Richard G. Everett
Site Vice President
R.E. Ginna Clean Energy Center
1503 Lake Rd.
Ontario, NY 14519
315-791-5205 Office
richard.everett@constellation.com
www.constellation.com

Constellation

May 12, 2025

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

R.E. Ginna Nuclear Power Plant
Renewed Facility Operating License No. DPR-18
NRC Docket No. 50-244

Independent Spent Fuel Storage Installation (ISFSI)
NRC Docket No. 72-67

Subject: 2024 Annual Radioactive Effluent Release Report and 2024 Annual Radiological Environmental Operating Report

Enclosed is the Annual Radioactive Effluent Release Report (ARERR) for 2024 for the R.E. Ginna Nuclear Power Plant and Independent Spent Fuel Storage Installation (ISFSI). This report is being submitted in accordance with 10 CFR 50.36a(a)(2) and Technical Specifications (TS) Sections 5.5.1.c and 5.6.3.

One (1) revision to the Offsite Dose Calculation Manual (ODCM) and no (0) revisions to the Process Control Program (PCP) occurred during the 2024 reporting period. In the ARERR, ODCM revisions are described in Section 5.7 and PCP revisions are described in Section 5.8. Submitted as Appendices to the ARERR are (A) the Annual Report on the Meteorological Monitoring Program and, (B) a complete, legible copy of the entire ODCM, as required by TS 5.5.1.c (no annotations due to no changes during the reporting period).

Also enclosed is the Annual Radiological Environmental Operating Report (AREOR) for 2024, submitted in accordance with Technical Specification Section 5.6.2.

There are no regulatory commitments contained in this submittal. Should you have any other questions regarding this submittal, please contact Justin Follett at 315-791-3438.

Respectfully,

Richard G. Everett

Enclosures:
1. [p. 3 of 278] Annual Radioactive Effluent Release Report 2024
   a. [p. 37 of 278] App. A, Annual Report on the Meteorological Monitoring Program at the Ginna Nuclear Power Plant 2024
   b. [p. 83 of 278] App. B, CY-GI-170-300, Rev 037, Offsite Dose Calculation Manual (ODCM) R. E. Ginna Nuclear Power Plant
2. [p. 204 of 278] Annual Radiological Environmental Operating Report 2024

cc: NRC Regional Administrator, Region I (w/o)
NRC Project Manager, Ginna (w/o)
NRC Senior Resident Inspector, Ginna (w/o)

NYS Office of Emergency Management (electronic)
Division of Homeland Security and Emergency Services
1220 Washington Avenue
Building 22, Suite 101
Albany, NY 12226-2251
Attn.: Gary Machina

NYS Department of Public Service (electronic)
Office of Resilience and Emergency Preparedness
Empire State Plaza, Agency Building 3
Albany, NY 12223-1350
Attn.: Andrew Kauk

American Nuclear Insurers (electronic)
95 Glastonbury Blvd.
Glastonbury, CT 06033
Attn.: Dylan Freiermuth

NYS Division of Homeland Security and Emergency Services (electronic)
Attn: Radiological Preparedness Department
1220 Washington Avenue
Building 7A Suite 710
Albany, NY 12242

Monroe County Office of Emergency Management (electronic)
1190 Scottsville Rd., Suite 200
Rochester, NY 14624
Attn.: Tim Henry

Wayne County Emergency Management (electronic)
7376 Rt. 31, Suite 2000
Lyons, NY 14489-9174
Attn.: George Bastedo, Director, Office of Disaster Preparedness

ENCLOSURE 1

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

2024

Constellation

R.E. Ginna Nuclear Power Plant



Annual Radioactive Effluent Release Report

2024

Document Number: 50-244

TABLE OF CONTENTS

1.0 LIST OF ACRONYMS AND DEFINITIONS 3
2.0 EXECUTIVE SUMMARY 5
2.1 Comparison to Regulatory Limits 6
3.0 INTRODUCTION 8
3.1 About Nuclear Power 8
3.2 About Radiation Dose 10
3.3 About Dose Calculation 12
4.0 DOSE ASSESSMENT FOR PLANT OPERATIONS 14
4.1 Regulatory Limits 14
4.2 Regulatory Limits for Gaseous Effluent Doses 14
4.3 Regulatory Limits for Liquid Effluent Doses 15
4.4 40 CFR 190 Regulatory Dose Limits for a Member of the Public 16
5.0 SUPPLEMENTAL INFORMATION 16
5.1 Gaseous Batch Releases 16
5.2 Liquid Batch Releases 16
5.3 Abnormal Releases 16
5.4 Land Use Census Changes 17
5.5 Meteorological Data 17
5.6 Effluent Radiation Monitors Out of Service Greater Than 30 Days 18
5.7 Offsite Dose Calculation Manual (ODCM) Changes 18
5.8 Process Control Program (PCP) Changes 18
5.9 Radioactive Waste Treatment System Changes 18
5.10 Other Supplemental Information 18
6.0 NEI 07-07 ONSITE RADIOLOGICAL GROUNDWATER MONITORING PROGRAM 20
6.1 Voluntary Notification 21
7.0 BIBLIOGRAPHY 22

TABLES

Table 1, R.E. Ginna Nuclear Power Plant Dose Summary 6
Table 2, Total Annual Offsite-Dose Comparison to 40 CFR 190 Limits for Ginna 7
Table 3, Groundwater Protection Program Monitoring Well Sample Schedule 20
Table 4, Groundwater Protection Program Monitoring Well Tritium Results 21
Table 5, Gaseous Effluents Summation of All Releases at Ginna 23
Table 6, Gaseous Effluents – Mixed Level Release Batch Mode at Ginna 24
Table 7, Gaseous Effluents – Mixed Level Release Continuous Mode at Ginna 25
Table 8, Liquid Effluents - Summation of All Releases at Ginna 26
Table 9, Batch Mode Liquid Effluents - Ginna 27
Table 10, Continuous Mode Liquid Effluents - Ginna 28
Table 11, Types of Solid Waste Summary from Ginna 29
Table 12, Major Nuclides at Ginna 29

Table 13, Solid Waste Disposition from Ginna 30
Table 14, Irradiated Fuel Shipments Disposition from Ginna..... 30
Table 15, Classification of Atmospheric Stability 32

FIGURES

Figure 1, Pressurized Water Reactor (PWR) [1]..... 8
Figure 2, Boiling Water Reactor (BWR) [2]..... 9
Figure 3, Sources of Radiation Exposure (NCRP Report No. 160) [3]..... 10
Figure 4, Potential exposure pathways to Members of the Public due to Plant Operations [4] 12

ATTACHMENTS

Attachment 1, ARERR Release Summary Tables (RG-1.21 Tables) 23
Attachment 2, Solid Waste Information..... 29
Attachment 3, Meteorological Data 31

1.0 LIST OF ACRONYMS AND DEFINITIONS

1. Alpha Particle (α): A charged particle emitted from the nucleus of an atom having a mass and charge equal in magnitude of a helium nucleus.

2. BWR: Boiling Water Reactor

3. Composite Sample: A series of single collected portions (aliquots) analyzed as one sample. The aliquots making up the sample are collected at time intervals that are very short compared to the composite period.

4. Control: A sampling station in a location not likely to be affected by plant effluents due to its distance and/or direction from the Plant.

5. Counting Error: An estimate of the two-sigma uncertainty associated with the sample results based on total counts accumulated.

6. Curie (Ci): A measure of radioactivity; equal to 3.7×10^{10} disintegrations per second, or 2.22×10^{12} disintegrations per minute.

7. Direct Radiation Monitoring: The measurement of radiation dose at various distances from the plant is assessed using thermoluminescent dosimeters (TLDs), optically stimulated luminescent dosimeters (OSLDs), and/or pressurized ionization chambers.

8. Grab Sample: A single discrete sample drawn at one point in time.

9. Indicator: A sampling location that is potentially affected by plant effluents due to its proximity and/or direction from the plant.

10. Ingestion Pathway: The ingestion pathway includes milk, fish, drinking water and garden produce. Also sampled (under special circumstances) are other media such as vegetation or animal products when additional information about radionuclides is needed.

11. ISFSI: Independent Spent Fuel Storage Installation

12. LLD: Lower Limit of Detection. An *a priori* measure of the detection capability of a radiochemistry measurement based on instrument setup, calibration, background, decay time, and sample volume. An LLD is expressed as an activity concentration. The MDA is used for reporting results. LLD are specified by a regulator, such as the NRC and are typically listed in the ODCM.

13. MDA: Minimum Detectable Activity. For radiochemistry instruments, the MDA is the *a posteriori* minimum concentration that a counting system detects. The smallest concentration or activity of radioactive material in a sample that will yield a net count above instrument background and that is detected with 95% probability, with only 5% probability of falsely concluding that a blank observation represents a true signal.

14. MDC: Minimum Detectable Concentration. Essentially synonymous with MDA for the purposes of radiological monitoring.

15. Mean: The sum of all the values in a distribution divided by the number of values in the distribution, synonymous with average.

16. Microcurie (µCi): 3.7 x 10^4 disintegrations per second, or 2.22 x10^6 disintegrations per minute.

17. millirem (mrem): 1/1000 rem; a unit of radiation dose equivalent in tissue.

18. Milliroentgen (mR): 1/1000 Roentgen; a unit of exposure to X- or gamma radiation.

19. N/A: Not Applicable

20. NEI: Nuclear Energy Institute

21. NRC: Nuclear Regulatory Commission

22. ODCM: Offsite Dose Calculation Manual

23. OSLD: Optically Stimulated Luminescence Dosimeter

24. Protected Area: A 10 CFR 73 security term is an area encompassed by physical barriers and to which access is controlled for security purposes. The fenced area immediately surrounding the plant and around ISFSI are commonly classified by the licensee as “Protected areas.” Access to the protected area requires a security badge or escort.

25. PWR: Pressurized Water Reactor

26. REC: Radiological Effluent Control

27. REMP: Radiological Environmental Monitoring Program

28. Restricted Area: A 10 CFRR 20 defined term where access to which is limited by the licensee for the purpose of protecting individuals against undue risks from exposure to radiation and radioactive materials.

29. TEDE: Total Effective Dose Equivalent (TEDE) means the sum of the effective dose equivalent (for external exposures) and the committed effective dose equivalent (for internal exposures).

30. TLD: Thermoluminescent Dosimeter

31. TRM: Technical Requirements Manual

32. TS: Technical Specification

33. Unrestricted Area: An area, access to which is neither limited nor controlled by the licensee.

2.0 EXECUTIVE SUMMARY

R.E. Ginna Nuclear Power Plant (Ginna) Radiological Effluent Control (REC) Program was established to limit the quantities of radioactive material that may be released based on calculated radiation doses or dose rates. Dose to members of the public due to radioactive materials released from the plant is limited by Technical Specifications,10 CFR 20, and by 40 CFR 190. Operational doses to the public during 2024 were calculated to be within the limits required by regulation, compared to other sources of radiation dose and determined to pose no health hazard. These doses are summarized and compared to the regulatory limits in Section 2.1 Comparison to Regulatory Limits below.

The Annual Radioactive Effluent Release Report (ARERR) is published per REC requirements and provides data related to plant operation, including: quantities of radioactive materials released in liquid and gaseous effluents; radiation doses to members of the public; solid radioactive waste shipped offsite for processing or direct disposal; and other information as required by site licensing documents.

In 2024, Ginna staff completed gaseous effluent assessments and concluded the critical receptor to be an infant in the south southeast meteorological sector (due to inhalation). The maximum Annual Organ Dose calculated for this receptor was 1.201E-01 mRem, to the thyroid.

The maximum dose calculated to any organ due to radioactive liquid effluents was Gastrointestinal - Liver, for adults due to drinking water (1.692E-02 mRem).

Solid radioactive waste shipped offsite for processing or direct disposal included 6.366 Curies and 81.5 cubic meters ($m^{3)}$, shipped in 3 shipments.

In addition to monitoring radioactive effluents, Ginna has a Radiological Environmental Monitoring Program (REMP) that monitors for levels of radiation and radioactive materials in the local environment. Data from the REMP is published in the Annual Radiological Environmental Operating Report (AREOR).

2.1 Comparison to Regulatory Limits

During 2024, all solid, liquid, and gaseous radioactive effluents from Ginna were well below regulatory limits, as summarized in Table 1 and Table 2.

Table 1, R.E. Ginna Nuclear Power Plant Dose Summary[1]

		Quarter 1	Quarter 2	Quarter 3	Quarter 4	Annual
Liquid Effluent Dose Limit, Total Body	Limit	1.5 mrem	1.5 mrem	1.5 mrem	1.5 mrem	3 mrem
	Total Body Dose	1.43E-04	1.74E-04	1.19E-03	7.61E-03	9.11E-03
	% of Limit	9.53E-03	1.16E-02	7.93E-02	5.07E-01	3.04E-01
Liquid Effluent Dose Limit, Any Organ	Limit	5 mrem	5 mrem	5 mrem	5 mrem	10 mrem
	Max Organ Dose	1.43E-04	3.44E-04	1.80E-03	1.48E-02	1.69E-02
	% of Limit	2.86E-03	6.88E-03	3.60E-02	2.96E-01	1.69E-01
Gaseous Effluent Dose Limit, Gamma Air (Noble Gas)	Limit	5 mrad	5 mrad	5 mrad	5 mrad	10 mrad
	Gamma Air Dose	1.22E-05	1.91E-05	6.06E-05	3.44E-04	4.36E-04
	% of Limit	2.44E-04	3.82E-04	1.21E-03	6.88E-03	4.36E-03
Gaseous Effluent Dose Limit, Beta Air (Noble Gas)	Limit	10 mrad	10 mrad	10 mrad	10 mrad	20 mrad
	Beta Air Dose	2.25E-05	6.22E-05	1.25E-04	9.84E-04	1.20E-03
	% of Limit	2.25E-04	6.22E-04	1.25E-03	9.84E-03	6.00E-03
Gaseous Effluent Organ Dose Limit (Iodine, Tritium, Particulates with > 8-day half-life)	Limit	7.5 mrem	7.5 mrem	7.5 mrem	7.5 mrem	15 mrem
	Max Organ Dose	9.99E-04	8.62E-04	9.51E-04	1.17E-01	1.18E-01
	% of Limit	1.33E-02	1.15E-02	1.27E-02	1.56E+00	7.87E-01

[1] Table 1 demonstrates compliance with 10 CFR Part 50, App. I Limits.

Table 2, Total Annual Offsite-Dose Comparison to 40 CFR 190 Limits for Ginna[2]

	Whole Body	Thyroid	Max Other Organ
Gaseous[3]	3.75E-03	1.18E-01	3.93E-03
Carbon-14	3.35E-05	3.35E-05	1.68E-04
Liquid	9.11E-03	9.27E-03	1.69E-02
Direct Shine	0.00E+00	0.00E+00	0.00E+00
Total Site Dose	1.29E-02	1.27E-01	2.10E-02
Total w/Other Nearby Facility[4]	1.29E-02	1.27E-01	2.10E-02
Limit	**25 mrem**	**75 mrem**	**25 mrem**
% of Limit	**8.81E-02**	**1.82E-01**	**1.52E-01**

[2] Table 2 is a summation of Units to show compliance with 40 CFR Part 190 Limits.
[3] Gaseous dose values in **Table 2** include organ dose from Noble Gas, Iodine, Tritium, and particulates.
[4] Other fuel cycle sources within 5 miles of the site are considered in this analysis.

3.0 INTRODUCTION

3.1 About Nuclear Power

Commercial nuclear power plants are generally classified as either Boiling Water Reactors (BWRs) or Pressurized Water Reactors (PWRs), based on their design. A BWR includes a single coolant system where water used as reactor coolant boils as it passes through the core and the steam generated is used to turn the turbine generator for power production. A PWR, in contrast, includes two separate water systems: radioactive reactor coolant and a secondary system. Reactor coolant is maintained under high pressure, preventing boiling. The high-pressure coolant is passed through a heat exchanger called a steam generator where the secondary system water is boiled, and the steam is used to turn the turbine generator for power production. Ginna operates as a PWR reactor.

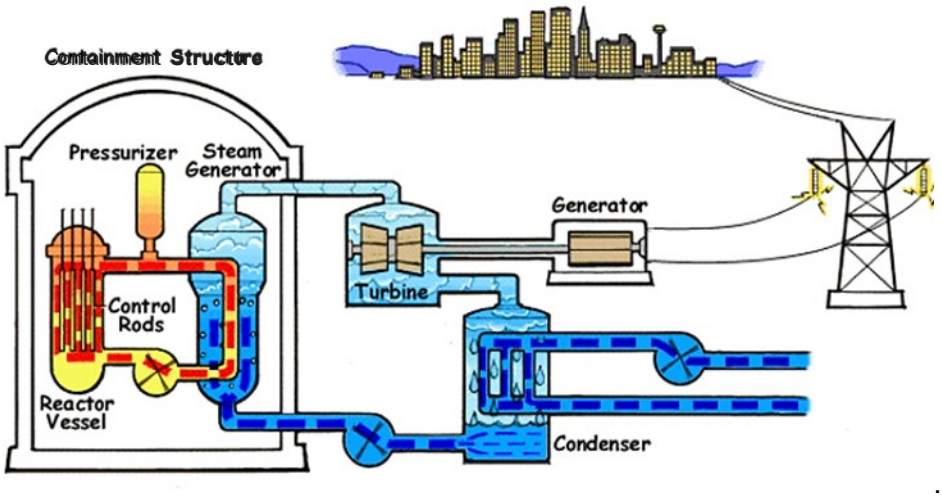


Figure 1, Pressurized Water Reactor (PWR) [1]

3.1 (Continued)

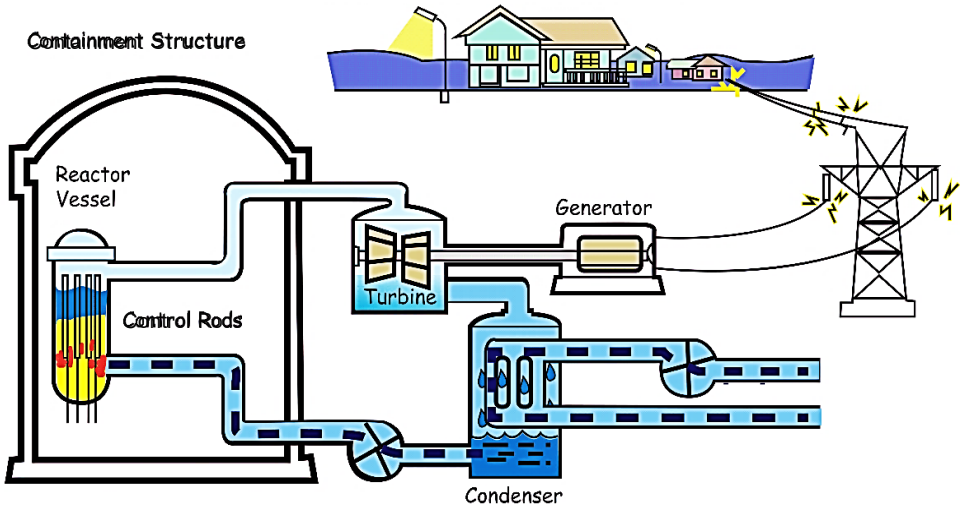


Figure 2, Boiling Water Reactor (BWR) [2]

Electricity is generated by a nuclear power plant similarly to the way that electricity is generated at other conventional types of power plants, such as those powered by coal or natural gas. Water is boiled to generate steam; the steam turns a turbine that is attached to a generator and the steam is condensed back into water to be returned to the boiler. What makes nuclear power different from these other types of power plants is that the heat is generated by fission and decay reactions occurring within and around the core containing fissionable uranium (U-235).

