 35
	01/26/22 - 02/23/22	< 6	< 6	< 10	< 5	< 10	< 5	< 10	< 4	< 5	< 25	< 9	< 34
	02/23/22 - 03/30/22	< 7	< 7	< 14	< 5	< 13	< 7	< 12	< 7	< 6	< 37	< 14	< 60
	03/30/22 - 04/27/22	< 5	< 4	< 10	< 4	< 8	< 5	< 7	< 5	< 5	< 19	< 6	< 41
	04/27/22 - 05/25/22	< 6	< 7	< 12	< 8	< 13	< 6	< 10	< 8	< 7	< 32	< 13	< 43
	05/25/22 - 06/29/22	< 5	< 6	< 12	< 5	< 15	< 6	< 11	< 9	< 5	< 30	< 12	< 53
	06/29/22 - 07/27/22	< 6	< 6	< 12	< 8	< 14	< 6	< 9	< 5	< 6	< 26	< 13	< 36
	07/27/22 - 08/31/22	< 5	< 6	< 12	< 7	< 10	< 6	< 9	< 5	< 5	< 28	< 11	< 40
	08/31/22 - 09/28/22	< 5	< 4	< 13	< 5	< 11	< 6	< 10	< 6	< 6	< 25	< 6	< 50
	09/28/22 - 10/26/22	< 5	< 5	< 11	< 6	< 14	< 7	< 11	< 6	< 6	< 28	< 9	< 41
	10/26/22 - 11/30/22	< 4	< 4	< 11	< 6	< 8	< 5	< 7	< 4	< 5	< 26	< 9	< 32
	11/30/22 - 12/28/22	< 7	< 7	< 14	< 7	< 16	< 8	< 11	< 7	< 7	< 34	< 11	< 54
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-
CL-99	12/29/21 - 01/26/22	< 4	< 4	< 8	< 5	< 7	< 5	< 7	< 4	< 5	< 18	< 6	< 28
	01/26/22 - 02/23/22	< 5	< 5	< 11	< 6	< 10	< 5	< 9	< 5	< 5	< 30	< 9	< 41
	02/23/22 - 03/30/22	< 5	< 5	< 9	< 4	< 12	< 5	< 8	< 5	< 5	< 21	< 7	< 32
	03/30/22 - 04/27/22	< 5	< 4	< 8	< 4	< 10	< 5	< 9	< 4	< 6	< 20	< 7	< 34
	04/27/22 - 05/25/22	< 6	< 6	< 13	< 7	< 11	< 7	< 10	< 6	< 5	< 33	< 13	< 37
	06/29/22 - 06/29/22	< 6	< 5	< 10	< 7	< 13	< 6	< 9	< 7	< 5	< 30	< 11	< 46
	07/27/22 - 07/27/22	< 5	< 5	< 12	< 6	< 13	< 5	< 9	< 6	< 5	< 27	< 9	< 30
	08/31/22 - 08/31/22	< 5	< 5	< 9	< 6	< 10	< 5	< 9	< 6	< 5	< 24	< 7	< 33
	08/31/22 - 09/28/22	< 7	< 8	< 15	< 9	< 12	< 5	< 12	< 6	< 8	< 30	< 12	< 43
	10/26/22 - 10/26/22	< 5	< 4	< 10	< 8	< 13	< 8	< 14	< 6	< 7	< 22	< 12	< 36
	11/30/22 - 11/30/22	< 6	< 7	< 14	< 7	< 13	< 7	< 13	< 7	< 6	< 35	< 8	< 51
	12/14/22 - 12/28/22	< 7	< 7	< 16	< 9	< 12	< 9	< 10	< 6	< 6	< 33	< 9	< 47
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-

Table C-II.1 **CONCENTRATIONS OF GROSS BETA IN DRINKING WATER SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2022**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	CL-14
12/29/21 - 01/26/22	< 1.6
01/26/22 - 02/23/22	< 1.5
02/23/22 - 03/30/22	< 1.4
03/30/22 - 04/27/22	< 1.3
04/27/22 - 05/25/22	< 1.7
05/25/22 - 06/29/22	< 1.7
06/29/22 - 07/27/22	< 1.3
07/27/22 - 08/31/22	< 1.6
08/31/22 - 09/28/22	< 1.7
09/28/22 - 10/26/22	< 1.9
10/26/22 - 11/30/22	< 1.7
11/30/22 - 12/28/22	< 1.5
MEAN	-

Table C-II.2 **CONCENTRATIONS OF TRITIUM IN DRINKING WATER SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2022**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	CL-14
12/29/21 - 03/30/22	< 171
03/30/22 - 06/29/22	< 184
06/29/22 - 09/28/22	< 183
09/28/22 - 12/28/22	< 181
MEAN	-

Table C-II.3 **CONCENTRATIONS OF I-131 IN DRINKING WATER SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2022**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	CL-14
12/29/21 - 01/26/22	< 0.5
01/26/22 - 02/23/22	< 0.8
02/23/22 - 03/30/22	< 0.6
03/30/22 - 04/27/22	< 0.9
04/27/22 - 05/25/22	< 0.9
05/25/22 - 06/29/22	< 0.8
06/29/22 - 07/27/22	< 0.7
07/27/22 - 08/31/22	< 0.9
08/31/22 - 09/28/22	< 0.9
09/28/22 - 10/26/22	< 0.8
10/26/22 - 11/30/22	< 0.6
11/30/22 - 12/28/22	< 0.8
MEAN	-

Table C-II.4

CONCENTRATIONS OF GAMMA EMITTERS IN DRINKING WATER SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2022

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION PERIOD	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-14	12/29/21 - 01/26/22	< 4	< 4	< 8	< 5	< 9	< 5	< 7	< 5	< 5	< 16	< 5	< 30
	01/26/22 - 02/23/22	< 5	< 6	< 10	< 6	< 13	< 8	< 10	< 7	< 6	< 27	< 8	< 39
	02/23/22 - 03/30/22	< 6	< 7	< 10	< 6	< 14	< 7	< 8	< 5	< 5	< 30	< 9	< 44
	03/30/22 - 04/27/22	< 4	< 4	< 9	< 5	< 10	< 4	< 7	< 4	< 3	< 19	< 5	< 31
	04/27/22 - 05/25/22	< 5	< 6	< 11	< 6	< 9	< 6	< 10	< 6	< 7	< 34	< 9	< 49
	05/25/22 - 06/29/22	< 6	< 5	< 18	< 8	< 12	< 8	< 12	< 7	< 9	< 37	< 12	< 40
	06/29/22 - 07/27/22	< 4	< 4	< 10	< 6	< 11	< 4	< 7	< 6	< 5	< 23	< 9	< 35
	07/27/22 - 08/31/22	< 6	< 7	< 12	< 7	< 13	< 6	< 10	< 7	< 7	< 28	< 13	< 42
	08/31/22 - 09/28/22	< 6	< 7	< 14	< 8	< 11	< 5	< 12	< 7	< 7	< 36	< 9	< 51
	09/28/22 - 10/26/22	< 6	< 6	< 13	< 6	< 10	< 6	< 7	< 5	< 7	< 30	< 4	< 38
	10/26/22 - 11/30/22	< 4	< 4	< 10	< 6	< 9	< 5	< 9	< 6	< 5	< 28	< 8	< 39
	11/30/22 - 12/28/22	< 7	< 8	< 14	< 8	< 17	< 7	< 10	< 9	< 9	< 35	< 14	< 52
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-

Table C-III.1 **CONCENTRATIONS OF TRITIUM IN WELL WATER SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2022**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	CL-07D	CL-12R	CL-12T
03/30/22 - 03/30/22	< 181	< 198	< 192
06/29/22 - 06/29/22	< 185	< 183	< 178
09/28/22 - 09/28/22	< 192	< 199	< 191
12/28/22 - 12/28/22	< 170	< 167	< 182
MEAN	-	-	-

Table C-III.2

CONCENTRATIONS OF GAMMA EMITTERS IN WELL WATER SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2022

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION PERIOD	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-07D	03/30/22	< 7	< 7	< 13	< 6	< 15	< 7	< 9	< 7	< 5	< 33	< 14	< 40
	06/29/22	< 7	< 6	< 15	< 7	< 12	< 7	< 12	< 7	< 7	< 32	< 11	< 36
	09/28/22	< 8	< 9	< 16	< 10	< 11	< 6	< 12	< 6	< 8	< 31	< 14	< 40
	12/28/22	< 8	< 8	< 15	< 8	< 14	< 7	< 10	< 7	< 10	< 35	< 7	< 40
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-
CL-12R	03/30/22	< 8	< 7	< 13	< 8	< 14	< 8	< 10	< 8	< 8	< 36	< 13	< 41
	06/29/22	< 5	< 5	< 16	< 8	< 6	< 5	< 14	< 7	< 6	< 37	< 9	< 47
	09/28/22	< 7	< 8	< 12	< 8	< 13	< 7	< 12	< 8	< 6	< 34	< 12	< 51
	12/28/22	< 7	< 7	< 13	< 7	< 13	< 8	< 10	< 7	< 6	< 27	< 6	< 47
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-
CL-12T	03/30/22	< 7	< 8	< 18	< 7	< 13	< 8	< 15	< 8	< 7	< 30	< 12	< 48
	06/29/22	< 7	< 5	< 13	< 7	< 13	< 5	< 13	< 8	< 5	< 32	< 11	< 32
	09/28/22	< 8	< 7	< 15	< 8	< 17	< 8	< 13	< 9	< 7	< 27	< 11	< 43
	12/28/22	< 6	< 7	< 14	< 6	< 14	< 6	< 13	< 5	< 6	< 33	< 11	< 48
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-

Table C-IV.1

CONCENTRATIONS OF GAMMA EMITTERS IN FISH SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2022

RESULTS IN UNITS OF PCI/KG WET ± 2 SIGMA

SITE	COLLECTION PERIOD	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-19													
Largemouth Bass	05/02/22	< 77	< 71	< 195	< 92	< 161	< 74	< 111	< 86	< 74	< 302	< 124	< 327
Channel Catfish	05/02/22	< 75	< 83	< 146	< 80	< 145	< 77	< 117	< 92	< 78	< 307	< 96	< 427
Bluegill	05/02/22	< 78	< 46	< 145	< 79	< 129	< 77	< 114	< 80	< 85	< 299	< 49	< 295
Carp	05/02/22	< 73	< 74	< 137	< 59	< 150	< 74	< 120	< 60	< 84	< 313	< 104	< 379
Largemouth Bass	09/29/22	< 79	< 68	< 149	< 47	< 143	< 78	< 106	< 83	< 61	< 389	< 81	< 427
Channel Catfish	09/29/22	< 66	< 92	< 186	< 98	< 144	< 71	< 157	< 86	< 67	< 317	< 121	< 347
Bluegill	09/29/22	< 61	< 56	< 127	< 57	< 123	< 70	< 102	< 65	< 59	< 243	< 89	< 338
Carp	09/29/22	< 54	< 52	< 109	< 61	< 115	< 66	< 97	< 72	< 62	< 277	< 87	< 314
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-
CL-105													
Largemouth Bass	04/27/22	< 61	< 52	< 94	< 57	< 108	< 50	< 87	< 59	< 50	< 259	< 66	< 283
White Crappie	04/27/22	< 47	< 45	< 98	< 34	< 103	< 37	< 96	< 59	< 42	< 289	< 75	< 256
Bluegill	04/27/22	< 70	< 61	< 151	< 79	< 146	< 69	< 99	< 90	< 56	< 321	< 85	< 302
Carp	04/27/22	< 55	< 57	< 104	< 55	< 150	< 56	< 96	< 69	< 55	< 335	< 98	< 306
Largemouth Bass	09/29/22	< 78	< 55	< 114	< 78	< 106	< 62	< 106	< 69	< 56	< 281	< 82	< 222
White Crappie/White Bass	09/29/22	< 51	< 73	< 165	< 62	< 144	< 52	< 104	< 68	< 54	< 208	< 125	< 240
Bluegill	09/29/22	< 67	< 61	< 185	< 75	< 131	< 64	< 102	< 77	< 71	< 295	< 116	< 335
Carp	09/29/22	< 42	< 59	< 142	< 53	< 123	< 56	< 69	< 51	< 59	< 200	< 58	< 264
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-

Table C-V.1

CONCENTRATIONS OF GAMMA EMITTERS IN SEDIMENT SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2022

RESULTS IN UNITS OF PCI/KG WET ± 2 SIGMA

SITE	COLLECTION PERIOD	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-07B	05/02/22	< 44	< 30	< 79	< 48	< 92	< 45	< 67	< 52	< 42	< 191	< 50	< 174
	09/29/22	< 43	< 36	< 83	< 42	< 137	< 40	< 80	< 47	< 38	< 176	< 66	< 208
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-
CL-105	04/27/22	< 40	< 37	< 91	< 47	< 97	< 44	< 75	< 48	< 37	< 244	< 68	< 208
	09/29/22	< 53	< 53	< 104	< 49	< 134	< 58	< 97	< 52	< 55	< 252	< 81	< 270
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-

Table C-VI.1 CONCENTRATIONS OF GROSS BETA IN AIR PARTICULATE SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2022

