Constellation

Clinton Power Station
8401 Power Road
Clinton, IL 61727

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Subject: Clinton Power Station 2023 Annual Radiological Environmental Operation Report

Clinton Power Station is submitting the 2023 Annual Radiological Environmental Operation Report. This report is submitted in accordance with Technical Specification requirement 5.6.2, "Annual Radiological Environmental Operation Report," and covers the period from January 1, 2023, through December 31, 2023.

There are no regulatory commitments contained in this report.

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

Respectfully,

Andrew Krukowski
Plant Manager
Clinton Power Station

Attachment: Annual Radiological Environmental Operation Report

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

IE25
NRR

Constellation.

January 01, 2023 – December 31, 2023

ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

CLINTON POWER STATION – DOCKET NUMBER 50-461

Prepared by:

Teledyne Brown Engineering Environmental Services

April 2024

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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 2023, covers the period January 1, 2023, through December 31, 2023. During that time period, 1,573 analyses were performed on 1,447 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 2023. 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 2023 due to the release of gaseous effluents from CPS was 2.42E-01 mrem or 0.242 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 and no activity was detected.

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 13,626 acres. This includes the approximately 4,900 acre, man-made cooling lake and about 95 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 13,626 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, 2023, through December 31, 2023.

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 2023. 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 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 one meter 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 2023. 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 broadleaf vegetation
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. Sampling Anomalies

   a. During the weekly compositor check on 01/04/23, the Environmental, Inc. sampling vendor identified damage to the CL-91 (6.1 mi ENE) SW compositor due to frozen water source. The water compositor was replaced. CL-14 (in Service Building) WD compositor had a low sample volume due to degraded compositor. Supplemental grab sample was taken for CL-14. (IR 04546769)

   b. Due to the degraded condition of the CL-14 (in Service Building) drinking water compositor and need for compositor replacement, grab samples were taken from January until the compositor was replaced in October 2023. An issue report was generated to

document the sampling deviation and WR was created for site to replace the compositor.
(IRs 04668004, 04688458, 04692879, 04699605, 04705435, 04713080)

c. During the weekly air sampling surveillance on 06/07/23 at location CL-6, the sampling vendor accidently dropped the "collected" charcoal cartridge and the new cartridge together. It was not possible to distinguish between them, so both were submitted to the laboratory. TBE assigned the cartridges as "A" and "B" and analyzed both samples. Both results were less than the detection limit.

d. During the monthly drinking water compositor collection on 11/29/23 from CL-14 (in Service Building), a leak was identified in the sampling line of the new compositor. After communications with the manufacturer, it is believed the sample line purge is unable to overcome the potable water system pressure. ECR (Engineering Change Request) was initiated to remove the compositor and actions created to revise the collection type and frequency in the REMP/ODCM. Grab samples were collected for November and December (see additional IR 04727177). (IR 04720400)

2. Air Sampler Timer Shortages

a. During weekly ODCM air sampling surveillance on 01/11/23, the sampling vendor identified ODCM sample locations CL-2 (0.7 mi NNE) and CL-3 (0.7 mi NE) were missing approximately 5-6 hours of run time from the collection timer, indicating a power outage in the area. Non-ODCM sample locations CL-4 (0.8 mi SW) and CL-6 (0.8 mi WSW) also experienced a sampling deviation of 5-6 hours. (IR 04548374)

b. During weekly ODCM air sampling surveillance on 07/05/23, the vendor identified seven air samplers with short timer readings indicating a power outage in the area. ODCM samplers CL-8 (2.2 mi E) indicated 108.6 hours of sample time, CL-15 (0.9 mi N) indicated 2.38 hours of sample time and did not have power. Non-ODCM air samplers CL-1 (1.8 mi W), CL-4 (0.8 mi SW), CL-6 (0.8 mi WSW), CL-7 (2.3 mi SE), and CL-94 (0.6 mi E) experienced lower than expected timer readings but were back up and running appropriately during the sample collection. (IR 046688811)

c. During weekly air sampling surveillance on 07/19/23, the air sampler timer at CL-15 (0.9 mi N) recorded 72.8 hours of collection during the week. The low sample collection was a result of the power outage identified in IRs 04690175 and 04688811. (IR 04691693)

d. During the weekly air sampling surveillance on 12/06/23, two air samplers were identified to have lost approximately 2 hours of collection time indicating a brief loss of power in the area. ODCM air sampler CL-8 is located 2.2 mi E and supplemental ODCM air sampler CL-94 is located 0.6 mi E. (IR 04722059)

3. Insufficient Vegetation for June 2023 REMP Sampling (IR 04687881)

   During the monthly vegetation collection surveillance performed on 06/28/23, it was identified that the vegetation at locations CL-115 (0.7 mi NE) and CL-118 (0.7 mi NNE) were not of adequate size to reach the collection requirement of 1 kg. This was due to being early in the growing season and overgrowth of brush blocking exposure to sunlight. FMD (Facilities Maintenance Department) request was created to remove overgrown brush and analyzing lab was notified of low sample volume.

Missed Samples

1. AP/AI Location CL-05 (07/05/23 – 07/12/23) (IR 04690175)

   During the weekly air sampling surveillance, air sampler CL-15 (0.9 mi N) indicated no sample run time and there was no power to the air sampler pump. Loss of power was identified in IR 04688811 and caused by the need for site EMD (Electric Maintenance Department) to rehang mast wires. Communications with Cornbelt Energy verified power would be restored after the EMD work was completed. FMD was notified to supply an alternate power source through a backup generator.

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

There were no program changes in 2023.

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. Detectible gross beta activity was observed in one sample at a concentration of 4.9 pCi/L. No gross beta was detected in any other samples and the required LLD was met. (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 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 9 to 41 E–3 pCi/m^3 with a mean of 21 E–3 pCi/m^3. The results from the Intermediate Distance location (Group II) ranged from 10 to 36 E–3 pCi/m^3 with a mean of 21 E–3 pCi/m^3. The results from the Control location (Group III) ranged from 12 to 39 E–3 pCi/m^3 with a mean of 22 E–3 pCi/m^3. Comparison of the 2023 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 2023 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 216 OSLD measurements were made in 2023. The average dose from the inner ring was 19.3 mRem/quarter. The average dose from the outer ring was 19.9 mRem/quarter. The average dose from the special interest group was 19.7 mRem/quarter. The average dose from the supplemental group was 18.6 mRem/quarter. The quarterly measurements ranged from 14.6 to 23.6 mRem/quarter.

The inner ring and outer ring measurements compared well to the Control Station, CL-11, which ranged from 16.1 to 20.6 mRem/quarter with an average measurement of 18.5 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 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 4, 2023. 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. 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	4.87	1.50
2 NNE	1.50	4.78	5.75
3 NE	2.07	> 8	> 8
4 ENE	4.20	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	> 8	> 8
12 WSW	3.62	> 8	4.32
13 W	1.95	3.32	> 8
14 WNW	2.63	2.63	> 8
15 NW	2.65	4.70	> 8
16 NNW	2.05	3.76	2.05

F. Errata Data

There was no errata data for 2023.

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 that represent test & matrix combinations available for REMP programs. 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, 124 out of 131 analyses performed met the specified acceptance criteria. Seven analyses did not meet the specified acceptance criteria and were addressed through the TBE Corrective Action Program. A summary is found below:

1. The MAPEP February 2023 Soil Ni-63 result was evaluated as *Not Acceptable*. TBE's reported values was 294 Bq/kg and the known result was 1130 Bq/kg (range 791 – 1469). The sample was reprepped by a different (senior) lab technician with results of 1120 & 1250 Bq. It was determined that there was a difference between the two techs during the sample prep (technique) and the procedure was revised to reflect these differences including using a specific aliquot amount. (NCR 23-08)

2. The MAPEP February 2023 vegetation Sr-90 result was evaluated as *Not Acceptable*. The reported value was 0.05 Bq (not detected) and the known result was a "false positive". This was considered to be a statistical failure because TBE's reported result with 3 times the uncertainty resulted in a slightly positive net result (0.03194 Bq/kg). The reported result was significantly below TBE's average detection limit for vegetation samples. (NCR 23-09)

3. The ERA RAD April 2023 water Ba-133 result was evaluated as *Not Acceptable*. The reported value was 26.0 pCi/L and the known was 22.3 (acceptance range 17.1 – 25.8 pCi) or 117% of the known (acceptable for TBE QC). The sample was used as the workgroup duplicate with a result of 25.4 (114%). The sample had also been counted on a different detector with a result of 21.9 (98%). This was TBE's first failure for Ba-133. (NCR 23-10)

4. The MAPEP August 2023 soil Fe-55 result was evaluated as *Not Acceptable*. The reported value was 346 Bq/kg and the known result was 1280 (acceptance range of 896-1664 Bq/kg). This was TBE's initial evaluation for Fe-55 in soils. The result was received at the end of December and the root cause is under investigation. No client samples were associated with this cross-check. (CAR 23-31)

5. The Analytics September 2023 milk Sr-90 result was evaluated as Not Acceptable. The reported result was 7.28 pCi/L and the known result was 12.8 (57% of known). This sample was used as the workgroup duplicate and the carrier yields for both samples were 107% and 75%. The LCS recovery for the workgroup was at 106%. The ERA drinking water Sr-90 cross check that was analyzed around the same time was acceptable at 108%. There was no explanation for the failure. This is the first low biased failure for Sr-90 milk. The last failure (high) was in 2016. (NCR 23-24)

6. The ERA RAD October 2023 water Gross Alpha result was evaluated as *Not Acceptable*. The reported result was 53.2 pCi/L and the known result was 70.6 (acceptable range of 54.0 – 87.2 pCi/L). The reported result was the workgroup duplicate and was within 75% of the known value (within TBE QC range). The original result was 63.3 pCi/L (90% of the known). Because the LCS result was biased slightly high, the decision was made to report the lower value. (NCR 23-20)

7. The ERA RAD October 2023 water I-131 result was evaluated as *Not Acceptable*. The reported value was 23.5 pCi/L and the known result was 29.7 (acceptable range of 25.8 – 33.6) The reported result was 79% of the known, which is within the acceptable TBE QC range. The workgroup was reviewed with no anomalies found. The LCS/LCSD results were 109% and 86.1%. The sample was not processed in a timely manner as per the ERA instructions which stated to analyze shortly after receipt due to the short half-life. Going forward, the QA &/or Lab Mgr. will ensure that this analysis is started sooner. (NCR 23-21)

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

V. References

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

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APPENDIX A

RADIOLOGICAL ENVIRONMENTAL MONITORING REPORT SUMMARY

TABLE A-1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY FOR THE CLINTON POWER STATION, 2023

NAME OF FACILITY:	**CLINTON POWER STATION**	**DOCKET NUMBER:**	**50-461**
LOCATION OF FACILITY:	**DEWITT COUNTY IL**	**REPORTING PERIOD:**	**2023**

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	48						
	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	4.9 (1/12)	*NA*	4.9 (1/12)	CL-14 INDICATOR STATION PLANT SERVICE BLDG ONSITE	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, 2023

NAME OF FACILITY:	CLINTON POWER STATION			DOCKET NUMBER:	50-461			
LOCATION OF FACILITY:	DEWITT COUNTY IL			REPORTING PERIOD:	2023			
				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, 2023

NAME OF FACILITY:	CLINTON POWER STATION			DOCKET NUMBER:	50-461		
LOCATION OF FACILITY:	DEWITT COUNTY IL			REPORTING PERIOD:	2023		

MEDIUM OR PATHWAY SAMPLED *(UNIT OF MEASUREMENT)*	TYPES OF ANALYSIS PERFORMED	NUMBER OF ANALYSIS PERFORMED	REQUIRED LOWER LIMIT OF DETECTION (LLD)	INDICATOR LOCATIONS MEAN (M) (F) *RANGE*	CONTROL LOCATION MEAN (M) (F) *RANGE*	LOCATION WITH HIGHEST ANNUAL MEAN (M) MEAN (M) (F) *RANGE*	LOCATION WITH HIGHEST ANNUAL MEAN (M) STATION # NAME DISTANCE AND DIRECTION	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
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**	518	10	21 (466/466) *9 - 41*	22 (52/52) *12 - 39*	22 (52/52) *12 - 39*	CL-11 CONTROL ILLINOIS POWER SUBSTATION 16 MILES S OF SITE	0
(E-3 PCI/CU.METER)								
	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**	519						
(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, 2023

NAME OF FACILITY:	CLINTON POWER STATION			DOCKET NUMBER:	50-461			
LOCATION OF FACILITY:	DEWITT COUNTY IL			REPORTING PERIOD:	2023			
				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
MILK	I-131 (LOW LVL)	18	1	*NA*	<LLD	-		0
(PCI/LITER)								
	GAMMA	18						
	K-40		*NA*	*NA*	1007 (18/18) *657 - 1243*	1007 (18/18) *657 - 1243*	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, 2023

NAME OF FACILITY:	**CLINTON POWER STATION**	**DOCKET NUMBER:**	**50-461**
LOCATION OF FACILITY:	**DEWITT COUNTY IL**	**REPORTING PERIOD:**	**2023**

MEDIUM OR PATHWAY SAMPLED *(UNIT OF MEASUREMENT)*	TYPES OF ANALYSIS PERFORMED	NUMBER OF ANALYSIS PERFORMED	REQUIRED LOWER LIMIT OF DETECTION (LLD)	**INDICATOR LOCATIONS** MEAN (M) (F) *RANGE*	**CONTROL LOCATION** MEAN (M) (F) *RANGE*	**LOCATION WITH HIGHEST ANNUAL MEAN (M)** MEAN (M) (F) *RANGE*	**STATION #** **NAME** DISTANCE AND DIRECTION	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
GRASS	**GAMMA**	48						
(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**	216	*NA*	19.4	18.5	21.9	CL-41 INDICATOR	0
(MILLI-ROENTGEN/QTR.)				(212/212)	(4/4)	(4/4)		
				14.6 - 23.6	*16.1 - 20.6*	*16.1 - 23.4*	2.4 MILES E	

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

APPENDIX B

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

TABLE B-1: Radiological Environmental Monitoring Program - Sampling Locations, Distance and Direction
Clinton Power Station, 2023

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, 2023

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, 2023

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(1)	12.5 miles WSW
	Control	
	CL-11	16 miles S

(1) The location for CL-114 changed at the beginning of 2023 due to a change in control garden location in 2022. CL-114 is a supplemental DLR and a 5-year baseline is being gathered before facility-related dose calculations can be performed. 2023 will be the first full year of a baseline data collection.

TABLE B-2: Radiological Environmental Monitoring Program – Summary of Sample Collection and Analytical Methods, Clinton Power Station, 2023

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

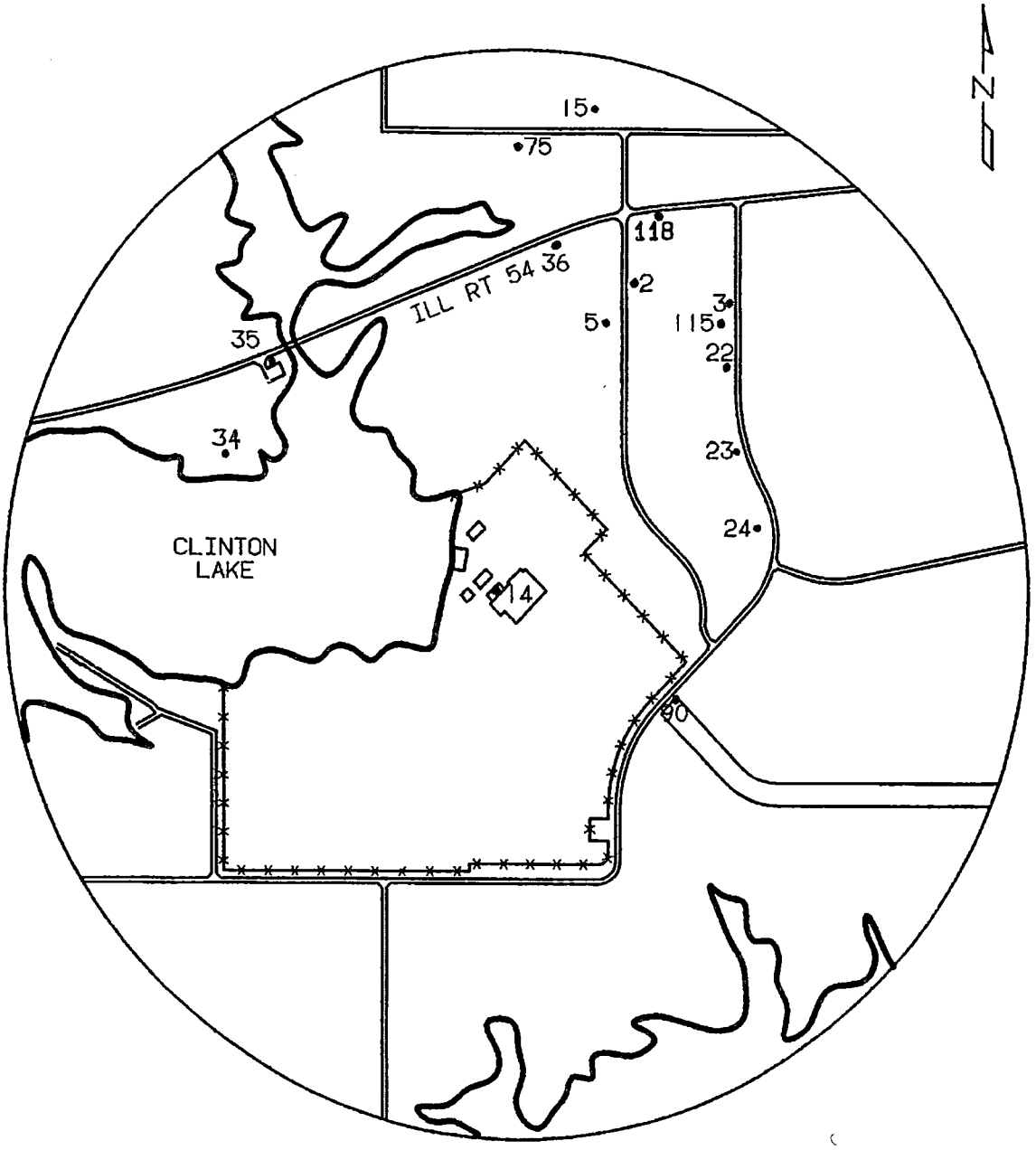

Figure B-1
Environmental Sampling Locations Within One
Mile of the Clinton Power Station, 2023