Nuclear fission occurs when certain nuclides (primarily U-233, U-235, or Pu-239) absorb a neutron and break into several smaller nuclides (called fission products) as well as producing some additional neutrons.

Fission results in production of radioactive materials including gases and solids that must be contained to prevent release or treated prior to release. These effluents are generally treated by filtration and/or hold-up prior to release. Releases are generally monitored by sampling and by continuously indicating radiation monitors. The effluent release data is used to calculate doses to ensure that dose to the public due to plant operation remains within required limits and as low as reasonably achievable.

3.2 About Radiation Dose

Ionizing radiation, including alpha, beta, and gamma radiation from radioactive decay, has enough energy to break chemical bonds in tissues and result in damage to tissue or genetic material. The amount of ionization that will be generated by a given exposure to ionizing radiation is quantified as dose. Radiation dose is generally reported in units of millirem (mrem) in the US.

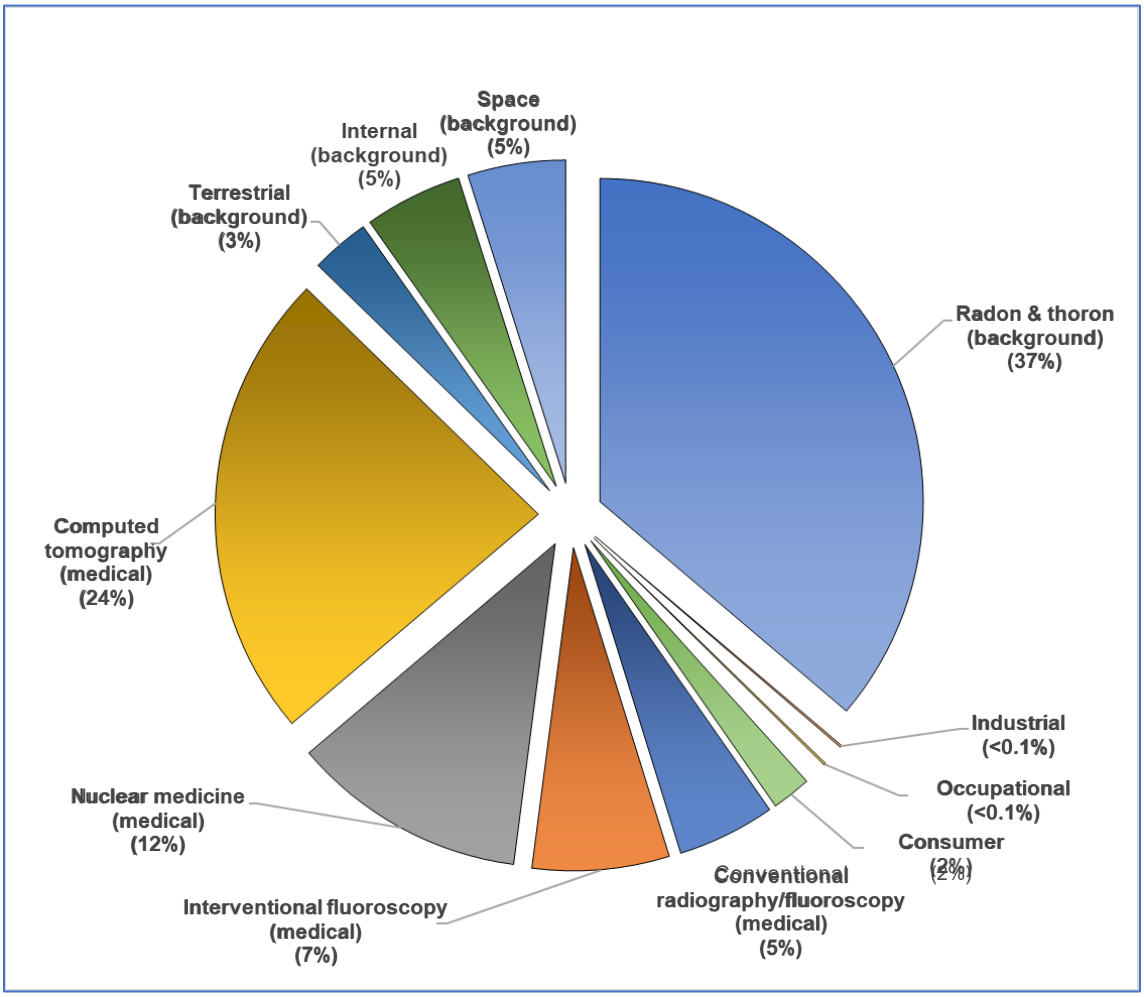


Figure 3, Sources of Radiation Exposure (NCRP Report No. 160) [3]

3.2 (Continued)

The National Council on Radiation Protection (NCRP) has evaluated the population dose for the US and determined that the average individual is exposed to approximately 620 mrem per year [3]. There are many sources for radiation dose, ranging from natural background sources to medical procedures, air travel, and industrial processes. Approximately half (310 mrem) of the average exposure is due to natural sources of radiation including exposure to radon, cosmic radiation, and internal radiation and terrestrial due to naturally occurring radionuclides. The remaining 310 mrem of exposure is due to man-made sources of exposure, with the most significant contributors being medical (48% of total mrem per year) due to radiation used in various types of medical scans and treatments. Of the remaining 2% of dose, most is due to consumer activities such as air travel, smoking cigarettes, and building materials. A small fraction of this 2% is due to industrial activities including generation of nuclear power.

Readers that are curious about common sources and effects of radiation dose that they may encounter can find excellent sources of information from the Health Physics Society, including the Radiation Fact Sheets [4], and from the US Nuclear Regulatory Commission website [5].

3.3 About Dose Calculation

Concentrations of radioactive material in the environment resulting from plant operations are very small and it is not possible to determine doses directly using measured activities of environmental samples. To overcome this, dose calculations based on measured activities of effluent streams are used to model the dose impact for Members of the Public due to plant operation and effluents. There are several mechanisms that can result in dose to Members of the Public, including: Ingestion of radionuclides in food or water; Inhalation of radionuclides in air; Immersion in a plume of noble gases; and Direct Radiation from the ground, the plant or from an elevated plume.

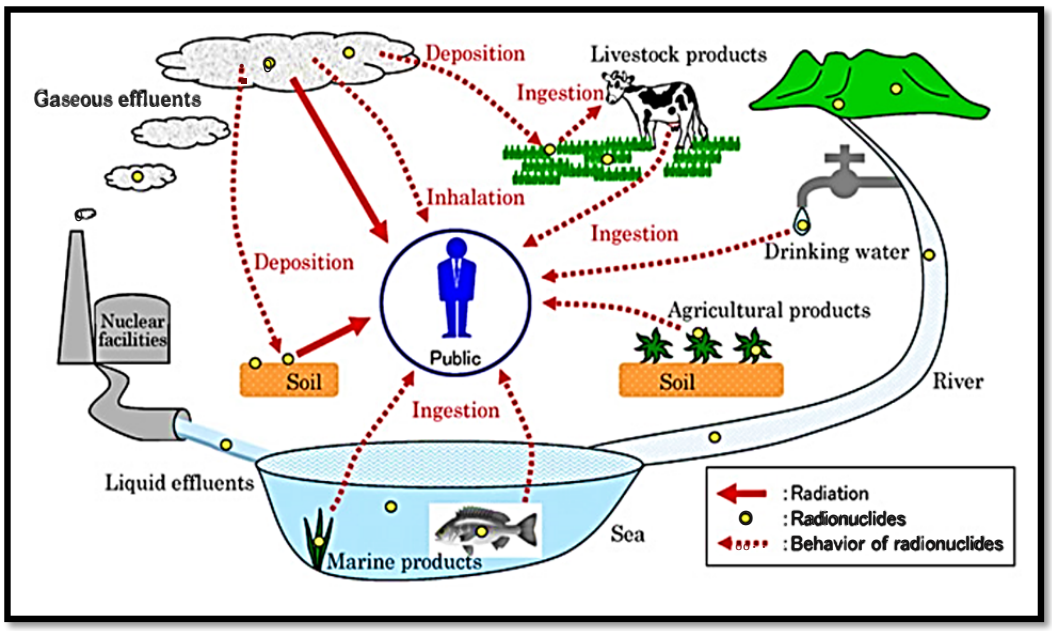


Figure 4, Potential exposure pathways to Members of the Public due to Plant Operations [4]

Each plant has an Offsite Dose Calculation Manual (ODCM) that specifies the methodology used to obtain the doses in the Dose Assessment section of this report. The dose assessment methodology in the ODCM is based on NRC Regulatory Guide 1.109 [7] and NUREG-0133 [8]. Doses are calculated by determining what the nuclide concentration will be in air, water, on the ground, or in food products based on plant effluent releases. Release points are continuously monitored to quantify what concentrations of nuclides are being released. For gaseous releases meteorological data is used to determine how much of the released activity will be present at a given location outside of the plant either deposited onto the ground or in gaseous form. Intake patterns and nuclide bio-concentration factors are used to determine how much activity will be transferred into animal milk or meat. Finally, human ingestion factors and dose factors are used to determine how much activity will be consumed and how much dose the consumer will receive. Inhalation dose is calculated by determining the concentration of nuclides and how much air is breathed by the individual.

3.3 (Continued)

For liquid releases, dilution and mixing factors are used to model the environmental concentrations in water. Drinking water pathways are modeled by determining the concentration of nuclides in the water at the point where the drinking water is sourced (e.g., taken from wells, rivers, or lakes). Fish and invertebrate pathways are determined by using concentration at the release point, bioaccumulation factors for the fish or invertebrate and an estimate of the quantity of fish consumed.

Each year a Land Use Census is performed to determine what potential dose pathways currently exist within a five-mile radius around the plant, the area most affected by plant operations. The Annual Land Use Census identifies the locations of vegetable gardens, nearest residences, milk animals and meat animals. The data from the census is used to determine who is the likely to be most exposed to radiation dose because of plant operation.

There is significant uncertainty in dose calculation results, due to modeling dispersion of material released and bioaccumulation factors, as well as assumptions associated with consumption and land-use patterns. Even with these sources of uncertainty, the calculations do provide a reasonable estimate of the order of magnitude of the exposure. Conservative assumptions are made in the calculation inputs such as the number of various foods and water consumed, the amount of air inhaled, and the amount of direct radiation exposure from the ground or plume, such that the actual dose received are likely lower than the calculated dose. Even with the built-in conservatism, doses calculated for the maximum exposed individual due to plant operation are a very small fraction of the annual dose that is received due to other sources. The calculated doses due to plant effluents, along with REMP results, serve to provide assurance that radioactive effluents releases are not exceeding safety standards for the environment or people living near the plant.

4.0 DOSE ASSESSMENT FOR PLANT OPERATIONS

4.1 Regulatory Limits

Regulatory limits are detailed in station licensing documents such as the plant Technical Specifications and the ODCM. These documents contain the limits to which Ginna must adhere. Ginna drives to maintain the philosophy to keep dose "as low as is reasonably achievable" (ALARA) and actions are taken to reduce the amount of radiation released to the environment. Liquid and gaseous release data show that the dose from Ginna is well below the ODCM limits. The instantaneous concentration of liquid radioactive material released shall be limited to ten times the concentration specified in 10 CFR 20, Appendix B, Table 2, Column 2, for radionuclides other than dissolved or entrained noble gases. For dissolved or entrained noble gases, the total concentration released shall be limited to 2.0 x 10^{-4} microcuries/ml.

The annual whole body, skin and organ dose was computed using the 2024 source term using the dose calculation methodology provided in the ODCM. The calculated doses due to gaseous effluents are used to demonstrate compliance with offsite dose limits are presented in Table 1, Ginna Nuclear Power Plant Dose Summary and Table 2, Total Annual Offsite-Dose Comparison to 40 CFR 190 Limits for Ginna.

4.2 Regulatory Limits for Gaseous Effluent Doses:

1. Fission and activation gases:

    a. Noble gases dose rate due to radioactive materials released in gaseous effluents from the site to areas at and beyond the site boundary shall be limited to the following:

        1) Less than or equal to 500 mrem/year to the total body

        2) Less than or equal to 3,000 mrem/year to the skin

    b. Noble gas air dose due to noble gases released in gaseous effluents, from each reactor unit to areas at and beyond the site boundary shall be limited to the following:

        1) Quarterly

            a) Less than or equal to 5 mrads gamma

            b) Less than or equal to 10 mrads beta

        2) Yearly

            a) Less than or equal to 10 mrads gamma

            b) Less than or equal to 20 mrads beta

4.2 (Continued)

2. Iodine, tritium, and all radionuclides in particulate form with half-lives greater than 8 days.

   a. The dose rate for iodine-131, iodine-133, tritium, and all radionuclides in particulate form with half-lives greater than 8 days in gaseous effluents released from the site to areas at and beyond the site boundary shall be limited to the following:

      1) Less than or equal to 1,500 mrem/yr to any organ

   b. The dose to a MEMBER OF THE PUBLIC from iodine-131, iodine-133, tritium, and all radionuclides in particulate form with half-lives greater than 8 DAYS in gaseous effluents released, from each reactor unit to areas at and beyond the site boundary shall be limited to the following:

      1) Quarterly

         a) Less than or equal to 7.5 mrem to any organ

      2) Yearly

         a) Less than or equal to 15 mrem to any organ

4.3 <u>Regulatory Limits for Liquid Effluent Doses</u>

1. The dose or dose commitment to a MEMBER OF THE PUBLIC from radioactive materials in liquid effluents released, from each reactor unit to unrestricted areas shall be limited to the following:

   a. Quarterly

      1) Less than or equal to 1.5 mrem total body

      2) Less than or equal to 5 mrem critical organ

   b. Yearly

      1) Less than or equal to 3 mrem total body

      2) Less than or equal to 10 mrem critical organ

4.4 40 CFR 190 Regulatory Dose Limits for a Member of the Public

1. Total Dose (40 CFR 190)

   a. The annual (calendar year) dose or dose commitment to any MEMBER OF THE PUBLIC in the unrestricted area due to releases of radioactivity and to radiation from uranium fuel cycle sources shall be limited to the following:

      1) Less than or equal to 25 mrem, Total Body or any Organ except Thyroid.

      2) Less than or equal to 75 mrem, Thyroid.

5.0 SUPPLEMENTAL INFORMATION

5.1 Gaseous Batch Releases

Number of batch releases	2.70E+01
Total time period for a batch release	5.31E+05 minutes
Maximum time period for a batch release	4.46E+04 minutes
Average time period for a batch release	1.97E+04 minutes
Minimum time period for a batch release	7.60E+01 minutes

5.2 Liquid Batch Releases

Number of batch releases	8.30E+01
Total time period for a batch release	9.88E+03 minutes
Maximum time period for a batch release	6.40E+02 minutes
Average time period for a batch release	1.19E+02 minutes
Minimum time period for a batch release	3.50E+01 minutes
Average total flow during period of release	3.31E+05 gpm

5.3 Abnormal Releases

5.3.1 Gaseous Abnormal Releases

Number of releases	0
Total activity released	0 Ci

5.3.2 Liquid Abnormal Releases

Number of releases	0
Total activity released	0 Ci

5.4 Land Use Census Changes

In September 2024, third-party contractors working under Ginna Chemistry conducted a Land Use Census to identify the location of the nearest milk animal, residence, and garden greater than 500 square feet in each of the nine sectors within a five-mile radius of the power plant. The Land Use Census is conducted in accordance with Ginna procedures (Reference #4). If changes are noted, alterations to Ginna's REMP program would be made to ensure sampling practices cover these new areas of potential public exposure.

Over the past year, the following land use observations were made within a 5-mile radius of the power plant:

- The nearest residence remains in the SSE sector, approximately 610 meters from the reactor.
- The nearest residence remains in the SSE sector, approximately 610 meters from the reactor.
- Single family house development continues in all sectors not in Lake Ontario.
- Commercial grow farm (hydroponic) continues operation on Timothy Lane.
- Fair Life Factory Development in the WSW sector.
- Commercial fishing information was collected from the New York State Department of Environmental Conservation (NYSDEC) which shows activity only in the Eastern basin of Lake Ontario. Commercial fishing operations have not changed in the last five-years and no commercial fishing takes place within five miles of Ginna.
- Sporadic orchard development was identified.

Change Description	Change Date	Changes to Receptor	Receptor Location	Sample Media Changes/Availability	Routes of Exposure
None	N/A	N/A	N/A	N/A	N/A

5.5 Meteorological Data

In 2024, Ginna produced 96,448 hours of valid meteorological data out of a possible 96,624 hours, yielding an overall recovery rate of 99.8%. Joint Frequency Distribution (JFD) tables are maintained onsite and are available for review upon request.

Hours of Missing Data	Date(s) of Missing Data	Description of Missing Data Event
16	June 2024	MET Tower Annual Calibration

5.6 Effluent Radiation Monitors Out of Service Greater Than 30 Days

No effluent radiation monitors were out of service greater than 30-days.

Effluent Radiation Monitor Name	Number of Days Out of Service	Date Range Out of Service	Reason Out of Service >30 Days	Additional Notes (ODCM or TS)
N/A	N/A	N/A	N/A	N/A

5.7 Offsite Dose Calculation Manual (ODCM) Changes

There was one change to the Offsite Dose Calculation Manual (CY-GI-170-300, ODCM) in 2024, updating a procedural reference. The most recent revision of the ODCM (Revision 37) was made effective on 3/7/2024

Date of Change	Revision	Description of Change
3/7/2024	37	Updating a procedural reference (not related to effluents)

5.8 Process Control Program (PCP) Changes

There were no changes to the PCP in 2024.

Date of Change	Revision	Description of Change
N/A	N/A	N/A

5.9 Radioactive Waste Treatment System Changes

There were no changes to the Radioactive Waste Treatment System in 2024.

Date of Change	System	Description of Change
N/A	N/A	N/A

5.10 Other Supplemental Information

There was one (1) laboratory analytical issue in 2024:

During the 3rd quarter 2024 Teledyne Brown Engineering (TBE) Hard-to-Detect (HTD) analyses of the High Conductivity Waste Tank (HCWT), the ODCM detection limit was not met for Strontium-89 (Sr-89). The Sr-89 recovery for sample # L107687-4 was lower than typically encountered and the required ODCM limit of 5.0E-08 uCi/ml could not be met by TBE as only 1.14E-07 uCi/ml was able to be achieved. This HTD analysis not meeting the required limit was captured via TBE report APLR 062924-100124. This was an isolated incident as all prior analyses and analyses since this event presented no issues.

5.10.1 Outside Tanks

No outside tanks exceeded ODCM or Technical Specification limits in 2024.