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
12/29/21 - 01/05/22	31 ± 5	34 ± 6	32 ± 5	*(1)*	37 ± 6	43 ± 6
01/05/22 - 01/12/22	30 ± 5	29 ± 5	29 ± 5	34 ± 4	27 ± 5	28 ± 5
01/12/22 - 01/19/22	22 ± 5	25 ± 5	23 ± 5	22 ± 5	25 ± 5	24 ± 5
01/19/22 - 01/26/22	22 ± 5	25 ± 5	25 ± 5	26 ± 5	22 ± 5	23 ± 5
01/26/22 - 02/02/22	32 ± 5	29 ± 5	30 ± 5	30 ± 5	26 ± 5	28 ± 5
02/02/22 - 02/09/22	24 ± 5	29 ± 5	28 ± 5	31 ± 5	31 ± 5	22 ± 4
02/09/22 - 02/16/22	13 ± 5	18 ± 5	18 ± 5	15 ± 5	18 ± 5	15 ± 5
02/16/22 - 02/23/22	11 ± 5	13 ± 5	13 ± 5	12 ± 5	15 ± 5	14 ± 5
02/23/22 - 03/02/22	19 ± 5	19 ± 5	23 ± 5	19 ± 5	21 ± 5	21 ± 5
03/02/22 - 03/09/22	22 ± 4	27 ± 5	20 ± 4	21 ± 5	23 ± 5	22 ± 5
03/09/22 - 03/16/22	21 ± 5	16 ± 5	19 ± 5	19 ± 5	18 ± 5	17 ± 5
03/16/22 - 03/23/22	16 ± 5	17 ± 5	17 ± 4	15 ± 4	17 ± 4	14 ± 4
03/23/22 - 03/30/22	11 ± 4	12 ± 4	10 ± 4	11 ± 4	12 ± 4	13 ± 4
03/30/22 - 04/06/22	10 ± 4	10 ± 4	10 ± 4	10 ± 4	14 ± 4	9 ± 4
04/06/22 - 04/13/22	12 ± 4	10 ± 3	15 ± 4	13 ± 4	13 ± 4	17 ± 4
04/13/22 - 04/20/22	10 ± 4	13 ± 4	16 ± 4	21 ± 4	20 ± 4	15 ± 4
04/20/22 - 04/27/22	16 ± 4	18 ± 4	14 ± 4	15 ± 4	19 ± 4	14 ± 4
04/27/22 - 05/04/22	14 ± 4	19 ± 5	15 ± 4	17 ± 5	11 ± 4	15 ± 4
05/04/22 - 05/11/22	14 ± 4	12 ± 4	10 ± 4	15 ± 4	15 ± 4	11 ± 4
05/11/22 - 05/18/22	20 ± 5	23 ± 5	20 ± 5	20 ± 5	17 ± 4	22 ± 5
05/18/22 - 05/25/22	19 ± 5	17 ± 4	19 ± 5	14 ± 4	13 ± 4	16 ± 4
05/25/22 - 06/01/22	15 ± 4	16 ± 4	16 ± 4	17 ± 4	12 ± 4	14 ± 4
06/01/22 - 06/08/22	19 ± 4	19 ± 4	21 ± 5	20 ± 5	19 ± 4	21 ± 5
06/08/22 - 06/15/22	19 ± 5	19 ± 5	20 ± 5	22 ± 5	21 ± 5	20 ± 5
06/15/22 - 06/22/22	14 ± 4	12 ± 4	15 ± 4	20 ± 5	12 ± 4	14 ± 4
06/22/22 - 06/29/22	13 ± 4	12 ± 4	12 ± 4	12 ± 4	10 ± 4	12 ± 4
06/29/22 - 07/06/22	20 ± 4	19 ± 4	17 ± 4	18 ± 4	17 ± 4	21 ± 4
07/06/22 - 07/13/22	13 ± 4	13 ± 4	10 ± 4	12 ± 4	9 ± 4	11 ± 4
07/13/22 - 07/20/22	24 ± 5	23 ± 5	26 ± 5	22 ± 5	23 ± 5	24 ± 5
07/20/22 - 07/27/22	20 ± 5	24 ± 5	20 ± 5	24 ± 5	17 ± 4	21 ± 5
07/27/22 - 08/03/22	15 ± 4	11 ± 4	14 ± 4	12 ± 4	13 ± 4	18 ± 5
08/03/22 - 08/10/22	15 ± 4	13 ± 3	16 ± 4	11 ± 3	8 ± 3	16 ± 4
08/10/22 - 08/17/22	18 ± 4	23 ± 5	23 ± 5	21 ± 4	17 ± 4	23 ± 5
08/17/22 - 08/24/22	17 ± 4	15 ± 4	14 ± 4	*(1)*	15 ± 4	12 ± 4
08/24/22 - 08/31/22	22 ± 4	22 ± 4	23 ± 4	22 ± 4	23 ± 5	25 ± 5
08/31/22 - 09/07/22	20 ± 5	21 ± 5	21 ± 5	22 ± 5	16 ± 4	18 ± 4
09/07/22 - 09/14/22	22 ± 4	23 ± 5	23 ± 5	18 ± 4	21 ± 4	19 ± 4
09/14/22 - 09/21/22	24 ± 5	25 ± 5	22 ± 5	25 ± 5	21 ± 4	26 ± 5
09/21/22 - 09/28/22	15 ± 4	17 ± 4	16 ± 4	16 ± 4	17 ± 4	15 ± 4
09/28/22 - 10/05/22	12 ± 4	17 ± 4	15 ± 4	14 ± 4	14 ± 4	18 ± 4
10/05/22 - 10/12/22	22 ± 4	25 ± 5	25 ± 5	24 ± 5	26 ± 5	26 ± 5
10/12/22 - 10/19/22	12 ± 4	14 ± 4	11 ± 3	16 ± 4	11 ± 4	13 ± 4
10/19/22 - 10/26/22	26 ± 5	32 ± 5	24 ± 5	26 ± 5	24 ± 5	29 ± 5
10/26/22 - 11/02/22	21 ± 4	27 ± 5	28 ± 5	28 ± 5	26 ± 5	29 ± 5
11/02/22 - 11/09/22	27 ± 5	28 ± 5	29 ± 5	28 ± 5	27 ± 5	28 ± 5
11/09/22 - 11/16/22	14 ± 4	17 ± 4	14 ± 4	14 ± 4	15 ± 4	24 ± 5
11/16/22 - 11/23/22	25 ± 5	25 ± 5	30 ± 5	27 ± 5	25 ± 5	28 ± 5
11/23/22 - 11/30/22	34 ± 5	37 ± 5	38 ± 5	37 ± 5	37 ± 5	43 ± 6
11/30/22 - 12/07/22	24 ± 4	32 ± 5	36 ± 5	28 ± 5	28 ± 5	34 ± 5
12/07/22 - 12/14/22	27 ± 5	31 ± 5	32 ± 5	29 ± 5	31 ± 5	36 ± 5
12/14/22 - 12/21/22	22 ± 4	27 ± 5	26 ± 5	28 ± 5	27 ± 5	30 ± 5
12/21/22 - 12/28/22	27 ± 5	27 ± 5	28 ± 5	29 ± 5	28 ± 5	33 ± 5
12/28/22 - 01/04/23	30 ± 5	24 ± 4	30 ± 5	25 ± 5	25 ± 5	33 ± 5
MEAN ± 2 STD DEV	19 ± 12	21 ± 14	21 ± 14	20 ± 13	20 ± 14	21 ± 16

THE MEAN AND TWO 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, 2022

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

COLLECTION PERIOD	GROUP II			GROUP III
	CL-1	CL-7	CL-8	CL-11
12/29/21 - 01/05/22	31 ± 5	30 ± 5	34 ± 6	32 ± 5
01/05/22 - 01/12/22	41 ± 6	28 ± 5	28 ± 5	34 ± 5
01/12/22 - 01/19/22	22 ± 5	24 ± 5	24 ± 5	25 ± 5
01/19/22 - 01/26/22	17 ± 5	21 ± 5	21 ± 5	26 ± 5
01/26/22 - 02/02/22	22 ± 5	28 ± 5	27 ± 5	27 ± 5
02/02/22 - 02/09/22	27 ± 5	29 ± 5	25 ± 5	33 ± 5
02/09/22 - 02/16/22	17 ± 5	13 ± 5	15 ± 5	17 ± 5
02/16/22 - 02/23/22	15 ± 5	11 ± 5	8 ± 5	16 ± 5
02/23/22 - 03/02/22	22 ± 5	24 ± 5	17 ± 5	20 ± 5
03/02/22 - 03/09/22	19 ± 4	25 ± 5	21 ± 5	23 ± 5
03/09/22 - 03/16/22	17 ± 5	19 ± 5	17 ± 5	19 ± 5
03/16/22 - 03/23/22	13 ± 4	14 ± 4	16 ± 4	15 ± 4
03/23/22 - 03/30/22	11 ± 4	11 ± 4	12 ± 4	12 ± 4
03/30/22 - 04/06/22	9 ± 4	11 ± 4	9 ± 4	15 ± 4
04/06/22 - 04/13/22	13 ± 4	11 ± 4	14 ± 4	13 ± 4
04/13/22 - 04/20/22	14 ± 4	13 ± 4	16 ± 4	15 ± 4
04/20/22 - 04/27/22	14 ± 4	15 ± 4	16 ± 4	18 ± 4
04/27/22 - 05/04/22	15 ± 4	14 ± 4	12 ± 4	17 ± 5
05/04/22 - 05/11/22	9 ± 4	13 ± 4	12 ± 4	13 ± 4
05/11/22 - 05/18/22	18 ± 5	19 ± 5	20 ± 5	22 ± 5
05/18/22 - 05/25/22	20 ± 5	11 ± 4	14 ± 4	18 ± 4
05/25/22 - 06/01/22	14 ± 4	13 ± 4	10 ± 4	19 ± 5
06/01/22 - 06/08/22	15 ± 4	18 ± 4	21 ± 5	22 ± 5
06/08/22 - 06/15/22	17 ± 4	20 ± 5	18 ± 5	23 ± 5
06/15/22 - 06/22/22	12 ± 4	10 ± 4	14 ± 4	14 ± 4
06/22/22 - 06/29/22	8 ± 4	10 ± 4	13 ± 4	15 ± 4
06/29/22 - 07/06/22	15 ± 4	17 ± 4	19 ± 4	25 ± 5
07/06/22 - 07/13/22	11 ± 4	13 ± 4	16 ± 4	12 ± 4
07/13/22 - 07/20/22	20 ± 4	18 ± 4	26 ± 5	24 ± 5
07/20/22 - 07/27/22	14 ± 4	14 ± 4	20 ± 5	22 ± 5
07/27/22 - 08/03/22	14 ± 4	13 ± 4	14 ± 4	15 ± 4
08/03/22 - 08/10/22	14 ± 4	13 ± 3	15 ± 4	13 ± 3
08/10/22 - 08/17/22	21 ± 4	20 ± 4	22 ± 5	23 ± 5
08/17/22 - 08/24/22	23 ± 5	*(1)*	15 ± 4	*(1)*
08/24/22 - 08/31/22	23 ± 4	*(1)*	26 ± 5	22 ± 4
08/31/22 - 09/07/22	15 ± 4	18 ± 5	20 ± 5	20 ± 5
09/07/22 - 09/14/22	20 ± 4	21 ± 4	23 ± 5	19 ± 4
09/14/22 - 09/21/22	23 ± 4	21 ± 4	25 ± 5	24 ± 5
09/21/22 - 09/28/22	13 ± 4	16 ± 4	21 ± 4	17 ± 4
09/28/22 - 10/05/22	14 ± 4	15 ± 4	18 ± 4	18 ± 4
10/05/22 - 10/12/22	22 ± 5	21 ± 4	31 ± 5	26 ± 5
10/12/22 - 10/19/22	13 ± 4	14 ± 4	13 ± 4	17 ± 4
10/19/22 - 10/26/22	29 ± 5	20 ± 5	27 ± 5	31 ± 5
10/26/22 - 11/02/22	20 ± 4	22 ± 4	30 ± 5	34 ± 5
11/02/22 - 11/09/22	26 ± 5	20 ± 4	34 ± 5	29 ± 5
11/09/22 - 11/16/22	14 ± 4	8 ± 4	16 ± 4	16 ± 4
11/16/22 - 11/23/22	28 ± 5	23 ± 5	29 ± 5	28 ± 5
11/23/22 - 11/30/22	42 ± 6	32 ± 5	36 ± 5	43 ± 6
11/30/22 - 12/07/22	31 ± 5	23 ± 4	30 ± 5	30 ± 5
12/07/22 - 12/14/22	39 ± 5	28 ± 5	32 ± 5	34 ± 5
12/14/22 - 12/21/22	29 ± 5	26 ± 4	24 ± 4	31 ± 5
12/21/22 - 12/28/22	25 ± 5	26 ± 5	30 ± 5	26 ± 5
12/28/22 - 01/04/23	33 ± 5	20 ± 4	23 ± 4	30 ± 5
MEAN ± 2 STD DEV	20 ± 16	18 ± 12	20 ± 14	22 ± 14

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

(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, 2022

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
12/29/21 - 02/02/22	22	43	28 ± 10	12/29/21 - 02/02/22	17	41	26 ± 12	12/29/21 - 02/02/22	25	34	29 ± 8
02/02/22 - 03/02/22	11	31	19 ± 12	02/02/22 - 03/02/22	8	29	19 ± 13	02/02/22 - 03/02/22	16	33	22 ± 16
03/02/22 - 03/30/22	10	27	17 ± 9	03/02/22 - 03/30/22	11	25	16 ± 9	03/02/22 - 03/30/22	12	23	17 ± 10
03/30/22 - 04/27/22	9	21	14 ± 7	03/30/22 - 04/27/22	9	16	13 ± 5	03/30/22 - 04/27/22	13	18	15 ± 4
04/27/22 - 06/01/22	10	23	16 ± 6	04/27/22 - 06/01/22	9	20	14 ± 7	04/27/22 - 06/01/22	13	22	18 ± 7
06/01/22 - 06/29/22	10	22	17 ± 8	06/01/22 - 06/29/22	8	21	15 ± 9	06/01/22 - 06/29/22	14	23	18 ± 9
06/29/22 - 08/03/22	9	26	18 ± 10	06/29/22 - 08/03/22	11	26	16 ± 7	06/29/22 - 08/03/22	12	25	20 ± 12
08/03/22 - 08/31/22	8	25	18 ± 9	08/03/22 - 08/31/22	13	26	19 ± 9	08/03/22 - 08/31/22	13	23	19 ± 11
08/31/22 - 09/28/22	15	26	20 ± 7	08/31/22 - 09/28/22	13	25	20 ± 7	08/31/22 - 09/28/22	17	24	20 ± 6
09/28/22 - 11/02/22	11	32	21 ± 13	09/28/22 - 11/02/22	13	31	21 ± 13	09/28/22 - 11/02/22	17	34	25 ± 15
11/02/22 - 11/30/22	14	43	27 ± 16	11/02/22 - 11/30/22	8	42	26 ± 20	11/02/22 - 11/30/22	16	43	29 ± 22
11/30/22 - 01/04/23	22	36	29 ± 7	11/30/22 - 01/04/23	20	39	28 ± 10	11/30/22 - 01/04/23	26	34	30 ± 6
12/29/21 - 01/04/23	8	43	20 ± 14	12/29/21 - 01/04/23	8	42	19 ± 14	12/29/21 - 01/04/23	12	43	22 ± 14