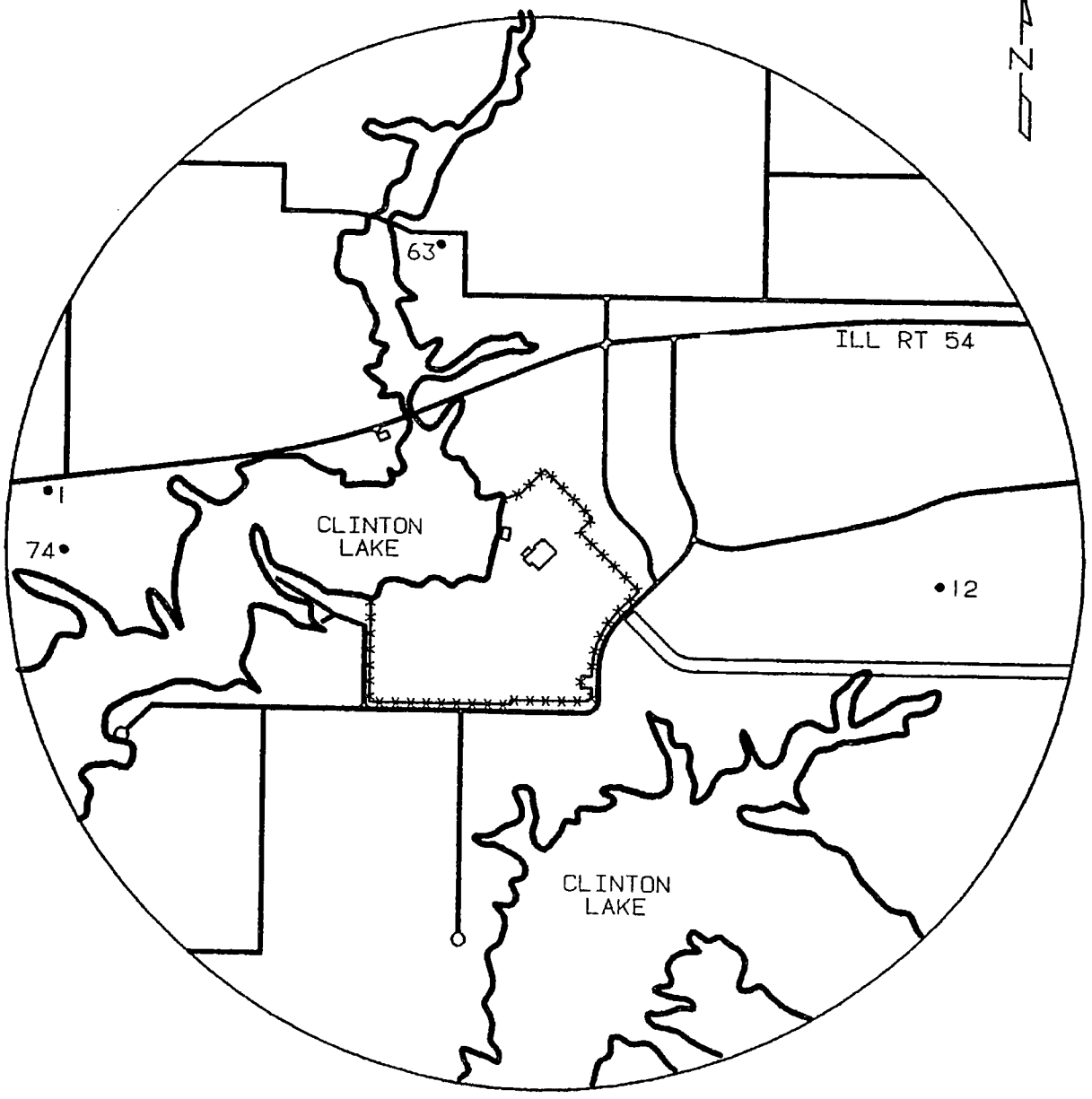

Figure B-2
Environmental Sampling Locations Between One and Two
Miles of the Clinton Power Station, 2023

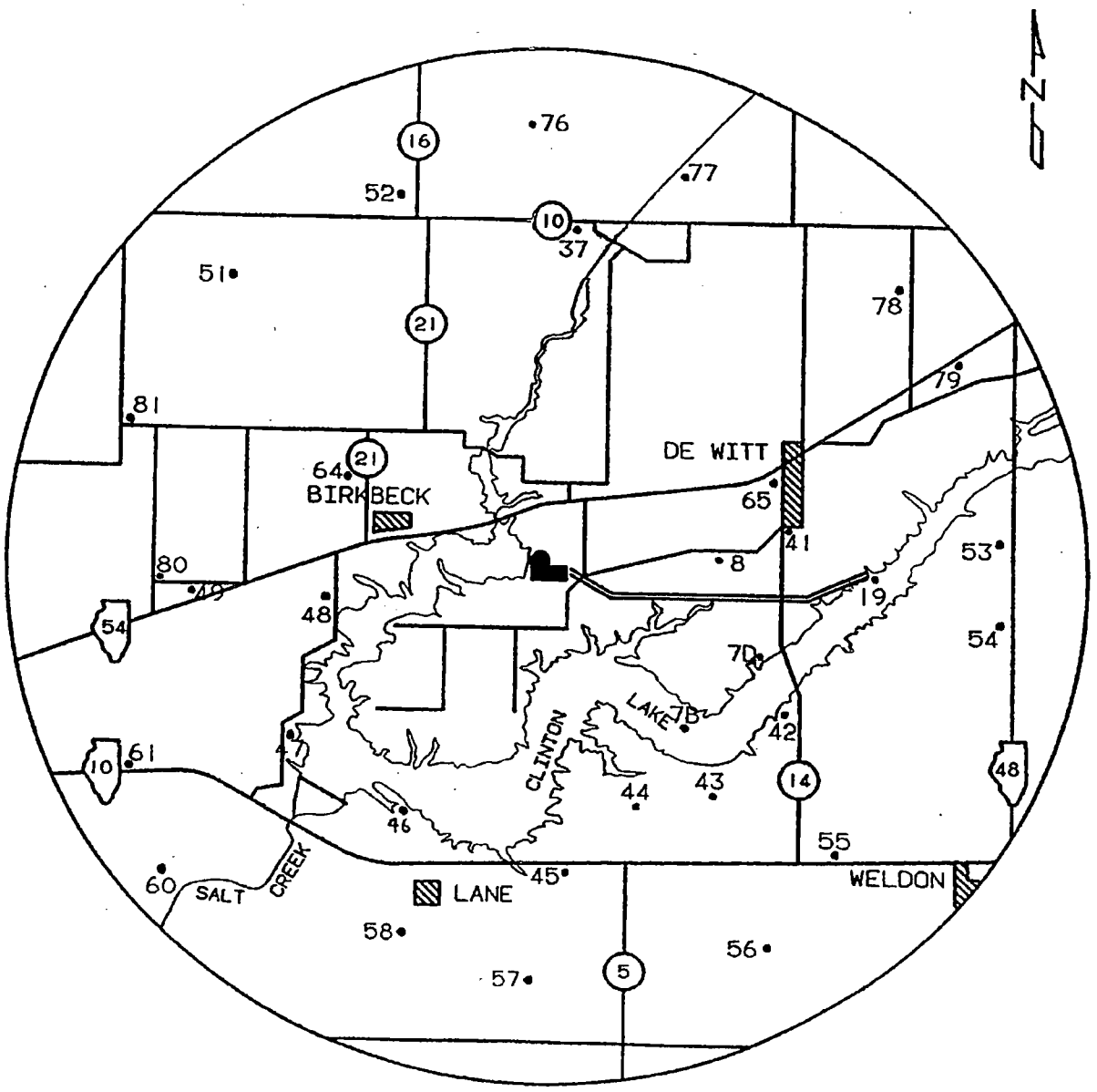

Figure B-3
Environmental Sampling Locations Between Two and Five
Miles of the Clinton Power Station, 2023

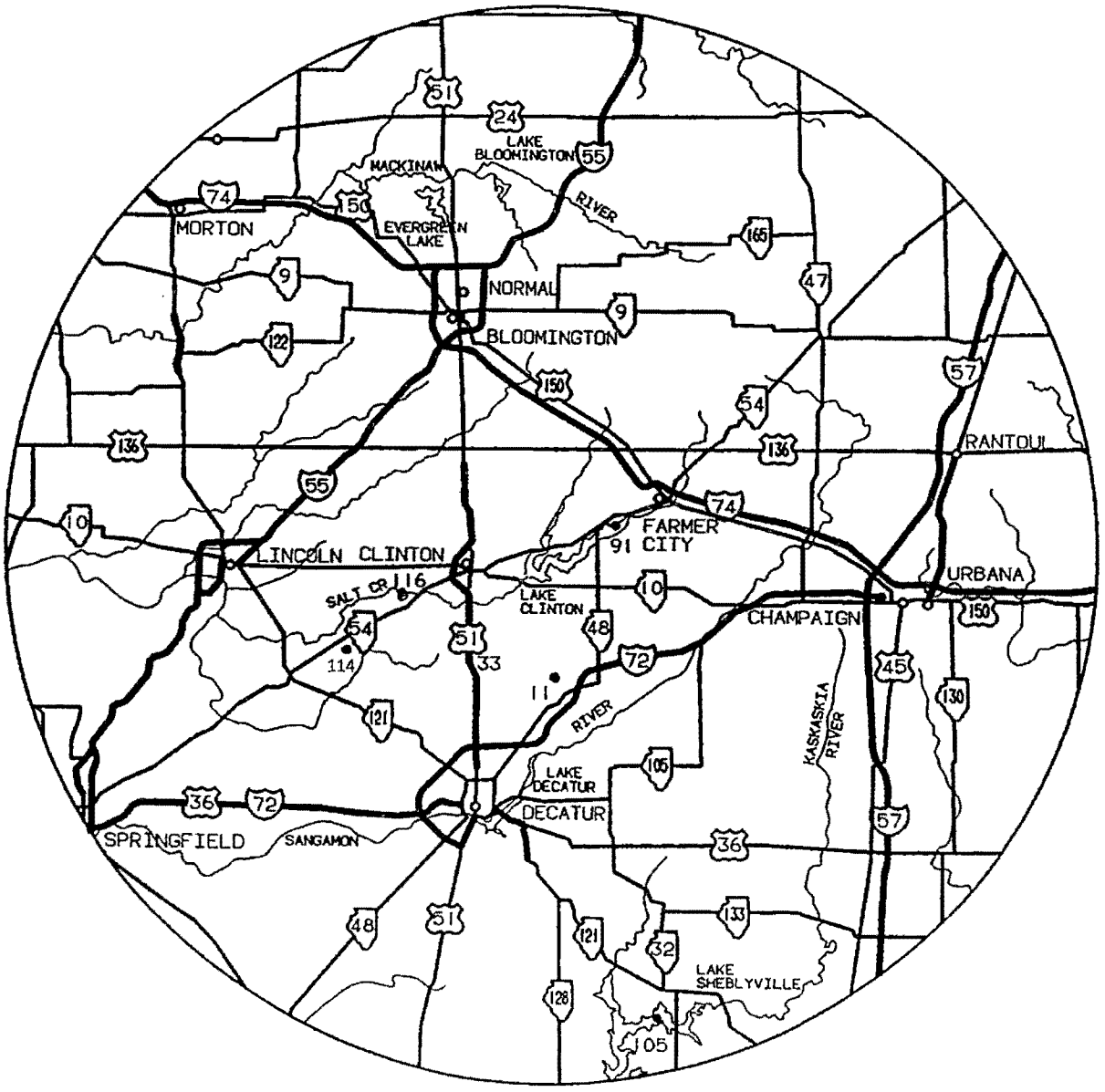

Figure B-4
Environmental Sampling Locations Greater Than Five
Miles of the Clinton Power Station, 2023

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, 2023**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	CL-90
12/28/22 - 01/25/23	< 0.9
01/25/23 - 02/22/23	< 0.6
02/22/23 - 03/29/23	< 0.5
03/29/23 - 04/26/23	< 0.9
04/26/23 - 05/31/23	< 0.8
05/31/23 - 06/28/23	< 0.9
06/28/23 - 07/26/23	< 0.8
07/26/23 - 08/30/23	< 0.8
08/30/23 - 09/27/23	< 0.9
09/27/23 - 10/25/23	< 0.8
10/25/23 - 11/29/23	< 0.8
11/29/23 - 12/27/23	< 0.9
MEAN	-

Table C-I.2 **CONCENTRATIONS OF TRITIUM IN SURFACE WATER SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2023**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	CL-90	CL-13	CL-91	CL-99
12/28/22 - 03/29/23	< 177	< 174	< 176	< 176
03/29/23 - 06/28/23	< 180	< 180	< 181	< 174
06/28/23 - 09/27/23	< 195	< 195	< 195	< 198
09/27/23 - 12/27/23	< 193	< 186	< 192	< 197
MEAN	-	-	-	-

Table C-I.3

CONCENTRATIONS OF GAMMA EMITTERS IN SURFACE WATER SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2023

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	01/25/23 - 01/25/23	< 7	< 7	< 14	< 8	< 14	< 7	< 13	< 5	< 7	< 29	< 11	< 56
	02/22/23 - 02/22/23	< 5	< 6	< 11	< 6	< 14	< 4	< 14	< 7	< 7	< 25	< 11	< 41
	03/29/23 - 03/29/23	< 6	< 8	< 17	< 6	< 13	< 7	< 10	< 8	< 6	< 22	< 11	< 46
	04/26/23 - 04/26/23	< 6	< 7	< 16	< 9	< 14	< 6	< 9	< 8	< 7	< 25	< 10	< 44
	05/31/23 - 05/31/23	< 5	< 6	< 13	< 10	< 16	< 7	< 9	< 7	< 6	< 28	< 9	< 40
	06/28/23 - 06/28/23	< 6	< 8	< 15	< 8	< 13	< 6	< 10	< 4	< 8	< 27	< 8	< 42
	07/26/23 - 07/26/23	< 6	< 7	< 10	< 8	< 10	< 7	< 11	< 6	< 6	< 29	< 12	< 41
	08/30/23 - 08/30/23	< 6	< 7	< 15	< 7	< 14	< 7	< 12	< 8	< 9	< 31	< 11	< 59
	09/27/23 - 09/27/23	< 6	< 6	< 13	< 8	< 11	< 6	< 12	< 8	< 7	< 28	< 8	< 50
	10/25/23 - 10/25/23	< 6	< 6	< 15	< 7	< 13	< 7	< 10	< 8	< 6	< 27	< 7	< 50
	11/29/23 - 11/29/23	< 8	< 8	< 17	< 8	< 20	< 11	< 15	< 7	< 9	< 37	< 12	< 53
	12/27/23 - 12/27/23	< 7	< 7	< 19	< 6	< 18	< 9	< 17	< 8	< 8	< 38	< 11	< 48
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-
CL-90	12/28/22 - 01/25/23	< 6	< 9	< 12	< 9	< 12	< 7	< 13	< 7	< 8	< 32	< 7	< 46
	01/25/23 - 02/22/23	< 7	< 4	< 13	< 8	< 13	< 6	< 11	< 6	< 7	< 31	< 7	< 39
	02/22/23 - 03/29/23	< 6	< 5	< 15	< 7	< 15	< 6	< 10	< 4	< 7	< 19	< 11	< 44
	03/29/23 - 04/26/23	< 5	< 8	< 16	< 6	< 12	< 9	< 10	< 9	< 6	< 33	< 9	< 46
	04/26/23 - 05/31/23	< 5	< 7	< 10	< 7	< 14	< 6	< 10	< 7	< 6	< 30	< 8	< 45
	05/31/23 - 06/28/23	< 5	< 7	< 14	< 5	< 12	< 7	< 14	< 6	< 7	< 32	< 10	< 57
	06/28/23 - 07/26/23	< 5	< 6	< 11	< 5	< 12	< 6	< 10	< 6	< 6	< 25	< 7	< 49
	07/26/23 - 08/30/23	< 8	< 9	< 10	< 9	< 18	< 7	< 10	< 9	< 8	< 36	< 13	< 41
	08/30/23 - 09/27/23	< 7	< 7	< 13	< 7	< 14	< 7	< 12	< 8	< 7	< 27	< 10	< 44
	09/27/23 - 10/25/23	< 4	< 4	< 11	< 6	< 12	< 4	< 8	< 6	< 4	< 22	< 10	< 33
	10/25/23 - 11/29/23	< 6	< 5	< 13	< 8	< 14	< 6	< 9	< 8	< 7	< 24	< 14	< 40
	11/29/23 - 12/27/23	< 6	< 6	< 17	< 8	< 15	< 7	< 9	< 7	< 7	< 27	< 10	< 41
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-