Outside Tank Name	Date of Occurrence	ODCM or TS Limits Exceeded	Description of Event
N/A	N/A	N/A	N/A

5.10.2 Independent Spent Fuel Storage Installation (ISFSI) Monitoring Program

A review of direct radiation between the Ginna ISFSI facility and the nearest residence was conducted. Environmental TLD station 13 is the highest direct radiation dose and is the basis for the maximum direct radiation dose reported. A review of TLD stations near the ISFSI structure since fuel was first stored indicate an increase in direct radiation dose for the area consistent with the storage of additional assemblies. However, this area is not accessible by members of the public. Ginna ISFSI design is such that effluent releases of noble gases are precluded.

5.10.3 Carbon-14

Carbon-14 (C-14) is a naturally occurring radionuclide with a 5,730-year half-life. Nuclear weapons testing in the 1950s and 1960s significantly increased the amount of C-14 in the atmosphere. Nuclear power plants also produce C-14, but the amount is infinitesimal compared to what has been distributed in the environment due to weapons testing and what is produced by natural cosmic ray interactions.

In accordance with Regulatory Guide 1.21, “Measuring, Evaluating, and Reporting Radioactive Material in Liquid and Gaseous Effluents and Solid Waste,” the NRC recommended re-evaluating “principal radionuclides” and reporting C-14 as appropriate. Carbon-14 production and release estimates were calculated using active core coolant mass, average neutron flux by energy and reactor coolant nitrogen concentrations to determine Carbon-14 generation based upon an effective full power year. The estimated generation for Ginna during 2024 was 6.8 Curies.

Public dose estimates were performed using methodology from the ODCM, which is based on Regulatory Guide 1.109 methodology. C-14 dose is included in the Dose Calculation results in Table 2.

5.10.4 Errata/Corrections to Previous ARERRs

No errata or corrections are needed for any previous ARERRs.

6.0 NEI 07-07 ONSITE RADIOLOGICAL GROUNDWATER MONITORING PROGRAM

Ginna has developed a Groundwater Protection Initiative (GPI) program in accordance with NEI 07-07, Industry Ground Water Protection Initiative – Final Guidance Document [9]. The purpose of the GPI is to ensure timely detection and an effective response to situations involving inadvertent radiological releases to groundwater to prevent migration of licensed radioactive material off-site and to quantify impacts on decommissioning. During 2024, Ginna collected and analyzed groundwater samples in accordance with the requirements of EN-GI-408-4160. Groundwater monitoring well sample schedule is detailed further in Table 3, Groundwater Protection Program Monitoring Well Sample Schedule.

This section is included in this report to communicate results of NEI 07-07 Radiological Groundwater Monitoring Program. Monitoring wells installed as part of GPI program are sampled and analyzed as summarized in Table 4, Groundwater Protection Program Monitoring Well Sample Schedule. In addition to reporting results from NEI 07-07 monitoring wells, voluntary communications to offsite governmental agencies for onsite leaks or spills per NEI 07-07 Objective 2.2, are also reported as part of this report. It is important to note, samples and results taken in support of NEI 07-07 groundwater monitoring program are not part of the Radiological Environmental Monitoring Program (REMP) but should be reported as part of ARERR.

Table 3, Groundwater Protection Program Monitoring Well Sample Schedule

Well Name	Tritium	Gamma	HTD	(Other as Needed)
GW01	Annually	1x/YR	N/A	N/A
GW03	Quarterly	1x/2YR	1x/5YR	Gross Alpha – 1x/2YR, Strontium – 1x/YR
GW04	Quarterly	1x/YR	1x/5YR	Gross Alpha / Strontium – 1x/YR
GW06	Annually	1x/2YR	N/A	N/A
GW08	Quarterly	1x/2YR	1x/5YR	Gross Alpha – 1x/2YR, Strontium – 1x/YR
GW10	Quarterly	1x/2YR	1x/5YR	Gross Alpha – 1x/2YR, Strontium – 1x/YR
GW11	Quarterly	1x/2YR	1x/5YR	Gross Alpha – 1x/2YR, Strontium – 1x/YR
GW12	Annually	1x/YR	N/A	N/A
GW13	Annually	1x/YR	N/A	N/A
GW14	Quarterly	1x/2YR	1x/5YR	Gross Alpha – 1x/2YR, Strontium – 1x/YR
GW15	Annually	1x/2YR	N/A	N/A
GW16	Annually	1x/2YR	N/A	N/A

Radiological Groundwater Monitoring Program tritium results are summarized in Table 5, Groundwater Protection Program Monitoring Well Tritium Results. No groundwater monitoring locations had detectable gamma or HTD in 2024.

Table 4, Groundwater Protection Program Monitoring Well Tritium Results

Well Name	Number of Positive Detections	Number of Analyses	Average Concentration[5] (pCi/L)	Maximum Concentration (pCi/L)
GW01	0	1	< 196	< 196
GW03	3	4	309	540
GW04	0	4	< 185	< 196
GW06	0	1	< 198	< 198
GW08	4	4	233	257
GW10	4	4	374	471
GW11	3	4	232	269
GW12	0	1	< 196	< 196
GW13	0	1	< 198	< 198
GW14	1	4	< 192	197
GW15	0	1	< 198	< 198
GW16	0	1	< 196	< 196

6.1 Voluntary Notification

During 2024, R.E. Ginna Nuclear Power Plant held a stakeholder briefing with State/Local officials, including the New York State Department of Environmental Conservation (NYSDEC) and the New York State Department of Health (NYSDOH), and to other stakeholders in accordance with NEI 07-07, Objective 2.1 and site procedures. Ginna notified stakeholders that no spills or ongoing sources of tritium were identified and that no values exceeded program limits in 2024.

Ginna did not make any voluntary communications to state or local officials during 2024 as defined under NEI 07-07, objective 2.2. There were no new or significant leaks or spills into groundwater or water sample results exceeding ODCM limits that would have warranted this type of communication.

[5] Results <MDA should not be included in the average concentration calculation.

7.0 BIBLIOGRAPHY

[1] Nuclear Regulatory Commission, 30 June 2015. [Online]. Available: http://www.nrc.gov/reading-rm/basic-ref/students/animated-pwr.html. [Accessed October 2020].

[2] Nuclear Regulatory Commission, 25 June 2015. [Online]. Available: http://www.nrc.gov/reading-rm/basic-ref/students/animated-bwr.html. [Accessed October 2020].

[3] "NCRP Report No. 160 - Ionizing Radiation Exposure of the Population of the United States," National Council on Radiation Protection and Measurements, Bethesda, MD, 2009.

[4] Health Physics Society, [Online]. Available: http://hps.org/hpspublications/radiationfactsheets.html. [Accessed 2020].

[5] "NRC Resource Page," [Online]. Available: http://www.nrc.gov/about-nrc/radiation.html. [Accessed 10 November 2020].

[6] "Japan Atomic Energy Agency," 06 November 2020. [Online]. Available: https://www.jaea.go.jp/english/04/ntokai/houkan/houkan_02.html.

[7] "Regulatory Guide 1.109 - Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Demonstrating Compliance with 10 CFR Part 50, Appendix I," Nuclear Regulatory Commission, October, 1977.

[8] "NUREG-0133 - Preparation of Effluent Technical Specifications for Nuclear Power Plants," Nuclear Regulatory Commission, 1987.

[9] "NEI 07-07 - Industry Ground Water Protection Initiative — Final Guidance Document, Rev. 1," Nuclear Energy Institute, Washington, D.C., 2019.

[10] "10 CFR 50 - Domestic Licensing of Production and Utilization Facilities," US Nuclear Regulatory Commission, Washington, DC.

[11] "40 CFR 190 - Environmental Radiation Protection Standards for Nuclear Power Operation," US Environmental Protection Agency, Washington, DC.

[12] "10 CFR 20 - Standards for Protection Against Radiation," US Nuclear Regulatory Commission, Washington, DC.

[13] "40 CFR 141 - National Primary Drinking Water Regulations," US Environmental Protection Agency, Washington, DC..

[14] "NUREG-0324 - XOQDOQ, Program for the Meteorological Evaluation of Routine Effluent Releases at Nuclear Power Stations," Nuclear Regulatory Commission, September, 1977.

[15] "NUREG-1301 - Offsite Dose Calculation Manual Guidance: Standard Radiological Effluent Controls for Pressurized Water Reactors," Nuclear Regulatory Commission, April 1991.

[16] "NUREG-1302 - Offsite Dose Calculation Manual Guidance: Standard Radiological Effluent Controls for Boiling Water Reactors," Nuclear Regulatory Commission, April 1991.

[17] "Regulatory Guide 4.13 - Performance, Testing, and Procedural Specifications for Thermoluminescence Dosimetry: Environmental Applications, Revision 2," Nuclear Regulatory Commission, June, 2019.

[18] "Regulatory Guide 4.15 - Quality Assurance for Radiological Monitoring Programs (Inception through Normal Operations to License Termination) -- Effluent Streams and the Environment," Nuclear Regulatory Commission, July, 2007.

Attachment 1, ARERR Release Summary Tables (RG-1.21 Tables)

1.0 GASEOUS EFFLUENTS

Table 5, Gaseous Effluents Summation of All Releases at Ginna[6]

A.	Fission & Activation Gases	Units	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Est. Total Error %
1.	Total Release	Ci	5.25E+00	1.25E+01	2.71E+01	2.32E+02	1.50E+01
2.	Average release rate for the period	μCi/sec	6.66E-01	1.59E+00	3.43E+00	2.95E+01	
B.	Iodine						
1.	Total Iodine – 131	Ci	0.00E+00	0.00E+00	1.21E-08	9.16E-04	1.50E+01
2.	Average release rate for the period	μCi/sec	0.00E+00	0.00E+00	1.54E-09	1.16E-04	
C.	Particulates						
1.	Particulates with half-lives > 8 days	Ci	0.00E+00	8.46E-09	0.00E+00	0.00E+00	1.50E+01
2.	Average release rate for the period	μCi/sec	0.00E+00	1.07E-09	0.00E+00	0.00E+00	
D.	Tritium						
1.	Total Release	Ci	3.70E+01	3.23E+01	3.56E+01	3.18E+01	9.20E+00
2.	Average release rate for the period	μCi/sec	4.70E+00	4.09E+00	4.51E+00	4.04E+00	

[6] % of limit is provided in Table 1, R.E. Ginna Nuclear Power Plant Dose **Summary**

Table 6, Gaseous Effluents – Mixed Level Release Batch Mode - Ginna

Radionuclide Released	Units	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Total for year
Fission Gases						
Ar-41	Ci	1.48E-01	1.52E-01	1.61E-01	1.02E-01	5.63E-01
Kr-85	Ci	0.00E+00	2.90E+00	2.44E+00	4.32E+00	9.66E+00
Xe-131m	Ci	1.47E-02	0.00E+00	3.82E-01	1.65E+00	2.05E+00
Xe-133	Ci	5.08E+00	6.84E+00	1.67E+01	1.75E+02	2.03E+02
Xe-133m	Ci	0.00E+00	3.64E-03	8.42E-02	1.85E+00	1.94E+00
Xe-135	Ci	3.98E-04	1.59E-03	4.34E-02	5.16E-01	5.61E-01
(List Others)	Ci					
Total for Period	**Ci**	5.24E+00	9.90E+00	1.98E+01	1.83E+02	2.18E+02
Iodines						
I-131	Ci	0.00E+00	0.00E+00	1.21E-08	9.94E-05	9.94E-05
I-133	Ci	0.00E+00	0.00E+00	0.00E+00	1.93E-05	1.93E-05
(List Others)	Ci					
Total for Period	**Ci**	0.00E+00	0.00E+00	1.21E-08	1.19E-04	1.19E-04
Particulates						
Ag-110m	Ci	0.00E+00	8.46E-09	0.00E+00	0.00E+00	8.46E-09
(List Others)	Ci					
Total for Period	**Ci**	0.00E+00	8.46E-09	0.00E+00	0.00E+00	8.46E-09
Tritium						
H-3	Ci	8.86E-02	1.56E-01	3.00E-01	6.62E-02	6.10E-01

Table 7, Gaseous Effluents – Mixed Level Release Continuous Mode - Ginna

Radionuclide Released	Units	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Total for year
Fission Gases						
Ar-41	Ci	0.00E+00	1.49E-02	6.12E-01	2.90E-01	9.17E-01
Xe-131m	Ci	0.00E+00	0.00E+00	2.04E-02	0.00E+00	2.04E-02
Xe-133m	Ci	0.00E+00	0.00E+00	0.00E+00	1.31E-02	1.31E-02
Xe-133	Ci	0.00E+00	2.62E+00	6.58E+00	4.62E+01	5.54E+01
Xe-135	Ci	0.00E+00	0.00E+00	5.90E-02	2.68E+00	2.74E+00
(List Others)	Ci					
Total for Period	**Ci**	0.00E+00	2.63E+00	7.27E+00	4.92E+01	5.91E+01
Iodines						
I-131	Ci	0.00E+00	0.00E+00	0.00E+00	8.16E-04	8.16E-04
(List Others)	Ci					
Total for Period	**Ci**	0.00E+00	0.00E+00	0.00E+00	8.16E-04	8.16E-04
Particulates						
(List Others)	Ci					
Total for Period	**Ci**					
Tritium						
H-3	Ci	3.70E+01	3.22E+01	3.52E+01	3.18E+01	1.36E+02

2.0 LIQUID EFFLUENTS

Table 8, Liquid Effluents – Summation of All Releases at Ginna [7]

A.	Fission & Activation Products	Units	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Est. Total Error %
1.	Total Release	Ci	0.00E+00	5.16E-04	1.96E-03	2.32E-03	9.90E+00
2.	Average diluted concentration	μCi/mL	0.00E+00	9.10E-13	3.76E-12	5.42E-12	
B.	Tritium						
1.	Total Release	Ci	3.25E+01	4.83E+01	3.34E+02	9.62E+01	9.20E+00
2.	Average diluted concentration	μCi/mL	7.68E-08	8.52E-08	6.41E-07	2.24E-07	
C.	Dissolved & Entrained Gases						
1.	Total Release	Ci	0.00E+00	5.56E-05	1.36E-02	5.44E-02	9.90E+00
2.	Average diluted concentration	μCi/mL	0.00E+00	9.79E-14	2.62E-11	1.27E-10	
D.	Gross Alpha Activity						
1.	Total Release	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
E.	Volume of Waste Released (prior to dilution)	Liters	1.03E+08	1.72E+08	1.11E+08	1.72E+08	
F.	Volume of Dilution Water Used During Period	Liters	4.23E+11	5.67E+11	5.21E+11	4.28E+11	

[7] % of limit is provided in Table 1, R.E. Ginna Nuclear Power Plant Dose Summary

Table 9, Batch Mode Liquid Effluents - Ginna

Radionuclide Released	Units	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Total for year
Fission and Activation Products						
Co-58	Ci	0.00E+00	0.00E+00	0.00E+00	1.64E-03	1.64E-03
Co-60	Ci	0.00E+00	0.00E+00	9.79E-05	3.07E-05	1.29E-04
Te-123m	Ci	0.00E+00	5.16E-04	1.86E-03	9.42E-05	2.47E-03
I-131	Ci	0.00E+00	0.00E+00	0.00E+00	3.67E-05	3.67E-05
I-132	Ci	0.00E+00	0.00E+00	0.00E+00	3.27E-04	3.27E-04
Te-132	Ci	0.00E+00	0.00E+00	0.00E+00	1.94E-04	1.94E-04
Cs-137	Ci	0.00E+00	0.00E+00	0.00E+00	6.07E-07	6.07E-07
(List Others)	Ci					
Total for Period	Ci	0.00E+00	5.16E-04	1.96E-03	2.32E-03	4.80E-03
Tritium						
H-3	Ci	3.25E+01	4.83E+01	3.34E+02	9.62E+01	5.11E+02
Gross Alpha						
Alpha	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Entrained Gases						
Xe-131m	Ci	0.00E+00	0.00E+00	0.00E+00	3.19E-03	3.19E-03
Xe-133	Ci	0.00E+00	0.00E+00	0.00E+00	6.82E-04	6.82E-04
Xe-133m	Ci	0.00E+00	5.56E-05	1.36E-02	5.05E-02	6.42E-02
(List Others)	Ci					
Total for Period	Ci	0.00E+00	5.56E-05	1.36E-02	5.44E-02	6.80E-02

Table 10, Continuous Mode Liquid Effluents - Ginna

Radionuclide Released	Units	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Total for year
Fission and Activation Products						
(List Others)	Ci					
Total for Period	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tritium						
H-3	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Gross Alpha						
Alpha	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Entrained Gases						
(List Others)	Ci					
Total for Period	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Attachment 2, Solid Waste Information

1.0 SOLID WASTE SHIPPED OFFSITE FOR BURIAL OR DISPOSAL (NOT IRRADIATED FUEL)

Table 11, Types of Solid Waste Summary from Ginna

Types of Waste	Total Volume (m3)	Total Activity (Ci)	Est. Total Error (%)
a. Spent resins, filter sludges, evaporator bottoms, etc.	1.01E+01	6.36E+00	25
b. Dry compressible waste, contaminated equip, etc.	7.14E+01	5.65E-03	25
c. Irradiated components, control rods, etc.	0.00E+00	0.00E+00	25
d. Other (describe)	0.00E+00	0.00E+00	25

2.0 ESTIMATE OF MAJOR NUCLIDE COMPOSITION (BY WASTE TYPE) ONLY >1% ARE REPORTED. [NOTE 1]

Table 12, Major Nuclides from Ginna

Major Nuclide Composition	%	Curies
a. Spent resins, filter sludges, evaporator bottoms, etc.	(Ni-63) 49.9	3.17
	(Cs-137) 27.3	1.74
	(Cs-134) 9.3	0.59
	(Co-60) 5.6	0.35
	(H-3) 4.9	0.31
	(Sb-125) 1.2	0.08
b. Dry compressible waste, contaminated equip, etc.	N/A	N/A
	N/A	N/A
c. Irradiated components, control rods, etc.	N/A	N/A
	N/A	N/A
d. Other (describe)	N/A	N/A

3.0 SOLID WASTE DISPOSITION

Table 13, Solid Waste Disposition from Ginna

Number of Shipments	Mode of Transportation	Destination
1	Sole Use Truck (Metal Containers)	Direct to Disposal (Clive, Utah)
2	Sole Use Truck (High Integrity Containers)	Energy Solutions (Treatment Facility)

4.0 IRRADIATED FUEL DISPOSITION

Table 14, Irradiated Fuel Shipments Disposition from Ginna

Number of Shipments	Mode of Transportation	Destination
NONE	N/A	N/A

Attachment 3, Meteorological Data

1.0 METEOROLOGICAL DATA SUMMARY

1.1 Joint Frequency Distributions

1. Period of Record: 2024

2. Stability Class: All

   a. Periods of calm (hours): 3

   b. Hours of missing data: 16

   c. Meteorological data are reported in percentage of hours (out of 8784 hours) for all stability classes.