Table C-VI.3 **CONCENTRATIONS OF GAMMA EMITTERS IN AIR PARTICULATE SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2022**

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

SITE	COLLECTION PERIOD	Co-60	Nb-95	Zr-95	Ru-103	Ru-106	Cs-134	Cs-137	Ce-141	Ce-144
CL-1	12/29/21 - 03/30/22	< 3	< 4	< 7	< 4	< 25	< 3	< 3	< 5	< 14
	03/30/22 - 06/29/22	< 2	< 3	< 5	< 3	< 26	< 4	< 3	< 3	< 10
	06/29/22 - 09/28/22	< 4	< 3	< 5	< 4	< 25	< 3	< 3	< 5	< 13
	09/28/22 - 01/04/23	< 3	< 3	< 5	< 2	< 23	< 3	< 3	< 4	< 12
	MEAN	-	-	-	-	-	-	-	-	-
CL-2	12/29/21 - 03/30/22	< 2	< 2	< 4	< 2	< 17	< 2	< 2	< 3	< 9
	03/30/22 - 06/29/22	< 2	< 2	< 5	< 2	< 16	< 2	< 2	< 3	< 6
	06/29/22 - 09/28/22	< 3	< 3	< 5	< 3	< 24	< 3	< 2	< 4	< 11
	09/28/22 - 01/04/23	< 2	< 2	< 3	< 2	< 11	< 2	< 2	< 2	< 7
	MEAN	-	-	-	-	-	-	-	-	-
CL-3	12/29/21 - 03/30/22	< 2	< 2	< 5	< 3	< 18	< 2	< 2	< 3	< 9
	03/30/22 - 06/29/22	< 3	< 2	< 3	< 2	< 17	< 2	< 2	< 3	< 8
	06/29/22 - 09/28/22	< 2	< 2	< 3	< 2	< 18	< 2	< 2	< 3	< 7
	09/28/22 - 01/04/23	< 2	< 2	< 1	< 1	< 17	< 2	< 2	< 2	< 6
	MEAN	-	-	-	-	-	-	-	-	-
CL-4	12/29/21 - 03/30/22	< 4	< 4	< 7	< 4	< 27	< 4	< 3	< 4	< 12
	03/30/22 - 06/29/22	< 2	< 2	< 3	< 3	< 14	< 2	< 2	< 3	< 7
	06/29/22 - 09/28/22	< 2	< 3	< 4	< 2	< 14	< 2	< 2	< 3	< 5
	09/28/22 - 01/04/23	< 3	< 2	< 4	< 3	< 23	< 2	< 2	< 3	< 11
	MEAN	-	-	-	-	-	-	-	-	-
CL-6	12/29/21 - 03/30/22	< 3	< 2	< 6	< 2	< 19	< 3	< 2	< 3	< 9
	03/30/22 - 06/29/22	< 4	< 3	< 4	< 2	< 21	< 2	< 2	< 3	< 10
	06/29/22 - 09/28/22	< 3	< 4	< 8	< 4	< 25	< 3	< 3	< 5	< 13
	09/28/22 - 01/04/23	< 3	< 2	< 3	< 2	< 12	< 2	< 2	< 2	< 7
	MEAN	-	-	-	-	-	-	-	-	-

Table C-VI.3 CONCENTRATIONS OF GAMMA EMITTERS IN AIR PARTICULATE SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2022

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

SITE	COLLECTION PERIOD	Co-60	Nb-95	Zr-95	Ru-103	Ru-106	Cs-134	Cs-137	Ce-141	Ce-144
CL-7	12/29/21 - 03/30/22	< 3	< 3	< 5	< 3	< 21	< 2	< 2	< 4	< 10
	03/30/22 - 06/29/22	< 3	< 4	< 6	< 4	< 26	< 4	< 3	< 3	< 11
	06/29/22 - 09/28/22	< 3	< 4	< 6	< 4	< 27	< 4	< 3	< 5	< 11
	09/28/22 - 01/04/23	< 2	< 2	< 3	< 1	< 10	< 2	< 2	< 2	< 7
	MEAN	-	-	-	-	-	-	-	-	-
CL-8	12/29/21 - 03/30/22	< 2	< 3	< 6	< 3	< 20	< 3	< 3	< 4	< 10
	03/30/22 - 06/29/22	< 2	< 2	< 3	< 3	< 20	< 2	< 2	< 3	< 6
	06/29/22 - 09/28/22	< 2	< 2	< 4	< 2	< 16	< 2	< 2	< 3	< 8
	09/28/22 - 01/04/23	< 3	< 1	< 4	< 2	< 16	< 2	< 2	< 3	< 7
	MEAN	-	-	-	-	-	-	-	-	-
CL-11	12/29/21 - 03/30/22	< 2	< 2	< 3	< 2	< 15	< 2	< 2	< 3	< 7
	03/30/22 - 06/29/22	< 3	< 2	< 6	< 3	< 25	< 4	< 3	< 3	< 10
	06/29/22 - 09/28/22	< 2	< 3	< 5	< 2	< 17	< 2	< 1	< 3	< 7
	09/28/22 - 01/04/23	< 2	< 3	< 5	< 2	< 24	< 3	< 3	< 4	< 12
	MEAN	-	-	-	-	-	-	-	-	-
CL-15	12/29/21 - 03/30/22	< 2	< 2	< 3	< 3	< 18	< 2	< 2	< 3	< 7
	03/30/22 - 06/29/22	< 3	< 3	< 4	< 3	< 20	< 2	< 2	< 3	< 11
	06/29/22 - 09/28/22	< 3	< 3	< 5	< 3	< 26	< 3	< 2	< 5	< 12
	09/28/22 - 01/04/23	< 2	< 2	< 4	< 1	< 15	< 2	< 2	< 2	< 6
	MEAN	-	-	-	-	-	-	-	-	-
CL-94	12/29/21 - 03/30/22	< 2	< 2	< 4	< 2	< 18	< 2	< 2	< 3	< 9
	03/30/22 - 06/29/22	< 2	< 2	< 4	< 2	< 15	< 2	< 2	< 2	< 8
	06/29/22 - 09/28/22	< 3	< 3	< 5	< 3	< 21	< 3	< 2	< 4	< 9
	09/28/22 - 01/04/23	< 2	< 2	< 3	< 2	< 10	< 2	< 2	< 2	< 6
	MEAN	-	-	-	-	-	-	-	-	-

Table C-VII.1 **CONCENTRATIONS OF I-131 IN AIR IODINE SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2022**

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
12/29/21 - 01/05/22	< 17	< 33	< 33	*(1)*	< 39	< 38
01/05/22 - 01/12/22	< 46	< 46	< 46	< 10	< 43	< 43
01/12/22 - 01/19/22	< 24	< 24	< 24	< 25	< 18	< 18
01/19/22 - 01/26/22	< 30	< 31	< 30	< 30	< 26	< 25
01/26/22 - 02/02/22	< 33	< 27	< 32	< 32	< 37	< 37
02/02/22 - 02/09/22	< 39	< 39	< 38	< 38	< 13	< 30
02/09/22 - 02/16/22	< 50	< 50	< 50	< 22	< 17	< 35
02/16/22 - 02/23/22	< 39	< 39	< 39	< 27	< 34	< 33
02/23/22 - 03/02/22	< 40	< 41	< 41	< 40	< 16	< 32
03/02/22 - 03/09/22	< 44	< 44	< 44	< 22	< 24	< 58
03/09/22 - 03/16/22	< 18	< 38	< 37	< 37	< 56	< 56
03/16/22 - 03/23/22	< 28	< 33	< 25	< 26	< 33	< 14
03/23/22 - 03/30/22	< 59	< 59	< 59	< 59	< 41	< 17
03/30/22 - 04/06/22	< 30	< 15	< 30	< 31	< 13	< 28
04/06/22 - 04/13/22	< 26	< 25	< 25	< 15	< 40	< 19
04/13/22 - 04/20/22	< 54	< 54	< 54	< 26	< 34	< 34
04/20/22 - 04/27/22	< 34	< 34	< 33	< 23	< 41	< 41
04/27/22 - 05/04/22	< 57	< 23	< 56	< 58	< 43	< 43
05/04/22 - 05/11/22	< 43	< 19	< 43	< 43	< 30	< 29
05/11/22 - 05/18/22	< 46	< 45	< 46	< 47	< 29	< 29
05/18/22 - 05/25/22	< 36	< 29	< 36	< 36	< 60	< 26
05/25/22 - 06/01/22	< 51	< 52	< 52	< 52	< 43	< 43
06/01/22 - 06/08/22	< 53	< 53	< 53	< 55	< 53	< 52
06/08/22 - 06/15/22	< 54	< 54	< 54	< 55	< 57	< 57
06/15/22 - 06/22/22	< 41	< 41	< 40	< 20	< 36	< 36
06/22/22 - 06/29/22	< 53	< 54	< 53	< 23	< 58	< 24
06/29/22 - 07/06/22	< 21	< 51	< 51	< 51	< 25	< 59
07/06/22 - 07/13/22	< 19	< 47	< 46	< 47	< 64	< 64
07/13/22 - 07/20/22	< 19	< 46	< 46	< 47	< 48	< 20
07/20/22 - 07/27/22	< 47	< 46	< 20	< 47	< 51	< 51
07/27/22 - 08/03/22	< 36	< 36	< 35	< 15	< 46	< 45
08/03/22 - 08/10/22	< 24	< 30	< 29	< 30	< 60	< 60
08/10/22 - 08/17/22	< 23	< 27	< 27	< 27	< 27	< 32
08/17/22 - 08/24/22	< 19	< 38	< 38	< 38	< 14	< 31
08/24/22 - 08/31/22	< 57	< 48	< 57	< 57	< 67	< 68
08/31/22 - 09/07/22	< 45	< 44	< 45	< 19	< 47	< 47
09/07/22 - 09/14/22	< 53	< 52	< 52	< 22	< 59	< 59
09/14/22 - 09/21/22	< 55	< 23	< 56	< 56	< 29	< 35
09/21/22 - 09/28/22	< 51	< 50	< 51	< 50	< 53	< 22
09/28/22 - 10/05/22	< 50	< 50	< 50	< 21	< 65	< 66
10/05/22 - 10/12/22	< 44	< 44	< 44	< 44	< 59	< 24
10/12/22 - 10/19/22	< 16	< 20	< 20	< 20	< 27	< 11
10/19/22 - 10/26/22	< 19	< 47	< 49	< 47	< 46	< 46
10/26/22 - 11/02/22	< 27	< 41	< 40	< 41	< 41	< 41
11/02/22 - 11/09/22	< 54	< 54	< 53	< 53	< 22	< 50
11/09/22 - 11/16/22	< 50	< 51	< 50	< 21	< 43	< 21
11/16/22 - 11/23/22	< 51	< 49	< 52	< 51	< 22	< 46
11/23/22 - 11/30/22	< 23	< 23	< 23	< 23	< 14	< 33
11/30/22 - 12/07/22	< 63	< 62	< 27	< 64	< 46	< 22
12/07/22 - 12/14/22	< 50	< 50	< 21	< 50	< 53	< 22
12/14/22 - 12/21/22	< 44	< 45	< 45	< 44	< 43	< 42
12/21/22 - 12/28/22	< 45	< 46	< 47	< 47	< 38	< 38
12/28/22 - 01/04/23	< 41	< 41	< 21	< 41	< 43	< 43
MEAN	-	-	-	-	-	-

(1) SEE PROGRAM EXCEPTIONS SECTION FOR EXPLANATION

Table C-VII.1 **CONCENTRATIONS OF I-131 IN AIR IODINE SAMPLES**
COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2022
RESULTS IN UNITS OF E-3 PCI/CU METER ± 2 SIGMA

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

(1) SEE PROGRAM EXCEPTIONS SECTION FOR EXPLANATION

Table C-VIII.1 CONCENTRATIONS OF I-131 IN MILK SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2022

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	CONTROL FARM CL-116
01/26/22	< 0.8
02/23/22	< 0.9
03/30/22	< 0.9
04/27/22	< 1.0
05/11/22	< 0.6
05/25/22	< 0.7
06/08/22	< 0.9
06/22/22	< 0.8
07/06/22	< 0.9
07/20/22	< 0.8
08/03/22	< 0.8
08/17/22	< 0.8
08/31/22	< 0.9
09/14/22	< 0.9
09/28/22	< 0.7
10/12/22	< 0.9
10/26/22	< 0.9
11/30/22	< 0.8
12/28/22	< 0.9
MEAN	-