Table C-I.3

CONCENTRATIONS OF GAMMA EMITTERS IN SURFACE WATER SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2023

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	12/28/22 - 01/25/23	< 7	< 9	< 14	< 7	< 18	< 9	< 12	< 8	< 8	< 32	< 13	< 53
	01/25/23 - 02/22/23	< 6	< 7	< 12	< 6	< 11	< 6	< 10	< 6	< 6	< 24	< 7	< 46
	02/22/23 - 03/29/23	< 6	< 8	< 12	< 8	< 14	< 8	< 12	< 7	< 7	< 32	< 8	< 51
	03/29/23 - 04/26/23	< 7	< 6	< 14	< 8	< 13	< 7	< 11	< 8	< 7	< 30	< 11	< 52
	04/26/23 - 05/31/23	< 6	< 5	< 11	< 7	< 11	< 6	< 11	< 6	< 6	< 22	< 10	< 49
	05/31/23 - 06/28/23	< 6	< 7	< 16	< 11	< 13	< 6	< 11	< 7	< 6	< 31	< 13	< 46
	06/28/23 - 07/26/23	< 6	< 5	< 11	< 6	< 9	< 5	< 9	< 5	< 5	< 27	< 7	< 34
	07/26/23 - 08/30/23	< 7	< 9	< 17	< 7	< 18	< 8	< 13	< 6	< 9	< 23	< 7	< 44
	08/30/23 - 09/27/23	< 5	< 7	< 13	< 6	< 11	< 7	< 10	< 6	< 7	< 27	< 9	< 53
	09/27/23 - 10/25/23	< 4	< 5	< 15	< 8	< 11	< 7	< 13	< 9	< 5	< 32	< 9	< 46
	10/25/23 - 11/29/23	< 8	< 8	< 15	< 7	< 17	< 7	< 12	< 7	< 8	< 28	< 12	< 41
	11/29/23 - 12/27/23	< 9	< 9	< 15	< 8	< 17	< 10	< 16	< 10	< 8	< 45	< 14	< 61
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-
CL-99	12/28/22 - 01/25/23	< 6	< 7	< 12	< 7	< 14	< 6	< 12	< 7	< 7	< 26	< 8	< 43
	01/25/23 - 02/22/23	< 5	< 5	< 8	< 7	< 12	< 7	< 9	< 6	< 6	< 28	< 11	< 43
	02/22/23 - 03/29/23	< 7	< 8	< 10	< 8	< 13	< 9	< 11	< 6	< 5	< 32	< 10	< 49
	03/29/23 - 04/26/23	< 6	< 5	< 12	< 6	< 13	< 6	< 8	< 6	< 5	< 18	< 12	< 36
	04/26/23 - 05/31/23	< 5	< 7	< 12	< 10	< 10	< 7	< 12	< 5	< 7	< 23	< 8	< 42
	05/31/23 - 06/28/23	< 6	< 7	< 16	< 8	< 13	< 7	< 12	< 8	< 8	< 33	< 12	< 52
	06/28/23 - 07/26/23	< 6	< 5	< 15	< 6	< 9	< 5	< 12	< 8	< 6	< 27	< 12	< 41
	07/26/23 - 08/30/23	< 7	< 6	< 16	< 5	< 14	< 7	< 12	< 7	< 6	< 37	< 11	< 56
	08/30/23 - 09/27/23	< 7	< 8	< 11	< 10	< 17	< 9	< 13	< 7	< 8	< 33	< 13	< 43
	09/27/23 - 10/25/23	< 5	< 5	< 9	< 8	< 9	< 5	< 7	< 4	< 5	< 22	< 8	< 32
	10/25/23 - 11/29/23	< 5	< 6	< 13	< 6	< 15	< 7	< 13	< 8	< 7	< 29	< 12	< 52
	11/29/23 - 12/27/23	< 5	< 6	< 13	< 7	< 14	< 6	< 9	< 6	< 6	< 26	< 9	< 41
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-

Table C-II.1 CONCENTRATIONS OF GROSS BETA IN DRINKING WATER SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2023

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	CL-14
01/25/23 - 01/25/23	4.9 ± 3.2
02/22/23 - 02/22/23	< 1.8
03/29/23 - 03/29/23	< 1.7
04/26/23 - 04/26/23	< 1.6
05/31/23 - 05/31/23	< 1.5
06/28/23 - 06/28/23	< 1.8
07/26/23 - 07/26/23	< 1.8
08/30/23 - 08/30/23	< 1.7
09/27/23 - 09/27/23	< 1.6
10/25/23 - 10/25/23	< 1.8
11/29/23 - 11/29/23	< 1.6
12/27/23 - 12/27/23	< 1.7
MEAN ± 2 STD DEV	4.9 ± 0.0

Table C-II.2 CONCENTRATIONS OF TRITIUM IN DRINKING WATER SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2023

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	CL-14
01/25/23 - 03/29/23	< 177
04/26/23 - 06/28/23	< 182
07/26/23 - 09/27/23	< 194
10/25/23 - 12/27/23	< 199
MEAN	-

Table C-II.3 CONCENTRATIONS OF I-131 IN DRINKING WATER SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2023

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	CL-14
01/25/23 - 01/25/23	< 0.9
02/22/23 - 02/22/23	< 0.8
03/29/23 - 03/29/23	< 0.5
04/26/23 - 04/26/23	< 0.8
05/31/23 - 05/31/23	< 0.8
06/28/23 - 06/28/23	< 1.0
07/26/23 - 07/26/23	< 0.8
08/30/23 - 08/30/23	< 0.9
09/27/23 - 09/27/23	< 0.6
10/25/23 - 10/25/23	< 0.9
11/29/23 - 11/29/23	< 0.9
12/27/23 - 12/27/23	< 0.8
MEAN	-

Table C-II.4

CONCENTRATIONS OF GAMMA EMITTERS IN DRINKING WATER SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2023

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	01/25/23 - 01/25/23	< 6	< 5	< 13	< 6	< 15	< 7	< 12	< 7	< 7	< 31	< 12	< 57
	02/22/23 - 02/22/23	< 6	< 5	< 12	< 6	< 12	< 5	< 9	< 7	< 6	< 26	< 8	< 40
	03/29/23 - 03/29/23	< 6	< 5	< 11	< 8	< 11	< 7	< 13	< 8	< 5	< 31	< 12	< 46
	04/26/23 - 04/26/23	< 6	< 7	< 12	< 10	< 14	< 7	< 15	< 7	< 8	< 24	< 5	< 55
	05/31/23 - 05/31/23	< 6	< 6	< 12	< 6	< 14	< 7	< 10	< 5	< 6	< 30	< 15	< 41
	06/28/23 - 06/28/23	< 6	< 6	< 11	< 5	< 9	< 4	< 9	< 7	< 5	< 31	< 11	< 43
	07/26/23 - 07/26/23	< 6	< 5	< 9	< 7	< 10	< 5	< 12	< 5	< 6	< 26	< 10	< 35
	08/30/23 - 08/30/23	< 6	< 6	< 14	< 8	< 14	< 6	< 14	< 7	< 7	< 30	< 12	< 57
	09/27/23 - 09/27/23	< 7	< 6	< 13	< 7	< 13	< 7	< 12	< 9	< 6	< 27	< 13	< 44
	10/25/23 - 10/25/23	< 6	< 6	< 11	< 7	< 11	< 5	< 10	< 6	< 7	< 24	< 9	< 40
	11/29/23 - 11/29/23	< 6	< 7	< 12	< 8	< 18	< 8	< 13	< 7	< 8	< 31	< 12	< 56
	12/27/23 - 12/27/23	< 6	< 7	< 16	< 8	< 19	< 9	< 11	< 5	< 7	< 32	< 12	< 50
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-

Table C-III.1 **CONCENTRATIONS OF TRITIUM IN WELL WATER SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2023**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	CL-07D	CL-12R	CL-12T
03/29/23 - 03/29/23	< 189	< 184	< 187
06/28/23 - 06/28/23	< 185	< 184	< 184
09/27/23 - 09/27/23	< 189	< 185	< 189
12/27/23 - 12/27/23	< 188	< 188	< 187
MEAN	-	-	-

Table C-III.2

CONCENTRATIONS OF GAMMA EMITTERS IN WELL WATER SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2023

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	03/29/23	< 7	< 8	< 15	< 8	< 17	< 8	< 13	< 9	< 8	< 40	< 7	< 65
	06/28/23	< 8	< 8	< 15	< 7	< 13	< 8	< 12	< 6	< 9	< 26	< 10	< 42
	09/27/23	< 6	< 4	< 8	< 5	< 10	< 6	< 8	< 6	< 5	< 25	< 9	< 42
	12/27/23	< 7	< 6	< 16	< 6	< 16	< 8	< 13	< 7	< 7	< 36	< 14	< 62
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-
CL-12R	03/29/23	< 4	< 4	< 13	< 10	< 13	< 7	< 11	< 7	< 6	< 28	< 11	< 40
	06/28/23	< 7	< 5	< 13	< 7	< 10	< 6	< 8	< 6	< 8	< 28	< 6	< 39
	09/27/23	< 6	< 6	< 15	< 9	< 16	< 6	< 12	< 6	< 7	< 27	< 9	< 43
	12/27/23	< 6	< 6	< 14	< 6	< 15	< 6	< 11	< 7	< 6	< 28	< 9	< 46
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-
CL-12T	03/29/23	< 8	< 7	< 12	< 6	< 14	< 7	< 12	< 8	< 8	< 37	< 10	< 60
	06/28/23	< 6	< 6	< 11	< 7	< 14	< 4	< 12	< 8	< 6	< 27	< 9	< 42
	09/27/23	< 6	< 5	< 15	< 8	< 13	< 6	< 12	< 7	< 11	< 30	< 9	< 37
	12/27/23	< 7	< 7	< 14	< 7	< 19	< 8	< 13	< 8	< 7	< 31	< 12	< 59
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-

Table C-IV.1

CONCENTRATIONS OF GAMMA EMITTERS IN FISH SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2023

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	05/10/23	< 50	< 52	< 141	< 65	< 94	< 48	< 83	< 41	< 41	< 266	< 125	< 256
Channel Catfish	05/10/23	< 50	< 53	< 113	< 46	< 107	< 54	< 87	< 79	< 48	< 275	< 53	< 237
Bluegill	05/10/23	< 67	< 70	< 200	< 99	< 169	< 69	< 125	< 80	< 88	< 405	< 143	< 422
Carp	05/10/23	< 65	< 57	< 153	< 77	< 161	< 77	< 117	< 84	< 85	< 445	< 126	< 464
Largemouth Bass	10/06/23	< 56	< 48	< 90	< 50	< 120	< 50	< 83	< 58	< 50	< 255	< 73	< 241
Bluegill	10/06/23	< 49	< 46	< 113	< 60	< 133	< 53	< 66	< 55	< 49	< 218	< 60	< 253
White Bass	10/06/23	< 51	< 57	< 115	< 66	< 113	< 66	< 94	< 64	< 45	< 250	< 78	< 220
Common Carp	10/06/23	< 36	< 57	< 127	< 59	< 108	< 61	< 100	< 70	< 51	< 261	< 53	< 250
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-
CL-105													
Largemouth Bass	05/10/23	< 44	< 57	< 138	< 63	< 94	< 53	< 88	< 57	< 58	< 245	< 113	< 281
Crappie	05/10/23	< 55	< 58	< 136	< 48	< 112	< 50	< 120	< 62	< 60	< 382	< 93	< 262
Bluegill	05/10/23	< 57	< 63	< 79	< 58	< 145	< 64	< 111	< 76	< 43	< 366	< 139	< 290
Carp	05/10/23	< 66	< 68	< 112	< 70	< 117	< 62	< 98	< 66	< 61	< 377	< 58	< 318
Largemouth Bass	10/05/23	< 64	< 62	< 139	< 77	< 146	< 66	< 141	< 71	< 74	< 343	< 117	< 387
Bluegill	10/05/23	< 72	< 72	< 115	< 65	< 139	< 75	< 100	< 74	< 75	< 315	< 105	< 375
Channel Catfish	10/05/23	< 63	< 59	< 133	< 60	< 160	< 63	< 100	< 48	< 64	< 252	< 66	< 259
Common Carp	10/05/23	< 46	< 46	< 87	< 64	< 84	< 37	< 70	< 32	< 36	< 190	< 54	< 221
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-

Table C-V.1

CONCENTRATIONS OF GAMMA EMITTERS IN SEDIMENT SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2023

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	05/10/23	< 60	< 70	< 123	< 62	< 138	< 68	< 109	< 69	< 65	< 414	< 84	< 322
	10/06/23	< 69	< 68	< 175	< 63	< 161	< 73	< 140	< 74	< 70	< 310	< 111	< 351
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-
CL-105	05/11/23	< 49	< 67	< 100	< 72	< 124	< 49	< 100	< 61	< 51	< 346	< 125	< 233
	10/05/23	< 50	< 22	< 91	< 71	< 134	< 58	< 91	< 57	< 45	< 226	< 82	< 233
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-

Table C-VI.1 **CONCENTRATIONS OF GROSS BETA IN AIR PARTICULATE SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2023**