3. Elevation: 45.72 meters

Wind Speed (mph)												
Wind Dir.	< 0.5	0.5 – 1.0	1.1 – 1.5	1.6 – 2.0	2.1 – 3.0	3.1 – 4.0	4.1 – 5.0	5.1 – 6.0	6.1 – 8.0	8.1 – 10.0	> 10.0	Total
N	0	4	6	20	30	22	17	17	52	53	29	250
NNE	0	6	13	16	35	26	20	12	24	35	20	207
NE	0	8	19	25	47	49	33	30	62	35	46	354
ENE	1	7	19	28	80	77	69	50	32	12	6	381
E	1	14	22	31	96	130	104	85	39	0	0	522
ESE	0	8	14	23	70	66	46	37	13	0	0	277
SE	0	8	20	22	70	87	80	44	36	15	5	387
SSE	0	7	12	17	54	60	113	128	222	101	42	756
S	0	4	17	22	60	83	93	131	237	98	37	782
SSW	1	8	9	16	61	90	108	117	138	14	0	562
SW	1	5	8	18	61	123	196	217	191	69	19	908
WSW	0	6	9	10	46	110	152	146	233	90	49	851
W	0	3	8	15	46	79	93	89	154	90	69	646
WNW	0	1	12	23	78	74	83	95	159	149	219	893
NW	0	5	15	26	82	65	48	37	102	89	169	638
NNW	1	13	16	32	37	35	35	38	92	35	17	351
VAR.	0	0	0	0	0	0	0	0	0	0	0	0
Total	5	107	219	344	953	1,176	1,290	1,273	1,786	885	727	8,765

1.2 Stability class

Table 15, Classification of Atmospheric Stability

Stability Condition	Pasquill Categories	Percentage
Extremely Unstable	A	14.57
Moderately Stable	B	6.76
Slightly Unstable	C	3.54
Neutral	D	33.55
Slightly Stable	E	26.35
Moderately Stable	F	8.30
Extremely Stable	G	6.71

ENCLOSURE 1 (continued)

Appendix A to the ARERR

ANNUAL REPORT ON THE METEOROLOGICAL MONITORING PROGRAM AT THE GINNA NUCLEAR POWER PLANT 2024

Annual Report

On the

Meteorological Monitoring Program

At the

Ginna Nuclear Power Plant

2024

prepared for

Constellation Energy Corporation

by

Murray and Trettel, Incorporated
1602 Barclay Blvd
Buffalo Grove, IL 60089
(847) 963-9000
e-mail: mt@weathercommand.com
web : http://www.weathercommand.com

2/18/2025

For Exelon Use Only

Reviewed By: _____

Date: _____

Table of Contents

Section	Description	Page
	List of Tables	ii
1	Introduction	1
2	Summary	2
3	Data Acquisition	3
4	Data Analysis	4
5	Results	7

List of Tables

Number	Description	Page
1	Instrument Locations	3
2	Data Loggers	3
3	Wind Direction Classes	5
4	Wind Speed Classes	5
5	Atmospheric Stability Classes	6
6	D/Q Plant Vent Release	8
7	X/Q Plant Vent Release	9
8	D/Q Containment Vent Release	10
9	X/Q Containment Vent Release	11
10	D/Q Air Ejector Release	12
11	X/Q Air Ejector Release	13
12	Special X/Q and D/Q Release	14
13	Data Recovery Summary	16
14	Annual Joint Frequency Tables	18

1. Introduction

The purpose of the meteorological program being conducted at the Ginna Plant site is to provide sufficient information to assess the local weather conditions and to determine the degree of atmospheric dispersion of airborne radioactive effluent from the station.

The meteorological tower is 300 ft. high and is instrumented at three levels. Wind speed and direction, and ambient temperature are measured at 33 ft., 150 ft., and 250 ft. Differential temperatures, referenced to 33 ft., are measured at 150 ft. and 250 ft. Precipitation is measured at ground level.

Joint frequency stability wind rose tables of wind direction, wind speed, and stability are routinely tabulated from hourly measurements. The annual tables are included in this report.

Descriptions of the instruments and data computers are given in Section 3 (Data Acquisition) of this report. Data reduction and processing are described in Section 4 (Data Analysis). The results given in Section 5 of this report include X/Q and D/Q data results and site meteorology.

2. Summary

The Ginna Plant meteorological monitoring program produced 96,448 hours of valid data out of a possible 96,624 (leap year) priority parameter hours during 2024, which represents an overall data recovery rate of 99.8%. Priority parameters are all parameters except precipitation.

The stability wind rose tables included in this report have been generated using the 33 ft. wind data with the 150-33 ft. differential temperature data, the 150 ft. wind data with the 150-33 ft differential temperature data and the 250 ft. wind data with the 250-33 ft. differential temperature data.

3. Data Acquisition

Wind speed and direction are measured with Climatronics F460 wind sensors. The wind speed sensors have a starting speed of 0.5 mph (0.22 mps), a range of 0 to 100 mph (0 to 44.7 mps), and a system accuracy of ±1.0 mph at 100 mph (±0.45 mps at 44.7 mps). The wind direction sensors have a threshold speed of 0.5 mph (0.22 mps), a range of 0 to 540°, and a system accuracy of ±5°.

Ambient and differential temperature are measured with the Climatronics 100093 system. Ambient temperature is measured within the range of -20 to 120°F (-28.9 to 48.9°C) with an accuracy of ±0.5°F (±0.3°C). Differential temperatures are measured within the range of -10 to 20°F (-5.6 to 11.1°C) with an accuracy of ±0.18°F (±0.10°C). Precipitation is measured with a Climatronics tipping bucket rain gauge and is measured in increments of one one-hundredth of an inch with a system accuracy of ±0.01" (±0.25mm).

The meteorological data are collected and stored by Campbell Scientific CR3000 and CR850 data loggers. The data loggers measure the analog voltages of the instruments and record the digital equivalent within the range of 0 to +5 volts. Data are obtained from the Campbell Scientific CR850 by a direct dial telephone hookup to an in-house computer system.

Table 1

Instrument Locations

Measurement	Sensor Type	Location	Elevation
Wind Speed	Climatronics 100075 F460	Tower	250 ft.
Wind Direction	Climatronics 100076 F460	Tower	250 ft.
Differential Temperature	Climatronics 100093	Tower	250 ft.
Wind Speed	Climatronics 100075 F460	Tower	150 ft.
Wind Direction	Climatronics 100076 F460	Tower	150 ft.
Differential Temperature	Climatronics 100093	Tower	150 ft.
Wind Speed	Climatronics 100075 F460	Tower	33 ft.
Wind Direction	Climatronics 100076 F460	Tower	33 ft.
Ambient Temperature	Climatronics 100093	Tower	33 ft.
Precipitation	Climatronics 100097-1 Tipping Bucket Rain Gage	Meteorological shelter roof	Ground

Table 2

Data Loggers

Measurement	Logger Type	Sampling Frequency
Winds, Temperatures, and Precipitation	Campbell Scientific CR3000 (A & B) and CR850	1 sec.
Winds, Temperatures, and Precipitation	Johnson Yokogawa Corp. Digital Recorder	10 sec.

4. Data Analysis

The meteorological data is collected via modem connection to a Campbell Scientific CR850 data logger. Data is sampled once per second. The data are then stored in the meteorological database and hourly listings of the data are generated. The data listings are examined by qualified personnel and any apparent problems are brought to the attention of the Project Manager or Environmental Meteorologist and the Instrument Maintenance staff.

Hourly values of wind speed, wind direction, ambient temperature, differential temperature, and precipitation are obtained through measurements taken at the site. The standard deviation of wind direction (sigma) is derived. The wind direction variation is described in terms of the standard deviation of the direction about the mean direction. The MIDAS computer derives an hourly value of wind sigma.

The database files are edited approximately once a week. Missing values are replaced with back up data values, when available. Invalid data is deleted from the database.

When an hourly value is missing or invalid, the numeral 999 is entered into the computer data file in the appropriate location.

A professional meteorologist reviews the data, calibration findings, equipment maintenance reports, and other information and determines which data are valid. Only valid data is retained in the database.

Joint frequency stability wind rose tables of hourly data measured at the site are generated. These tables indicate the prevailing wind direction, wind speed, and stability classes measured during the period of observation as well as the joint frequencies of occurrence of the wind direction, wind speed, and stability classes. The values are also used as input to atmospheric transport and diffusion models. Wind direction, wind speed, and stability classes are given in Tables 3, 4, and 5.

Table 3

Wind Direction Classes

IF	348.75°	<	WD	≤	11.25°	THEN	Class is	N
IF	11.25°	<	WD	≤	33.75°	THEN	Class is	NNE
IF	33.75°	<	WD	≤	56.25°	THEN	Class is	NE
IF	56.25°	<	WD	≤	78.75°	THEN	Class is	ENE
IF	78.75°	<	WD	≤	101.25°	THEN	Class is	E
IF	101.25°	<	WD	≤	123.75°	THEN	Class is	ESE
IF	123.75°	<	WD	≤	146.25°	THEN	Class is	SE
IF	146.25°	<	WD	≤	168.75°	THEN	Class is	SSE
IF	168.75°	<	WD	≤	191.25°	THEN	Class is	S
IF	191.25°	<	WD	≤	213.75°	THEN	Class is	SSW
IF	213.75°	<	WD	≤	236.25°	THEN	Class is	SW
IF	236.25°	<	WD	≤	258.75°	THEN	Class is	WSW
IF	258.75°	<	WD	≤	281.25°	THEN	Class is	W
IF	281.25°	<	WD	≤	303.75°	THEN	Class is	WNW
IF	303.75°	<	WD	≤	326.25°	THEN	Class is	NW
IF	326.25°	<	WD	≤	348.75°	THEN	Class is	NNW

Table 4

Wind Speed Classes

IF			WS	≤	0.50 m/s	THEN	Class is	1
IF	0.50 m/s	<	WS	≤	1.0 m/s	THEN	Class is	2
IF	1.1 m/s	<	WS	≤	1.5 m/s	THEN	Class is	3
IF	1.6 m/s	<	WS	≤	2.0 m/s	THEN	Class is	4
IF	2.1 m/s	<	WS	≤	3.0 m/s	THEN	Class is	5
IF	3.1 m/s	<	WS	≤	4.0 m/s	THEN	Class is	6
IF	4.1 m/s	<	WS	≤	5.0 m/s	THEN	Class is	7
IF	5.1 m/s	<	WS	≤	6.0 m/s	THEN	Class is	8
IF	6.1 m/s	<	WS	≤	8.0 m/s	THEN	Class is	9
IF	8.1 m/s	<	WS	≤	10.0 m/s	THEN	Class is	10
IF	10.0 m/s	<	WS			THEN	Class is	11

Table 5

Atmospheric Stability Classes

Class	Differential Temperature Interval (in °C/100m) (1)	Differential Temperature Interval (in °F over the 150-33ft. range) (2)	Differential Temperature Interval (in °F over the 250-33ft. range) (2)
Extremely Unstable	$\Delta T \leq -1.9$	$\Delta T \leq -1.2$	$\Delta T \leq -2.3$
Moderately Unstable	$-1.9 < \Delta T \leq -1.7$	$-1.2 < \Delta T \leq -1.1$	$-2.3 < \Delta T \leq -2.1$
Slightly Unstable	$-1.7 < \Delta T \leq -1.5$	$-1.1 < \Delta T \leq -1.0$	$-2.1 < \Delta T \leq -1.8$
Neutral	$-1.5 < \Delta T \leq -0.5$	$-1.0 < \Delta T \leq -0.3$	$-1.8 < \Delta T \leq -0.6$
Slightly Stable	$-0.5 < \Delta T \leq 1.5$	$-0.3 < \Delta T \leq 1.0$	$-0.6 < \Delta T \leq 1.8$
Moderately Stable	$1.5 < \Delta T \leq 4.0$	$1.0 < \Delta T \leq 2.6$	$1.8 < \Delta T \leq 4.8$
Extremely Stable	$4.0 < \Delta T$	$2.6 < \Delta T$	$4.8 < \Delta T$

(1) from ANSI/ANS 2.5
(2) ANSI/ANS 2.5 intervals scaled for instrument heights on the Ginna meteorological tower

5. Results

5.1 X/Q and D/Q

The ground and mixed mode values for X/Q and D/Q can be found in tables 4-9.

The following program was used to calculate X/Q and D/Q values:

1. XOQDOQ: Computer Program for the Meteorological Evaluation of Routine Effluent Releases at Nuclear Power Stations (NUREG/CR-2919).

The program is based on the theory that material released to the atmosphere will be normally distributed (Gaussian) about the plume centerline. A straight-line trajectory is assumed between the point of release and all receptors.

The program implements the assumptions outlined in Section C of NRC Regulatory Guide 1.111. In evaluating routine releases from nuclear power plants, it primarily is designed to calculate annual relative effluent concentrations, X/Q values and annual average relative deposition, D/Q values.

Distance	804m	1609m	2414m	3218m	4022m	4827m	5632m	6436m	7240m	8045m
Sector										
N	2.95E-09	1.44E-09	8.47E-10	5.53E-10	3.91E-10	2.92E-10	2.28E-10	1.83E-10	1.50E-10	1.26E-10
NNE	1.85E-09	8.64E-10	5.01E-10	3.26E-10	2.30E-10	1.73E-10	1.35E-10	1.08E-10	8.89E-11	7.45E-11
NE	3.36E-09	1.57E-09	9.12E-10	5.92E-10	4.17E-10	3.11E-10	2.42E-10	1.94E-10	1.60E-10	1.34E-10
ENE	3.91E-09	1.94E-09	1.15E-09	7.49E-10	5.27E-10	3.94E-10	3.06E-10	2.46E-10	2.02E-10	1.69E-10
E	3.18E-09	1.63E-09	9.72E-10	6.34E-10	4.47E-10	3.34E-10	2.61E-10	2.09E-10	1.73E-10	1.44E-10
ESE	8.53E-09	3.91E-09	1.85E-09	1.19E-09	8.42E-10	6.23E-10	4.77E-10	3.92E-10	3.28E-10	2.83E-10
SE	8.02E-09	2.77E-09	1.42E-09	8.90E-10	6.10E-10	4.50E-10	3.93E-10	3.16E-10	3.01E-10	2.67E-10
SSE	4.33E-09	1.43E-09	7.83E-10	5.01E-10	3.47E-10	2.55E-10	2.27E-10	2.33E-10	1.75E-10	1.49E-10
S	3.26E-09	1.13E-09	5.75E-10	3.61E-10	2.58E-10	2.26E-10	1.87E-10	1.63E-10	1.35E-10	1.12E-10
SSW	1.97E-09	7.92E-10	4.51E-10	2.84E-10	2.04E-10	1.51E-10	1.26E-10	1.18E-10	1.07E-10	9.39E-11
SW	3.99E-09	1.50E-09	7.75E-10	5.02E-10	3.46E-10	2.69E-10	2.17E-10	1.75E-10	1.56E-10	1.43E-10
WSW	3.59E-09	1.37E-09	7.30E-10	4.70E-10	3.25E-10	2.44E-10	1.90E-10	1.54E-10	1.33E-10	1.15E-10
W	1.97E-09	9.53E-10	5.41E-10	3.57E-10	2.55E-10	1.92E-10	1.50E-10	1.21E-10	9.98E-11	8.37E-11
WNW	4.53E-10	3.03E-10	1.94E-10	1.32E-10	9.61E-11	7.32E-11	5.77E-11	4.66E-11	3.85E-11	3.22E-11
NW	1.19E-09	7.03E-10	4.41E-10	2.96E-10	2.13E-10	1.61E-10	1.26E-10	1.02E-10	8.38E-11	7.02E-11
NNW	4.10E-09	1.92E-09	1.13E-09	7.32E-10	5.16E-10	3.86E-10	3.00E-10	2.41E-10	1.98E-10	1.66E-10

Distance	804m	1609m	2416m	3218m	4022m	4827m	5632m	6436m	7240m	8045m
Sector										
N	1.26E-07	1.14E-07	9.76E-08	8.06E-08	6.72E-08	5.70E-08	4.92E-08	4.30E-08	3.81E-08	3.41E-08
NNE	7.93E-08	7.67E-08	7.06E-08	6.08E-08	5.21E-08	4.50E-08	3.94E-08	3.48E-08	3.11E-08	2.81E-08
NE	1.22E-07	1.23E-07	1.12E-07	9.48E-08	8.04E-08	6.89E-08	5.98E-08	5.26E-08	4.68E-08	4.20E-08
ENE	1.36E-07	1.28E-07	1.07E-07	8.75E-08	7.24E-08	6.10E-08	5.24E-08	4.56E-08	4.03E-08	3.60E-08
E	1.12E-07	1.02E-07	8.41E-08	6.79E-08	5.57E-08	4.67E-08	4.18E-08	3.62E-08	3.32E-08	2.82E-08
ESE	1.64E-07	1.69E-07	8.99E-08	7.32E-08	6.94E-08	5.95E-08	4.52E-08	4.36E-08	3.91E-08	3.50E-08
SE	1.71E-07	1.04E-07	8.58E-08	6.73E-08	5.47E-08	4.86E-08	4.11E-08	3.54E-08	3.16E-08	2.79E-08
SSE	1.54E-07	9.39E-08	7.80E-08	7.07E-08	5.88E-08	4.87E-08	4.24E-08	4.14E-08	3.29E-08	2.91E-08
S	7.60E-08	6.67E-08	4.27E-08	3.76E-08	3.08E-08	2.79E-08	2.38E-08	2.06E-08	1.77E-08	1.52E-08
SSW	4.33E-08	3.50E-08	4.39E-08	4.06E-08	3.29E-08	2.79E-08	2.44E-08	2.27E-08	2.04E-08	1.83E-08
SW	7.09E-08	5.37E-08	4.61E-08	4.50E-08	3.58E-08	3.36E-08	3.09E-08	2.64E-08	2.33E-08	2.16E-08
WSW	8.01E-08	6.03E-08	4.78E-08	4.96E-08	3.80E-08	3.41E-08	2.87E-08	2.54E-08	2.36E-08	2.10E-08
W	6.85E-08	9.13E-08	7.29E-08	6.52E-08	5.72E-08	5.02E-08	4.45E-08	3.97E-08	3.57E-08	3.24E-08
WNW	1.93E-08	3.54E-08	3.78E-08	3.49E-08	3.12E-08	2.77E-08	2.48E-08	2.24E-08	2.03E-08	1.85E-08
NW	3.95E-08	5.87E-08	5.68E-08	4.95E-08	4.26E-08	3.69E-08	3.23E-08	2.86E-08	2.56E-08	2.31E-08
NNW	1.32E-07	1.16E-07	9.59E-08	7.75E-08	6.36E-08	5.33E-08	4.55E-08	3.95E-08	3.47E-08	3.09E-08