Table C-VIII.2

CONCENTRATIONS OF GAMMA EMITTERS IN MILK SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2022

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION PERIOD	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	01/26/22	1200 ± 124	< 5	< 5	< 10	< 5	< 13	< 5	< 9	< 6	< 5	< 20	< 5	< 38
	02/23/22	1066 ± 152	< 7	< 8	< 18	< 7	< 15	< 7	< 12	< 8	< 7	< 37	< 10	< 51
	03/30/22	947 ± 179	< 8	< 7	< 19	< 8	< 18	< 8	< 13	< 9	< 9	< 39	< 12	< 48
	04/27/22	839 ± 156	< 8	< 9	< 17	< 8	< 19	< 9	< 12	< 8	< 10	< 42	< 11	< 64
	05/11/22	721 ± 161	< 6	< 6	< 11	< 7	< 16	< 5	< 12	< 7	< 7	< 27	< 12	< 43
	05/25/22	1073 ± 168	< 7	< 9	< 16	< 9	< 17	< 8	< 14	< 7	< 8	< 38	< 9	< 52
	06/08/22	669 ± 140	< 8	< 9	< 16	< 11	< 16	< 5	< 16	< 8	< 9	< 27	< 10	< 54
	06/22/22	874 ± 167	< 8	< 7	< 18	< 10	< 16	< 9	< 14	< 6	< 8	< 39	< 9	< 47
	07/06/22	936 ± 150	< 6	< 7	< 18	< 9	< 13	< 7	< 12	< 8	< 6	< 27	< 8	< 42
	07/20/22	1180 ± 138	< 8	< 8	< 18	< 9	< 20	< 8	< 15	< 9	< 7	< 37	< 10	< 52
	08/03/22	841 ± 128	< 7	< 6	< 15	< 7	< 13	< 6	< 12	< 7	< 7	< 28	< 11	< 36
	08/17/22	1018 ± 180	< 7	< 8	< 18	< 8	< 18	< 7	< 13	< 9	< 9	< 29	< 12	< 49
	08/31/22	1139 ± 147	< 5	< 5	< 14	< 6	< 13	< 7	< 12	< 6	< 6	< 27	< 10	< 49
	09/14/22	972 ± 197	< 10	< 11	< 24	< 14	< 21	< 15	< 18	< 11	< 11	< 49	< 14	< 93
	09/28/22	846 ± 187	< 10	< 6	< 14	< 9	< 17	< 9	< 13	< 9	< 8	< 37	< 10	< 53
	10/12/22	635 ± 127	< 6	< 6	< 16	< 10	< 17	< 9	< 14	< 9	< 7	< 31	< 11	< 48
	10/26/22	1185 ± 178	< 9	< 7	< 15	< 8	< 17	< 7	< 13	< 8	< 6	< 39	< 11	< 60
	11/30/22	1089 ± 166	< 8	< 6	< 19	< 6	< 18	< 6	< 14	< 9	< 7	< 35	< 12	< 45
	12/28/22	960 ± 155	< 8	< 8	< 17	< 7	< 19	< 7	< 12	< 9	< 9	< 32	< 9	< 54
	MEAN ± 2 STD DEV	957 ± 343	-	-	-	-	-	-	-	-	-	-	-	-

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

Table C-IX.1

CONCENTRATIONS OF GAMMA EMITTERS IN VEGETATION SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2022

RESULTS IN UNITS OF PCI/KG WET ± 2 SIGMA

SITE	COLLECTION PERIOD	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														
Kale	06/29/22	< 22	< 23	< 53	< 31	< 59	< 23	< 46	< 35	< 28	< 22	< 116	< 39	< 104
Lettuce	06/29/22	< 28	< 24	< 76	< 33	< 72	< 32	< 57	< 56	< 32	< 33	< 144	< 17	< 206
Swiss Chard	06/29/22	< 24	< 27	< 63	< 30	< 78	< 29	< 49	< 54	< 29	< 30	< 125	< 27	< 186
Kale	07/27/22	< 44	< 33	< 79	< 38	< 90	< 31	< 73	< 52	< 43	< 37	< 158	< 39	< 187
Lettuce	07/27/22	< 29	< 31	< 81	< 36	< 77	< 30	< 53	< 41	< 32	< 35	< 135	< 22	< 176
Swiss Chard	07/27/22	< 28	< 39	< 81	< 39	< 77	< 31	< 61	< 48	< 37	< 36	< 116	< 11	< 216
Kale	08/31/22	< 29	< 29	< 75	< 35	< 73	< 29	< 52	< 55	< 32	< 28	< 153	< 51	< 144
Lettuce	08/31/22	< 21	< 24	< 64	< 24	< 61	< 25	< 42	< 52	< 26	< 21	< 137	< 34	< 129
Swiss Chard	08/31/22	< 26	< 29	< 71	< 29	< 71	< 33	< 46	< 58	< 27	< 28	< 160	< 56	< 152
Kale	09/28/22	< 35	< 36	< 88	< 49	< 96	< 39	< 66	< 54	< 40	< 41	< 149	< 52	< 203
Cabbage	09/28/22	< 36	< 32	< 63	< 43	< 83	< 34	< 58	< 53	< 35	< 34	< 161	< 38	< 200
Swiss Chard	09/28/22	< 45	< 28	< 66	< 30	< 89	< 34	< 45	< 50	< 43	< 36	< 143	< 39	< 189
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-	-
CL-115														
Kale	06/29/22	< 32	< 35	< 68	< 30	< 78	< 33	< 53	< 55	< 36	< 26	< 148	< 23	< 168
Lettuce	06/29/22	< 23	< 22	< 22	< 18	< 42	< 21	< 33	< 28	< 21	< 17	< 79	< 40	< 89
Swiss Chard	06/29/22	< 17	< 16	< 40	< 18	< 37	< 16	< 27	< 26	< 16	< 13	< 92	< 15	< 94
Kale	07/27/22	< 30	< 24	< 54	< 31	< 57	< 26	< 49	< 37	< 28	< 28	< 122	< 36	< 123
Lettuce	07/27/22	< 26	< 23	< 46	< 26	< 46	< 23	< 35	< 31	< 28	< 26	< 107	< 22	< 156
Swiss Chard	07/27/22	< 18	< 20	< 50	< 24	< 41	< 20	< 31	< 34	< 19	< 23	< 90	< 19	< 135
Kale	08/31/22	< 20	< 23	< 48	< 24	< 51	< 25	< 41	< 55	< 21	< 23	< 136	< 26	< 135
Lettuce	08/31/22	< 22	< 20	< 56	< 23	< 54	< 22	< 43	< 51	< 25	< 20	< 135	< 49	< 105
Swiss Chard	08/31/22	< 23	< 24	< 55	< 25	< 50	< 24	< 35	< 58	< 22	< 26	< 135	< 32	< 106
Kale	09/28/22	< 31	< 28	< 61	< 33	< 69	< 38	< 54	< 48	< 27	< 32	< 141	< 37	< 199
Cabbage	09/28/22	< 25	< 23	< 56	< 27	< 56	< 23	< 48	< 46	< 27	< 24	< 124	< 32	< 171
Swiss Chard	09/28/22	< 30	< 32	< 70	< 32	< 80	< 32	< 53	< 53	< 34	< 37	< 146	< 51	< 191
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-	-
CL-118														
Cabbage/Kale	06/29/22	< 30	< 31	< 74	< 37	< 81	< 32	< 64	< 39	< 33	< 31	< 146	< 35	< 139
Lettuce	06/29/22	< 24	< 24	< 54	< 23	< 56	< 25	< 39	< 34	< 25	< 21	< 102	< 43	< 96
Swiss Chard/Lettuce	06/29/22	< 21	< 21	< 57	< 21	< 46	< 26	< 42	< 37	< 24	< 22	< 105	< 26	< 143
Kale	07/27/22	< 34	< 43	< 67	< 32	< 77	< 37	< 65	< 53	< 42	< 35	< 182	< 30	< 254
Lettuce	07/27/22	< 24	< 31	< 50	< 23	< 62	< 25	< 49	< 45	< 31	< 29	< 129	< 33	< 191
Swiss Chard	07/27/22	< 33	< 32	< 73	< 29	< 82	< 29	< 59	< 53	< 37	< 40	< 145	< 43	< 194
Kale	08/31/22	< 13	< 13	< 32	< 15	< 30	< 14	< 24	< 37	< 14	< 13	< 88	< 22	< 71
Lettuce	08/31/22	< 20	< 26	< 54	< 21	< 51	< 25	< 36	< 56	< 27	< 20	< 139	< 29	< 136
Cabbage	08/31/22	< 22	< 18	< 51	< 23	< 51	< 20	< 34	< 57	< 22	< 21	< 122	< 37	< 120
Swiss Chard	09/28/22	< 36	< 36	< 62	< 32	< 79	< 33	< 63	< 50	< 39	< 31	< 155	< 48	< 221
Cabbage	09/28/22	< 33	< 37	< 68	< 35	< 85	< 31	< 59	< 50	< 34	< 33	< 118	< 44	< 228
Cabbage	09/28/22	< 37	< 31	< 71	< 34	< 86	< 36	< 58	< 49	< 36	< 39	< 164	< 42	< 189
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-	-

Table C-IX.2

CONCENTRATIONS OF GAMMA EMITTERS IN GRASS SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2022

RESULTS IN UNITS OF PCI/KG WET ± 2 SIGMA

SITE	COLLECTION PERIOD	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	05/11/22	< 32	< 37	< 63	< 38	< 80	< 31	< 53	< 39	< 33	< 32	< 107	< 41	< 169
	05/25/22	< 32	< 35	< 73	< 32	< 67	< 35	< 67	< 50	< 32	< 28	< 137	< 39	< 163
	06/08/22	< 24	< 20	< 39	< 22	< 53	< 26	< 37	< 28	< 24	< 22	< 99	< 33	< 110
	06/22/22	< 26	< 30	< 73	< 32	< 74	< 30	< 55	< 46	< 34	< 29	< 124	< 46	< 149
	07/06/22	< 32	< 36	< 70	< 28	< 74	< 34	< 52	< 50	< 37	< 23	< 154	< 39	< 189
	07/20/22	< 28	< 25	< 64	< 36	< 67	< 28	< 45	< 39	< 36	< 28	< 130	< 45	< 151
	08/03/22	< 31	< 24	< 46	< 30	< 62	< 23	< 51	< 31	< 25	< 25	< 93	< 29	< 173
	08/17/22	< 25	< 24	< 66	< 34	< 61	< 27	< 43	< 29	< 28	< 31	< 102	< 33	< 182
	08/31/22	< 24	< 28	< 56	< 31	< 54	< 25	< 41	< 44	< 28	< 25	< 118	< 34	< 160
	09/14/22	< 33	< 27	< 72	< 39	< 74	< 29	< 54	< 48	< 39	< 25	< 126	< 46	< 152
	09/28/22	< 33	< 30	< 69	< 34	< 84	< 32	< 63	< 51	< 29	< 34	< 136	< 33	< 206
	10/12/22	< 43	< 36	< 80	< 45	< 86	< 43	< 69	< 45	< 34	< 33	< 150	< 49	< 223
	10/26/22	< 33	< 29	< 64	< 26	< 60	< 36	< 60	< 52	< 30	< 39	< 155	< 33	< 209
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-	-
CL-02	05/11/22	< 24	< 26	< 48	< 31	< 48	< 26	< 34	< 41	< 34	< 30	< 109	< 22	< 178
	05/25/22	< 32	< 31	< 73	< 26	< 71	< 37	< 62	< 49	< 35	< 36	< 133	< 51	< 187
	06/08/22	< 29	< 25	< 60	< 26	< 60	< 35	< 41	< 37	< 26	< 23	< 108	< 25	< 171
	06/22/22	< 31	< 33	< 95	< 38	< 82	< 32	< 60	< 49	< 24	< 38	< 141	< 29	< 219
	07/06/22	< 31	< 31	< 70	< 45	< 75	< 31	< 59	< 45	< 34	< 36	< 135	< 37	< 188
	07/20/22	< 39	< 33	< 92	< 38	< 84	< 24	< 51	< 52	< 33	< 35	< 119	< 56	< 196
	08/03/22	< 26	< 35	< 67	< 37	< 65	< 35	< 58	< 36	< 37	< 27	< 133	< 33	< 209
	08/17/22	< 25	< 30	< 82	< 29	< 79	< 30	< 39	< 26	< 38	< 28	< 99	< 27	< 173
	08/31/22	< 27	< 27	< 52	< 23	< 57	< 26	< 46	< 47	< 29	< 26	< 134	< 45	< 127
	09/14/22	< 40	< 48	< 70	< 43	< 68	< 39	< 65	< 57	< 39	< 47	< 180	< 35	< 281
	09/28/22	< 25	< 42	< 68	< 38	< 80	< 33	< 44	< 46	< 37	< 27	< 120	< 33	< 155
	10/12/22	< 31	< 26	< 70	< 38	< 75	< 32	< 56	< 51	< 37	< 25	< 128	< 35	< 191
	10/26/22	< 28	< 26	< 79	< 39	< 82	< 35	< 69	< 41	< 39	< 31	< 117	< 46	< 186
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-	-