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
01/04/23 - 01/11/23	25 ± 4	30 ± 5	29 ± 5	27 ± 5	31 ± 5	27 ± 4
01/11/23 - 01/18/23	26 ± 5	30 ± 5	33 ± 5	28 ± 5	29 ± 5	30 ± 5
01/18/23 - 01/25/23	19 ± 4	19 ± 4	24 ± 5	15 ± 4	19 ± 4	21 ± 4
01/25/23 - 02/01/23	25 ± 5	19 ± 4	20 ± 4	23 ± 4	21 ± 4	23 ± 5
02/01/23 - 02/08/23	29 ± 5	24 ± 5	25 ± 5	23 ± 5	18 ± 5	32 ± 5
02/08/23 - 02/15/23	20 ± 4	22 ± 5	17 ± 4	12 ± 4	14 ± 4	16 ± 4
02/15/23 - 02/22/23	15 ± 4	18 ± 4	18 ± 4	20 ± 5	14 ± 4	16 ± 4
02/22/23 - 03/01/23	10 ± 4	13 ± 4	11 ± 4	11 ± 4	17 ± 4	15 ± 4
03/01/23 - 03/08/23	17 ± 4	17 ± 4	21 ± 4	16 ± 4	19 ± 4	14 ± 4
03/08/23 - 03/15/23	15 ± 4	14 ± 4	13 ± 4	12 ± 4	13 ± 4	17 ± 4
03/15/23 - 03/22/23	20 ± 4	24 ± 5	24 ± 5	23 ± 5	24 ± 5	24 ± 5
03/22/23 - 03/29/23	20 ± 4	21 ± 4	21 ± 4	19 ± 4	21 ± 5	24 ± 5
03/29/23 - 04/05/23	13 ± 4	12 ± 4	13 ± 4	14 ± 5	14 ± 4	17 ± 5
04/05/23 - 04/12/23	18 ± 4	23 ± 5	21 ± 4	23 ± 5	25 ± 5	24 ± 5
04/12/23 - 04/19/23	15 ± 4	17 ± 4	18 ± 4	19 ± 4	17 ± 4	16 ± 4
04/19/23 - 04/26/23	12 ± 4	12 ± 4	13 ± 4	12 ± 4	15 ± 4	13 ± 4
04/26/23 - 05/03/23	13 ± 4	15 ± 4	11 ± 4	14 ± 4	15 ± 4	14 ± 4
05/03/23 - 05/10/23	10 ± 4	12 ± 4	13 ± 4	12 ± 4	15 ± 4	17 ± 4
05/10/23 - 05/17/23	14 ± 4	17 ± 4	16 ± 4	16 ± 4	19 ± 4	19 ± 4
05/17/23 - 05/24/23	16 ± 4	18 ± 4	18 ± 4	16 ± 4	21 ± 4	20 ± 4
05/24/23 - 05/31/23	21 ± 4	19 ± 4	18 ± 4	21 ± 4	20 ± 4	20 ± 4
05/31/23 - 06/07/23	25 ± 5	22 ± 4	23 ± 4	25 ± 5	25 ± 5	23 ± 4
06/07/23 - 06/14/23	9 ± 4	13 ± 4	13 ± 4	14 ± 4	13 ± 4	16 ± 4
06/14/23 - 06/21/23	20 ± 4	20 ± 4	17 ± 4	21 ± 4	19 ± 4	22 ± 4
06/21/23 - 06/28/23	15 ± 4	14 ± 4	18 ± 4	16 ± 4	20 ± 4	23 ± 4
06/28/23 - 07/05/23	20 ± 4	23 ± 4	25 ± 5	21 ± 4	*(1)*	25 ± 5
07/05/23 - 07/12/23	17 ± 4	14 ± 4	19 ± 4	18 ± 4	*(1)*	22 ± 5
07/12/23 - 07/19/23	17 ± 4	22 ± 5	22 ± 5	17 ± 4	12 ± 8	16 ± 4
07/19/23 - 07/26/23	16 ± 4	29 ± 5	21 ± 5	23 ± 5	20 ± 4	23 ± 5
07/26/23 - 08/02/23	21 ± 5	25 ± 5	20 ± 4	24 ± 5	19 ± 4	22 ± 5
08/02/23 - 08/09/23	21 ± 4	23 ± 4	21 ± 4	25 ± 4	22 ± 4	28 ± 5
08/09/23 - 08/16/23	16 ± 4	20 ± 4	21 ± 5	17 ± 4	18 ± 4	17 ± 4
08/16/23 - 08/23/23	19 ± 4	32 ± 5	28 ± 5	26 ± 5	27 ± 5	26 ± 5
08/23/23 - 08/30/23	27 ± 5	35 ± 5	41 ± 5	28 ± 5	31 ± 5	28 ± 5
08/30/23 - 09/06/23	17 ± 4	20 ± 4	16 ± 4	16 ± 4	20 ± 4	17 ± 4
09/06/23 - 09/13/23	11 ± 4	11 ± 4	13 ± 4	10 ± 4	14 ± 4	15 ± 4
09/13/23 - 09/20/23	21 ± 4	23 ± 5	24 ± 5	22 ± 5	22 ± 5	25 ± 5
09/20/23 - 09/27/23	36 ± 6	32 ± 5	30 ± 5	36 ± 6	32 ± 5	33 ± 5
09/27/23 - 10/04/23	37 ± 6	27 ± 5	31 ± 5	32 ± 5	37 ± 6	35 ± 6
10/04/23 - 10/11/23	17 ± 4	16 ± 4	14 ± 4	13 ± 4	14 ± 4	18 ± 4
10/11/23 - 10/18/23	19 ± 4	21 ± 4	22 ± 5	17 ± 4	17 ± 4	19 ± 4
10/18/23 - 10/25/23	23 ± 5	28 ± 5	27 ± 5	22 ± 4	27 ± 5	30 ± 5
10/25/23 - 11/01/23	17 ± 4	27 ± 5	22 ± 5	16 ± 4	16 ± 4	20 ± 4
11/01/23 - 11/08/23	36 ± 5	37 ± 5	40 ± 6	35 ± 5	30 ± 5	34 ± 5
11/08/23 - 11/15/23	22 ± 4	24 ± 4	22 ± 4	19 ± 4	24 ± 4	23 ± 4
11/15/23 - 11/22/23	26 ± 5	30 ± 5	27 ± 5	24 ± 4	28 ± 5	25 ± 4
11/22/23 - 11/29/23	23 ± 4	21 ± 4	20 ± 4	21 ± 4	12 ± 4	20 ± 4
11/29/23 - 12/06/23	19 ± 4	21 ± 4	24 ± 5	20 ± 5	20 ± 5	29 ± 5
12/06/23 - 12/13/23	22 ± 5	26 ± 5	22 ± 5	21 ± 5	20 ± 5	24 ± 5
12/13/23 - 12/20/23	26 ± 5	23 ± 4	18 ± 4	23 ± 5	24 ± 5	23 ± 4
12/20/23 - 12/27/23	23 ± 5	21 ± 5	26 ± 5	23 ± 5	22 ± 5	28 ± 5
12/27/23 - 01/03/24	15 ± 4	15 ± 4	13 ± 4	16 ± 4	14 ± 4	17 ± 4
MEAN ± 2 STD DEV	20 ± 12	21 ± 12	21 ± 13	20 ± 12	20 ± 12	22 ± 11

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, 2023**

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
01/04/23 - 01/11/23	31 ± 5	22 ± 4	28 ± 5	33 ± 5
01/11/23 - 01/18/23	34 ± 5	26 ± 5	27 ± 5	28 ± 5
01/18/23 - 01/25/23	23 ± 4	19 ± 4	18 ± 4	20 ± 4
01/25/23 - 02/01/23	24 ± 5	16 ± 4	26 ± 5	21 ± 4
02/01/23 - 02/08/23	27 ± 5	21 ± 5	27 ± 5	31 ± 5
02/08/23 - 02/15/23	16 ± 4	15 ± 4	14 ± 4	20 ± 4
02/15/23 - 02/22/23	19 ± 4	13 ± 4	18 ± 4	19 ± 5
02/22/23 - 03/01/23	14 ± 4	12 ± 4	15 ± 4	15 ± 4
03/01/23 - 03/08/23	17 ± 4	16 ± 4	20 ± 4	21 ± 4
03/08/23 - 03/15/23	13 ± 4	17 ± 4	17 ± 4	15 ± 4
03/15/23 - 03/22/23	21 ± 4	24 ± 5	22 ± 4	23 ± 5
03/22/23 - 03/29/23	26 ± 5	22 ± 4	18 ± 4	24 ± 5
03/29/23 - 04/05/23	17 ± 5	11 ± 4	10 ± 4	17 ± 5
04/05/23 - 04/12/23	25 ± 5	23 ± 5	24 ± 5	22 ± 4
04/12/23 - 04/19/23	20 ± 4	15 ± 4	16 ± 4	19 ± 4
04/19/23 - 04/26/23	14 ± 4	11 ± 4	11 ± 4	12 ± 4
04/26/23 - 05/03/23	14 ± 4	15 ± 4	15 ± 4	16 ± 4
05/03/23 - 05/10/23	15 ± 4	14 ± 4	11 ± 4	12 ± 4
05/10/23 - 05/17/23	19 ± 4	15 ± 4	13 ± 4	16 ± 4
05/17/23 - 05/24/23	20 ± 4	18 ± 4	12 ± 4	23 ± 5
05/24/23 - 05/31/23	19 ± 4	17 ± 4	18 ± 4	24 ± 4
05/31/23 - 06/07/23	24 ± 4	26 ± 5	24 ± 4	27 ± 5
06/07/23 - 06/14/23	17 ± 4	12 ± 4	15 ± 4	17 ± 4
06/14/23 - 06/21/23	20 ± 4	19 ± 4	19 ± 4	20 ± 4
06/21/23 - 06/28/23	20 ± 5	22 ± 4	17 ± 4	20 ± 4
06/28/23 - 07/05/23	24 ± 5	21 ± 6	22 ± 6	22 ± 4
07/05/23 - 07/12/23	19 ± 4	23 ± 5	18 ± 4	22 ± 4
07/12/23 - 07/19/23	20 ± 4	14 ± 4	15 ± 4	19 ± 4
07/19/23 - 07/26/23	25 ± 5	20 ± 5	19 ± 4	28 ± 5
07/26/23 - 08/02/23	20 ± 5	16 ± 4	20 ± 5	20 ± 4
08/02/23 - 08/09/23	22 ± 4	20 ± 4	22 ± 4	23 ± 4
08/09/23 - 08/16/23	17 ± 4	17 ± 4	15 ± 4	23 ± 5
08/16/23 - 08/23/23	26 ± 5	28 ± 5	25 ± 5	24 ± 5
08/23/23 - 08/30/23	28 ± 5	31 ± 5	26 ± 5	31 ± 5
08/30/23 - 09/06/23	17 ± 4	19 ± 4	18 ± 4	20 ± 4
09/06/23 - 09/13/23	14 ± 4	10 ± 4	18 ± 4	14 ± 4
09/13/23 - 09/20/23	23 ± 5	26 ± 5	26 ± 5	24 ± 5
09/20/23 - 09/27/23	33 ± 5	33 ± 5	28 ± 5	34 ± 5
09/27/23 - 10/04/23	34 ± 5	34 ± 5	33 ± 5	39 ± 6
10/04/23 - 10/11/23	16 ± 4	18 ± 4	16 ± 4	17 ± 4
10/11/23 - 10/18/23	17 ± 4	17 ± 4	23 ± 5	23 ± 5
10/18/23 - 10/25/23	22 ± 4	28 ± 5	25 ± 5	29 ± 5
10/25/23 - 11/01/23	17 ± 4	23 ± 5	21 ± 5	20 ± 4
11/01/23 - 11/08/23	36 ± 5	31 ± 5	32 ± 5	36 ± 5
11/08/23 - 11/15/23	22 ± 4	24 ± 4	21 ± 4	24 ± 4
11/15/23 - 11/22/23	29 ± 5	25 ± 4	25 ± 5	29 ± 5
11/22/23 - 11/29/23	28 ± 5	25 ± 5	26 ± 5	23 ± 4
11/29/23 - 12/06/23	22 ± 5	24 ± 5	24 ± 5	23 ± 5
12/06/23 - 12/13/23	25 ± 5	24 ± 5	15 ± 4	23 ± 5
12/13/23 - 12/20/23	24 ± 5	26 ± 5	22 ± 4	26 ± 5
12/20/23 - 12/27/23	21 ± 5	17 ± 4	21 ± 5	23 ± 5
12/27/23 - 01/03/24	16 ± 4	15 ± 4	13 ± 4	13 ± 4
MEAN ± 2 STD DEV	22 ± 11	20 ± 12	20 ± 11	22 ± 12

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

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, 2023

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
01/04/23 - 02/01/23	15	33	25 ± 10	01/04/23 - 02/01/23	16	34	25 ± 11	01/04/23 - 02/01/23	20	33	25 ± 12
02/01/23 - 03/01/23	10	32	18 ± 11	02/01/23 - 03/01/23	12	27	17 ± 10	02/01/23 - 03/01/23	15	31	21 ± 14
03/01/23 - 03/29/23	12	24	19 ± 8	03/01/23 - 03/29/23	13	26	19 ± 8	03/01/23 - 03/29/23	15	24	21 ± 8
03/29/23 - 05/03/23	11	25	16 ± 8	03/29/23 - 05/03/23	10	25	16 ± 10	03/29/23 - 05/03/23	12	22	17 ± 8
05/03/23 - 05/31/23	10	21	17 ± 6	05/03/23 - 05/31/23	11	20	16 ± 6	05/03/23 - 05/31/23	12	24	19 ± 11
05/31/23 - 06/28/23	9	25	19 ± 9	05/31/23 - 06/28/23	12	26	19 ± 8	05/31/23 - 06/28/23	17	27	21 ± 9
06/28/23 - 08/02/23	12	29	20 ± 8	06/28/23 - 08/02/23	14	25	20 ± 6	06/28/23 - 08/02/23	19	28	22 ± 7
08/02/23 - 08/30/23	16	41	25 ± 12	08/02/23 - 08/30/23	15	31	23 ± 10	08/02/23 - 08/30/23	23	31	25 ± 8
08/30/23 - 10/04/23	10	37	24 ± 17	08/30/23 - 10/04/23	10	34	24 ± 16	08/30/23 - 10/04/23	14	39	26 ± 21
10/04/23 - 11/01/23	13	30	20 ± 10	10/04/23 - 11/01/23	16	28	20 ± 8	10/04/23 - 11/01/23	17	29	22 ± 10
11/01/23 - 11/29/23	12	40	26 ± 13	11/01/23 - 11/29/23	21	36	27 ± 9	11/01/23 - 11/29/23	23	36	28 ± 12
11/29/23 - 01/03/24	13	29	21 ± 8	11/29/23 - 01/03/24	13	26	21 ± 8	11/29/23 - 01/03/24	13	26	22 ± 10
01/04/23 - 01/03/24	9	41	21 ± 12	01/04/23 - 01/03/24	10	36	21 ± 11	01/04/23 - 01/03/24	12	39	22 ± 12

Table C-VI.3 **CONCENTRATIONS OF GAMMA EMITTERS IN AIR PARTICULATE SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2023**

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	01/04/23 - 03/29/23	< 4	< 3	< 9	< 5	< 22	< 3	< 3	< 6	< 14
	03/29/23 - 06/28/23	< 3	< 2	< 3	< 2	< 17	< 2	< 2	< 3	< 6
	06/28/23 - 10/04/23	< 2	< 2	< 3	< 2	< 12	< 2	< 2	< 2	< 6
	10/04/23 - 01/03/24	< 2	< 2	< 3	< 2	< 17	< 2	< 2	< 2	< 7
	MEAN	-	-	-	-	-	-	-	-	-
CL-2	01/04/23 - 03/29/23	< 3	< 3	< 4	< 3	< 17	< 3	< 2	< 4	< 10
	03/29/23 - 06/28/23	< 3	< 3	< 4	< 3	< 21	< 3	< 2	< 3	< 9
	06/28/23 - 10/04/23	< 2	< 2	< 3	< 2	< 16	< 2	< 2	< 2	< 6
	10/04/23 - 01/03/24	< 2	< 2	< 3	< 2	< 15	< 2	< 2	< 2	< 7
	MEAN	-	-	-	-	-	-	-	-	-
CL-3	01/04/23 - 03/29/23	< 2	< 3	< 5	< 3	< 15	< 3	< 2	< 5	< 10
	03/29/23 - 06/28/23	< 3	< 4	< 7	< 4	< 25	< 3	< 3	< 4	< 12
	06/28/23 - 10/04/23	< 1	< 2	< 3	< 2	< 15	< 2	< 2	< 2	< 7
	10/04/23 - 01/03/24	< 2	< 3	< 4	< 2	< 21	< 3	< 2	< 2	< 9
	MEAN	-	-	-	-	-	-	-	-	-
CL-4	01/04/23 - 03/29/23	< 3	< 3	< 4	< 3	< 19	< 2	< 2	< 4	< 9
	03/29/23 - 06/28/23	< 2	< 2	< 4	< 2	< 18	< 2	< 2	< 3	< 8
	06/28/23 - 10/04/23	< 3	< 3	< 5	< 3	< 19	< 2	< 2	< 4	< 11
	10/04/23 - 01/03/24	< 4	< 3	< 4	< 3	< 24	< 3	< 3	< 4	< 12
	MEAN	-	-	-	-	-	-	-	-	-
CL-6	01/04/23 - 03/29/23	< 2	< 4	< 7	< 4	< 33	< 3	< 3	< 6	< 16
	03/29/23 - 06/28/23	< 2	< 3	< 3	< 2	< 15	< 2	< 2	< 3	< 10
	06/28/23 - 10/04/23	< 3	< 1	< 3	< 2	< 12	< 2	< 2	< 2	< 8
	10/04/23 - 01/03/24	< 3	< 3	< 4	< 3	< 25	< 3	< 3	< 3	< 12
	MEAN	-	-	-	-	-	-	-	-	-

Table C-VI.3 **CONCENTRATIONS OF GAMMA EMITTERS IN AIR PARTICULATE SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2023**

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	01/04/23 - 03/29/23	< 2	< 3	< 6	< 3	< 18	< 2	< 2	< 4	< 10
	03/29/23 - 06/28/23	< 5	< 4	< 6	< 4	< 31	< 3	< 3	< 4	< 12
	06/28/23 - 10/04/23	< 3	< 2	< 5	< 2	< 17	< 2	< 2	< 3	< 8
	10/04/23 - 01/03/24	< 2	< 2	< 5	< 2	< 18	< 2	< 2	< 2	< 9
	MEAN	-	-	-	-	-	-	-	-	-
CL-8	01/04/23 - 03/29/23	< 2	< 3	< 3	< 3	< 16	< 2	< 2	< 4	< 7
	03/29/23 - 06/28/23	< 3	< 2	< 4	< 3	< 14	< 2	< 2	< 3	< 8
	06/28/23 - 10/04/23	< 2	< 2	< 4	< 2	< 17	< 3	< 2	< 3	< 8
	10/04/23 - 01/03/24	< 3	< 2	< 3	< 2	< 15	< 2	< 2	< 2	< 8
	MEAN	-	-	-	-	-	-	-	-	-
CL-11	01/04/23 - 03/29/23	< 2	< 2	< 5	< 3	< 17	< 2	< 2	< 4	< 10
	03/29/23 - 06/28/23	< 3	< 4	< 6	< 4	< 22	< 3	< 3	< 4	< 12
	06/28/23 - 10/04/23	< 4	< 3	< 6	< 3	< 25	< 3	< 3	< 3	< 9
	10/04/23 - 01/03/24	< 3	< 2	< 4	< 2	< 18	< 2	< 2	< 2	< 8
	MEAN	-	-	-	-	-	-	-	-	-
CL-15	01/04/23 - 03/29/23	< 3	< 4	< 4	< 3	< 18	< 2	< 2	< 4	< 9
	03/29/23 - 06/28/23	< 3	< 2	< 5	< 3	< 13	< 3	< 2	< 3	< 9
	07/12/23 - 10/04/23	< 3	< 2	< 3	< 2	< 19	< 2	< 2	< 2	< 8
	10/04/23 - 01/03/24	< 3	< 4	< 6	< 3	< 23	< 4	< 3	< 3	< 11
	MEAN	-	-	-	-	-	-	-	-	-
CL-94	01/04/23 - 03/29/23	< 2	< 3	< 5	< 3	< 18	< 2	< 2	< 4	< 9
	03/29/23 - 06/28/23	< 3	< 3	< 6	< 3	< 22	< 3	< 2	< 5	< 13
	06/28/23 - 10/04/23	< 2	< 2	< 3	< 2	< 13	< 2	< 2	< 2	< 5
	10/04/23 - 01/03/24	< 2	< 2	< 3	< 2	< 18	< 2	< 2	< 2	< 7
	MEAN	-	-	-	-	-	-	-	-	-