Distance	804m	1609m	2416m	3218m	4022m	4827m	5632m	6436m	7240m	8045m
Sector										
N	1.55E-08	4.95E-09	2.48E-09	1.51E-09	1.02E-09	7.42E-10	5.65E-10	4.46E-10	3.62E-10	3.00E-10
NNE	1.07E-08	3.40E-09	1.71E-09	1.04E-09	7.03E-10	5.10E-10	3.89E-10	3.08E-10	2.50E-10	2.08E-10
NE	1.82E-08	5.78E-09	2.89E-09	1.76E-09	1.19E-09	8.63E-10	6.57E-10	5.19E-10	4.21E-10	3.50E-10
ENE	1.73E-08	5.48E-09	2.74E-09	1.66E-09	1.13E-09	8.17E-10	6.23E-10	4.92E-10	3.99E-10	3.31E-10
E	1.29E-08	4.09E-09	2.05E-09	1.24E-09	8.41E-10	6.10E-10	4.68E-10	3.71E-10	3.04E-10	2.52E-10
ESE	1.82E-08	5.87E-09	2.92E-09	1.77E-09	1.20E-09	8.71E-10	6.64E-10	5.26E-10	4.33E-10	3.76E-10
SE	1.32E-08	4.11E-09	2.05E-09	1.24E-09	8.42E-10	6.52E-10	5.16E-10	4.08E-10	3.31E-10	2.74E-10
SSE	6.88E-09	2.16E-09	1.08E-09	6.66E-10	5.09E-10	3.78E-10	2.88E-10	2.27E-10	1.84E-10	1.52E-10
S	4.98E-09	1.58E-09	7.88E-10	4.85E-10	3.66E-10	2.68E-10	2.04E-10	1.61E-10	1.30E-10	1.08E-10
SSW	3.55E-09	1.24E-09	6.19E-10	4.17E-10	3.02E-10	2.26E-10	1.72E-10	1.36E-10	1.10E-10	9.09E-11
SW	6.58E-09	2.20E-09	1.09E-09	6.63E-10	4.49E-10	3.76E-10	2.92E-10	2.30E-10	1.86E-10	1.54E-10
WSW	6.91E-09	2.22E-09	1.10E-09	6.71E-10	4.55E-10	3.31E-10	2.54E-10	2.02E-10	1.66E-10	1.40E-10
W	8.48E-09	2.72E-09	1.34E-09	8.18E-10	5.56E-10	4.04E-10	3.09E-10	2.45E-10	1.99E-10	1.66E-10
WNW	3.85E-09	1.26E-09	6.42E-10	3.93E-10	2.67E-10	1.95E-10	1.49E-10	1.18E-10	9.65E-11	8.07E-11
NW	6.19E-09	2.02E-09	1.03E-09	6.27E-10	4.26E-10	3.10E-10	2.36E-10	1.87E-10	1.52E-10	1.27E-10
NNW	1.51E-08	4.80E-09	2.41E-09	1.46E-09	9.90E-10	7.18E-10	5.47E-10	4.31E-10	3.50E-10	2.90E-10

Distance	804m	1609m	2414m	3218m	4022m	4827m	5632m	6436m	7240m	8045m
Sector										
N	1.40E-06	5.19E-07	3.00E-07	2.04E-07	1.51E-07	1.18E-07	9.65E-08	8.09E-08	6.92E-08	6.03E-08
NNE	1.11E-06	4.20E-07	2.47E-07	1.69E-07	1.27E-07	1.00E-07	8.20E-08	6.90E-08	5.94E-08	5.19E-08
NE	1.74E-06	6.44E-07	3.69E-07	2.49E-07	1.85E-07	1.45E-07	1.18E-07	9.85E-08	8.43E-08	7.34E-08
ENE	1.49E-06	5.46E-07	3.12E-07	2.11E-07	1.56E-07	1.22E-07	9.90E-08	8.28E-08	7.08E-08	6.15E-08
E	1.03E-06	3.82E-07	2.20E-07	1.49E-07	1.10E-07	8.57E-08	7.07E-08	5.90E-08	5.11E-08	4.37E-08
ESE	8.13E-07	3.47E-07	1.80E-07	1.24E-07	1.01E-07	8.16E-08	6.26E-08	5.61E-08	4.86E-08	4.24E-08
SE	5.91E-07	2.40E-07	1.48E-07	1.02E-07	7.58E-08	6.09E-08	4.92E-08	4.09E-08	3.48E-08	2.99E-08
SSE	5.59E-07	2.30E-07	1.47E-07	1.12E-07	8.48E-08	6.61E-08	5.38E-08	4.46E-08	3.75E-08	3.22E-08
S	2.86E-07	1.45E-07	7.91E-08	5.79E-08	4.29E-08	3.40E-08	2.70E-08	2.21E-08	1.86E-08	1.59E-08
SSW	1.98E-07	1.10E-07	8.88E-08	6.71E-08	4.96E-08	3.90E-08	3.19E-08	2.66E-08	2.24E-08	1.93E-08
SW	2.99E-07	1.56E-07	1.01E-07	7.90E-08	5.78E-08	4.76E-08	3.94E-08	3.26E-08	2.76E-08	2.39E-08
WSW	3.92E-07	1.96E-07	1.18E-07	9.59E-08	6.90E-08	5.68E-08	4.59E-08	3.90E-08	3.44E-08	3.00E-08
W	9.81E-07	4.25E-07	2.50E-07	1.77E-07	1.36E-07	1.09E-07	9.00E-08	7.64E-08	6.60E-08	5.80E-08
WNW	5.60E-07	2.36E-07	1.49E-07	1.07E-07	8.21E-08	6.61E-08	5.50E-08	4.69E-08	4.07E-08	3.58E-08
NW	7.06E-07	2.89E-07	1.77E-07	1.25E-07	9.50E-08	7.60E-08	6.30E-08	5.35E-08	4.63E-08	4.07E-08
NNW	1.13E-06	4.21E-07	2.42E-07	1.64E-07	1.22E-07	9.55E-08	7.78E-08	6.52E-08	5.58E-08	4.86E-08

Distance	804m	1609m	2414m	3218m	4022m	4827m	5632m	6436m	7240m	8045m
Sector										
N	1.75E-08	5.51E-09	2.75E-09	1.67E-09	1.13E-09	8.16E-10	6.20E-10	4.89E-10	3.96E-10	3.27E-10
NNE	1.26E-08	3.96E-09	1.97E-09	1.20E-09	8.10E-10	5.87E-10	4.46E-10	3.51E-10	2.85E-10	2.35E-10
NE	2.03E-08	6.40E-09	3.19E-09	1.93E-09	1.31E-09	9.47E-10	7.20E-10	5.68E-10	4.59E-10	3.80E-10
ENE	1.90E-08	5.99E-09	2.99E-09	1.81E-09	1.23E-09	8.88E-10	6.75E-10	5.32E-10	4.31E-10	3.56E-10
E	1.44E-08	4.55E-09	2.27E-09	1.38E-09	9.30E-10	6.74E-10	5.12E-10	4.04E-10	3.27E-10	2.70E-10
ESE	1.99E-08	6.29E-09	3.14E-09	1.90E-09	1.29E-09	9.32E-10	7.08E-10	5.58E-10	4.52E-10	3.74E-10
SE	1.43E-08	4.49E-09	2.24E-09	1.36E-09	9.18E-10	6.65E-10	5.06E-10	3.99E-10	3.23E-10	2.67E-10
SSE	7.85E-09	2.47E-09	1.23E-09	7.48E-10	5.06E-10	3.66E-10	2.79E-10	2.20E-10	1.78E-10	1.47E-10
S	5.58E-09	1.76E-09	8.78E-10	5.32E-10	3.60E-10	2.61E-10	1.98E-10	1.56E-10	1.27E-10	1.05E-10
SSW	4.63E-09	1.46E-09	7.27E-10	4.41E-10	2.98E-10	2.16E-10	1.64E-10	1.29E-10	1.05E-10	8.67E-11
SW	7.91E-09	2.49E-09	1.24E-09	7.54E-10	5.10E-10	3.69E-10	2.81E-10	2.21E-10	1.79E-10	1.48E-10
WSW	8.51E-09	2.68E-09	1.34E-09	8.12E-10	5.49E-10	3.98E-10	3.02E-10	2.38E-10	1.93E-10	1.60E-10
W	1.17E-08	3.68E-09	1.83E-09	1.11E-09	7.52E-10	5.45E-10	4.14E-10	3.26E-10	2.64E-10	2.19E-10
WNW	6.19E-09	1.95E-09	9.73E-10	5.90E-10	3.99E-10	2.89E-10	2.20E-10	1.73E-10	1.40E-10	1.16E-10
NW	8.65E-09	2.73E-09	1.36E-09	8.24E-10	5.57E-10	4.04E-10	3.07E-10	2.42E-10	1.96E-10	1.62E-10
NNW	1.69E-08	5.33E-09	2.66E-09	1.61E-09	1.09E-09	7.89E-10	6.00E-10	4.73E-10	3.83E-10	3.17E-10

Distance	804m	1609m	2416m	3218m	4022m	4827m	5632m	6436m	7240m	8045m
Sector										
N	2.17E-06	7.49E-07	4.13E-07	2.72E-07	1.98E-07	1.53E-07	1.23E-07	1.02E-07	8.66E-08	7.48E-08
NNE	1.92E-06	6.70E-07	3.72E-07	2.46E-07	1.79E-07	1.39E-07	1.12E-07	9.30E-08	7.91E-08	6.85E-08
NE	2.60E-06	9.05E-07	4.99E-07	3.29E-07	2.39E-07	1.84E-07	1.48E-07	1.23E-07	1.04E-07	9.03E-08
ENE	2.22E-06	7.66E-07	4.21E-07	2.77E-07	2.01E-07	1.55E-07	1.24E-07	1.03E-07	8.72E-08	7.53E-08
E	1.58E-06	5.42E-07	2.96E-07	1.93E-07	1.40E-07	1.07E-07	8.59E-08	7.09E-08	6.00E-08	5.17E-08
ESE	1.38E-06	4.58E-07	2.49E-07	1.62E-07	1.17E-07	8.99E-08	7.20E-08	5.95E-08	5.03E-08	4.34E-08
SE	1.01E-06	3.30E-07	1.76E-07	1.14E-07	8.15E-08	6.22E-08	4.96E-08	4.08E-08	3.43E-08	2.95E-08
SSE	1.05E-06	3.50E-07	1.88E-07	1.21E-07	8.67E-08	6.61E-08	5.26E-08	4.33E-08	3.64E-08	3.13E-08
S	5.43E-07	1.79E-07	9.50E-08	6.11E-08	4.36E-08	3.32E-08	2.63E-08	2.16E-08	1.82E-08	1.56E-08
SSW	6.09E-07	2.03E-07	1.10E-07	7.11E-08	5.10E-08	3.90E-08	3.12E-08	2.57E-08	2.17E-08	1.87E-08
SW	7.65E-07	2.51E-07	1.35E-07	8.79E-08	6.32E-08	4.84E-08	3.87E-08	3.20E-08	2.70E-08	2.33E-08
WSW	1.04E-06	3.47E-07	1.89E-07	1.24E-07	8.99E-08	6.92E-08	5.56E-08	4.60E-08	3.90E-08	3.37E-08
W	2.30E-06	7.99E-07	4.41E-07	2.91E-07	2.12E-07	1.64E-07	1.32E-07	1.09E-07	9.28E-08	8.02E-08
WNW	1.43E-06	5.02E-07	2.79E-07	1.85E-07	1.35E-07	1.05E-07	8.46E-08	7.03E-08	5.98E-08	5.18E-08
NW	1.71E-06	5.94E-07	3.30E-07	2.18E-07	1.59E-07	1.23E-07	9.90E-08	8.23E-08	6.99E-08	6.05E-08
NNW	1.93E-06	6.61E-07	3.63E-07	2.38E-07	1.73E-07	1.33E-07	1.07E-07	8.84E-08	7.49E-08	6.46E-08

Direction	Distance to Nearset Residence (m)	Air Ejector		Containment Vent		Plant Vent	
		X/Q (sec/m^3)	D/Q (m^{-2})	X/Q (sec/m^3)	D/Q (m^{-2})	X/Q (sec/m^3)	D/Q (m^{-2})
E	1170	8.80E-07	7.81E-09	5.96E-07	7.00E-09	1.08E-07	2.28E-09
ESE	1660	4.37E-07	5.96E-09	3.30E-07	5.56E-09	1.60E-07	3.71E-09
SE	840	9.40E-07	1.33E-08	5.55E-07	1.23E-08	1.58E-07	7.55E-09
SSE	610	1.63E-06	1.22E-08	7.02E-07	1.06E-08	1.49E-07	5.53E-09
S	1500	1.99E-07	1.98E-09	1.55E-07	1.78E-09	6.73E-08	1.27E-09
SSW	620	9.24E-07	7.02E-09	2.74E-07	5.28E-09	5.50E-08	2.64E-09
SW	740	8.78E-07	9.05E-09	3.34E-07	7.50E-09	7.34E-08	4.42E-09
WSW	900	8.65E-07	7.09E-09	3.41E-07	5.77E-09	6.52E-08	3.32E-09
W	1330	1.06E-06	5.08E-09	5.24E-07	3.76E-09	8.46E-08	1.18E-09

Direction	Distance to Nearest Milk Producing Animal (m)	Air Ejector		Containment Vent		Plant Vent	
		X/Q (sec/m^3)	D/Q (m^{-2})	X/Q (sec/m^3)	D/Q (m^{-2})	X/Q (sec/m^3)	D/Q (m^{-2})
ESE	8240	4.20E-08	3.58E-10	4.11E-08	3.60E-10	3.40E-08	2.74E-10

Direction	Distance to Nearest Garden (m)	Air Ejector		Containment Vent		Plant Vent	
		X/Q (sec/m^3)	D/Q (m^{-2})	X/Q (sec/m^3)	D/Q (m^{-2})	X/Q (sec/m^3)	D/Q (m^{-2})
E	610	2.44E-06	2.25E-08	1.55E-06	2.00E-08	1.21E-07	3.93E-09
ESE	430	3.87E-06	5.33E-08	2.12E-06	4.80E-08	3.42E-07	1.60E-08
SSE	660	1.44E-06	1.08E-08	6.54E-07	9.39E-09	1.49E-07	5.08E-09

5.2 Instrument Maintenance

In June, a calibration of the Primary Tower and Backup Tower was performed. Cable replacements for 35ft and 250ft also took place during the calibration.

.

No problems were encountered with the equipment, and at the end of the year, no problems were evident at the site.

5.3 Data Recovery

The record of data recovery for the year is summarized in Table 12.

Table 12

Ginna Site

Data Recovery Summary

2024

Measurement	Elevation	Recovered Hours	Recovered Percent	Lost Hours	Percent Changed
Wind Speed	33 ft.	8768	99.8	16	0.2
Wind Speed	150 ft.	8768	99.8	16	0.2
Wind Speed	250 ft.	8768	99.8	16	0.2
Wind Direction	33 ft.	8768	99.8	16	2.0
Wind Direction	150 ft.	8768	99.8	16	0.3
Wind Direction	250 ft.	8768	99.8	16	0.2
Ambient Temperature	33 ft.	8768	99.8	16	0.2
Ambient Temperature	150 ft.	8768	99.8	16	0.2
Ambient Temperature	250 ft.	8768	99.8	16	0.2
Differential Temperature	150-33 ft.	8768	99.8	16	0.3
Differential Temperature	250-33 ft.	8768	99.8	16	0.7
Precipitation	10 ft.	8768	99.8	16	0.3
AVERAGE*			99.8		

* average of priority parameters (all except precipitation)

	Valid Hours	Recovered Percent	Lost Hours
Lower Level Joint Frequency %	8768	99.8	16
Middle Level Joint Frequency %	8768	99.8	16
Upper Level Joint Frequency %	8768	99.8	16

5.4 Stability Wind Rose Data

The annual stability wind roses are given at the end of this report. Wind speed classes have been altered to reflect the sensor threshold.

For the year, winds measured at 33 ft. most frequently came from the south-southwest (11.14%) and most frequently fell into the 2.1-3.0 m/s wind speed class (24.91%). Calms (wind speeds at or below the sensor threshold) were measured 0.00% of the time and speeds greater than 10.0 m/s were measured (0.93%) of the time. Winds measured at 150 ft. most frequently came from the southwest (10.36%) and most frequently fell into the 6.1-8.0 m/s wind speed class (20.38%). Calms were measured 0.00% of the time and speeds greater than 10.0 m/s were measured (8.29%) of the time. Winds measured at 250 ft. most frequently came from the west-northwest (10.87%) and most frequently fell into the 6.1-8.1 m/s wind speed class (22.72%). Calms were measured 0.00% of the time and speeds greater than 10.0 m/s were measured (13.24%) of the time.

Stability based on the 150-33 ft. differential temperature most frequently fell into the neutral classification and stability based on the 250-33 ft. differential temperature most frequently fell into the neutral classification.

2024

Joint Frequency Tables

Joint Frequency Distribution

Site:: Ginna Primary

Period:: Months Jan - Dec for years 2024 - 2024

All Stabilities

Elevations:: Winds 33ft Stability 150ft

Wind Direction Sector	Wind Speed Range (m/s) <0.50	0.5-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-4.0	4.1-5.0	5.1-6.0	6.1-8.0	8.1-10.0	>10.00	Total
N	0	18	26	33	65	37	21	4	2	0	0	206
NNE	0	14	25	52	107	89	67	32	36	18	2	442
NE	3	19	28	43	82	75	40	45	36	26	30	427
ENE	0	26	70	107	156	74	41	33	26	8	2	543
E	2	11	32	61	136	84	46	25	7	0	0	404
ESE	0	27	21	33	71	34	6	2	0	0	0	194
SE	1	24	28	23	82	74	30	22	18	3	1	306
SSE	1	20	29	40	95	104	110	93	60	13	2	567
S	1	26	71	82	147	156	153	125	131	24	0	916
SSW	1	31	105	200	316	169	107	38	10	0	0	977
SW	0	26	83	161	360	119	98	61	34	10	0	942
WSW	0	17	25	50	153	144	165	125	117	21	2	819
W	1	9	38	41	128	137	115	95	90	24	4	682
WNW	0	18	29	74	180	174	147	121	143	47	38	971
NW	1	12	34	45	73	30	25	13	29	6	1	269
NNW	0	11	23	20	33	10	1	2	1	0	0	101
Tot	11	309	667	1065	2184	1510	1172	836	740	190	82	8766

Hours of Calm 2
Hours of Variable Direction 0
Hours of Valid Data 8768
Hours of Missing Data . . . 16
Hours in Period 8784

Joint Frequency Distribution

Site:: Ginna Primary

Period:: Months Jan - Dec for years 2024 - 2024

Stability Class A Extremely Unstable based on Lapse Rate

Elevations:: Winds 33ft Stability 150ft

Wind Direction Sector	Wind Speed Range (m/s) <0.50	0.5-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-4.0	4.1-5.0	5.1-6.0	6.1-8.0	8.1-10.0	>10.00	Total
N	0	0	2	7	15	4	7	1	0	0	0	36
NNE	0	0	1	5	9	17	20	14	25	9	2	102
NE	0	0	0	6	28	33	19	24	26	18	29	183
ENE	0	0	2	28	56	38	25	19	17	7	2	194
E	0	0	0	0	2	0	1	3	1	0	0	7
ESE	0	0	0	1	1	0	0	0	0	0	0	2
SE	0	0	0	0	1	7	1	3	0	0	0	12
SSE	0	0	0	2	3	8	27	19	9	0	0	68
S	0	0	1	0	6	12	9	6	1	0	0	35
SSW	0	0	1	3	11	9	6	1	0	0	0	31
SW	0	0	1	2	12	8	12	6	4	0	0	45
WSW	0	0	0	2	1	5	16	9	4	0	0	37
W	0	0	0	0	14	5	3	10	8	1	0	41
WNW	0	0	0	21	102	85	63	39	62	14	6	392
NW	0	0	3	16	32	8	4	2	10	0	0	75
NNW	0	0	1	6	12	1	0	0	0	0	0	20
Tot	0	0	12	99	305	240	213	156	167	49	39	1280