Table C-IX.2

CONCENTRATIONS OF GAMMA EMITTERS IN GRASS SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2022

RESULTS IN UNITS OF PCI/KG WET ± 2 SIGMA

SITE	COLLECTION PERIOD	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	05/11/22	< 26	< 22	< 45	< 25	< 68	< 26	< 53	< 37	< 26	< 25	< 118	< 24	< 145
	05/25/22	< 32	< 37	< 73	< 34	< 69	< 32	< 58	< 53	< 32	< 35	< 158	< 46	< 220
	06/08/22	< 25	< 29	< 77	< 32	< 64	< 28	< 45	< 48	< 31	< 31	< 121	< 36	< 175
	06/22/22	< 32	< 35	< 80	< 41	< 79	< 29	< 57	< 51	< 36	< 31	< 125	< 39	< 212
	07/06/22	< 31	< 33	< 69	< 37	< 98	< 39	< 70	< 48	< 47	< 38	< 154	< 52	< 199
	07/20/22	< 38	< 35	< 83	< 52	< 94	< 40	< 70	< 57	< 43	< 39	< 169	< 41	< 212
	08/03/22	< 45	< 33	< 84	< 43	< 90	< 48	< 70	< 47	< 39	< 33	< 170	< 39	< 269
	08/17/22	< 30	< 32	< 84	< 30	< 63	< 32	< 55	< 34	< 31	< 32	< 93	< 23	< 188
	08/31/22	< 25	< 23	< 65	< 24	< 51	< 25	< 37	< 43	< 23	< 22	< 109	< 29	< 162
	09/14/22	< 37	< 34	< 83	< 31	< 81	< 35	< 37	< 56	< 37	< 34	< 123	< 55	< 193
	09/28/22	< 31	< 28	< 70	< 31	< 75	< 30	< 54	< 58	< 33	< 26	< 146	< 43	< 204
	10/12/22	< 34	< 25	< 68	< 25	< 61	< 33	< 53	< 40	< 30	< 30	< 100	< 38	< 182
	10/26/22	< 21	< 26	< 59	< 26	< 53	< 25	< 41	< 46	< 25	< 24	< 137	< 33	< 166
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-	-
CL-116	05/11/22	< 29	< 27	< 57	< 33	< 66	< 26	< 45	< 38	< 24	< 24	< 105	< 33	< 158
	05/25/22	< 27	< 25	< 66	< 27	< 72	< 28	< 54	< 47	< 34	< 31	< 100	< 27	< 164
	06/08/22	< 20	< 24	< 69	< 21	< 51	< 28	< 43	< 35	< 28	< 26	< 99	< 39	< 135
	06/22/22	< 34	< 38	< 65	< 34	< 85	< 36	< 49	< 54	< 33	< 35	< 161	< 47	< 203
	07/06/22	< 38	< 28	< 93	< 40	< 88	< 30	< 69	< 53	< 36	< 35	< 125	< 47	< 180
	07/20/22	< 32	< 35	< 75	< 48	< 75	< 36	< 61	< 54	< 41	< 50	< 151	< 45	< 227
	08/03/22	< 21	< 23	< 57	< 32	< 61	< 28	< 48	< 27	< 30	< 25	< 99	< 37	< 146
	08/17/22	< 23	< 27	< 52	< 27	< 63	< 25	< 44	< 29	< 30	< 30	< 85	< 29	< 128
	08/31/22	< 21	< 24	< 40	< 22	< 36	< 21	< 36	< 37	< 21	< 20	< 94	< 32	< 136
	09/14/22	< 36	< 38	< 83	< 32	< 74	< 33	< 58	< 57	< 40	< 38	< 152	< 42	< 208
	09/28/22	< 29	< 32	< 58	< 34	< 64	< 28	< 48	< 44	< 36	< 23	< 126	< 39	< 170
	10/12/22	< 31	< 31	< 63	< 32	< 62	< 37	< 54	< 46	< 37	< 34	< 145	< 35	< 216
	10/26/22	< 23	< 17	< 50	< 22	< 59	< 21	< 34	< 33	< 24	< 26	< 109	< 23	< 140
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-	-

Table C-X.1 QUARTERLY DLR RESULTS FOR CLINTON POWER STATION, 2022

Location	Qtr 1 (mrem)	Qtr 2 (mrem)	Qtr 3 (mrem)	Qtr 4 (mrem)	Normalized Annual Dose, M_A (mrem/yr)	B_A[1]	B_A + MDD_A[2]	Annual Facility Dose, F_A (mrem)
CL-01	18.4	18.0	19.4	17.1	74.0	83.6	72.9	ND
CL-02	19.3	19.6	20.0	21.4	76.7	86.2	80.3	ND
CL-03	18.4	17.1	18.4	20.3	74.7	84.2	74.2	ND
CL-04	18.4	18.6	19.6	20.5	72.8	82.3	77.1	ND
CL-05	19.5	18.3	20.3	18.4	76.5	86.0	76.5	ND
CL-06	15.8	15.9	17.0	16.0	65.8	75.3	64.7	ND
CL-07	*17.5*	*16*	18.3	19.3	69.5	79.0	71.1	ND
CL-08	17.0	17.6	18.6	18.4	74.0	83.5	71.6	ND
CL-11	17.0	16.8	18.1	15.8	69.3	78.8	67.7	ND
CL-15	18.1	16.8	18.1	17.5	66.3	75.8	70.5	ND
CL-22	19.1	19.0	20.4	19.1	77.6	87.1	77.6	ND
CL-23	19.3	18.2	20.4	20.3	81.5	91.0	78.2	ND
CL-24	19.4	19.1	21.1	20.2	80.5	90.0	79.8	ND
CL-33	17.5	19.9	20.3	19.8	79.2	88.7	77.5	ND
CL-34	18.6	17.5	18.4	18.6	77.5	87.0	73.1	ND
CL-35	19.4	17.8	17.9	16.7	71.6	81.1	71.8	ND
CL-36	17.2	16.5	20.1	18.6	74.2	83.7	72.4	ND
CL-37	17.9	17.4	19.5	18.2	71.1	80.6	73.0	ND
CL-41	19.1	18.8	22.8	19.1	79.4	88.9	79.8	ND
CL-42	18.2	16.5	18.8	19.8	74.2	83.7	73.3	ND
CL-43	18.2	18.3	20.3	20.0	79.7	89.2	76.8	ND
CL-44	18.0	17.3	19.4	17.1	75.4	84.9	71.8	ND
CL-45	19.9	18.9	21.1	20.9	80.6	90.1	80.8	ND
CL-46	18.6	16.6	19.2	17.5	73.0	82.5	71.9	ND
CL-47	18.9	18.3	19.2	16.9	79.4	88.9	73.3	ND
CL-48	19.0	17.6	20.5	20.3	74.2	83.7	77.4	ND
CL-49	19.9	17.7	21.2	22.1	79.8	89.3	80.9	ND
CL-51	19.0	18.8	20.8	20.2	76.6	86.1	78.8	ND
CL-52	19.9	19.2	18.3	21.2	75.6	85.1	78.6	ND
CL-53	17.5	15.7	19.4	20.7	71.9	81.4	73.3	ND
CL-54	19.4	18.7	20.4	18.7	78.0	87.5	77.2	ND
CL-55	19.1	17.8	18.5	18.9	78.7	88.2	74.3	ND
CL-56	19.3	17.0	19.8	19.5	81.0	90.5	75.6	ND
CL-57	19.7	16.7	21.8	21.8	81.5	91.0	80.0	ND
CL-58	19.1	20.0	20.3	20.4	79.1	88.6	79.8	ND
CL-60	18.6	17.6	20.5	19.8	79.0	88.5	76.5	ND
CL-61	17.5	17.3	19.2	17.9	78.1	87.6	71.9	ND
CL-63	16.6	15.7	17.4	16.6	66.6	76.1	66.3	ND
CL-64	19.0	17.8	18.8	19.0	75.9	85.4	74.6	ND
CL-65	18.8	18.9	20.2	19.2	80.5	90.01	77.1	ND
CL-74	17.0	15.0	16.3	17.5	68	77.51	65.8	ND
CL-75	19.6	16.8	19.8	15.7	75.7	85.21	71.9	ND
CL-76	19.8	19.0	19.9	19.4	78.7	88.21	78.1	ND
CL-77	18.2	16.5	17.4	18.2	72.2	81.71	70.3	ND
CL-78	18.5	*(3)*	20.1	16.9	72	81.51	73.7	ND
CL-79	19.0	18.2	18.3	18.8	77.1	86.61	73.6	ND
CL-80	18.4	17.5	20.0	19.2	75.5	85.01	74.6	ND
CL-81	20.1	17.0	21.6	19.6	76.8	86.31	77	ND
CL-84	20.0	15.7	18.4	19.1	76.3	85.81	72	ND
CL-90	15.2	14.5	15.9	16.0	62.2	71.71	61.9	ND
CL-91	16.0	14.8	18.3	18.5	69.5	79.01	72.2	ND
CL-97	20.0	19.4	20.9	20.1	77.6	87.11	75.3	ND
CL-99	15.3	14.3	16.2	16.7	60.6	70.11	54	ND
CL-114	18.9	18.1	18.1	18.5	72.3	81.8	73.6	ND

[1] **Baseline background dose (B_A):** The estimated mean background radiation dose at each field monitoring location annually based on historical measurements, excluding any dose contribution from the monitored facility

[2] **Minimum differential dose (MDD_A):** The smallest amount of facility related dose at each monitored location annually above the baseline background dose that can be reliably detected by an environmental dosimetry system

(3) SEE PROGRAM EXCEPTIONS SECTION FOR EXPLANATION

FIGURE C-1
MEAN MONTHLY GROSS BETA CONCENTRATION IN AIR PARTICULATE SAMPLES COLLECTED IN THE VICINITY OF CPS, 2022

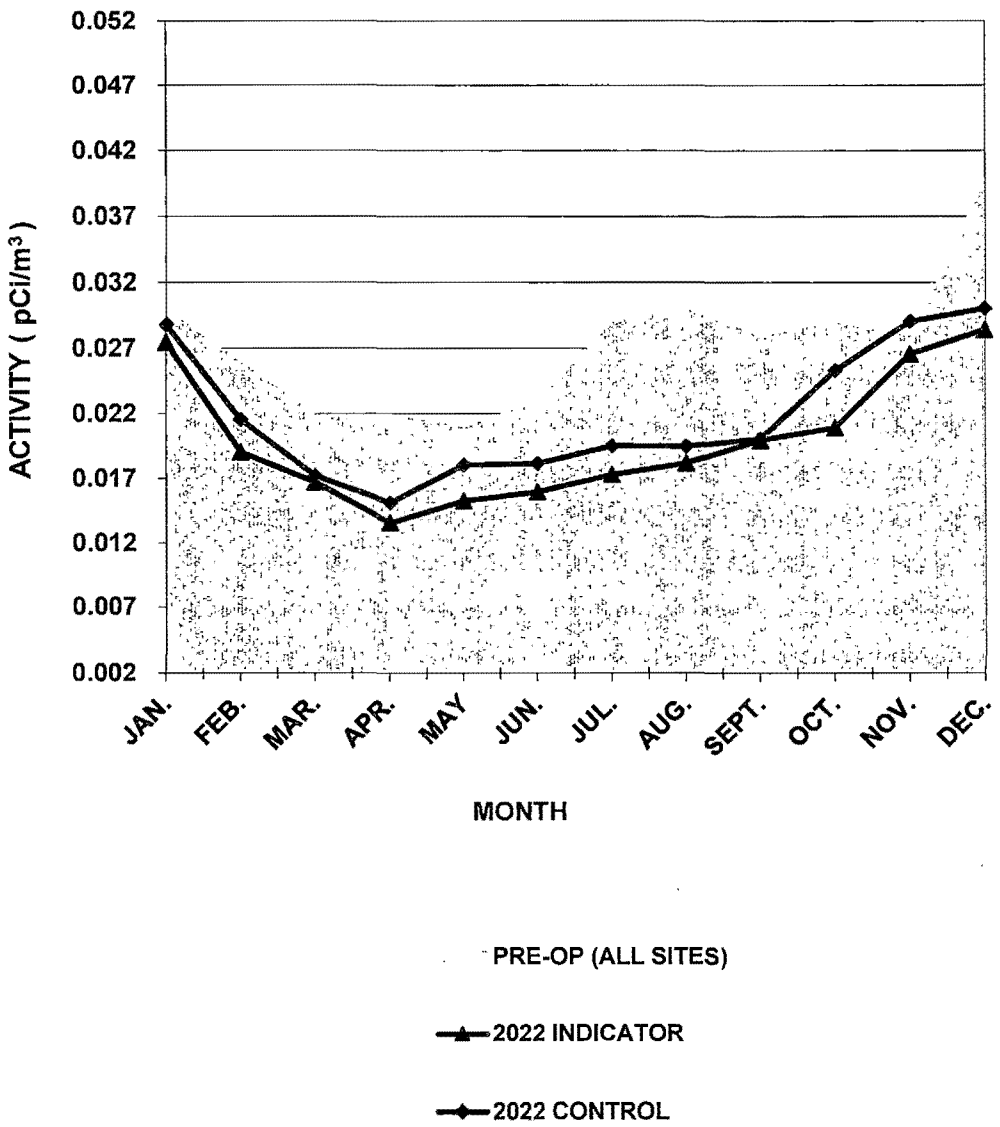
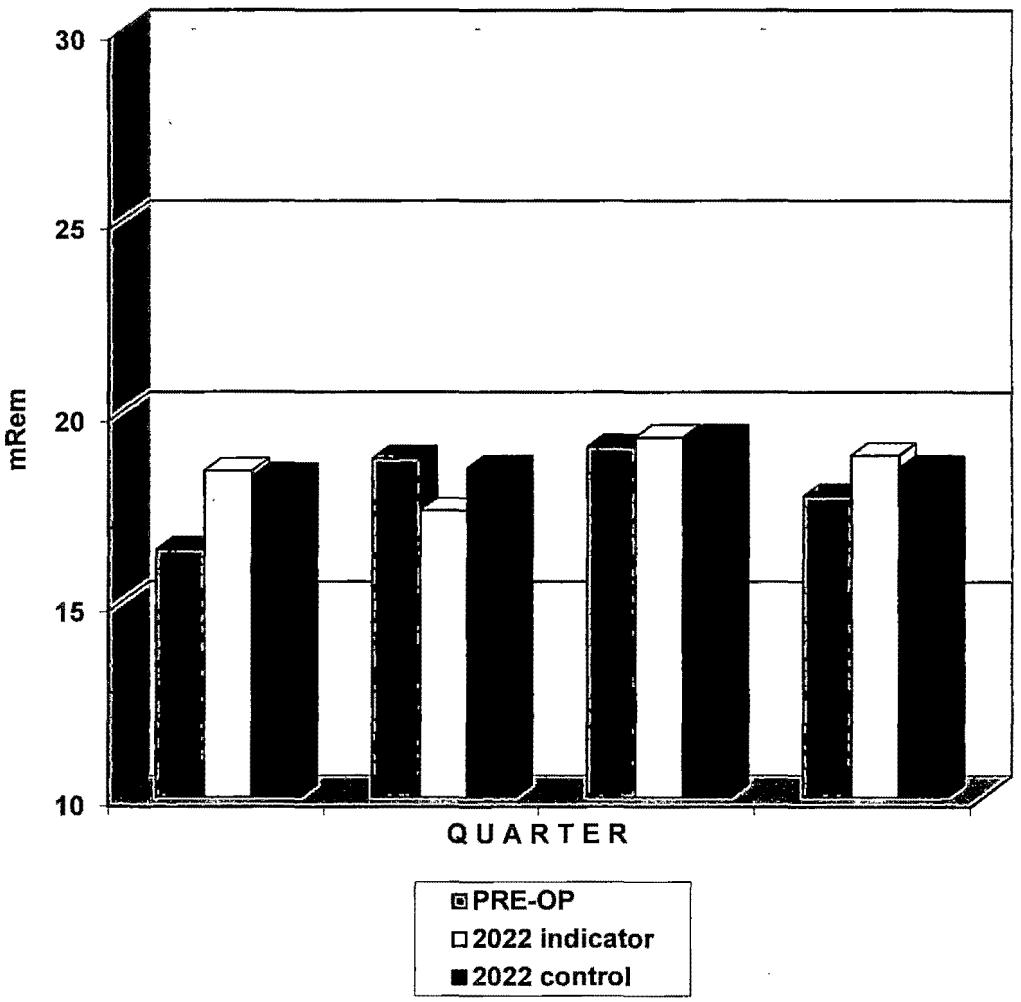