Table C-VII.1 **CONCENTRATIONS OF I-131 IN AIR IODINE SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2023**

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
01/04/23 - 01/11/23	< 57	< 56	< 24	< 56	< 40	< 40
01/11/23 - 01/18/23	< 52	< 51	< 22	< 51	< 44	< 44
01/18/23 - 01/25/23	< 45	< 30	< 45	< 45	< 19	< 36
01/25/23 - 02/01/23	< 25	< 25	< 25	< 12	< 44	< 44
02/01/23 - 02/08/23	< 54	< 53	< 22	< 53	< 32	< 13
02/08/23 - 02/15/23	< 55	< 55	< 55	< 24	< 44	< 44
02/15/23 - 02/22/23	< 52	< 22	< 53	< 53	< 47	< 47
02/22/23 - 03/01/23	< 52	< 52	< 52	< 22	< 27	< 41
03/01/23 - 03/08/23	< 41	< 19	< 41	< 41	< 38	< 25
03/08/23 - 03/15/23	< 39	< 38	< 16	< 40	< 53	< 53
03/15/23 - 03/22/23	< 35	< 35	< 35	< 35	< 16	< 38
03/22/23 - 03/29/23	< 46	< 45	< 45	< 45	< 48	< 46
03/29/23 - 04/05/23	< 34	< 16	< 34	< 35	< 33	< 34
04/05/23 - 04/12/23	< 31	< 14	< 31	< 31	< 50	< 49
04/12/23 - 04/19/23	< 47	< 46	< 46	< 48	< 23	< 51
04/19/23 - 04/26/23	< 20	< 47	< 48	< 48	< 14	< 34
04/26/23 - 05/03/23	< 25	< 59	< 59	< 59	< 51	< 51
05/03/23 - 05/10/23	< 38	< 37	< 37	< 37	< 31	< 31
05/10/23 - 05/17/23	< 49	< 50	< 50	< 50	< 46	< 46
05/17/23 - 05/24/23	< 20	< 44	< 44	< 44	< 64	< 64
05/24/23 - 05/31/23	< 57	< 57	< 57	< 24	< 57	< 56
05/31/23 - 06/07/23	< 51	< 50	< 50	< 22	< 38	< 16
05/31/23 - 06/07/23 *(1)*				< 20		
06/07/23 - 06/14/23	< 48	< 49	< 49	< 49	< 50	< 50
06/14/23 - 06/21/23	< 24	< 57	< 57	< 57	< 39	< 39
06/21/23 - 06/28/23	< 59	< 61	< 62	< 62	< 43	< 20
06/28/23 - 07/05/23	< 55	< 54	< 56	< 55	*(1)*	< 41
07/05/23 - 07/12/23	< 20	< 20	< 21	< 25	*(1)*	< 25
07/12/23 - 07/19/23	< 58	< 57	< 58	< 58	< 30	< 30
07/19/23 - 07/26/23	< 45	< 46	< 20	< 46	< 23	< 55
07/26/23 - 08/02/23	< 17	< 41	< 42	< 42	< 43	< 44
08/02/23 - 08/09/23	< 23	< 54	< 54	< 54	< 36	< 36
08/09/23 - 08/16/23	< 40	< 40	< 21	< 40	< 45	< 22
08/16/23 - 08/23/23	< 39	< 40	< 40	< 27	< 34	< 18
08/23/23 - 08/30/23	< 42	< 18	< 42	< 42	< 58	< 56
08/30/23 - 09/06/23	< 37	< 27	< 37	< 37	< 49	< 51
09/06/23 - 09/13/23	< 41	< 42	< 41	< 41	< 39	< 38
09/13/23 - 09/20/23	< 20	< 38	< 38	< 38	< 38	< 37
09/20/23 - 09/27/23	< 40	< 40	< 40	< 20	< 18	< 27
09/27/23 - 10/04/23	< 57	< 57	< 57	< 24	< 63	< 63
10/04/23 - 10/11/23	< 62	< 62	< 62	< 26	< 44	< 34
10/11/23 - 10/18/23	< 50	< 50	< 50	< 50	< 56	< 55
10/18/23 - 10/25/23	< 19	< 46	< 46	< 46	< 55	< 55
10/25/23 - 11/01/23	< 46	< 46	< 31	< 46	< 39	< 39
11/01/23 - 11/08/23	< 46	< 20	< 46	< 47	< 29	< 37
11/08/23 - 11/15/23	< 59	< 59	< 59	< 59	< 28	< 68
11/15/23 - 11/22/23	< 49	< 38	< 50	< 50	< 51	< 56
11/22/23 - 11/29/23	< 25	< 61	< 61	< 61	< 16	< 36
11/29/23 - 12/06/23	< 57	< 56	< 57	< 57	< 52	< 47
12/06/23 - 12/13/23	< 44	< 45	< 44	< 19	< 36	< 36
12/13/23 - 12/20/23	< 64	< 65	< 67	< 28	< 20	< 43
12/20/23 - 12/27/23	< 62	< 61	< 62	< 62	< 62	< 62
12/27/23 - 01/03/24	< 35	< 35	< 35	< 27	< 18	< 36
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, 2023**

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

Table C-VIII.1 CONCENTRATIONS OF I-131 IN MILK SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2023

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	CONTROL FARM CL-116
01/25/23	< 0.8
02/22/23	< 0.9
03/29/23	< 0.5
04/26/23	< 0.9
05/17/23	< 0.9
05/31/23	< 0.8
06/14/23	< 0.8
06/28/23	< 0.8
07/12/23	< 0.8
07/26/23	< 0.9
08/09/23	< 0.9
08/23/23	< 0.8
09/06/23	< 0.9
09/20/23	< 0.9
10/04/23	< 0.9
10/25/23	< 0.9
11/29/23	< 0.9
12/27/23	< 0.9
MEAN	-

Table C-VIII.2

CONCENTRATIONS OF GAMMA EMITTERS IN MILK SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2023

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	01/25/23	1217 ± 127	< 5	< 5	< 11	< 6	< 12	< 5	< 9	< 5	< 6	< 25	< 8	< 40
	02/22/23	909 ± 153	< 7	< 9	< 13	< 7	< 16	< 7	< 14	< 7	< 7	< 32	< 9	< 51
	03/29/23	1243 ± 171	< 9	< 8	< 17	< 10	< 16	< 8	< 14	< 8	< 9	< 34	< 12	< 55
	04/26/23	999 ± 124	< 6	< 5	< 13	< 5	< 13	< 5	< 11	< 7	< 5	< 22	< 10	< 29
	05/17/23	1111 ± 166	< 6	< 4	< 15	< 8	< 16	< 5	< 9	< 6	< 6	< 24	< 9	< 39
	05/31/23	1054 ± 156	< 7	< 7	< 18	< 6	< 16	< 8	< 13	< 7	< 6	< 34	< 13	< 46
	06/14/23	1221 ± 171	< 7	< 7	< 15	< 8	< 15	< 7	< 14	< 9	< 7	< 35	< 7	< 52
	06/28/23	1117 ± 166	< 6	< 6	< 16	< 10	< 18	< 9	< 11	< 7	< 8	< 41	< 8	< 50
	07/12/23	1019 ± 126	< 7	< 6	< 12	< 6	< 15	< 6	< 11	< 5	< 7	< 25	< 8	< 40
	07/26/23	973 ± 116	< 6	< 6	< 14	< 6	< 13	< 7	< 12	< 6	< 6	< 29	< 10	< 40
	08/09/23	1157 ± 125	< 6	< 5	< 15	< 8	< 16	< 7	< 13	< 8	< 8	< 32	< 7	< 49
	08/23/23	783 ± 161	< 8	< 9	< 18	< 7	< 19	< 9	< 13	< 8	< 9	< 37	< 12	< 64
	09/06/23	657 ± 145	< 8	< 7	< 18	< 9	< 17	< 7	< 13	< 8	< 8	< 30	< 8	< 59
	09/20/23	899 ± 152	< 7	< 7	< 20	< 8	< 18	< 9	< 12	< 9	< 8	< 25	< 9	< 45
	10/04/23	1091 ± 150	< 7	< 7	< 19	< 9	< 19	< 9	< 14	< 9	< 8	< 34	< 12	< 59
	10/25/23	832 ± 175	< 7	< 8	< 15	< 7	< 14	< 8	< 12	< 8	< 9	< 31	< 12	< 50
	11/29/23	909 ± 170	< 8	< 7	< 14	< 8	< 14	< 8	< 12	< 8	< 7	< 31	< 12	< 50
	12/27/23	939 ± 142	< 8	< 8	< 16	< 7	< 20	< 9	< 15	< 8	< 8	< 40	< 10	< 64
	MEAN ± 2 STD DEV	1007 ± 322	-	-	-	-	-	-	-	-	-	-	-	-

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, 2023

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															
Broccoli	06/28/23		< 34	< 24	< 59	< 30	< 55	< 30	< 47	< 53	< 33	< 27	< 125	< 38	< 160
Lettuce	06/28/23		< 20	< 20	< 47	< 27	< 43	< 25	< 33	< 43	< 24	< 24	< 102	< 40	< 138
Chard	06/28/23		< 26	< 22	< 61	< 26	< 59	< 25	< 42	< 47	< 27	< 23	< 129	< 38	< 164
Broccoli	07/26/23		< 25	< 27	< 52	< 24	< 59	< 20	< 46	< 37	< 34	< 21	< 108	< 30	< 120
Lettuce	07/26/23		< 24	< 19	< 55	< 34	< 54	< 27	< 48	< 30	< 28	< 25	< 96	< 41	< 124
Kale	07/26/23		< 32	< 31	< 67	< 24	< 72	< 31	< 47	< 40	< 41	< 33	< 124	< 25	< 137
Broccoli	08/30/23		< 26	< 20	< 57	< 36	< 66	< 29	< 38	< 37	< 27	< 25	< 111	< 17	< 141
Lettuce	08/30/23		< 30	< 35	< 71	< 46	< 96	< 36	< 61	< 50	< 42	< 39	< 188	< 39	< 191
Chard	08/30/23		< 23	< 25	< 53	< 32	< 69	< 23	< 39	< 32	< 24	< 27	< 102	< 20	< 121
Broccoli	09/27/23		< 30	< 27	< 73	< 38	< 74	< 33	< 54	< 40	< 37	< 29	< 121	< 28	< 168
Kale	09/27/23		< 37	< 31	< 65	< 36	< 60	< 39	< 51	< 46	< 39	< 34	< 157	< 32	< 186
Chard	09/27/23		< 28	< 27	< 51	< 27	< 64	< 29	< 43	< 43	< 30	< 24	< 118	< 31	< 180
	MEAN		-	-	-	-	-	-	-	-	-	-	-	-	-
CL-115															
Broccoli	06/28/23	*(1)*	< 31	< 34	< 62	< 38	< 78	< 37	< 61	< 56	< 32	< 28	< 155	< 52	< 164
Lettuce	06/28/23	*(1)*	< 32	< 33	< 70	< 37	< 63	< 29	< 53	< 56	< 31	< 34	< 174	< 51	< 181
Chard	06/28/23	*(1)*	< 24	< 25	< 64	< 29	< 56	< 28	< 43	< 52	< 24	< 24	< 146	< 42	< 143
Broccoli	07/26/23		< 28	< 26	< 48	< 26	< 63	< 25	< 52	< 29	< 29	< 31	< 111	< 39	< 141
Lettuce	07/26/23		< 22	< 22	< 38	< 23	< 51	< 26	< 44	< 37	< 26	< 24	< 107	< 34	< 152
Chard	07/26/23		< 23	< 21	< 62	< 31	< 59	< 23	< 46	< 40	< 27	< 25	< 107	< 38	< 125
Broccoli	08/30/23		< 40	< 34	< 78	< 35	< 61	< 35	< 54	< 49	< 35	< 37	< 154	< 34	< 187
Lettuce	08/30/23		< 30	< 30	< 48	< 33	< 55	< 26	< 48	< 42	< 29	< 28	< 116	< 35	< 169
Chard	08/30/23		< 26	< 29	< 56	< 30	< 52	< 27	< 45	< 41	< 24	< 30	< 103	< 46	< 137
Broccoli	09/27/23		< 26	< 26	< 48	< 28	< 62	< 30	< 43	< 49	< 28	< 25	< 130	< 31	< 181
Kale	09/27/23		< 23	< 29	< 56	< 25	< 54	< 25	< 53	< 45	< 30	< 28	< 105	< 32	< 149
Chard	09/27/23		< 28	< 39	< 59	< 29	< 86	< 34	< 55	< 46	< 23	< 28	< 148	< 22	< 160
	MEAN		-	-	-	-	-	-	-	-	-	-	-	-	-
CL-118															
Broccoli	06/28/23	*(1)*	< 24	< 28	< 56	< 32	< 65	< 26	< 47	< 47	< 25	< 24	< 134	< 43	< 134
Lettuce/Kale	06/28/23	*(1)*	< 29	< 24	< 69	< 26	< 62	< 24	< 54	< 52	< 32	< 27	< 135	< 48	< 140
Chard	06/28/23	*(1)*	< 28	< 25	< 65	< 26	< 64	< 33	< 50	< 47	< 31	< 30	< 146	< 52	< 139
Broccoli	07/26/23		< 25	< 24	< 62	< 28	< 66	< 24	< 44	< 44	< 29	< 27	< 124	< 33	< 154
Lettuce	07/26/23		< 19	< 26	< 58	< 23	< 57	< 21	< 33	< 31	< 26	< 23	< 109	< 42	< 118
Chard	07/26/23		< 26	< 23	< 58	< 28	< 57	< 29	< 41	< 35	< 31	< 27	< 104	< 39	< 129
Broccoli	08/30/23		< 27	< 29	< 75	< 34	< 76	< 33	< 53	< 46	< 34	< 35	< 147	< 46	< 184
Lettuce	08/30/23		< 28	< 25	< 54	< 34	< 64	< 33	< 54	< 51	< 27	< 30	< 143	< 35	< 168
Chard	08/30/23		< 24	< 28	< 63	< 34	< 64	< 22	< 51	< 40	< 29	< 23	< 106	< 40	< 129
Broccoli/Lettuce	09/27/23		< 26	< 26	< 69	< 29	< 63	< 33	< 46	< 44	< 31	< 29	< 119	< 24	< 167
Lettuce	09/27/23		< 28	< 25	< 56	< 32	< 80	< 29	< 44	< 42	< 32	< 27	< 109	< 38	< 185
Chard	09/27/23		< 32	< 33	< 73	< 37	< 71	< 34	< 57	< 45	< 35	< 28	< 120	< 39	< 177
	MEAN		-	-	-	-	-	-	-	-	-	-	-	-	-

(1) SEE PROGRAM EXCEPTIONS SECTION FOR EXPLANATION

Table C-IX.2

CONCENTRATIONS OF GAMMA EMITTERS IN GRASS SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2023

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	05/17/23	< 29	< 31	< 61	< 26	< 75	< 28	< 47	< 37	< 32	< 25	< 130	< 18	< 176
	05/31/23	< 37	< 24	< 71	< 42	< 77	< 32	< 48	< 55	< 31	< 34	< 180	< 46	< 218
	06/14/23	< 26	< 28	< 55	< 33	< 71	< 32	< 57	< 40	< 22	< 26	< 108	< 28	< 162
	06/28/23	< 26	< 24	< 52	< 24	< 57	< 27	< 40	< 43	< 27	< 24	< 113	< 28	< 148
	07/12/23	< 34	< 29	< 69	< 31	< 79	< 35	< 56	< 49	< 36	< 36	< 152	< 47	< 249
	07/26/23	< 10	< 9	< 24	< 15	< 30	< 9	< 16	< 13	< 11	< 10	< 43	< 14	< 49
	08/09/23	< 27	< 29	< 54	< 32	< 68	< 25	< 47	< 50	< 28	< 27	< 113	< 28	< 167
	08/23/23	< 33	< 32	< 80	< 28	< 82	< 42	< 57	< 50	< 39	< 33	< 167	< 37	< 242
	09/06/23	< 35	< 28	< 75	< 43	< 79	< 31	< 61	< 37	< 43	< 36	< 100	< 42	< 185
	09/20/23	< 34	< 30	< 79	< 35	< 85	< 32	< 64	< 50	< 29	< 38	< 161	< 26	< 204
	10/04/23	< 30	< 33	< 85	< 30	< 80	< 32	< 61	< 46	< 41	< 30	< 184	< 52	< 185
	10/25/23	< 20	< 27	< 46	< 27	< 55	< 28	< 42	< 39	< 34	< 29	< 110	< 25	< 153
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-	-
CL-02	05/17/23	< 26	< 29	< 63	< 29	< 80	< 28	< 58	< 38	< 26	< 26	< 114	< 31	< 162
	05/31/23	< 32	< 31	< 76	< 42	< 61	< 25	< 48	< 36	< 30	< 28	< 142	< 39	< 171
	06/14/23	< 27	< 25	< 63	< 31	< 68	< 32	< 51	< 48	< 23	< 33	< 129	< 23	< 207
	06/28/23	< 23	< 28	< 59	< 28	< 50	< 25	< 47	< 40	< 23	< 22	< 101	< 37	< 169
	07/12/23	< 31	< 40	< 73	< 37	< 81	< 31	< 61	< 49	< 43	< 33	< 142	< 50	< 192
	07/26/23	< 26	< 26	< 60	< 29	< 53	< 25	< 47	< 40	< 29	< 31	< 120	< 37	< 163
	08/09/23	< 30	< 35	< 63	< 34	< 51	< 35	< 58	< 49	< 27	< 36	< 153	< 46	< 196
	08/23/23	< 33	< 35	< 68	< 31	< 74	< 29	< 52	< 49	< 33	< 31	< 140	< 46	< 178
	09/06/23	< 31	< 33	< 79	< 37	< 77	< 33	< 60	< 52	< 37	< 37	< 137	< 37	< 241
	09/20/23	< 29	< 38	< 82	< 36	< 74	< 40	< 55	< 50	< 40	< 29	< 165	< 37	< 151
	10/04/23	< 33	< 27	< 66	< 38	< 78	< 31	< 57	< 50	< 28	< 29	< 149	< 55	< 207
	10/25/23	< 22	< 25	< 43	< 29	< 68	< 28	< 60	< 31	< 30	< 20	< 88	< 31	< 137
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-	-