Hours of Calm 0
Hours of Variable Direction 0
Hours of Valid Data 1280
Hours of Missing Data . . . 16
Hours in Period 8784

Joint Frequency Distribution

Site:: Ginna Primary

Period:: Months Jan - Dec for years 2024 - 2024

Stability Class B Moderately Unstable based on Lapse Rate

Elevations:: Winds 33ft Stability 150ft

Wind Direction Sector	Wind Speed Range (m/s) <0.50	0.5-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-4.0	4.1-5.0	5.1-6.0	6.1-8.0	8.1-10.0	>10.00	Total
N	0	0	3	4	12	11	10	1	1	0	0	42
NNE	0	0	0	3	20	15	11	9	2	3	0	63
NE	0	1	2	5	17	16	9	7	6	5	1	69
ENE	0	0	3	6	11	2	5	8	5	0	0	40
E	0	0	0	1	2	8	1	5	1	0	0	18
ESE	0	0	1	0	0	1	0	0	0	0	0	2
SE	0	0	0	1	2	7	1	1	0	0	0	12
SSE	0	0	0	0	4	11	3	10	6	0	0	34
S	0	0	2	1	7	2	3	3	1	0	0	19
SSW	0	0	3	5	7	9	7	2	1	0	0	34
SW	0	0	1	1	9	8	14	9	4	0	0	46
WSW	0	0	1	0	7	6	12	5	5	4	0	40
W	0	0	0	2	5	6	7	6	5	1	0	32
WNW	0	0	3	10	10	12	4	14	20	7	2	82
NW	0	0	1	6	5	4	7	1	16	2	0	42
NNW	0	0	5	7	4	3	0	0	0	0	0	19
Tot	0	1	25	52	122	121	94	81	73	22	3	594

Hours of Calm	0
Hours of Variable Direction	0
Hours of Valid Data	594
Hours of Missing Data . . .	16
Hours in Period	8784

Joint Frequency Distribution

Site:: Ginna Primary

Period:: Months Jan - Dec for years 2024 - 2024

Stability Class C Slightly Unstable based on Lapse Rate

Elevations:: Winds 33ft Stability 150ft

Wind Direction Sector	Wind Speed Range (m/s) <0.50	0.5-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-4.0	4.1-5.0	5.1-6.0	6.1-8.0	8.1-10.0	>10.00	Total
N	0	0	3	8	10	7	2	0	0	0	0	30
NNE	0	0	1	5	9	8	10	3	2	2	0	40
NE	0	0	0	6	3	3	5	4	3	3	0	27
ENE	0	1	4	3	11	2	0	1	1	0	0	23
E	0	0	0	1	3	1	2	1	1	0	0	9
ESE	0	0	0	0	1	1	0	0	0	0	0	2
SE	0	0	0	0	1	4	0	0	0	0	0	5
SSE	0	0	0	1	3	1	2	6	4	0	0	17
S	0	0	1	1	3	3	3	2	5	0	0	18
SSW	0	0	1	3	3	1	2	3	1	0	0	14
SW	0	0	0	2	4	2	2	1	0	0	0	11
WSW	0	0	0	1	2	4	4	4	3	1	0	19
W	0	0	1	1	3	3	2	7	6	1	0	24
WNW	0	0	2	5	2	4	9	6	7	4	5	44
NW	0	0	1	4	3	1	7	1	2	1	0	20
NNW	0	0	3	1	2	2	0	0	0	0	0	8
Tot	0	1	17	42	63	47	50	39	35	12	5	311

Hours of Calm	0
Hours of Variable Direction	0
Hours of Valid Data	311
Hours of Missing Data . . .	16
Hours in Period	8784

Joint Frequency Distribution

Site:: Ginna Primary

Period:: Months Jan - Dec for years 2024 - 2024

Stability Class D Neutral based on Lapse Rate

Elevations:: Winds 33ft Stability 150ft

Wind Direction Sector	Wind Speed Range (m/s) <0.50	0.5-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-4.0	4.1-5.0	5.1-6.0	6.1-8.0	8.1-10.0	>10.00	Total
N	0	11	8	12	26	12	2	2	1	0	0	74
NNE	0	5	10	28	52	44	26	5	6	4	0	180
NE	0	2	7	15	21	19	6	9	1	0	0	80
ENE	0	5	19	26	33	18	6	4	1	1	0	113
E	0	1	9	10	51	44	32	9	2	0	0	158
ESE	0	3	4	7	30	15	3	2	0	0	0	64
SE	0	0	8	5	40	42	23	11	17	3	1	150
SSE	0	2	6	11	33	51	45	48	28	8	2	234
S	0	2	9	17	43	42	59	65	74	18	0	329
SSW	0	3	11	15	44	34	36	13	3	0	0	159
SW	0	5	5	22	60	48	48	36	22	0	0	246
WSW	0	2	3	13	47	62	100	75	81	13	2	398
W	1	1	11	12	45	65	70	56	64	21	4	350
WNW	0	5	13	22	30	36	51	51	42	18	25	293
NW	0	4	17	8	21	14	7	9	1	3	1	85
NNW	0	2	9	3	13	4	0	2	1	0	0	34
Tot	1	53	149	226	589	550	514	397	344	89	35	2947

Hours of Calm	0
Hours of Variable Direction	0
Hours of Valid Data	2947
Hours of Missing Data . . .	16
Hours in Period	8784

Joint Frequency Distribution

Site:: Ginna Primary

Period:: Months Jan - Dec for years 2024 - 2024

Stability Class E Slightly Stable based on Lapse Rate

Elevations:: Winds 33ft Stability 150ft

Wind Direction Sector	Wind Speed Range (m/s) <0.50	0.5-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-4.0	4.1-5.0	5.1-6.0	6.1-8.0	8.1-10.0	>10.00	Total
N	0	7	9	1	2	3	0	0	0	0	0	22
NNE	0	6	11	9	17	5	0	1	1	0	0	50
NE	0	7	10	4	9	2	1	1	0	0	0	34
ENE	0	10	16	17	30	7	5	1	2	0	0	88
E	1	5	10	25	45	25	5	5	2	0	0	123
ESE	0	9	7	17	29	15	3	0	0	0	0	80
SE	0	8	9	10	31	12	4	7	1	0	0	82
SSE	0	4	8	13	33	32	33	10	13	5	0	151
S	1	7	15	27	49	83	74	49	50	6	0	361
SSW	1	11	14	47	89	64	50	19	5	0	0	300
SW	0	9	34	49	178	50	22	9	4	0	0	355
WSW	0	8	11	22	69	65	33	32	24	3	0	267
W	0	6	20	21	52	56	32	16	7	0	0	210
WNW	0	9	9	13	29	34	19	11	12	4	0	140
NW	1	8	10	7	10	2	0	0	0	0	0	38
NNW	0	6	2	3	1	0	1	0	0	0	0	13
Tot	4	120	195	285	673	455	282	161	121	18	0	2314

Hours of Calm	2
Hours of Variable Direction	0
Hours of Valid Data	2316
Hours of Missing Data . . .	16
Hours in Period	8784

Joint Frequency Distribution

Site:: Ginna Primary

Period:: Months Jan - Dec for years 2024 - 2024

Stability Class F Moderately Stable based on Lapse Rate

Elevations:: Winds 33ft Stability 150ft

Wind Direction Sector	Wind Speed Range (m/s) <0.50	0.5-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-4.0	4.1-5.0	5.1-6.0	6.1-8.0	8.1-10.0	>10.00	Total
N	0	0	1	0	0	0	0	0	0	0	0	1
NNE	0	2	1	2	0	0	0	0	0	0	0	5
NE	2	7	6	2	3	2	0	0	0	0	0	22
ENE	0	9	13	8	6	6	0	0	0	0	0	42
E	0	4	10	13	14	1	2	0	0	0	0	44
ESE	0	11	8	6	8	2	0	0	0	0	0	35
SE	1	11	8	6	6	2	1	0	0	0	0	35
SSE	0	5	10	4	10	1	0	0	0	0	0	30
S	0	8	19	9	20	12	5	0	0	0	0	73
SSW	0	9	24	50	70	34	6	0	0	0	0	193
SW	0	6	29	49	67	3	0	0	0	0	0	154
WSW	0	4	9	9	22	2	0	0	0	0	0	46
W	0	1	5	2	8	2	1	0	0	0	0	19
WNW	0	3	2	3	6	3	1	0	0	0	0	18
NW	0	0	2	4	0	1	0	0	0	0	0	7
NNW	0	2	2	0	1	0	0	0	0	0	0	5
Tot	3	82	149	167	241	71	16	0	0	0	0	729

Hours of Calm	0
Hours of Variable Direction	0
Hours of Valid Data	729
Hours of Missing Data . . .	16
Hours in Period	8784

Joint Frequency Distribution

Site:: Ginna Primary

Period:: Months Jan - Dec for years 2024 - 2024

Stability Class G Extremely Stable based on Lapse Rate

Elevations:: Winds 33ft Stability 150ft

Wind Direction Sector	Wind Speed Range (m/s) <0.50	0.5-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-4.0	4.1-5.0	5.1-6.0	6.1-8.0	8.1-10.0	>10.00	Total
N	0	0	0	1	0	0	0	0	0	0	0	1
NNE	0	1	1	0	0	0	0	0	0	0	0	2
NE	1	2	3	5	1	0	0	0	0	0	0	12
ENE	0	1	13	19	9	1	0	0	0	0	0	43
E	1	1	3	11	19	5	3	2	0	0	0	45
ESE	0	4	1	2	2	0	0	0	0	0	0	9
SE	0	5	3	1	1	0	0	0	0	0	0	10
SSE	1	9	5	9	9	0	0	0	0	0	0	33
S	0	9	24	27	19	2	0	0	0	0	0	81
SSW	0	8	51	77	92	18	0	0	0	0	0	246
SW	0	6	13	36	30	0	0	0	0	0	0	85
WSW	0	3	1	3	5	0	0	0	0	0	0	12
W	0	1	1	3	1	0	0	0	0	0	0	6
WNW	0	1	0	0	1	0	0	0	0	0	0	2
NW	0	0	0	0	2	0	0	0	0	0	0	2
NNW	0	1	1	0	0	0	0	0	0	0	0	2
Tot	3	52	120	194	191	26	3	2	0	0	0	591

Hours of Calm	0
Hours of Variable Direction	0
Hours of Valid Data	591
Hours of Missing Data . . .	16
Hours in Period	8784

Joint Frequency Distribution

Site:: Ginna Primary

Period:: Months Jan - Dec for years 2024 - 2024

All Stabilities

Elevations:: Winds 150ft Stability 150ft

Wind Direction Sector	Wind Speed Range (m/s) <0.50	0.5- 1.0	1.1- 1.5	1.6- 2.0	2.1- 3.0	3.1- 4.0	4.1- 5.0	5.1- 6.0	6.1- 8.0	8.1- 10.0	>10.00	Total
N	0	4	6	20	30	22	17	17	52	53	29	250
NNE	0	6	13	16	35	26	20	12	24	35	20	207
NE	0	8	19	25	47	49	33	30	62	35	46	354
ENE	1	7	19	28	80	77	69	50	32	12	6	381
E	1	14	22	31	96	130	104	85	39	0	0	522
ESE	0	8	14	23	70	66	46	37	13	0	0	277
SE	0	8	20	22	70	87	80	44	36	15	5	387
SSE	0	7	12	17	54	60	113	128	222	101	42	756
S	0	4	17	22	60	83	93	131	237	98	37	782
SSW	1	8	9	16	61	90	108	117	138	14	0	562
SW	1	5	8	18	61	123	196	217	191	69	19	908
WSW	0	6	9	10	46	110	152	146	233	90	49	851
W	0	3	8	15	46	79	93	89	154	90	69	646
WNW	0	1	12	23	78	74	83	95	159	149	219	893
NW	0	5	15	26	82	65	48	37	102	89	169	638
NNW	1	13	16	32	37	35	35	38	92	35	17	351
Tot	5	107	219	344	953	1176	1290	1273	1786	885	727	8765

Hours of Calm	3
Hours of Variable Direction	0
Hours of Valid Data	8768
Hours of Missing Data . . .	16
Hours in Period	8784

Joint Frequency Distribution

Site:: Ginna Primary

Period:: Months Jan - Dec for years 2024 - 2024

Stability Class A Extremely Unstable based on Lapse Rate

Elevations:: Winds 150ft Stability 150ft

Wind Direction Sector	Wind Speed Range (m/s) <0.50	0.5-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-4.0	4.1-5.0	5.1-6.0	6.1-8.0	8.1-10.0	>10.00	Total
N	0	0	0	0	4	4	3	5	12	13	14	55
NNE	0	0	0	0	1	6	4	5	15	16	16	63
NE	0	0	1	1	15	23	13	13	41	26	40	173
ENE	0	0	1	3	28	36	41	28	25	6	3	171
E	0	0	0	1	2	6	10	6	3	0	0	28
ESE	0	0	0	1	0	1	0	0	0	0	0	2
SE	0	0	0	0	1	1	5	3	3	0	0	13
SSE	0	0	0	1	1	3	9	19	26	7	0	66
S	0	0	1	1	3	3	10	8	6	1	0	33
SSW	0	0	0	0	6	10	6	3	3	0	0	28
SW	0	0	0	2	3	9	6	7	14	6	1	48
WSW	0	0	0	0	4	1	0	12	14	6	2	39
W	0	0	0	0	1	10	1	4	3	1	2	22
WNW	0	0	0	0	11	37	33	45	51	45	82	304
NW	0	0	0	2	38	41	23	14	34	23	19	194
NNW	0	0	0	2	12	7	7	5	7	1	0	41
Tot	0	0	3	14	130	198	171	177	257	151	179	1280

Hours of Calm	0
Hours of Variable Direction	0
Hours of Valid Data	1280
Hours of Missing Data . . .	16
Hours in Period	8784

Joint Frequency Distribution

Site:: Ginna Primary

Period:: Months Jan - Dec for years 2024 - 2024

Stability Class B Moderately Unstable based on Lapse Rate

Elevations:: Winds 150ft Stability 150ft

Wind Direction Sector	Wind Speed Range (m/s) <0.50	0.5-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-4.0	4.1-5.0	5.1-6.0	6.1-8.0	8.1-10.0	>10.00	Total
N	0	0	0	2	1	2	5	5	8	14	4	41
NNE	0	0	0	0	12	7	6	4	4	5	4	42
NE	0	1	1	3	8	5	3	8	9	5	3	46
ENE	0	0	1	1	8	4	6	7	4	0	1	32
E	0	0	0	0	4	10	7	7	5	0	0	33
ESE	0	0	1	1	1	1	1	0	0	0	0	5
SE	0	0	0	0	1	2	5	2	0	0	0	10
SSE	0	0	0	0	0	5	9	6	11	7	0	38
S	0	0	1	1	4	5	1	0	5	0	0	17
SSW	0	0	1	2	6	3	7	5	4	0	0	28
SW	0	0	1	0	5	4	2	10	15	10	1	48
WSW	0	0	0	0	2	5	5	8	10	4	6	40
W	0	0	0	1	3	3	2	4	6	5	1	25
WNW	0	0	0	1	7	5	6	3	7	17	18	64
NW	0	0	0	3	13	4	1	2	7	5	40	75
NNW	0	0	0	7	5	8	4	4	15	6	1	50
Tot	0	1	6	22	80	73	70	75	110	78	79	594

Hours of Calm	0
Hours of Variable Direction	0
Hours of Valid Data	594
Hours of Missing Data . . .	16
Hours in Period	8784

Joint Frequency Distribution

Site:: Ginna Primary

Period:: Months Jan - Dec for years 2024 - 2024

Stability Class C Slightly Unstable based on Lapse Rate

Elevations:: Winds 150ft Stability 150ft

Wind Direction Sector	Wind Speed Range (m/s) <0.50	0.5-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-4.0	4.1-5.0	5.1-6.0	6.1-8.0	8.1-10.0	>10.00	Total
N	0	0	0	1	7	2	1	1	7	11	2	32
NNE	0	0	0	1	3	0	1	0	0	4	0	9
NE	0	1	1	5	3	0	2	3	3	2	3	23
ENE	0	0	1	2	5	4	2	2	2	3	0	21
E	0	0	0	0	2	6	2	2	2	0	0	14
ESE	0	0	0	0	1	1	1	0	0	0	0	3
SE	0	0	0	0	0	2	3	0	0	0	0	5
SSE	0	0	0	0	2	1	2	2	8	4	0	19
S	0	0	0	2	2	3	2	1	3	4	0	17
SSW	0	0	1	0	2	2	1	1	2	1	0	10
SW	0	0	0	1	2	1	0	5	1	1	0	11
WSW	0	0	0	0	1	5	2	3	3	5	1	20
W	0	0	0	0	0	3	1	1	7	5	3	20
WNW	0	0	0	2	6	0	3	0	7	3	17	38
NW	0	0	0	3	6	1	0	2	5	6	14	37
NNW	0	0	0	3	4	1	3	5	8	4	4	32
Tot	0	1	3	20	46	32	26	28	58	53	44	311

Hours of Calm 0
Hours of Variable Direction 0
Hours of Valid Data 311
Hours of Missing Data . . . 16
Hours in Period 8784

Joint Frequency Distribution

Site:: Ginna Primary

Period:: Months Jan - Dec for years 2024 - 2024

Stability Class D Neutral based on Lapse Rate

Elevations:: Winds 150ft Stability 150ft

Wind Direction Sector	Wind Speed Range (m/s) <0.50	0.5-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-4.0	4.1-5.0	5.1-6.0	6.1-8.0	8.1-10.0	>10.00	Total
N	0	2	3	11	8	10	6	3	19	14	9	85
NNE	0	1	5	12	10	5	8	2	4	9	0	56
NE	0	2	9	7	8	17	7	5	6	2	0	63
ENE	0	2	7	6	19	20	5	10	1	2	2	74
E	0	2	6	5	21	34	37	42	13	0	0	160
ESE	0	3	2	5	15	17	18	14	7	0	0	81
SE	0	1	2	4	30	37	38	16	22	13	5	168
SSE	0	0	4	2	19	18	44	48	105	49	29	318
S	0	1	8	5	16	30	14	34	76	44	25	253
SSW	0	1	2	2	13	27	25	25	31	3	0	129
SW	0	0	3	1	14	35	38	31	73	38	13	246
WSW	0	0	1	3	11	32	38	44	139	51	31	350
W	0	1	2	2	9	24	33	39	83	62	60	315
WNW	0	0	6	9	19	18	17	23	50	62	79	283
NW	0	2	7	8	13	7	10	8	31	45	71	202
NNW	0	3	7	13	11	9	11	20	58	20	12	164
Tot	0	21	74	95	236	340	349	364	718	414	336	2947

Hours of Calm	0
Hours of Variable Direction	0
Hours of Valid Data	2947
Hours of Missing Data . . .	16
Hours in Period	8784