FIGURE C-2
MEAN QUARTERLY AMBIENT GAMMA RADIATION LEVELS (DLR)
IN THE VICINITY OF CPS, 2022



APPENDIX D

INTER-LABORATORY COMPARISON PROGRAM

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Table D.1 **Analytics Environmental Radioactivity Cross Check Program**
Teledyne Brown Engineering Environmental Services

Month/Year	Identification Number	Matrix	Nuclide	Units	TBE Reported Value	Known Value [a]	Ratio of TBE to Analytics Result	Evaluation [b]
March 2022	E13706	Milk	Sr-89	pCi/L	80.3	96.8	0.83	A
			Sr-90	pCi/L	12.7	12.6	1.01	A
	E13707	Milk	Ce-141	pCi/L	62.3	65	0.96	A
			Co-58	pCi/L	158	164	0.96	A
			Co-60	pCi/L	286	302	0.95	A
			Cr-51	pCi/L	314	339	0.93	A
			Cs-134	pCi/L	155	182	0.85	A
			Cs-137	pCi/L	210	223	0.94	A
			Fe-59	pCi/L	211	185	1.14	A
			I-131	pCi/L	88.0	96.7	0.91	A
			Mn-54	pCi/L	169	164	1.03	A
			Zn-65	pCi/L	238	246	0.97	A
	E13708	Charcoal	I-131	pCi	79.9	87.1	0.92	A
	E13709	AP	Ce-141	pCi	60.9	42.0	1.45	N(1)
			Co-58	pCi	118	107	1.11	A
			Co-60	pCi	218	196	1.11	A
			Cr-51	pCi	251	221	1.14	A
			Cs-134	pCi	129	118	1.09	A
			Cs-137	pCi	156	145.0	1.07	A
			Fe-59	pCi	124	120.0	1.03	A
			Mn-54	pCi	120	107	1.12	A
			Zn-65	pCi	162	160	1.01	A
	E13710	Soil	Ce-141	pCi/g	0.123	0.103	1.19	A
			Co-58	pCi/g	0.254	0.263	0.97	A
			Co-60	pCi/g	0.493	0.483	1.02	A
			Cr-51	pCi/g	0.603	0.543	1.11	A
			Cs-134	pCi/g	0.268	0.292	0.92	A
			Cs-137	pCi/g	0.399	0.431	0.93	A
			Fe-59	pCi/g	0.320	0.296	1.08	A
			Mn-54	pCi/g	0.263	0.263	1.00	A
			Zn-65	pCi/g	0.407	0.395	1.03	A
	E13711	AP	Sr-89	pCi	83.2	97.4	0.85	A
			Sr-90	pCi	12.7	12.7	1.00	A

(a) 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

(b) 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

*(1) See **NCR 22-04***

Table D.1 **Analytics Environmental Radioactivity Cross Check Program**
Teledyne Brown Engineering Environmental Services

Month/Year	Identification Number	Matrix	Nuclide	Units	TBE Reported Value	Known Value [a]	Ratio of TBE to Analytics Result	Evaluation [b]
September 2022	E13712	Milk	Sr-89	pCi/L	71.1	89.1	0.80	A
			Sr-90	pCi/L	12.0	13.6	0.88	A
	E13713	Milk	Ce-141	pCi/L	148	161	0.92	A
			Co-58	pCi/L	178	189	0.94	A
			Co-60	pCi/L	229	260	0.88	A
			Cr-51	pCi/L	486	456	1.07	A
			Cs-134	pCi/L	220	252	0.87	A
			Cs-137	pCi/L	203	222	0.92	A
			Fe-59	pCi/L	174	173	1.01	A
			I-131	pCi/L	75.9	94.2	0.81	A
			Mn-54	pCi/L	269	282	0.95	A
			Zn-65	pCi/L	364	373	0.97	A
	E13714	Charcoal	I-131	pCi	81.4	83.6	0.97	A
	E13715	AP	Ce-141	pCi	102	91	1.12	A
			Co-58	pCi	118	107	1.11	A
			Co-60	pCi	207	147	1.41	N[(2)]
			Cr-51	pCi	310	257	1.21	W
			Cs-134	pCi	148	142	1.04	A
			Cs-137	pCi	137	125	1.10	A
			Fe-59	pCi	115	98	1.18	A
			Mn-54	pCi	168	159	1.05	A
			Zn-65	pCi	240	211	1.14	A
	E13716	Soil	Ce-141	pCi/g	0.288	0.284	1.01	A
			Co-58	pCi/g	0.320	0.334	0.96	A
			Co-60	pCi/g	0.445	0.459	0.97	A
			Cr-51	pCi/g	0.883	0.805	1.10	A
			Cs-134	pCi/g	0.410	0.446	0.92	A
			Cs-137	pCi/g	0.447	0.465	0.96	A
			Fe-59	pCi/g	0.314	0.305	1.03	A
			Mn-54	pCi/g	0.489	0.499	0.98	A
			Zn-65	pCi/g	0.666	0.660	1.01	A
	E13717	AP	Sr-89	pCi	87.5	98.3	0.89	A
			Sr-90	pCi	12.6	15.0	0.84	A

(a) 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

(b) 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

*(2) See **NCR 22-21***

DOE's Mixed Analyte Performance Evaluation Program (MAPEP)

Table D.2 **Teledyne Brown Engineering Environmental Services**

Month/Year	Identification Number	Matrix	Nuclide	Units	TBE Reported Value	Known Value [a]	Acceptance Range	Evaluation [b]
February 2022	22-GrF46	AP	Gross Alpha	Bq/sample	0.402	1.20	0.36 - 2.04	A
			Gross Beta	Bq/sample	0.669	0.68	0.341 - 1.022	A
	22-MaS46	Soil	Ni-63	Bq/kg	645	780	546 - 1014	A
			Tc-99	Bq/kg	526	778	545 - 1011	N(3)
	22-MaSU46	Urine	Cs-134	Bq/L	1.67	1.77	1.24 - 2.30	A
			Cs-137	Bq/L	1.50	1.56	1.09 - 2.03	A
			Co-57	Bq/L	4.93	5.39	3.77 - 7.01	A
			Co-60	Bq/L	2.13	2.06	1.44 - 2.68	A
			Mn-54	Bq/L	4.83	5.08	3.56 - 6.60	A
			U-234	Bq/L	0.142	0.0074	0.0052 - 0.0096	N(4)
			U-238	Bq/L	0.0254	0.0103	0.0072 - 0.0134	N(4)
			Zn-65	Bq/L	4.71	4.48	3.14 - 5.82	A
	22-MaW46	Water	Ni-63	Bq/L	28.6	34.0	23.8 - 44.2	A
			Tc-99	Bq/L	8.59	7.90	5.5 - 10.3	A
	22-RdV46	Vegetation	Cs-134	Bq/sample	6.61	7.61	5.33 - 9.89	A
			Cs-137	Bq/sample	1.50	1.52	1.06 - 1.98	A
			Co-57	Bq/sample	5.11	5.09	3.56 - 6.62	A
			Co-60	Bq/sample	0.0162		*(1)*	A
			Mn-54	Bq/sample	2.42	2.59	1.81 - 3.37	A
			Sr-90	Bq/sample	0.684	0.789	0.552 - 1.026	A
			Zn-65	Bq/sample	1.44	1.47	1.03 - 1.91	A
August 2022	22-MaS47	Soil	Ni-63	Bq/kg	14.6		*(1)*	A
			Tc-99	Bq/kg	994	1000	700 - 1300	A
	22-MaW47	Water	Ni-63	Bq/L	24.4	32.9	23.0 - 42.8	A
			Tc-99	Bq/L	1.9		*(1)*	N(5)
	25-RdV47	Vegetation	Cs-134	Bq/sample	0.032		*(1)*	A
			Cs-137	Bq/sample	0.891	1.08	0.758 - 1.408	A
			Co-57	Bq/sample	0.006		*(1)*	A
			Co-60	Bq/sample	4.04	4.62	3.23 - 6.01	A
			Mn-54	Bq/sample	2.01	2.43	1.70 - 3.16	A
			Sr-90	Bq/sample	1.25	1.60	1.12 - 2.08	W
			Zn-65	Bq/sample	6.16	7.49	5.24 - 9.74	A

(a) 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

(b) DOE/MAPEP evaluation:

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

(1) False positive test

(2) Sensitivity evaluation

(3) Tc-99 soil cross-checks done for TBE information only - not required

*(4) See **NCR 22-05***

*(5) See **NCR 22-22***

ERA Environmental Radioactivity Cross Check Program

Table D.3 **Teledyne Brown Engineering Environmental Services**

Month/Year	Identification Number	Matrix	Nuclide	Units	TBE Reported Value	Known Value [a]	Acceptance Limits	Evaluation [b]
March 2022	MRAD-36	Water	Am-241	pCi/L	68.3	74.6	51.2 - 95.4	A
			Fe-55	pCi/L	797	1140	670 - 1660	A
			Pu-238	pCi/L	146	147	88.4 - 190	A
			Pu-239	pCi/L	69.9	71.9	44.5 - 88.6	A
		Soil	Sr-90	pCi/kg	8050	6720	2090 - 10500	A
		AP	Fe-55	pCi/filter	148	127	46.4 - 203	A
			Pu-238	pCi/filter	29.9	29.6	22.3 - 36.4	A
			Pu-239	pCi/filter	51.6	49.7	37.2 - 60.0	A
			U-234	pCi/filter	59.9	67.3	49.9 - 78.9	A
			U-238	pCi/filter	59.0	66.7	50.4 - 79.6	A
			GR-A	pCi/filter	95.6	94.2	49.2 - 155	A
			GR-B	pCi/filter	71.2	66.8	40.5 - 101	A
April 2022	RAD-129	Water	Ba-133	pCi/L	61.7	62.9	52.3 - 69.2	A
			Cs-134	pCi/L	80.9	81.6	68.8 - 89.8	A
			Cs-137	pCi/L	37.4	36.6	32.1 - 43.3	A
			Co-60	pCi/L	103	97.4	87.7 - 109	A
			Zn-65	pCi/L	318	302	272 - 353	A
			GR-A	pCi/L	26.9	20.8	10.4 - 28.3	A
			GR-B	pCi/L	49.7	51.0	34.7 - 58.1	A
			U-Nat	pCi/L	56.3	68.9	56.3 - 75.8	A
			H-3	pCi/L	17,000	18,100	15,800 - 19,000	A
			Sr-89	pCi/L	65.3	67.9	55.3 - 76.1	A
			Sr-90	pCi/L	42.1	42.7	31.5 - 49.0	A
			I-131	pCi/L	25.7	26.2	21.8 - 30.9	A
September 2022	MRAD-37	Water	Am-241	pCi/L	111	96.2	66.0 - 123	A
			Fe-55	pCi/L	850	926	544 - 1350	A
			Pu-238	pCi/L	62.1	52.6	31.6 - 68.2	A
			Pu-239	pCi/L	139.5	117	72.5 - 144	A
		Soil	Sr-90	pCi/kg	3350	6270	1950 - 9770	A
			U-234	pCi/kg	1684	3350	1570 - 4390	A
			U-238	pCi/kg	1658	3320	1820 - 4460	N(2)
		AP	Fe-55	pCi/filter	71.9	122	44.5 - 195	A
			Pu-238	pCi/filter	38.8	29.9	22.6 - 36.7	N(1)
			Pu-239	pCi/filter	14.5	13.0	9.73 - 15.7	A
			U-234	pCi/filter	78.0	71.5	53.0 - 83.8	A
			U-238	pCi/filter	79.7	70.9	53.5 - 84.6	A
			GR-A	pCi/filter	62.8	55.5	29.0 - 91.4	A
			GR-B	pCi/filter	70.9	64.8	39.3 - 97.9	A
October 2022	RAD-131	Water	Ba-133	pCi/L	76.2	79.4	66.6 - 87.3	A
			Cs-134	pCi/L	28.0	30.5	23.9 - 33.6	A
			Cs-137	pCi/L	202	212	191 - 235	A
			Co-60	pCi/L	52.4	51.4	46.3 - 59.1	A
			Zn-65	pCi/L	216	216	194 - 253	A
			GR-A	pCi/L	19.7	16.9	8.28 - 23.7	A
			GR-B	pCi/L	49.8	53.0	36.1 - 60.0	A
			U-Nat	pCi/L	10.54	8.53	6.60 - 9.88	N(3)
			H-3	pCi/L	13,900	15,100	13,200 - 16,600	A
			Sr-89	pCi/L	59.7	64.5	52.3 - 72.5	A
			Sr-90	pCi/L	32.9	37.3	27.4 - 43.0	A
			I-131	pCi/L	26.9	24.4	20.2 - 28.9	A

(a) 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.