Table C-IX.2

CONCENTRATIONS OF GAMMA EMITTERS IN GRASS SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2023

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	05/17/23	< 25	< 32	< 61	< 40	< 73	< 29	< 53	< 43	< 29	< 32	< 121	< 38	< 195
	05/31/23	< 24	< 35	< 63	< 34	< 69	< 33	< 51	< 45	< 26	< 29	< 111	< 39	< 167
	06/14/23	< 25	< 31	< 61	< 33	< 71	< 30	< 49	< 41	< 29	< 30	< 127	< 32	< 182
	06/28/23	< 25	< 25	< 59	< 37	< 80	< 24	< 45	< 39	< 30	< 29	< 121	< 27	< 129
	07/12/23	< 18	< 20	< 53	< 24	< 48	< 24	< 35	< 28	< 25	< 20	< 82	< 15	< 128
	07/26/23	< 23	< 22	< 60	< 29	< 57	< 21	< 47	< 34	< 27	< 23	< 116	< 29	< 108
	08/09/23	< 27	< 30	< 70	< 30	< 69	< 31	< 51	< 47	< 38	< 34	< 130	< 41	< 168
	08/23/23	< 31	< 29	< 82	< 32	< 80	< 33	< 59	< 34	< 35	< 36	< 138	< 44	< 192
	09/06/23	< 34	< 31	< 65	< 27	< 73	< 32	< 46	< 38	< 33	< 33	< 135	< 32	< 165
	09/20/23	< 30	< 32	< 80	< 38	< 81	< 31	< 67	< 49	< 27	< 30	< 151	< 44	< 193
	10/04/23	< 33	< 34	< 103	< 47	< 96	< 39	< 74	< 49	< 42	< 38	< 197	< 51	< 214
	10/25/23	< 28	< 21	< 64	< 26	< 59	< 27	< 43	< 44	< 22	< 26	< 96	< 31	< 187
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-	-
CL-116	05/17/23	< 26	< 26	< 56	< 19	< 53	< 24	< 47	< 29	< 30	< 28	< 92	< 22	< 148
	05/31/23	< 34	< 31	< 78	< 38	< 90	< 36	< 60	< 55	< 45	< 33	< 144	< 47	< 170
	06/14/23	< 28	< 34	< 67	< 33	< 94	< 35	< 56	< 48	< 39	< 34	< 153	< 27	< 194
	06/28/23	< 24	< 21	< 65	< 35	< 57	< 23	< 41	< 40	< 32	< 22	< 101	< 32	< 133
	07/12/23	< 31	< 26	< 57	< 34	< 56	< 31	< 58	< 38	< 33	< 32	< 107	< 27	< 168
	07/26/23	< 25	< 23	< 54	< 28	< 62	< 25	< 47	< 42	< 25	< 24	< 105	< 31	< 153
	08/09/23	< 25	< 25	< 55	< 27	< 55	< 21	< 46	< 39	< 26	< 26	< 93	< 44	< 114
	08/23/23	< 35	< 38	< 75	< 33	< 74	< 39	< 59	< 52	< 38	< 38	< 179	< 47	< 181
	09/06/23	< 32	< 43	< 79	< 42	< 84	< 37	< 56	< 51	< 37	< 31	< 172	< 29	< 220
	09/20/23	< 28	< 32	< 65	< 34	< 71	< 27	< 51	< 51	< 32	< 32	< 131	< 38	< 210
	10/04/23	< 33	< 30	< 61	< 33	< 75	< 29	< 52	< 49	< 35	< 30	< 138	< 42	< 237
	10/25/23	< 22	< 24	< 48	< 22	< 54	< 22	< 35	< 32	< 26	< 21	< 80	< 32	< 161
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-	-

Table C-X.1 QUARTERLY DLR RESULTS FOR CLINTON POWER STATION, 2023

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
CL-01	17.3	20.5	20.4	19.9	78.1	74.0	83.6	ND
CL-02	19.1	21.6	21.9	20.5	83.1	76.7	86.2	ND
CL-03	18.4	17.7	19.6	20.3	76.0	74.7	84.2	ND
CL-04	15.2	19.1	21.1	18.5	73.9	72.8	82.3	ND
CL-05	17.2	21.8	19.9	18.9	77.8	76.5	86.0	ND
CL-06	16.1	15.9	19.8	18.4	70.2	65.8	75.3	ND
CL-07	16.4	18.2	18.7	17.1	70.4	69.5	79.0	ND
CL-08	16.5	18.6	21.8	18.8	75.7	74.0	83.5	ND
CL-11	16.1	18.6	18.7	20.6	74.0	69.3	78.8	ND
CL-15	17.3	17.1	19.5	17.9	71.8	66.3	75.8	ND
CL-22	17.6	19.7	21.3	21.2	79.8	77.6	87.1	ND
CL-23	15.2	19.4	21.1	19.7	75.4	81.5	91.0	ND
CL-24	18.2	22.0	22.9	20.7	83.8	80.5	90.0	ND
CL-33	16.1	21.8	20.8	20.8	79.5	79.2	88.7	ND
CL-34	15.5	18.5	21.2	19.1	74.3	77.5	87.0	ND
CL-35	16.8	19.2	19.9	19.8	75.7	71.6	81.1	ND
CL-36	16.9	19.3	21.1	19.6	76.9	74.2	83.7	ND
CL-37	17.6	19.4	20.3	20.2	77.5	71.1	80.6	ND
CL-41	19.4	22.9	23.4	22.0	87.7	79.4	88.9	ND
CL-42	17.0	18.5	20.6	20.2	76.3	74.2	83.7	ND
CL-43	18.4	20.8	21.7	23.3	84.2	79.7	89.2	ND
CL-44	14.9	18.3	20.4	19.7	73.3	75.4	84.9	ND
CL-45	18.2	21.0	23.6	18.9	81.7	80.6	90.1	ND
CL-46	17.7	16.8	21.0	18.1	73.6	73.0	82.5	ND
CL-47	17.3	20.1	22.7	19.7	79.8	79.4	88.9	ND
CL-48	17.4	18.3	19.6	19.3	74.6	74.2	83.7	ND
CL-49	17.4	20.8	21.8	22.3	82.3	79.8	89.3	ND
CL-51	19.7	21.2	22.3	20.8	84.0	76.6	86.1	ND
CL-52	19.9	21.7	21.8	19.9	83.3	75.6	85.1	ND
CL-53	15.0	20.2	19.9	21.1	76.2	71.9	81.4	ND
CL-54	18.3	19.8	22.1	22.0	82.2	78.0	87.5	ND
CL-55	17.9	18.0	20.8	22.5	79.2	78.7	88.2	ND
CL-56	16.2	21.7	23.4	20.9	82.2	81.0	90.5	ND
CL-57	16.1	21.3	22.9	21.9	82.2	81.5	91.0	ND
CL-58	19.5	21.9	22.1	20.1	83.6	79.1	88.6	ND
CL-60	17.0	21.2	22.2	19.2	79.6	79.0	88.5	ND
CL-61	17.7	20.0	20.8	19.7	78.2	78.1	87.6	ND
CL-63	17.3	17.4	18.9	17.2	70.8	66.6	76.1	ND
CL-64	17.7	18.6	20.4	17.5	74.2	75.9	85.4	ND
CL-65	19.4	18.7	21.4	21.0	80.5	80.5	90.01	ND
CL-74	16.4	16.1	19.5	17.8	69.8	68	77.51	ND
CL-75	17.3	21.5	20.4	19.5	78.7	75.7	85.21	ND
CL-76	18.2	20.9	22.7	20.5	82.3	78.7	88.21	ND
CL-77	14.6	18.8	19.6	17.8	70.8	72.2	81.71	ND
CL-78	19.5	19.7	20.6	19.7	79.5	72	81.51	ND
CL-79	17.8	18.5	21.3	21.3	78.9	77.1	86.61	ND
CL-80	16.7	18.9	21.1	19.6	76.3	75.5	85.01	ND
CL-81	18.5	19.9	20.9	17.4	76.7	76.8	86.31	ND
CL-84	17.1	19.7	21.5	18.5	76.8	76.3	85.81	ND
CL-90	15.0	16.2	16.5	16.0	63.7	62.2	71.71	ND
CL-91	16.7	17.8	18.6	18.9	72	69.5	79.01	ND
CL-97	18.0	19.7	21.3	21.2	80.2	77.6	87.11	ND
CL-99	15.2	17.7	17.2	17.0	67.1	60.6	70.11	ND
CL-114 [3]	17.7	21.3	22.8	20.9	82.7	N/A	N/A	N/A

[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 Table B-1 for CL-114 location baseline and facility-related dose information

FIGURE C-1
MEAN MONTHLY GROSS BETA CONCENTRATION IN AIR PARTICULATE SAMPLES COLLECTED IN THE VICINITY OF CPS, 2023

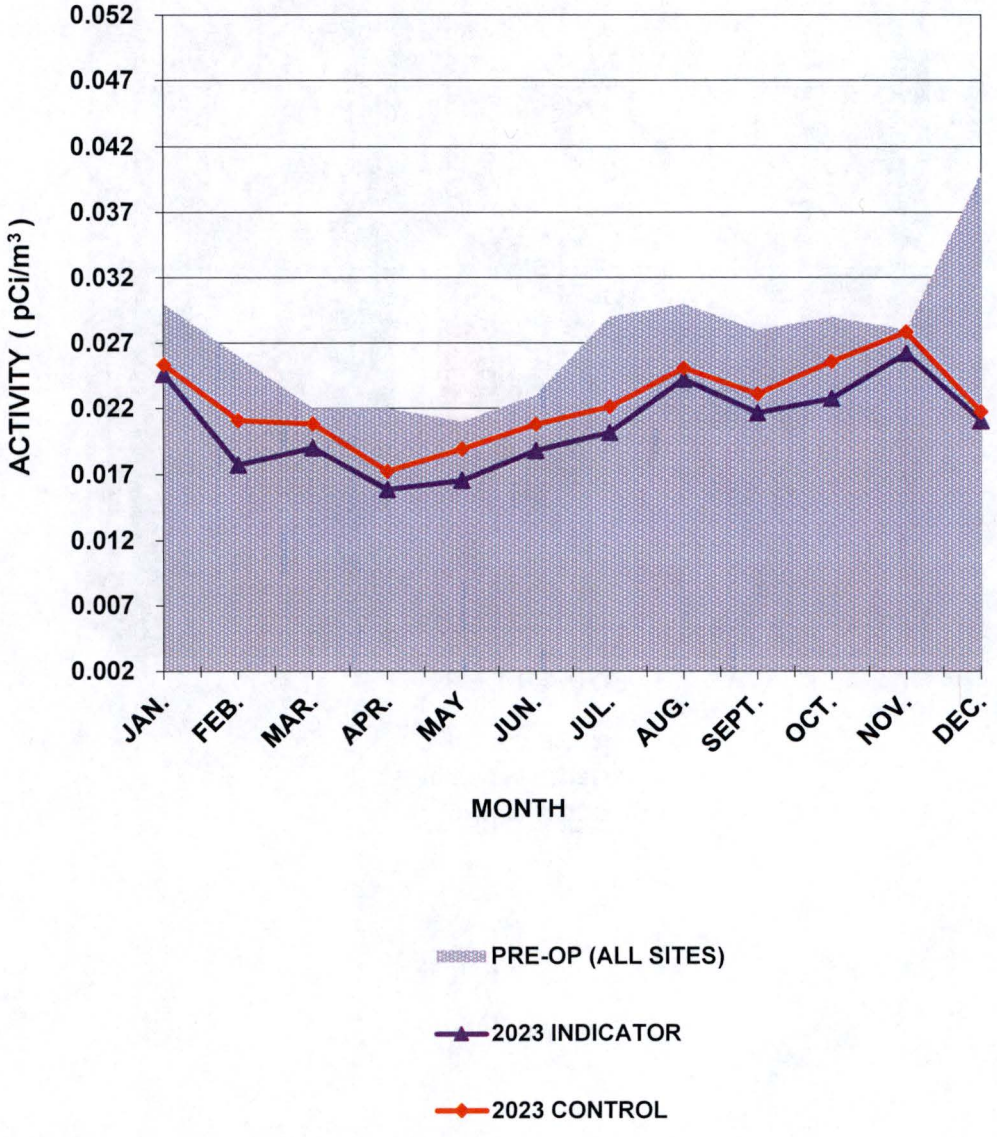
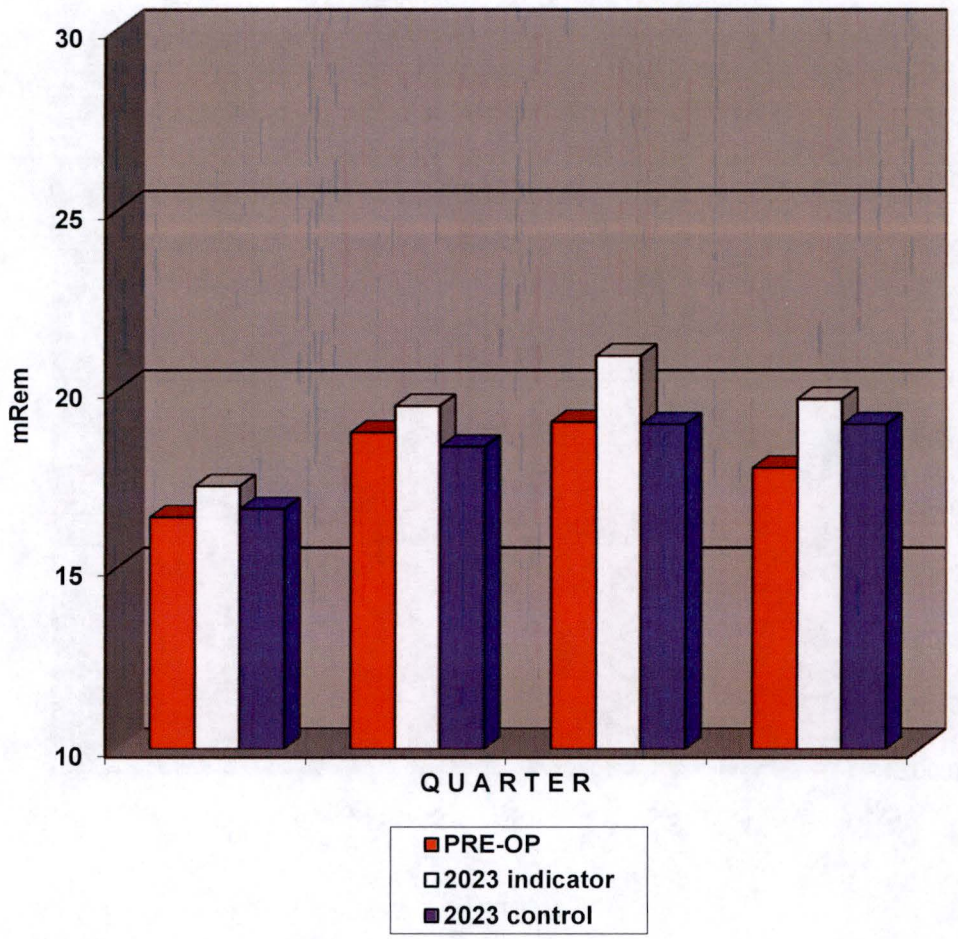