Joint Frequency Distribution

Site:: Ginna Primary

Period:: Months Jan - Dec for years 2024 - 2024

Stability Class E Slightly Stable based on Lapse Rate

Elevations:: Winds 150ft Stability 150ft

Wind Direction Sector	Wind Speed Range (m/s) <0.50	0.5-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-4.0	4.1-5.0	5.1-6.0	6.1-8.0	8.1-10.0	>10.00	Total
N	0	0	0	6	7	4	1	3	6	1	0	28
NNE	0	3	4	2	6	7	1	1	1	1	0	26
NE	0	0	5	5	7	3	4	0	2	0	0	26
ENE	0	4	2	8	13	8	9	2	0	1	0	47
E	1	9	5	10	28	43	28	17	10	0	0	151
ESE	0	3	3	8	20	19	13	15	6	0	0	87
SE	0	3	6	2	22	26	15	16	10	2	0	102
SSE	0	4	3	5	11	19	37	35	68	34	13	229
S	0	0	2	5	16	22	38	55	104	49	12	303
SSW	0	4	1	4	15	29	40	41	61	10	0	205
SW	0	1	1	7	16	41	90	105	75	14	4	354
WSW	0	2	3	5	14	27	58	52	63	24	9	257
W	0	2	3	6	16	16	36	32	52	16	3	182
WNW	0	0	3	5	19	10	16	20	40	22	23	158
NW	0	1	7	6	5	8	12	9	23	10	25	106
NNW	0	6	7	5	4	10	10	4	4	4	0	54
Tot	1	42	55	89	219	292	408	407	525	188	89	2315

Hours of Calm	1
Hours of Variable Direction	0
Hours of Valid Data	2316
Hours of Missing Data . . .	16
Hours in Period	8784

Joint Frequency Distribution

Site:: Ginna Primary

Period:: Months Jan - Dec for years 2024 • 2024

Stability Class F Moderately Stable based on Lapse Rate

Elevations:: Winds 150ft Stability 150ft

Wind Direction Sector	Wind Speed Range (m/s) <0.50	0.5 - 1.0	1.1 - 1.5	1.6 - 2.0	2.1 - 3.0	3.1 - 4.0	4.1 - 5.0	5.1 - 6.0	6.1 - 8.0	8.1 - 10.0	>10.00	Total
N	0	2	2	0	1	0	0	0	0	0	0	5
NNE	0	1	3	1	1	1	0	0	0	0	0	7
NE	0	4	0	3	2	1	2	0	1	0	0	13
ENE	0	1	6	5	2	0	3	1	0	0	0	18
E	0	2	6	7	24	14	9	6	1	0	0	69
ESE	0	2	5	3	11	15	7	5	0	0	0	48
SE	0	2	4	9	7	8	8	4	1	0	0	43
SSE	0	0	2	4	10	8	6	9	1	0	0	40
S	0	1	2	3	11	8	9	18	26	0	0	78
SSW	0	0	2	3	12	13	14	29	25	0	0	98
SW	1	1	0	1	13	24	42	45	7	0	0	134
WSW	0	2	2	0	6	22	27	20	4	0	0	83
W	0	0	2	2	8	12	7	9	3	1	0	44
WNW	0	0	2	1	6	0	7	2	4	0	0	22
NW	0	2	0	3	6	3	2	2	2	0	0	20
NNW	1	2	2	1	1	0	0	0	0	0	0	7
Tot	2	22	40	46	121	129	143	150	75	1	0	729

Hours of Calm	0
Hours of Variable Direction	0
Hours of Valid Data	729
Hours of Missing Data . . .	16
Hours in Period	8784

Joint Frequency Distribution

Site:: Ginna Primary

Period:: Months Jan - Dec for years 2024 • 2024

Stability Class G Extremely Stable based on Lapse Rate

Elevations:: Winds 150ft Stability 150ft

Wind Direction Sector	Wind Speed Range (m/s) <0.50	0.5- 1.0	1.1- 1.5	1.6- 2.0	2.1- 3.0	3.1- 4.0	4.1- 5.0	5.1- 6.0	6.1- 8.0	8.1- 10.0	>10.00	Total
N	0	0	1	0	2	0	1	0	0	0	0	4
NNE	0	1	1	0	2	0	0	0	0	0	0	4
NE	0	0	2	1	4	0	2	1	0	0	0	10
ENE	1	0	1	3	5	5	3	0	0	0	0	18
E	0	1	5	8	15	17	11	5	5	0	0	67
ESE	0	0	3	5	22	12	6	3	0	0	0	51
SE	0	2	8	7	9	11	6	3	0	0	0	46
SSE	0	3	3	5	11	6	6	9	3	0	0	46
S	0	2	3	5	8	12	19	15	17	0	0	81
SSW	1	3	2	5	7	6	15	13	12	0	0	64
SW	0	3	3	6	8	9	18	14	6	0	0	67
WSW	0	2	3	2	8	18	22	7	0	0	0	62
W	0	0	1	4	9	11	13	0	0	0	0	38
WNW	0	1	1	5	10	4	1	2	0	0	0	24
NW	0	0	1	1	1	1	0	0	0	0	0	4
NNW	0	2	0	1	0	0	0	0	0	0	0	3
Tot	2	20	38	58	121	112	123	72	43	0	0	589

Hours of Calm	2
Hours of Variable Direction	0
Hours of Valid Data , . . .	591
Hours of Missing Data . . .	16
Hours in Period , ...	8784

Joint Frequency Distribution

Site:: Ginna Primary

Period:: Months Jan - Dec for years 2024 - 2024

All Stabilities

Elevations:: Winds 250ft Stability 250ft

Wind Direction Sector	Wind Speed Range (m/s) <0.50	0.5-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-4.0	4.1-5.0	5.1-6.0	6.1-8.0	8.1-10.0	>10.00	Total
N	0	8	13	19	28	23	16	18	37	45	31	238
NNE	0	5	12	24	39	25	15	11	20	27	24	202
NE	0	10	18	23	40	48	39	28	58	28	52	344
ENE	0	8	32	27	94	109	67	44	41	16	4	442
E	0	11	16	26	92	115	78	78	53	2	0	471
ESE	0	9	17	22	37	46	40	44	54	7	0	276
SE	1	4	10	17	50	50	76	72	82	38	25	425
SSE	0	6	7	13	28	46	51	94	214	191	131	781
S	0	3	9	14	35	48	64	52	161	150	101	637
SSW	0	5	7	5	33	46	76	90	137	93	10	502
SW	0	5	11	22	33	54	84	99	263	152	48	771
WSW	1	3	8	9	28	69	91	139	354	155	79	936
W	0	5	13	14	33	68	90	112	190	124	120	769
WNW	1	8	12	20	58	86	71	92	134	163	308	953
NW	0	4	11	23	68	74	65	36	109	101	191	682
NNW	2	0	10	13	37	18	29	30	85	77	37	338
Tot	5	94	206	291	733	925	952	1039	1992	1369	1161	8767

Hours of Calm	1
Hours of Variable Direction	0
Hours of Valid Data	8768
Hours of Missing Data . . .	16
Hours in Period	8784

Joint Frequency Distribution

Site:: Ginna Primary

Period:: Months Jan - Dec for years 2024 • 2024

Stability Class A Extremely Unstable based on Lapse Rate

Elevations:: Winds 250ft Stability 250ft

Wind Direction Sector	Wind Speed Range (m/s) <0.50	0.5-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-4.0	4.1-5.0	5.1-6.0	6.1-8.0	8.1-10.0	>10.00	Total
N	0	0	0	1	0	1	0	2	2	3	7	16
NNE	0	0	0	0	0	0	0	0	6	5	10	21
NE	0	0	0	0	2	5	6	6	7	5	18	49
ENE	0	0	0	0	10	27	16	10	12	2	0	77
E	0	0	0	0	1	0	2	0	1	0	0	4
ESE	0	0	0	0	0	1	0	0	0	0	0	1
SE	0	0	0	0	0	0	0	2	1	0	0	3
SSE	0	0	0	0	0	0	2	7	10	2	0	21
S	0	0	0	0	0	0	4	3	2	0	0	9
SSW	0	0	0	0	0	0	1	0	0	0	0	1
SW	0	0	0	0	0	0	4	1	1	1	0	7
WSW	0	0	0	0	0	0	0	0	4	2	0	6
W	0	0	0	0	0	2	0	0	0	0	0	2
WNW	0	0	0	0	0	14	17	24	20	21	23	119
NW	0	0	0	0	12	37	29	9	28	16	6	137
NNW	0	0	0	0	3	3	3	3	8	0	0	20
Tot	0	0	0	1	28	90	84	67	102	67	64	493

Hours of Calm	0
Hours of Variable Direction	0
Hours of Valid Data	493
Hours of Missing Data . . .	16
Hours in Period	8784

Joint Frequency Distribution

Site:: Ginna Primary

Period:: Months Jan - Dec for years 2024 - 2024

Stability Class B Moderately Unstable based on Lapse Rate

Elevations:: Winds 250ft Stability 250ft

Wind Direction Sector	Wind Speed Range (m/s) <0.50	0.5-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-4.0	4.1-5.0	5.1-6.0	6.1-8.0	8.1-10.0	>10.00	Total
N	0	0	0	0	2	1	1	1	5	6	7	23
NNE	0	0	0	0	0	1	1	2	3	3	3	13
NE	0	0	0	1	3	2	3	2	15	7	13	46
ENE	0	0	0	1	6	8	4	2	7	0	1	29
E	0	0	0	0	0	2	1	1	0	0	0	4
ESE	0	0	0	0	0	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	2	2	2	1	0	7
SSE	0	0	0	0	0	2	1	5	11	7	1	27
S	0	0	0	0	0	0	0	3	3	1	0	7
SSW	0	0	0	0	1	3	2	1	2	1	0	10
SW	0	0	0	0	0	2	2	2	4	3	1	14
WSW	0	0	0	0	0	0	0	3	10	3	0	16
W	0	0	0	0	1	2	0	1	1	1	0	6
WNW	0	0	0	0	1	4	4	6	6	4	16	41
NW	0	0	0	1	3	3	1	2	4	7	3	24
NNW	0	0	0	0	4	1	5	1	1	4	0	16
Tot	0	0	0	3	21	31	27	34	74	48	45	283

Hours of Calm 0
Hours of Variable Direction 0
Hours of Valid Data 283
Hours of Missing Data . . . 16
Hours in Period 8784

Joint Frequency Distribution

Site:: Ginna Primary

Period:: Months Jan - Dec for years 2024 - 2024

Stability Class C Slightly Unstable based on Lapse Rate

Elevations:: Winds 250ft Stability 250ft

Wind Direction Sector	Wind Speed Range (m/s) <0.50	0.5-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-4.0	4.1-5.0	5.1-6.0	6.1-8.0	8.1-10.0	>10.00	Total
N	0	0	0	1	2	5	3	8	6	7	4	36
NNE	0	0	0	1	3	3	5	3	6	7	2	30
NE	0	1	0	2	6	12	4	7	19	13	11	75
ENE	0	0	0	1	6	12	11	9	8	2	2	51
E	0	0	0	0	1	8	7	4	2	0	0	22
ESE	0	0	0	0	0	0	1	0	0	0	0	1
SE	0	0	0	0	1	4	1	4	3	1	0	14
SSE	0	0	0	1	1	1	4	6	12	11	3	39
S	0	0	0	0	2	4	4	3	5	2	0	20
SSW	0	0	0	0	2	3	8	5	4	0	0	22
SW	0	0	0	1	2	6	1	6	11	9	2	38
WSW	0	0	0	1	3	2	2	5	11	11	5	36
W	0	0	0	0	1	2	3	2	2	2	3	15
WNW	0	0	0	1	3	16	4	6	8	15	43	96
NW	0	0	0	1	9	1	3	5	7	9	50	85
NNW	0	0	0	0	5	5	4	2	7	12	5	40
Tot	0	1	0	10	47	84	65	75	111	97	130	620

Hours of Calm	0
Hours of Variable Direction	0
Hours of Valid Data	620
Hours of Missing Data . . .	16
Hours in Period	8784

Joint Frequency Distribution

Site:: Ginna Primary

Period:: Months Jan - Dec for years 2024 - 2024

Stability Class D Neutral based on Lapse Rate

Elevations:: Winds 250ft Stability 250ft

Wind Direction Sector	Wind Speed Range (m/s) <0.50	0.5-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-4.0	4.1-5.0	5.1-6.0	6.1-8.0	8.1-10.0	>10.00	Total
N	0	3	7	10	13	12	10	5	21	29	13	123
NNE	0	0	2	12	26	14	7	4	5	12	9	91
NE	0	2	13	10	14	17	20	9	14	3	10	112
ENE	0	1	13	10	39	31	21	12	6	12	1	146
E	0	2	3	5	22	41	27	36	28	0	0	164
ESE	0	3	4	7	10	16	18	18	24	3	0	103
SE	0	2	2	4	21	24	38	44	38	25	25	223
SSE	0	2	2	2	3	22	16	49	100	129	87	412
S	0	0	6	8	12	23	13	14	65	68	62	271
SSW	0	2	3	1	5	16	22	28	51	25	1	154
SW	0	2	3	4	11	18	29	28	79	77	40	291
WSW	0	2	1	2	10	34	48	51	158	107	68	481
W	0	2	2	8	7	17	43	43	104	104	110	440
WNW	0	2	3	7	29	25	21	32	59	94	176	448
NW	0	2	2	9	19	17	16	12	46	59	121	303
NNW	0	0	6	4	18	8	13	20	65	58	32	224
Tot	0	27	72	103	259	335	362	405	863	805	755	3986

Hours of Calm	0
Hours of Variable Direction	0
Hours of Valid Data	3986
Hours of Missing Data	16
Hours in Period	8784

Joint Frequency Distribution

Site:: Ginna Primary

Period:: Months Jan - Dec for years 2024 - 2024

Stability Class E Slightly Stable based on Lapse Rate

Elevations:: Winds 250ft Stability 250ft

Wind Direction Sector	Wind Speed Range (mls) <0.50	0.5-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-4.0	4.1-5.0	5.1-6.0	6.1-8.0	8.1-10.0	>10.00	Total
N	0	3	5	6	7	3	0	2	3	0	0	29
NNE	0	4	9	7	8	6	2	2	0	0	0	38
NE	0	3	4	3	6	9	2	3	3	0	0	33
ENE	0	3	10	8	22	19	9	8	5	0	0	84
E	0	6	9	7	36	34	25	23	17	2	0	159
ESE	0	3	4	8	11	10	6	12	15	3	0	72
SE	1	0	2	4	7	12	20	11	23	6	0	86
SSE	0	2	2	5	11	13	16	13	52	81	38	189
S	0	2	1	1	9	7	21	14	51	52	27	185
SSW	0	2	3	4	11	6	19	25	52	39	4	165
SW	0	0	2	5	9	13	26	43	123	33	5	259
WSW	0	1	3	2	7	16	17	43	96	32	6	223
W	0	0	6	3	11	22	19	33	55	15	7	171
WNW	0	0	8	10	13	15	15	18	31	24	43	177
NW	0	1	5	7	16	10	9	5	19	8	11	91
NNW	2	0	2	5	3	0	3	3	4	3	0	25
Tot	3	30	75	85	187	195	209	258	549	294	141	1986

Hours of Calm	0
Hours of Variable Direction	0
Hours of Valid Data	1986
Hours of Missing Data . . .	16
Hours in Period	8784

Joint Frequency Distribution

Site:: Ginna Primary

Period:: Months Jan - Dec for years 2024 - 2024

Stability Class F Moderately Stable based on Lapse Rate

Elevations:: Winds 250ft Stability 250ft

Wind Direction Sector	Wind Speed Range (mls) <0.50	0.5-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-4.0	4.1-5.0	5.1-6.0	6.1-8.0	8.1-10.0	>10.00	Total
N	0	2	0	1	3	1	2	0	0	0	0	9
NNE	0	1	1	3	2	0	0	0	0	0	0	7
NE	0	2	1	7	6	3	3	1	0	0	0	23
ENE	0	3	8	5	7	9	4	0	1	0	0	37
E	0	2	3	10	22	19	10	9	3	0	0	78
ESE	0	0	7	5	11	13	10	7	13	1	0	67
SE	0	2	5	4	9	5	9	4	8	4	0	50
SSE	0	0	1	4	6	6	8	10	13	2	2	52
S	0	1	1	3	5	10	8	6	10	17	10	71
SSW	0	1	0	0	9	12	10	6	12	24	4	78
SW	0	2	3	5	9	8	16	8	24	5	0	80
WSW	1	0	2	2	5	11	14	20	52	3	0	110
W	0	0	3	1	9	18	15	15	20	2	0	83
WNW	0	5	1	0	5	6	8	3	8	5	7	48
NW	0	0	3	5	6	4	7	3	4	1	0	33
NNW	0	0	1	1	1	1	1	1	0	0	0	6
Tot	1	21	40	56	115	126	125	93	168	64	23	832

Hours of Calm	1
Hours of Variable Direction	0
Hours of Valid Data	833
Hours of Missing Data . . .	16
Hours in Period	8784

Joint Frequency Distribution

Site:: Ginna Primary

Period:: Months Jan - Dec for years 2024 - 2024

Stability Class G Extremely Stable based on Lapse Rate

Elevations:: Winds 250ft Stability 250ft

Wind Direction Sector	Wind Speed Range (m/s) <0.50	0.5-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-4.0	4.1-5.0	5.1-6.0	6.1-8.0	8.1-10.0	>10.00	Total
N	0	0	1	0	1	0	0	0	0	0	0	2
NNE	0	0	0	1	0	1	0	0	0	0	0	2
NE	0	2	0	0	3	0	1	0	0	0	0	6
ENE	0	1	1	2	4	3	2	3	2	0	0	18
E	0	1	1	4	10	11	6	5	2	0	0	40
ESE	0	3	2	2	5	6	5	7	2	0	0	32
SE	0	0	1	5	12	5	6	5	7	1	0	42
SSE	0	2	2	1	7	2	4	4	16	3	0	41
S	0	0	1	2	7	4	14	9	25	10	2	74
SSW	0	0	1	0	5	6	14	25	16	4	1	72
SW	0	1	3	7	2	7	6	11	21	24	0	82
WSW	0	0	2	2	3	6	10	17	23	1	0	64
W	0	3	2	2	4	5	10	18	8	0	0	52
WNW	1	1	0	2	7	6	2	3	2	0	0	24
NW	0	1	1	0	3	2	0	0	1	1	0	9
NNW	0	0	1	3	3	0	0	0	0	0	0	7
Tot	1	15	19	33	76	64	80	107	125	44	3	567

Hours of Calm	0
Hours of Variable Direction	0
Hours of Valid Data	567
Hours of Missing Data . . .	16
Hours in Period	8784

ENCLOSURE 1 (continued)

Appendix B to the ARERR

ANNOTATED COPY OF ODCM, REVISION 37

(one annotation on page 73 of 120 of the procedure)

OFFSITE DOSE CALCULATION MANUAL (ODCM)