(b) ERA evaluation:
A = Acceptable - Reported value falls within the Acceptance Limits
N = Not Acceptable - Reported value falls outside of the Acceptance Limits

*(1) See **NCR 22-19***

(2) U soil cross-checks done for TBE information only - not required

*(3) See **NCR 22-20***

APPENDIX E

ERRATA DATA

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In the 2021 AREOR, the following statement was incorrect:

> "The highest calculated offsite dose received by a member of the public in 2021 due to the release of gaseous effluents from CPS was 3.3E-02 or 0.0337 mRem." (page 5)

The correct values should have been 3.13E-02 or 0.0313 mRem. (IR 04543917)

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 January 1, 2021, through December 31, 2021. During that time period, 1,556 analyses were performed on 1,430 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.

There were zero (0) radioactive liquid releases from CPS during 2021. 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 in 2021 due to the release of gaseous effluents from CPS was 3.37E-02 or 0.0337 mRem. 3.13E-02 mRem or 0.0313 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 iodine-131 (I-131). 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. No fission or activation products were detected.

Iodine-131 analyses were performed on weekly air samples. All results were less than the lower limit of detection for I-131.

High sensitivity I-131 analyses and gamma analyses were performed on cow milk samples. All results were below the required LLDs for I-131. 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. No fission or activation products were detected.

Grass samples were analyzed for concentrations of gamma-emitting nuclides. No fission or activation products were detected.

Environmental gamma radiation measurements were performed quarterly using Dosimeters of Legal Record (DLR). Levels detected were consistent with those observed in previous years.

There was no other errata data for 2022.

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APPENDIX F

ANNUAL RADIOLOGICAL GROUNDWATER PROTECTION PROGRAM REPORT (ARGPPR)

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ARGPPR Table Of Contents

ARGPPR Appendices

I. Summary and Conclusions

In 2006, Constellation, formerly 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 2022. During that time period, 114 analyses were performed on 72 samples from 29 locations. The monitoring was conducted in four 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 2022.

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, Constellation specified that the independent laboratory achieve a lower limit of detection ten times lower than that required by the United States Environmental Protection Agency (USEPA) regulation.

Strontium-89 (Sr-89) was not detected in any samples. Strontium-90 (Sr-90) was not detected in any samples.

Gross Alpha in the suspended fraction was not detected in any samples. Gross Alpha in the dissolved fraction was detected in one sample.

Tritium was not detected in any of the groundwater 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 4 of 17 groundwater monitoring locations. The detected tritium concentrations ranged from 188 ± 122 pCi/L to 383 ± 133 pCi/L. Tritium was detected in 7 of 25 precipitation water samples with concentrations ranging from 202 ± 121 pCi/L to 464 ± 134 pCi/L.

II. Introduction

The Clinton Power Station (CPS), consisting of one approximately 1,120 MW gross electrical power output boiling water reactor is located in Harp Township, DeWitt County, Illinois. CPS is owned and operated by Constellation and became operational in 1987. Unit No. 1 went critical on February 27, 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 Constellation. 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 2022.

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 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. Constellation 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 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, A–2, A–3, and A–4 Appendix A.

Groundwater, Surface Water and Precipitation Water

Samples of water are collected, managed, transported and analyzed in accordance with approved procedures following regulatory methods. Groundwater, surface water, and precipitation 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 and 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 (Li-7) and/or Boron-10 (B-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 (He-3). 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 to analyze the environmental samples for radioactivity for the Clinton Power Station RGPP in 2022. In order to achieve the stated objectives, the current program includes the following analyses:

1. Concentrations of gamma emitters in groundwater
2. Concentrations of strontium in groundwater
3. Concentrations of tritium in groundwater and precipitation samples
4. Concentrations of gross alpha (dissolved and suspended) 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 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 is intended as an *a priori* (a before the fact) estimate of a system (including instrumentation, procedure and sample type) and not as an *a posteriori* (after the fact) criteria for the presence of activity. All analyses were designed to achieve the required CPS detection capabilities for environmental sample analysis.

The minimum detectable concentration (MDC) is defined above with the exception that the measurement is an *a posteriori* (after the fact) estimate of the presence of activity.

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. Constellation 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. Constellation 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.

C. Background Analysis

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 Sr-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 a Constellation 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. Program Exceptions

1. Sample Anomalies

There were no sample anomalies in 2022.

2. Missed Samples

There were no missed samples in 2022.

B. Program Changes

There were no program changes in 2022.

C. Groundwater Results

Groundwater

Baseline samples were collected from off-site wells during four (4) phases at the station. Analytical results are discussed below:

Tritium

Samples from seventeen locations were analyzed for tritium activity. Tritium values ranged from below the Constellation-imposed LLD of 200 pCi/L to 383 pCi/L. (Table B–I.1 Appendix B)

Strontium

Sr-89 was not detected in any of the samples analyzed and the required LLD of 10 pCi/L was met. Sr-90 was also not detected in any of the samples analyzed and the required LLD of 1 pCi/L was met. (Table B-I.1 Appendix B)

Gamma Emitters

Analysis of gamma-emitting nuclides are required on a biennial basis and was not performed in 2022. (Table B–I.2, Appendix B)

Hard-to-Detect (HTD)

Hard-to-Detect analyses were performed on one sample in 2022. No HTD nuclides were detected and all MDC's were met. HTD analyses are performed on all wells biennially. (Table B–I.3 Appendix B)

D. Surface Water Results

There were no surface water samples analyzed in 2022 since surface water locations were removed from the program in 2021. (Table B–II.1 Appendix B)

E. Precipitation Water Results (Recapture)

Precipitation water samples from 11 locations were analyzed for tritium activity. Tritium was detected in seven samples at a concentration range of 202 pCi/L - 464 pCi/L. (Table B-III.1, Appendix B)

F. Summary of Results – Inter-Laboratory Comparison Program

Inter-Laboratory Comparison Program results for TBE are presented in Section IV, Part G in the Annual Radiological Environmental Operating Report.

G. Errata Data

There was no Errata Data for 2022.

H. Leaks, Spills, and Releases

There were no reportable leaks, spills or releases in 2022.

I. Trends

No trends have been identified in 2022.

J. Investigations

Currently no investigations are on-going.

K. Actions Taken

1. Compensatory Actions

   There have been no station events requiring compensatory actions at the Clinton Power Station in 2022.

2. Installation of Monitoring Wells

   No new wells were installed during the 2022.

3. Actions to Recover/Reverse Plumes

   No actions were required to recover or reverse groundwater plumes.

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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, 2022

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
RG-E	Precipitation Water
RG-ENE	Precipitation Water
RG-N	Precipitation Water
RG-NE	Precipitation Water
RG-NNW	Precipitation Water
RG-S	Precipitation Water
RG-SE	Precipitation Water
RG-SW	Precipitation Water
RG-SW2	Precipitation Water
RG-W	Precipitation Water
RG-WNW	Precipitation Water
RG-WSW	Precipitation Water