FIGURE C-2
MEAN QUARTERLY AMBIENT GAMMA RADIATION LEVELS (DLR)
IN THE VICINITY OF CPS, 2023



APPENDIX D

INTER-LABORATORY COMPARISON PROGRAM

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 2023	E13826	Milk	Sr-89	pCi/L	70.5	93.1	0.76	W
			Sr-90	pCi/L	12.3	14.7	0.84	A
	E13827	Milk	Ce-141	pCi/L	127	139	0.91	A
			Co-58	pCi/L	119	131	0.91	A
			Co-60	pCi/L	250	279	0.90	A
			Cr-51	pCi/L	246	302	0.82	A
			Cs-134	pCi/L	172	200	0.86	A
			Cs-137	pCi/L	125	140	0.89	A
			Fe-59	pCi/L	122	122	1.00	A
			I-131	pCi/L	70.2	82.0	0.86	A
			Mn-54	pCi/L	165	180	0.92	A
			Zn-65	pCi/L	306	306	1.00	A
	E13828	Charcoal	I-131	pCi	79.0	89.9	0.88	A
	E13829	AP	Ce-141	pCi	91.9	87.8	1.05	A
			Co-58	pCi	87.5	82.5	1.06	A
			Co-60	pCi	199	176	1.13	A
			Cr-51	pCi	218	191	1.14	A
			Cs-134	pCi	119	126	0.94	A
			Cs-137	pCi	92.4	88.7	1.04	A
			Fe-59	pCi	95.5	76.9	1.24	W
			Mn-54	pCi	120	113	1.06	A
			Zn-65	pCi	179	193	0.93	A
	E13830	Soil	Ce-141	pCi/g	0.224	0.220	1.02	A
			Co-58	pCi/g	0.193	0.207	0.93	A
			Co-60	pCi/g	0.406	0.441	0.92	A
			Cr-51	pCi/g	0.464	0.477	0.97	A
			Cs-134	pCi/g	0.334	0.316	1.06	A
			Cs-137	pCi/g	0.270	0.288	0.94	A
			Fe-59	pCi/g	0.183	0.193	0.95	A
			Mn-54	pCi/g	0.263	0.284	0.93	A
			Zn-65	pCi/g	0.475	0.484	0.98	A
	E13831	AP	Sr-89	pCi	99.4	90.8	1.09	A
			Sr-90	pCi	14.6	14.3	1.02	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

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 2023	E13832	Milk	Sr-89	pCi/L	49.8	71.4	0.70	W
			Sr-90	pCi/L	7.28	12.8	0.57	N[(1)]
	E13833	Milk	Ce-141	pCi/L	93.4	104	0.90	A
			Co-58	pCi/L	58.2	65.8	0.88	A
			Co-60	pCi/L	190	223	0.85	A
			Cr-51	pCi/L	207	205	1.01	A
			Cs-134	pCi/L	96.0	114	0.84	A
			Cs-137	pCi/L	121	141	0.86	A
			Fe-59	pCi/L	78.8	78.8	1.00	A
			I-131	pCi/L	27.9	37.4	0.75	W
			Mn-54	pCi/L	128	146	0.88	A
			Zn-65	pCi/L	185	203	0.91	A
	E13834	Charcoal	I-131	pCi	76.9	78.7	0.98	A
	E13835	AP	Ce-141	pCi	91.9	87.1	1.05	A
			Co-58	pCi	58.7	55.2	1.06	A
			Co-60	pCi	200	187	1.07	A
			Cr-51	pCi	192	172	1.12	A
			Cs-134	pCi	89.6	96	0.94	A
			Cs-137	pCi	109	119	0.92	A
			Fe-59	pCi	68.3	66.1	1.03	A
			Mn-54	pCi	129	123	1.05	A
			Zn-65	pCi	163	171	0.96	A
	E13836	Soil	Ce-141	pCi/g	0.228	0.184	1.24	W
			Co-58	pCi/g	0.103	0.116	0.89	A
			Co-60	pCi/g	0.364	0.394	0.92	A
			Cr-51	pCi/g	0.371	0.362	1.02	A
			Cs-134	pCi/g	0.176	0.202	0.87	A
			Cs-137	pCi/g	0.285	0.315	0.90	A
			Fe-59	pCi/g	0.140	0.139	1.00	A
			Mn-54	pCi/g	0.237	0.259	0.92	A
			Zn-65	pCi/g	0.349	0.359	0.97	A
	E13837	AP	Sr-89	pCi	74.6	80.2	0.93	A
			Sr-90	pCi	13.9	14.4	0.96	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 23-24**

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 2023	23-MaS48	Soil	Ni-63	Bq/kg	294	1130	791 - 1469	N[3]
	23-MaSU48	Urine	Cs-134	Bq/L	9.92	10	6.7 - 12.4	A
			Cs-137	Bq/L	0.0994		(1)	A
			Co-57	Bq/L	9.35	8.67	6.07 - 11.27	A
			Co-60	Bq/L	9.03	8.13	5.69 - 10.57	A
			Mn-54	Bq/L	11.80	10.0	7.0 - 13.0	A
			U-234	Bq/L	0.01		Not spiked	
			U-238	Bq/L	0.01		Not spiked	
			Zn-65	Bq/L	10.60	9.29	6.50 - 12.08	A
	23-MaW48	Water	Ni-63	Bq/L	23.1	27.3	19.1 - 35.5	A
	23-RdV48	Vegetation	Cs-134	Bq/sample	5.6	7.6	5.32 - 9.88	W
			Cs-137	Bq/sample	0.03		*(1)*	A
			Co-57	Bq/sample	5.9	6.9	4.85 - 9.01	A
			Co-60	Bq/sample	5.00	6.51	4.56 - 8.46	W
			Mn-54	Bq/sample	6.08	8.03	5.62 - 10.44	W
			Sr-90	Bq/sample	0.05		*(1)*	N[4]
			Zn-65	Bq/sample	5.49	7.43	*5.20 - 9.66*	W
August 2023	23-MaS49	Soil	Fe-55	Bq/kg	346	1280	896 - 1664	N[5]
			Ni-63	Bq/kg	1260	1370	959 - 1781	A
	23-MaW49	Water	Ni-63	Bq/L	1.0	1	*(2)*	A
	23-RdV49	Vegetation	Cs-134	Bq/sample	3.860	4.98	3.49 - 6.47	W
			Cs-137	Bq/sample	0.027		*(1)*	A
			Co-57	Bq/sample	3.88	4.24	2.97 - 5.51	A
			Co-60	Bq/sample	2.37	2.79	1.95 - 3.63	A
			Mn-54	Bq/sample	2.04	2.56	1.79 - 3.33	W
			Sr-90	Bq/sample	0.96	1.17	0.82 - 1.52	A
			Zn-65	Bq/sample	-0.514		*(1)*	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) See **NCR 23-08**

(4) See **NCR 23-09**

(5) Initial evaluation - See **CAR 23-31**

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 2023	MRAD-38	Water	Am-241	pCi/L	28.1	32.1	22.0 - 41.0	A
			Fe-55	pCi/L	1180	1380	811 - 2010	A
			Pu-238	pCi/L	65.6	70.7	42.5 - 91.6	A
			Pu-239	pCi/L	82.9	92.4	57.2 - 114	A
		Soil	Sr-90	pCi/kg	2630	2580	803 - 4020	A
		AP	GR-A	pCi/filter	69.6	76.8	40.1 - 127	A
			GR-B	pCi/filter	36.8	32.8	19.9 - 49.6	A
April 2023	RAD-133	Water	Ba-133	pCi/L	26.0	22.3	17.1 - 25.8	N[1]
			Cs-134	pCi/L	72.1	77.6	63.4 - 85.4	A
			Cs-137	pCi/L	62.1	63.1	56.8 - 72.2	A
			Co-60	pCi/L	32.6	30.3	26.7 - 36.1	A
			Zn-65	pCi/L	253	242	218 - 283	A
			GR-A	pCi/L	34.2	29.2	14.9 - 38.2	A
			GR-B	pCi/L	64.3	60.7	41.8 - 67.4	A
			U-Nat	pCi/L	61.75	62.7	51.2 - 69.0	A
			H-3	pCi/L	13,300	12700	11,100 - 14,000	A
			Sr-89	pCi/L	67.0	61.1	49.2 - 69.0	A
			Sr-90	pCi/L	36.5	36.0	26.4 - 41.5	A
			I-131	pCi/L	24.3	28.7	23.9 - 33.6	A
September 2023	MRAD-39	Water	Am-241	pCi/L	54.0	71.0	48.7 - 90.8	A
			Fe-55	pCi/L	2430	2630	1550 - 3830	A
			Pu-238	pCi/L	172	177	106 - 229	A
			Pu-239	pCi/L	171	182	113 - 224	A
		Soil	Sr-90	pCi/kg	9580	6800	2120 - 10,600	A
		AP	GR-A	pCi/filter	82.2	79.8	41.7 - 131	A
			GR-B	pCi/filter	54.3	42.6	25.8 - 64.4	A
October 2023	RAD-135	Water	Ba-133	pCi/L	86.3	92.2	73.8 - 111	A
			Cs-134	pCi/L	38.4	41.2	27.9 - 54.5	A
			Cs-137	pCi/L	194	199	161 - 237	A
			Co-60	pCi/L	49.5	47.8	33.8 - 61.8	A
			Zn-65	pCi/L	59.7	57.0	23.7 - 90.3	A
			GR-A	pCi/L	53.2	70.6	54.0 - 87.2	N[2]
			GR-B	pCi/L	46.9	42.2	30.5 - 53.9	A
			U-Nat	pCi/L	51.26	51.7	45.9- 57.5	A
			H-3	pCi/L	20,100	22,900	19,700 - 26,100	A
			Sr-89	pCi/L	51.1	38.2	25.2 - 51.2	A
			Sr-90	pCi/L	31.7	35.7	30.3 - 41.1	A
			I-131	pCi/L	23.5	29.7	25.8 - 33.6	N[3]

(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 23-10***

*(2) See **NCR 23-20***

*(3) See **NCR 23-21***

APPENDIX E

ERRATA DATA

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There was no errata data for 2023.

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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 2023. During that time period, 130 analyses were performed on 73 samples from 30 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 2023.

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 two samples.

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 2 of 17 groundwater monitoring locations. The detected tritium concentrations ranged from 206 ± 126 pCi/L to 417 ± 137 pCi/L. Tritium was detected in 4 of 26 precipitation water samples with concentrations ranging from 204 ± 121 pCi/L to 276 ± 125 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 13,626 acres. This includes the approximately 4,900-acre, man-made cooling lake and about 95 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 13,626-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 2023.

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 2023. 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 worldwide from 1960 to 2006. RadNet provides tritium precipitation concentration data for samples collected at stations throughout 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 2023.

2. Missed Samples

   There were no missed samples in 2023.

B. Program Changes

There were no program changes in 2023.

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 417 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

No plant-produced radionuclides were detected and all LLDs were met. (Table B–I.2, Appendix B)

Hard-to-Detect (HTD)

Hard-to-Detect analyses are required on a biennial basis and were not performed in 2023. (Table B–I.3 Appendix B)

D. Surface Water Results

There were no surface water samples analyzed in 2023. 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 13 locations were analyzed for tritium activity. Tritium was detected in 4 samples at a concentration range of 204 pCi/L - 276 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 2023.

H. Leaks, Spills, and Releases

On 09/18/23, sodium bisulfite chemical leak was discovered at the flume discharge chemical building. The cause was due to a fractured nipple attached to the chemical injection pulse dampener. Corrective actions have been completed. (IR 4703478)

There were no other reportable leaks, spills or releases in 2023.

I. Trends

No trends have been identified in 2023.

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 2023.

2. Installation of Monitoring Wells

   No new wells were installed during the 2023.

3. Actions to Recover/Reverse Plumes

   No actions were required to recover or reverse groundwater plumes.

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   No actions were required to recover or reverse groundwater plumes.

APPENDIX A

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

TABLE A-1: Radiological Groundwater Protection Program - Sampling Locations, Clinton Power Station, 2023

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-ESE	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