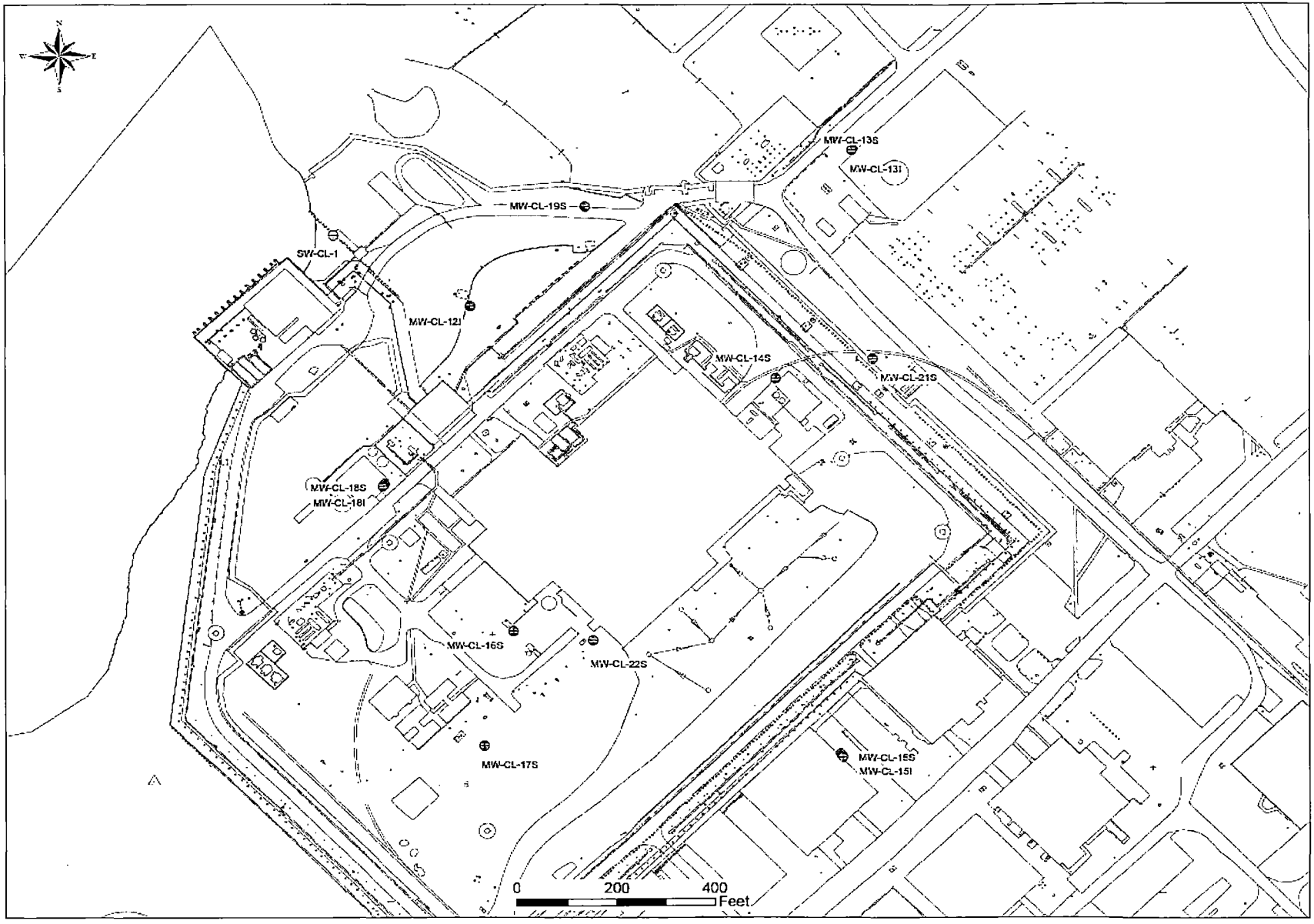

Figure A – 1
Onsite Sampling Locations at Clinton Power Station

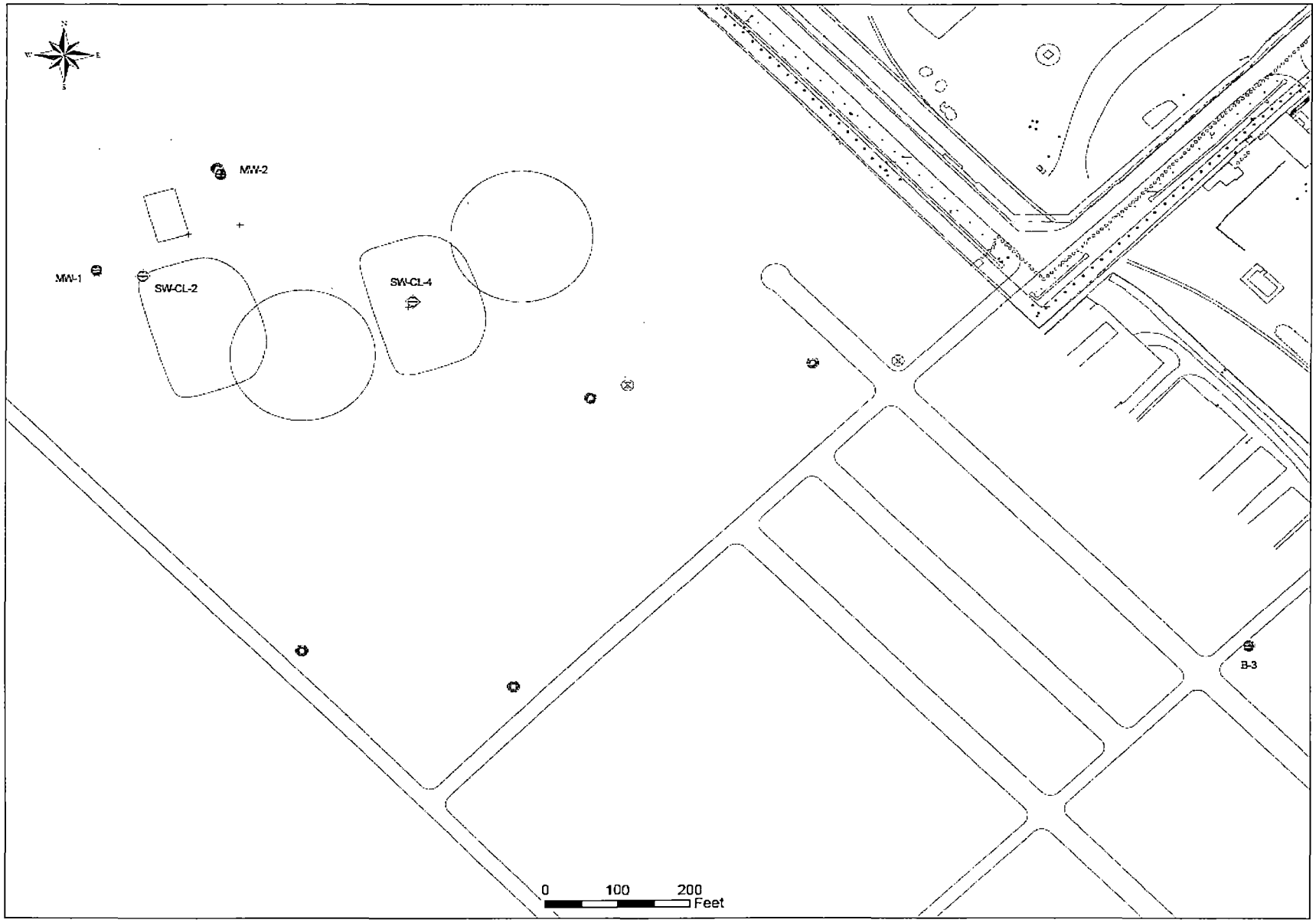

Figure A – 2
Sampling Locations South of Clinton Power Station

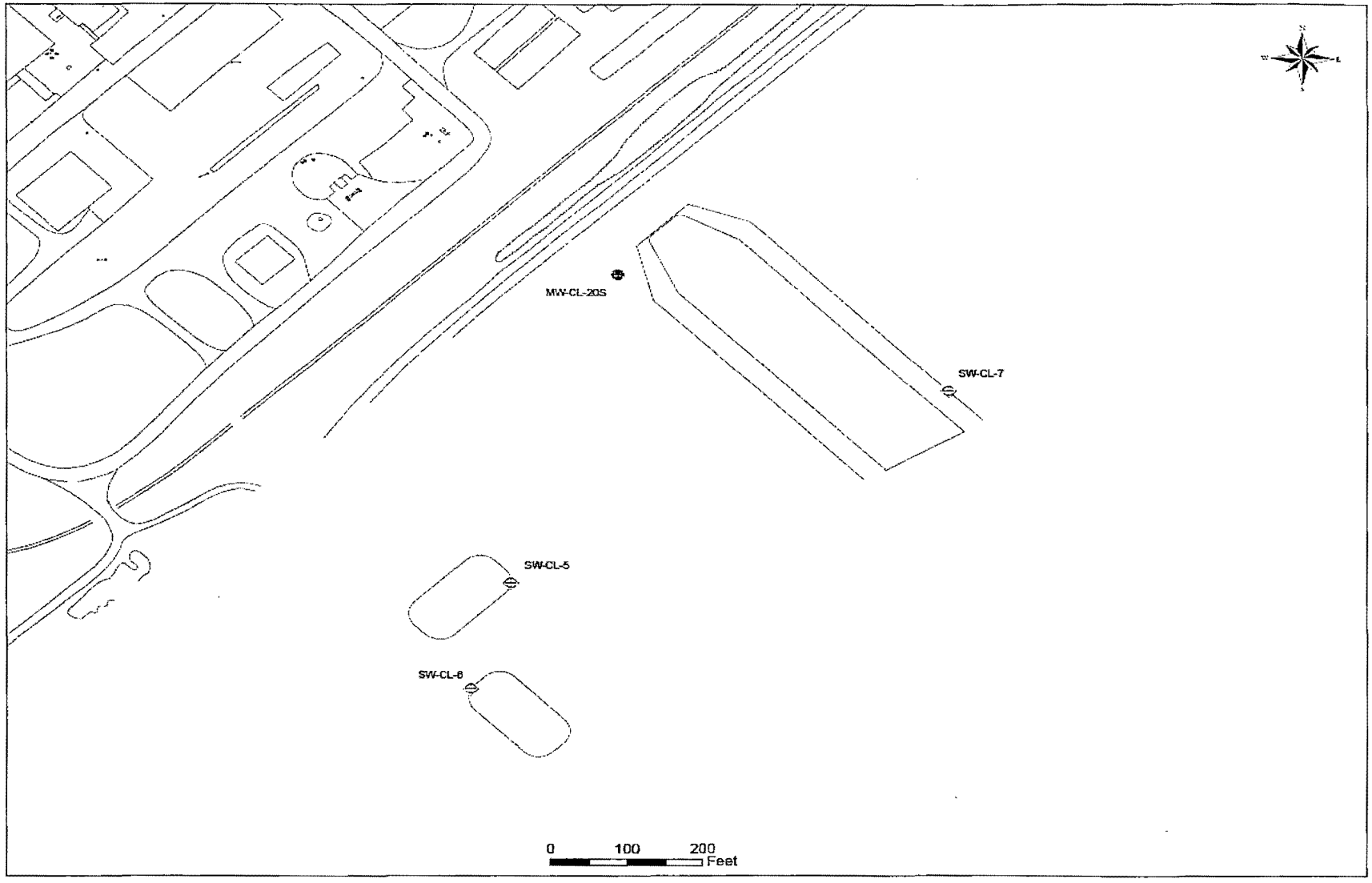

Figure A – 3
Sampling Locations East of Clinton Power Station

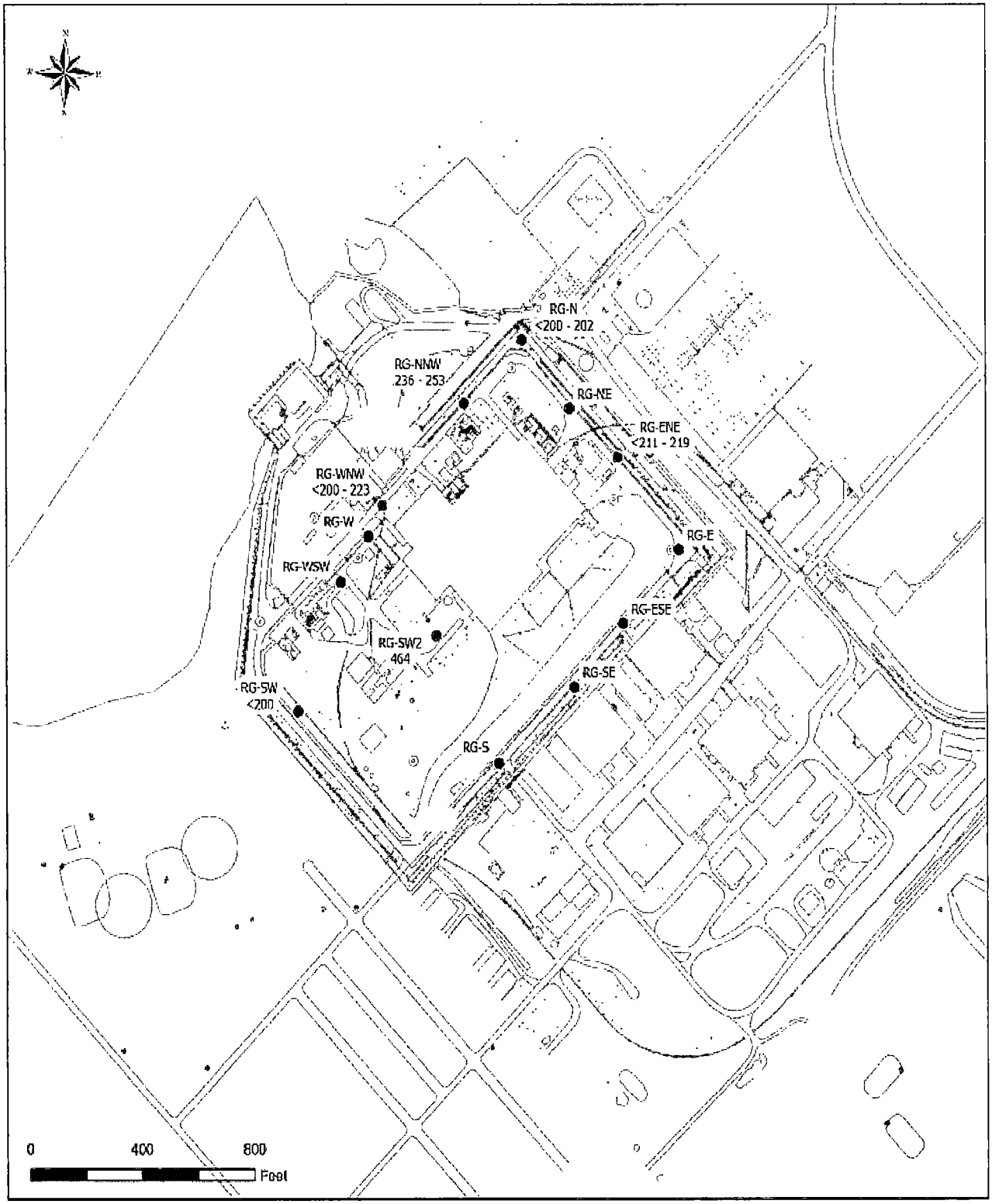

Figure A – 4
Recapture Sampling Locations of Clinton Power Station

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APPENDIX B

DATA TABLES

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TABLE B-I.1 CONCENTRATIONS OF TRITIUM AND STRONTIUM IN GROUNDWATER SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2022

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION DATE	H-3	Sr-89	Sr-90
B-3	06/01/22	< 169		
MW-CL-1	06/01/22	< 182		
MW-CL-2	06/01/22	< 198		
MW-CL-12I	02/16/22	< 183		
MW-CL-12I	06/01/22	< 188	< 7.1	< 0.9
MW-CL-12I	09/07/22	< 185		
MW-CL-12I	11/01/22	< 193		
MW-CL-13I	06/01/22	< 181		
MW-CL-13S	02/16/22	309 ± 133		
MW-CL-13S	02/16/22	< 184		
MW-CL-13S	06/01/22	< 189	< 7.8	< 0.9
MW-CL-13S	09/07/22	< 183		
MW-CL-13S	11/01/22	205 ± 131		
MW-CL-13S	11/01/22	< 183		
MW-CL-14S	02/16/22	383 ± 133		
MW-CL-14S	02/16/22	< 193		
MW-CL-14S	06/02/22	< 185	< 7.5	< 1.0
MW-CL-14S	09/08/22	188 ± 122		
MW-CL-14S	11/02/22	224 ± 131		
MW-CL-14S	11/02/22	345 ± 125		
MW-CL-15I	06/01/22	< 186		
MW-CL-15S	06/01/22	< 184		
MW-CL-16S	02/16/22	314 ± 135		
MW-CL-16S	02/16/22	236 ± 134		
MW-CL-16S	06/02/22	< 191	< 6.4	< 0.9
MW-CL-16S	09/08/22	< 174		
MW-CL-16S	11/02/22	< 191		
MW-CL-17S	02/16/22	< 198		
MW-CL-17S	06/02/22	< 179	< 8.1	< 0.8
MW-CL-17S	09/08/22	< 189		
MW-CL-17S	11/02/22	< 180		
MW-CL-18I	02/16/22	< 199		
MW-CL-18I	06/02/22	< 183	< 9.3	< 1.0
MW-CL-18I	09/08/22	< 170		
MW-CL-18I	11/02/22	< 198		
MW-CL-18S	02/16/22	< 185		
MW-CL-18S	06/02/22	< 187	< 8.8	< 0.9
MW-CL-18S	09/08/22	< 184		
MW-CL-18S	11/02/22	< 197		
MW-CL-19S	03/23/22	< 188		
MW-CL-19S	06/01/22	< 191	< 7.0	< 0.8
MW-CL-19S	09/07/22	< 191		
MW-CL-19S	11/01/22	< 193		
MW-CL-20S	06/01/22	< 182		
MW-CL-21S	02/16/22	< 189		
MW-CL-21S	06/01/22	< 182	< 8.6	< 0.9
MW-CL-21S	09/07/22	< 181		
MW-CL-21S	11/01/22	193 ± 121		
MW-CL-21S	11/01/22	< 179		
MW-CL-22S	02/16/22	< 179		
MW-CL-22S	06/02/22	< 187	< 6.7	< 0.9
MW-CL-22S	09/08/22	< 188		
MW-CL-22S	11/02/22	221 ± 126		
MW-CL-22S	11/02/22	232 ± 127		

Table B-I.2

CONCENTRATIONS OF GAMMA EMITTERS IN GROUNDWATER SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2022

RESULTS IN UNITS OF PCI/LITER + SIGMA

No samples collected or analyzed for gamma emitters in 2022

TABLE B-I.3 **CONCENTRATIONS OF HARD TO DETECTS IN GROUNDWATER SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2022**

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
MW-CL-19S	06/01/22	< 0.02	< 0.02	< 0.02	< 0.08	< 0.05	< 0.05	< 0.06	< 0.05

TABLE B-II.1 CONCENTRATIONS OF TRITIUM IN SURFACE WATER SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2022

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

There were no Surface Water Samples analyzed in 2022

TABLE B-III.1 CONCENTRATIONS OF TRITIUM IN PRECIPITATION WATER SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2022

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION DATE	H-3
RG-E	03/01/22	< 184
RG-E	11/09/22	< 185
RG-ENE	03/01/22	211 ± 118
RG-ENE	11/09/22	219 ± 119
RG-ESE	03/01/22	< 190
RG-ESE	11/09/22	< 190
RG-N	03/01/22	202 ± 121
RG-N	11/09/22	< 183
RG-NE	03/01/22	< 175
RG-NE	11/09/22	< 195
RG-NNW	03/01/22	236 ± 131
RG-NNW	11/09/22	253 ± 123
RG-S	03/01/22	< 189
RG-S	11/09/22	< 178
RG-SE	03/01/22	< 198
RG-SE	11/09/22	< 192
RG-SW	03/01/22	< 187
RG-SW	11/09/22	< 192
RG-SW2	11/30/22	464 ± 134
RG-W	03/01/22	< 192
RG-W	11/09/22	< 187
RG-WNW	03/01/22	< 184
RG-WNW	11/09/22	223 ± 128
RG-WSW	03/01/22	< 155
RG-WSW	11/09/22	< 200

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