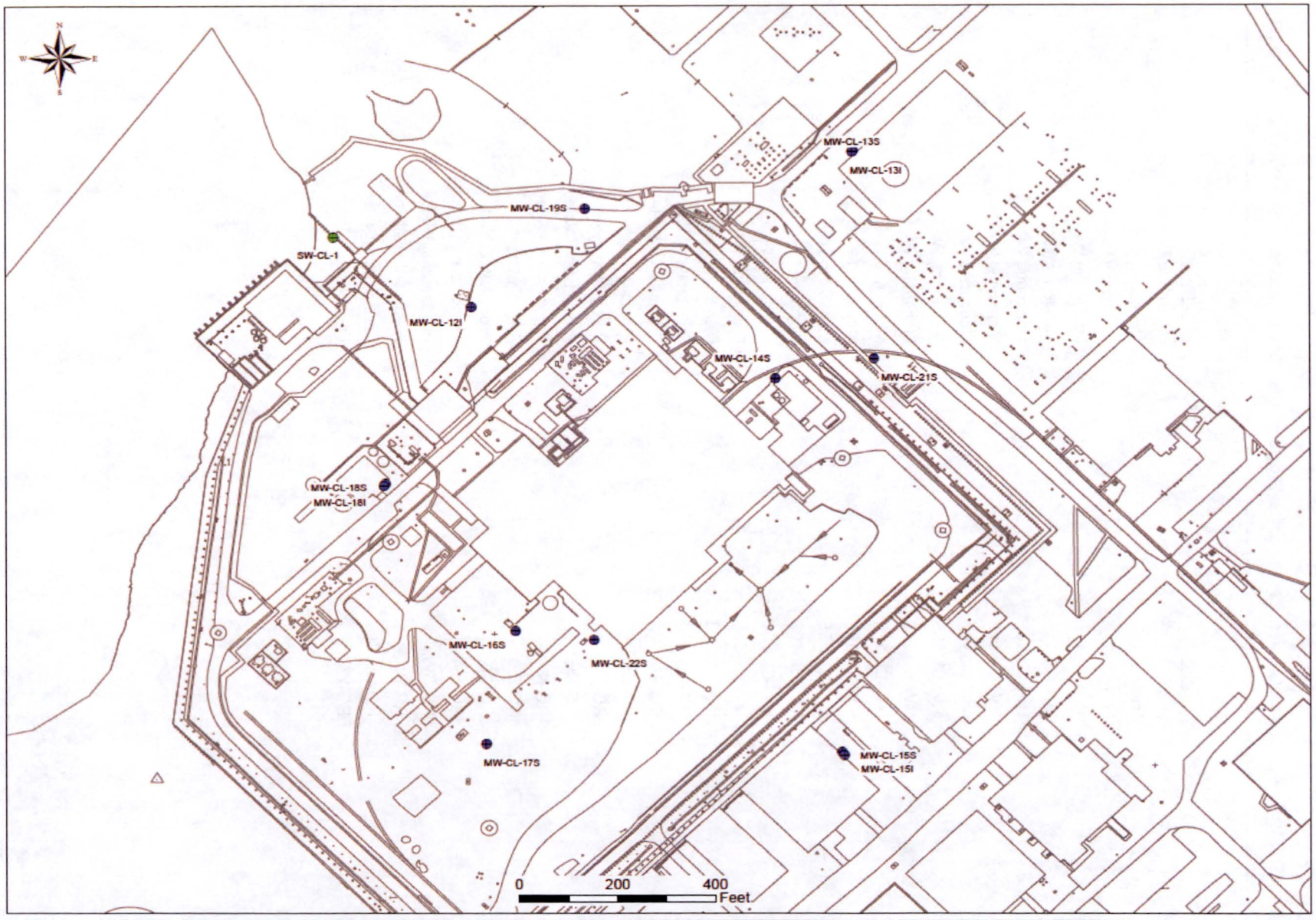


Figure A – 1
Onsite Sampling Locations at Clinton Power Station

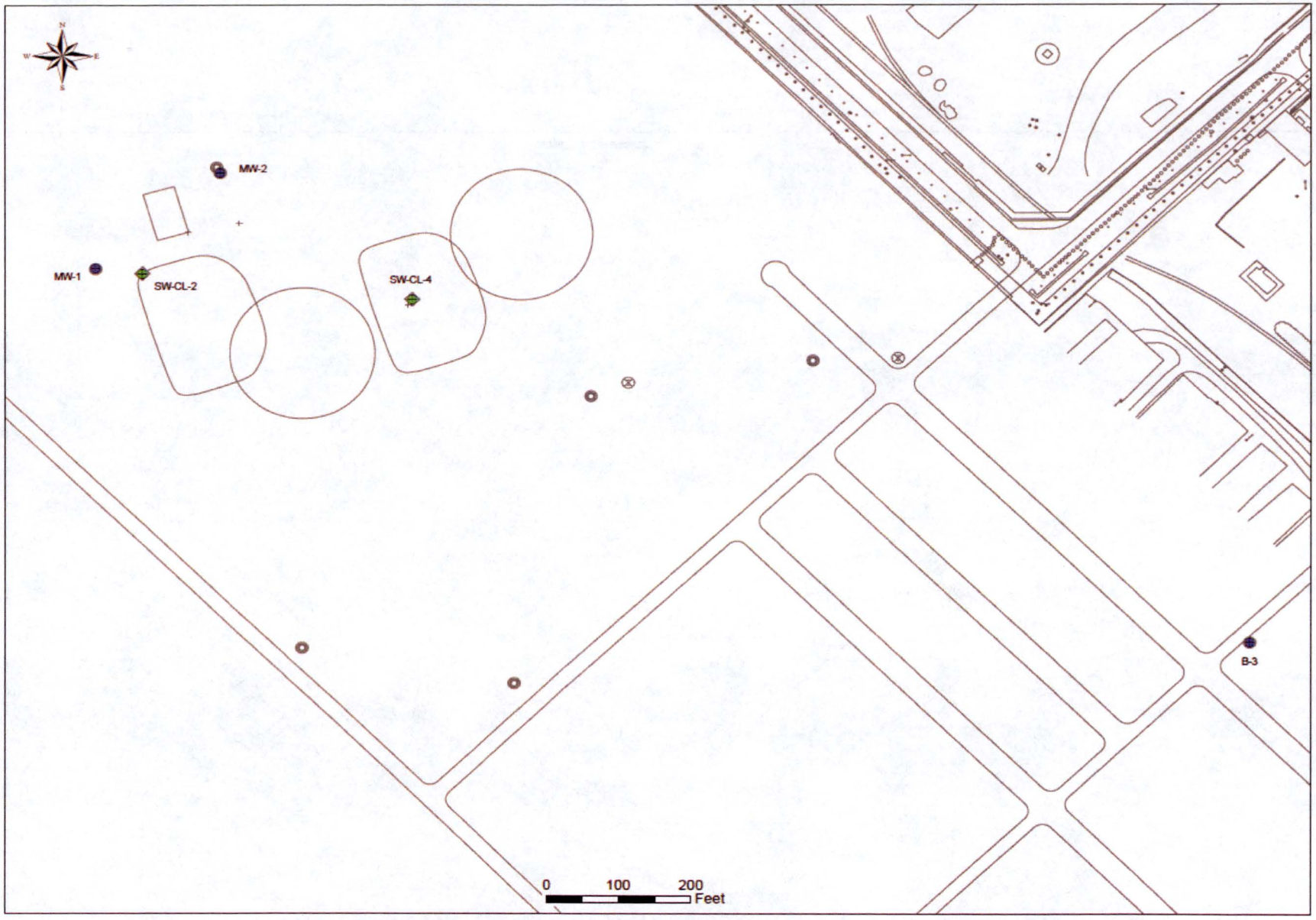


Figure A – 2
Sampling Locations South of Clinton Power Station

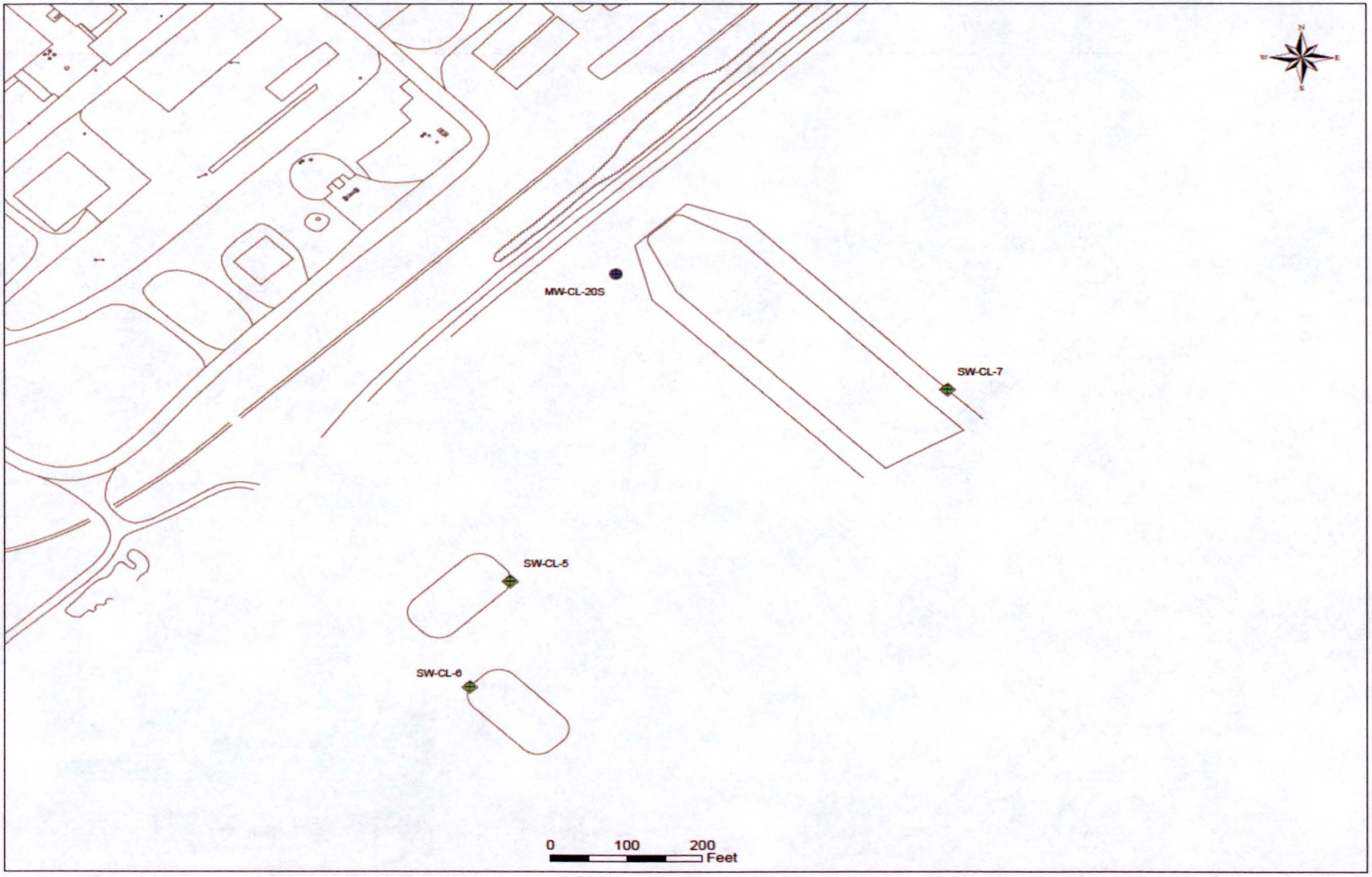
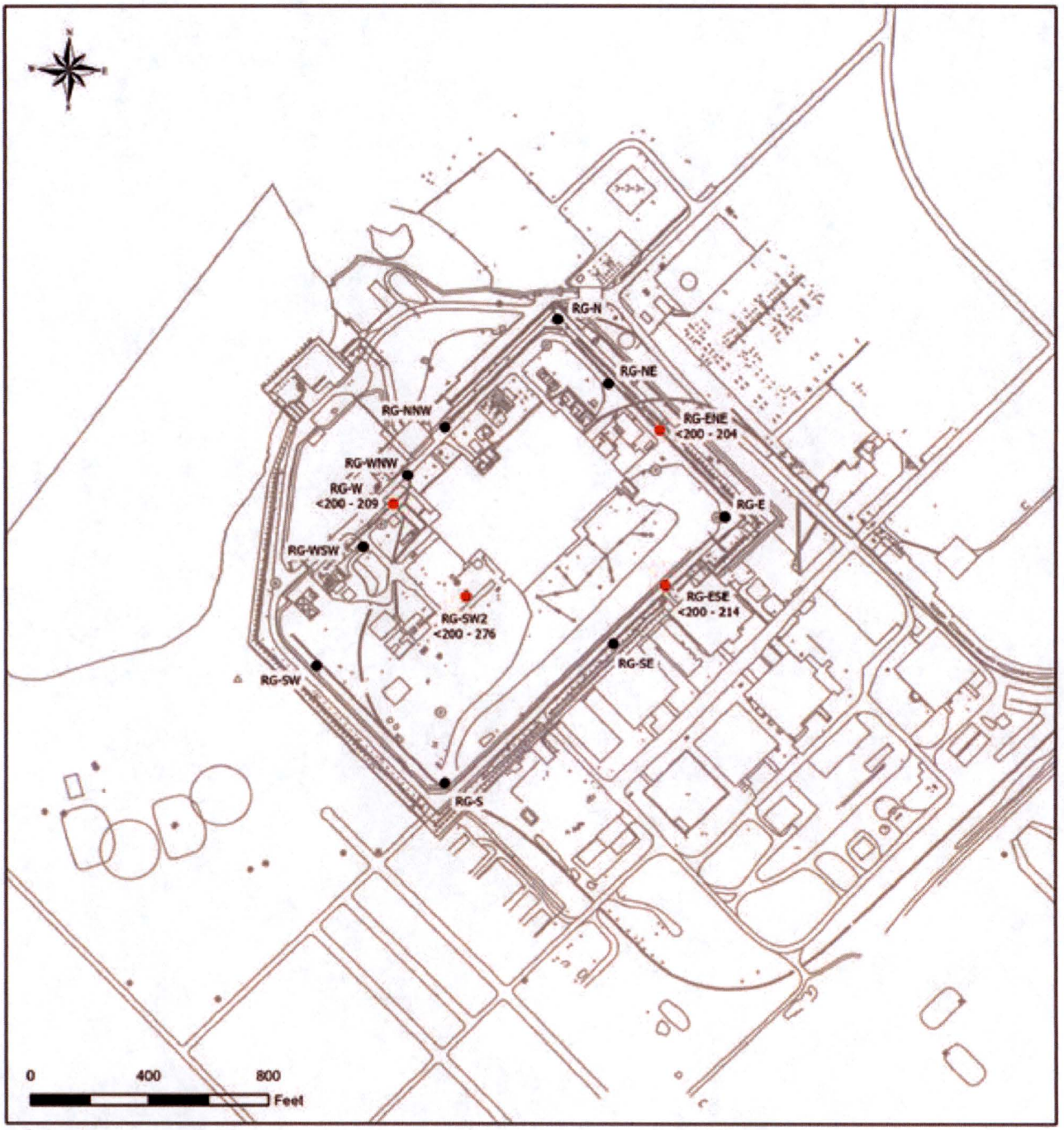


Figure A – 3
Sampling Locations East of Clinton Power Station



Explanation:
2023 Precipitation Recapture Sample Location
- Result >200 pCi/L
- Result <200 pCi/L
- Precipitation recapture samples collected in January and June, 2023.

Figure A – 4
Recapture Sampling Locations of Clinton Power Station

APPENDIX B

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

TABLE B-I.1 CONCENTRATIONS OF TRITIUM AND STRONTIUM IN GROUNDWATER SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2023

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION DATE	H-3	Sr-89	Sr-90	Gr-A (Dis)	Gr-A (Sus)
B-3	08/02/23	< 193				
MW-CL-1	08/02/23	< 196				
MW-CL-2	08/02/23	< 191				
MW-CL-12I	03/07/23	< 185				
MW-CL-12I	05/11/23	< 184				
MW-CL-12I	08/02/23	< 195	< 6.3	< 0.8	< 0.7	< 0.9
MW-CL-12I	11/03/23	< 193				
MW-CL-13I	08/02/23	< 193				
MW-CL-13S	03/07/23	< 185				
MW-CL-13S	05/11/23	< 187				
MW-CL-13S	08/02/23	< 198	< 7.4	< 0.8	< 0.7	< 0.9
MW-CL-13S	11/03/23	< 193				
MW-CL-14S	03/08/23	368 ± 130				
MW-CL-14S	05/12/23	< 187				
MW-CL-14S	08/03/23	206 ± 126	< 9.4	< 0.9	< 0.8	< 0.9
MW-CL-14S	11/02/23	< 192				
MW-CL-15I	08/02/23	< 193				
MW-CL-15S	08/02/23	< 197				
MW-CL-16S	03/08/23	213 ± 122				
MW-CL-16S	05/12/23	224 ± 125				
MW-CL-16S	08/03/23	< 196	< 9.2	< 0.9	1.9 ± 1.0	< 0.9
MW-CL-16S	11/02/23	417 ± 137				
MW-CL-17S	03/08/23	< 189				
MW-CL-17S	05/12/23	< 186				
MW-CL-17S	08/03/23	< 193	< 1.2	< 0.3	< 1.2	< 0.9
MW-CL-17S	11/02/23	< 194				
MW-CL-18I	03/08/23	< 184				
MW-CL-18I	05/12/23	< 193				
MW-CL-18I	08/03/23	< 193	< 8.7	< 0.9	< 1.2	< 0.6
MW-CL-18I	11/02/23	< 191				
MW-CL-18S	03/08/23	< 186				
MW-CL-18S	05/12/23	< 183				
MW-CL-18S	08/03/23	< 195	< 9.4	< 0.9	1.6 ± 1.1	< 0.6
MW-CL-18S	11/02/23	< 195				
MW-CL-19S	03/07/23	< 185				
MW-CL-19S	05/11/23	< 182				
MW-CL-19S	08/02/23	< 194	< 2.0	< 0.4	< 2.1	< 0.6
MW-CL-19S	11/03/23	< 193				
MW-CL-20S	08/02/23	< 195				
MW-CL-21S	03/07/23	< 181				
MW-CL-21S	05/11/23	< 194				
MW-CL-21S	08/02/23	< 197	< 7.2	< 0.7	< 1.4	< 0.6
MW-CL-21S	11/03/23	< 190				
MW-CL-22S	03/08/23	< 185				
MW-CL-22S	05/12/23	< 189				
MW-CL-22S	08/03/23	< 193	< 9.4	< 0.9	< 1.5	< 0.6
MW-CL-22S	11/02/23	< 198				

Table B-I.2

CONCENTRATIONS OF GAMMA EMITTERS IN GROUNDWATER SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2023

RESULTS IN UNITS OF PCI/LITER + SIGMA

SITE	COLLECTION DATE	Be-7	K-40	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	Cs-134	Cs-137	Ba-140	La-140
B-3	08/02/23	< 16	< 19	< 2	< 2	< 4	< 2	< 3	< 2	< 3	< 2	< 2	< 10	< 4
MW-CL-1	08/02/23	< 19	< 36	< 2	< 2	< 4	< 2	< 4	< 2	< 4	< 2	< 2	< 13	< 4
MW-CL-2	08/02/23	< 18	< 23	< 2	< 2	< 4	< 2	< 4	< 2	< 4	< 2	< 2	< 13	< 5
MW-CL-12I	08/02/23	< 17	< 36	< 2	< 2	< 4	< 2	< 4	< 2	< 4	< 2	< 2	< 11	< 4
MW-CL-13I	08/02/23	< 16	< 16	< 2	< 2	< 4	< 2	< 3	< 2	< 3	< 2	< 2	< 10	< 3
MW-CL-13S	08/02/23	< 19	< 32	< 2	< 2	< 4	< 2	< 4	< 2	< 4	< 2	< 2	< 12	< 4
MW-CL-14S	08/03/23	< 16	< 30	< 2	< 2	< 4	< 2	< 3	< 2	< 3	< 2	< 2	< 11	< 4
MW-CL-15I	08/02/23	< 17	< 31	< 2	< 2	< 4	< 2	< 4	< 2	< 4	< 2	< 2	< 12	< 5
MW-CL-15S	08/02/23	< 16	< 17	< 2	< 2	< 4	< 2	< 4	< 2	< 3	< 2	< 2	< 12	< 4
MW-CL-16S	08/03/23	< 19	< 40	< 2	< 2	< 4	< 2	< 4	< 2	< 4	< 2	< 2	< 13	< 4
MW-CL-17S	08/03/23	< 17	< 33	< 2	< 2	< 4	< 2	< 4	< 2	< 3	< 2	< 2	< 12	< 4
MW-CL-18I	08/03/23	< 14	< 15	< 2	< 2	< 3	< 2	< 3	< 2	< 3	< 2	< 2	< 10	< 3
MW-CL-18S	08/03/23	< 16	< 16	< 2	< 2	< 4	< 2	< 3	< 2	< 3	< 2	< 2	< 11	< 3
MW-CL-19S	08/02/23	< 13	< 16	< 2	< 2	< 3	< 2	< 3	< 2	< 3	< 2	< 2	< 9	< 3
MW-CL-20S	08/02/23	< 12	< 23	< 1	< 1	< 3	< 2	< 3	< 1	< 3	< 1	< 1	< 9	< 3
MW-CL-21S	08/02/23	< 16	< 39	< 2	< 2	< 4	< 2	< 4	< 2	< 3	< 2	< 2	< 12	< 4
MW-CL-22S	08/03/23	< 11	32 ± 18	< 1	< 1	< 3	< 1	< 3	< 1	< 2	< 1	< 1	< 8	< 3

TABLE B-I.3 **CONCENTRATIONS OF HARD TO DETECTS IN GROUNDWATER SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2023**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

There were no HTD samples analyzed in 2023

TABLE B-II.1 CONCENTRATIONS OF TRITIUM IN SURFACE WATER SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2023

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

There were no surface water samples analyzed in 2023

TABLE B-III.1 CONCENTRATIONS OF TRITIUM IN PRECIPITATION WATER SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2023

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION DATE	H-3
RG-E	01/01/23	< 192
RG-E	06/01/23	< 192
RG-ENE	01/01/23	204 ± 121
RG-ENE	06/01/23	< 196
RG-ESE	01/01/23	214 ± 125
RG-ESE	06/01/23	< 192
RG-N	01/01/23	< 188
RG-N	06/01/23	< 195
RG-NE	01/01/23	< 191
RG-NE	06/01/23	< 197
RG-NNW	01/01/23	< 192
RG-NNW	06/01/23	< 187
RG-S	01/01/23	< 192
RG-S	06/01/23	< 189
RG-SE	01/01/23	< 191
RG-SE	06/01/23	< 189
RG-SW	01/01/23	< 190
RG-SW	06/01/23	< 192
RG-SW2	01/01/23	276 ± 125
RG-SW2	06/01/23	< 189
RG-W	01/01/23	209 ± 125
RG-W	06/01/23	< 191
RG-WNW	01/01/23	< 187
RG-WNW	06/01/23	< 187
RG-WSW	01/01/23	< 187
RG-WSW	06/01/23	< 187

Intentionally left blank