R.E. GINNA NUCLEAR POWER PLANT

TABLE OF CONTENTS

1.0 Operability and Surveillance Requirements 4

2.0 Definitions 5

3.0 List of Acronyms 10

4.0 RADIOACTIVE LIQUID EFFLUENTS 12
4.1 Concentration (10 CFR 20) 12
4.2 Dose (10 CFR 50 Appendix I) 14
4.3 Total Dose (40 CFR 190) 16
4.4 Liquid Effluents Release Points 22
4.5 Liquid Effluents Monitor Setpoints 23
4.6 Liquid Effluent Release Concentrations 26
4.7 Liquid Effluent Dose 27

5.0 RADIOACTIVE GASEOUS EFFLUENTS 31
5.1 DELETED 31
5.2 Dose Rate 32
5.3 Dose (10 CFR 50, Appendix I) 34
5.4 Total Dose (40 CFR 190) 38
5.5 Gaseous Effluent Release Points 43
5.6 Gaseous Effluent Monitor Setpoints 44
5.7 Gaseous Effluent Dose Rate 50
5.8 Gaseous Effluent Doses 52

6.0 RADIOACTIVE EFFLUENT MONITORING INSTRUMENTATION 58
6.1 Liquid Effluent Monitors 58
6.2 Gaseous Effluent Monitors 64
6.3 Radiation Accident Monitoring Instrumentation 71
6.4 Area Radiation Monitors 75

7.0 RADWASTE TREATMENT 77
7.1 Liquid Radwaste Treatment System 77
7.2 Gaseous Radwaste Treatment System 80
7.3 Solid Radwaste System 83
7.4 Configuration Changes 84
7.5 Process Control Program 85

8.0 RADIOLOGICAL ENVIRONMENTAL MONITORING 86
8.1 Monitoring Program 86
8.2 Environmental Monitor Sample Locations 92
8.3 Land Use Census 110
8.4 Interlaboratory Comparison Program 112

9.0 REPORTING REQUIREMENTS 113
9.1 Annual Radiological Environmental Operating Report 113
9.2 Annual Radioactive Effluent Release Report 115
9.3 Special Reports 117

10.0 REFERENCES 119

FIGURES

Figure 7-1 Liquid Radwaste Treatment Systems Effluent Paths and Controls 79
Figure 7-2 Gaseous Radwaste Treatment Systems Effluent Paths and Controls 82
Figure 8-1 Location of Onsite Air Monitors and Dosimeters 96
Figure 8-2 Location of Farms for Milk Samples and Ontario Water District Intake 97
Figure 8-3 Location of Offsite Dosimeters 98
Figure 8-4 Location of Offsite Air Monitors 99

TABLES

Table 4-1 Radioactive Liquid Waste Sampling and Analysis Program 18
Table 5-1 Radioactive Gaseous Waste Sampling and Analysis Program 40
Table 5-2 Meteorological Data and Locations of Receptors for Set point Calculations 48
Table 5-3 Dose Factors to the Child for Noble Gases and Daughters 55
Table 5-4 Dose Parameters for Radionuclides and Radioactive Particulate, Gaseous Effluents 56
Table 5-5 Pathway Dose Factors Due to Radionuclides Other Than Noble Gases 57
Table 6.1-1 Radioactive Liquid Effluent Monitoring Instrumentation 60
Table 6.1-2 Radioactive Liquid Effluent Monitoring SURVEILLANCE REQUIREMENTS 62
Table 6.2-1 Radioactive Gaseous Effluent Monitoring Instrumentation 66
Table 6.2-2 Radioactive Gaseous Effluent Monitoring SURVEILLANCE REQUIREMENTS .. 69
Table 6.3-1 Radiation Accident Monitoring Instrumentation 72
Table 6.3-2 Radiation Accident Monitoring SURVEILLANCE REQUIREMENTS 74
Table 6-4 Area Radiation Monitor SURVEILLANCE REQUIREMENTS 76
Table 8-1 Radiological Environmental Monitoring Program 88
Table 8-2 Location, Direction, and Distances to Sample Points 93
Table 8-3 Detection Capabilities for Environmental Sample Analysis Lower Limit of Detection (LLD) 100
Table 8-4 Reporting Levels for Radioactivity Concentrations in Environmental Samples .. 102
Table 8-5 D/Q and X/Q 5 year Average 2011-2015 Plant Vent 104
Table 8-6 D/Q and X/Q 5 year Average 2011-2015 Containment Vent 106
Table 8-7 D/Q and X/Q 5 year Average 2011-2015 Air Ejector Vent 108
Table 9-1 Radiological Environmental Monitoring Program Summary 118

1.0 OPERABILITY and SURVEILLANCE REQUIREMENTS

The OPERABILITY requirements in this manual follow the same LCO applicabilities as the Improved Technical Specifications with the exception of:

a. LCO 3.0.3 which relates to the failure to meet a Required Action and the associated plant shutdown actions;
b. LCO 3.0.4 which relates to changing MODES with inoperable equipment; and
c. LCO 3.0.6 which deals solely with ITS LCOs on support/supported system inoperabilities.

The failure to meet any Required Action for which no additional ACTIONS are provided shall result in continued efforts to meet the specified Required Action. A plant shutdown to exit the MODE of Applicability is not required unless directed by plant management. This does not endorse the practice of failing to meet specified Required Actions.
The SURVEILLANCE REQUIREMENTS in this manual follow the same SR applicabilities as the Improved Technical Specifications with the exception of:

a. SR 3.0.4 which relates to changing MODES with incomplete surveillances.

2.0 DEFINITIONS

The defined terms of this section appear in capitalized type and are applicable throughout these controls. Terms used in these controls and not defined herein have the same definition as listed in the Technical Specifications and/or the Technical Requirements Manual. If a conflict in definition exists, the definition in the Technical Specifications takes precedence.

2.1 ACTION

ACTION shall be that part of a Control that prescribes required actions to be taken under designated conditions, within specified completion times.

2.2 CHANNEL CALIBRATION

A CHANNEL CALIBRATION shall be the adjustment, as necessary, of the channel such that it responds within the required range and accuracy to known values of input. The CHANNEL CALIBRATION shall encompass the entire channel including the sensors and alarm, interlock display, and/or trip functions and may be performed by any series of sequential, overlapping, or total channel steps such that the entire channel is calibrated.

2.3 CHANNEL CHECK

A CHANNEL CHECK shall be the qualitative assessment of channel behavior during operation by observation. This determination shall include, where possible, comparison of the channel indication and/or status with other indications and/or status derived from independent instrument channels measuring the same parameter.

2.4 DOSE EQUIVALENT I-131

DOSE EQUIVALENT I-131 shall be that concentration of I-131 (microCurie/gram) which alone would produce the same thyroid dose as the quantity and isotopic mixture of I-131, I-132, I-133, I-134, and I-135 actually present. The thyroid dose conversion factors used for this calculation shall be those listed in ICRP 30, Supplement to Part 1, Pages 192-212, table entitled, "Committed Dose Equivalent in Target Organs or Tissues per Intake of Unit Activity" (Reference 10).

2.5 FREQUENCY NOTATION

The FREQUENCY NOTATION specified for the performance of Surveillance Requirements shall correspond to the intervals defined as follows:

NOTATION	FREQUENCY
S	At least once per 12 hours
D	At least once per 24 hours
W	At least once per 7 days
M	At least once per 31 days
Q	At least once per 92 days
SA	At least once per 184 days
R	At least once per 18 months
S/U	Prior to each reactor startup
N/A	Not applicable
P	Completed prior to each release
6Y	At least once per 6 years

2.6 FUNCTIONAL TEST

A FUNCTIONAL TEST shall be the injection of a simulated signal into the channel as close to the sensor as practicable to verify OPERABILITY of alarm, interlock display and/or trip functions. The FUNCTIONAL TEST shall include adjustments, as necessary, of the alarm, interlock display and/or Trip Setpoints such that the setpoints are within the required range and accuracy.

2.7 LOWER LIMIT OF DETECTION

The LOWER LIMIT OF DETECTION (LLD) is the smallest concentration of radioactive material in a sample that will yield a net count above system background that will be detected with 95% probability with only 5% probability of falsely concluding that a blank observation represents a "real" signal. The LLD is defined as a *priori* (before the fact) limit representing the capability of a measurement system and not as a *posteriori* (after the fact) limit for a particular measurement, the minimum detectable activity (MDA).

2.8 MEMBER(S) OF THE PUBLIC

MEMBER(S) OF THE PUBLIC shall include all persons who are not occupationally associated with the plant. This category does not include employees of the licensee, its contractors, or vendors. Also excluded from this category are persons who enter the site to service equipment or to make deliveries. This category does include persons who use portions of the site for recreational, occupational, or other purposes not associated with the plant.

2.9 OFFSITE DOSE CALCULATION MANUAL

The OFFSITE DOSE CALCULATION MANUAL (ODCM) shall contain the methodology and parameters used in the calculation of offsite doses resulting

from radioactive gaseous and liquid effluents, in the calculation of gaseous and liquid effluent monitoring Alarm/Trip Setpoints, and in the conduct of the Radiological Environmental Monitoring Program (REMP). The ODCM shall also contain descriptions of the Radioactive Effluent Controls and Radiological Environmental Monitoring Program and descriptions of the information that shall be included in the Annual Radiological Environmental Operating Report and the Annual Radioactive Effluent Release Report, as required by Technical Specification 5.5.1.

2.10 OPERABLE - OPERABILITY

A system, subsystem, train, component, or device shall be OPERABLE or have OPERABILITY when it is capable of performing its specified function(s) and when all necessary attendant instrumentation, controls, electric power, cooling or seal water, lubrication or other auxiliary equipment that are required for the system, subsystem, train, component , or device to perform its function(s) are also capable of performing their related support function(s).

2.11 OPERATIONAL MODE - MODE

An OPERATIONAL MODE (i.e., MODE) shall correspond to any one inclusive combination of core reactivity condition, power level, and average reactor coolant temperature specified in Table 1.1-1 of Technical Specifications.

2.12 PURGE - PURGING

PURGE or PURGING shall be any controlled process of discharging air or gas from a confinement to maintain temperature, pressure, humidity, concentration, or other operating condition, in such a manner that replacement air or gas is required to purify the confinement.

2.13 RATED THERMAL POWER (RTP)

RTP shall be a total reactor core heat transfer rate to the reactor coolant of 1775 MWt.

2.14 SITE BOUNDARY

The SITE BOUNDARY shall be that line beyond which the land is neither owned, nor leased, nor otherwise controlled by the licensee.

2.15 SOURCE CHECK

A SOURCE CHECK shall be the qualitative assessment of channel response when the channel sensor is exposed to a source of increased radioactivity.

2.16 SURVEILLANCE REQUIREMENT

SURVEILLANCE REQUIREMENTS shall be met during the OPERATIONAL MODES or other conditions specified for individual CONTROLS unless otherwise stated in an individual SURVEILLANCE REQUIREMENT. Each SURVEILLANCE REQUIREMENT shall be performed within the specified time interval with:

1. A maximum allowable extension not to exceed 25% of the surveillance interval, but
2. The combined time interval for any three consecutive surveillance intervals shall not exceed 3.25 times the specified surveillance interval.

2.17 THERMAL POWER

THERMAL POWER shall be the total reactor core heat transfer rate to the reactor coolant.

2.18 UNRESTRICTED AREA

An UNRESTRICTED AREA shall be any area at or beyond the SITE BOUNDARY access to which is not controlled by the licensee for purposes of protection of individuals from exposure to radiation and radioactive materials, or any area within the SITE BOUNDARY used for residential quarters or for industrial, commercial, institutional, and/or recreational purposes.

2.19 VENTILATION EXHAUST TREATMENT SYSTEM

A VENTILATION EXHAUST TREATMENT SYSTEM shall be any system designed and installed to reduce gaseous radioiodine or radioactive material in particulate form in effluents by passing ventilation or vent exhaust gases through charcoal adsorbers and/or HEPA filters for the purpose of removing iodines or particulates from the gaseous exhaust stream prior to the release to the environment. Such a system is not considered to have any effect on noble gas effluents. Engineered Safety Features Atmospheric Cleanup Systems are not considered to be VENTILATION EXHAUST TREATMENT SYSTEM components.

2.20 VENTING

VENTING shall be the controlled process of discharging air or gas from a confinement to maintain temperature, pressure, humidity, concentration, or other operating condition, in such a manner that replacement air or gas is not provided or required during VENTING. Vent, used in system names, does not imply a venting process.

2.21 WASTE GAS HOLDUP SYSTEM

A WASTE GAS HOLDUP SYSTEM shall be any system designed and installed to reduce radioactive gaseous effluents by collecting Reactor Coolant System offgases and providing for delay or holdup for the purpose of reducing the total radioactivity prior to release to the environment.

3.0 LIST OF ACRONYMS

D	Frequency Notation noting a surveillance frequency requirement of at least once per 24 hours.
D/Q	Deposition parameter
E	East
ENE	East-Northeast
ESE	East-Southeast
HCWT	High Conductivity Waste Tank
ICRP	International Commission on Radiological Protection
LLD	Lower Limit of Detection
M	Frequency Notation noting a surveillance frequency requirement at least once per 31 days.
MDA	Minimum Detectable Activity
N	North
N.A.	Not Applicable
N/A	Not Applicable
NE	Northeast
NIST	National Institute for Standards and Technology
NNE	North-Northeast
NNW	North-Northwest
NW	Northwest
ODCM	Offsite Dose Calculation Manual
P	Frequency Notation noting a surveillance frequency requirement of being performed prior to each release.
PCP	Process Control Program
Q	Frequency Notation noting a surveillance frequency requirement at least once per 92 days.
R	Frequency Notation noting a surveillance frequency requirement at least once per 18 months.

REMP	Radiological Environmental Monitoring Program
RTP	Rated Thermal Power
SA	Frequency Notation noting a surveillance frequency requirement at least once 184 days.
SE	Southeast
S	Frequency Notation noting a surveillance frequency requirement of at least once per 12 hours.
S	South
SSE	South-Southeast
SSW	South-Southwest
S/U	Frequency Notation noting a surveillance frequency requirement of being performed prior to
SW	Southwest
W	Frequency Notation noting a surveillance frequency requirement at least once per 7 days.
W	West
WNW	West-Northwest
WSW	West-Southwest
X/Q	Dispersion parameter
6Y	At least once per 6 years.

4.0 RADIOACTIVE LIQUID EFFLUENTS

4.1 CONCENTRATION (10 CFR 20)

4.1.1 CONTROLS:

1. The release of radioactive liquid effluents shall be such that the concentration in the circulating water discharge does not exceed ten times the concentration values specified in Appendix B, Table 2, Column 2 to 10 CFR Part 20.1001 - 20.2402. For dissolved or entrained noble gases, the total activity due to dissolved or entrained noble gases shall not exceed 2.0E-04 µCi/ml.

4.1.2 APPLICABILITY: At all times.

4.1.3 ACTION:

If the concentration of radioactive material in the circulating water discharge exceeds ten times the concentration values of Appendix B, Table 2, Column 2 of 10 CFR 20, measures shall be initiated to restore the concentration to within these limits immediately.

4.1.4 ACTION:

If the concentration when averaged over one hour exceeds ten times the applicable concentrations specified in Appendix B of 10CFR Part 20, Table 2, Column 2, at the point of entry to receiving waters, submit to the commission a special report within 30 days.

4.1.5 SURVEILLANCE REQUIREMENTS:

1. Radioactive liquid wastes shall be sampled and analyzed according to the sampling and analysis program of Table 4-1. The results of pre-release analyses shall be used with the calculational methods in Section 4.6 to assure that the concentration at the point of release is limited to the values in Section 4.1.1 (Radioactive Liquid Effluents - Controls).

4.1.6 BASES:

This control is provided to ensure that the concentration of radioactive materials released in liquid waste effluents to UNRESTRICTED AREAS will be less than the concentration levels specified in 10 CFR 20, Appendix B, Table 2, Column 2. This limitation provides additional assurance that the levels of radioactive materials in bodies of water in UNRESTRICTED AREAS will result in exposures within (1) the Section II.A design objectives of Appendix I, 10 CFR 50, to a MEMBER OF THE PUBLIC, and (2) the limits of Appendix B, 10 CFR 20, to the population. The concentration limit for dissolved or entrained noble gases is based upon the assumption that Xe-135 is the controlling radioisotope and its MPC in air (submersion) was converted to an equivalent concentration in water using the

methods described in International Commission on Radiological Protection (ICRP) Publication 2.

4.2 DOSE (10 CFR 50 APPENDIX I)

4.2.1 CONTROLS:

1. The dose or dose commitment to a MEMBER OF THE PUBLIC from radioactive materials in liquid effluents released to UNRESTRICTED AREAS shall be limited:

   A. during any calendar quarter to ≤ 1.5 mrem to the total body and to ≤ 5 mrem to any organ, and

   B. during any calendar year to ≤ 3 mrem to the total body and to ≤ 10 mrem to any organ.

4.2.2 APPLICABILITY: At all times.

4.2.3 ACTION:

Whenever the calculated dose resulting from the release of radioactive materials in liquid effluents exceeds any of the above limits, a Special Report shall be submitted to the Commission within thirty days which includes the following information:

1. identification of the cause for exceeding the dose limit;

2. corrective actions taken and/or to be taken to reduce the releases of radioactive material in liquid effluents to assure that subsequent releases will remain within the above limits;

3. The results of the radiological analyses of the nearest public drinking water source, and an evaluation of the radiological impact due to licensee releases on finished drinking water with regard to the requirements of 40 CFR 141, Safe Drinking Water Act.

4.2.4 ACTION:

During any month when the calculated dose to a MEMBER OF THE PUBLIC exceeds 1/48 the annual limit (0.06 mrem to the total body or 0.2 mrem to any organ), projected cumulative dose contributions from liquid effluents shall be determined for that month and at least once every 31 days for the next 3 months.

4.2.5 SURVEILLANCE REQUIREMENTS:

Post-release analyses of samples composited from batch releases shall be performed in accordance with Table 4-1. The results of the post-release analyses shall be used with the calculational methods in Section 1.6 to assure that the dose commitments from liquids are limited to the values in Section 4.2.1 (Dose - Controls).

4.2.6 BASES:

This control is provided to implement the requirements of Sections II.A, III.A, and IV.A of Appendix I, 10 CFR 50. This control implements the guides set forth in Section II.A of Appendix I. The ACTION statements provide the required operating flexibility and at the same time implement the guides set forth in Section IV.A of Appendix I to assure that the releases of radioactive material in liquid effluents to UNRESTRICTED AREAS will be kept "as low as reasonably achievable". Also, with Lake Ontario drinking water supplies potentially affected by plant operations, there is reasonable assurance that the operation of the plant will not result in radionuclide concentrations in the finished drinking water that are in excess of the requirements of 40 CFR 141. The dose calculation methodology and parameters in the ODCM implement the requirements in Section III.A of Appendix I that conformance with the guides of Appendix I be shown by calculational models and data, such that the actual exposure of a MEMBER OF THE PUBLIC appropriate pathways is unlikely to be substantially underestimated. The equations specified in the ODCM for calculating the doses due to the actual release rates of radioactive materials in liquid effluents are consistent with the methodology provided in Regulatory Guide 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR 50, Appendix I", Revision 1, October 1977, and Regulatory Guide 1.113, "Estimating Aquatic Dispersion of Effluents from Accidental and Routine Reactor Releases for the Purpose of Implementing Appendix I", April 1977.

4.3 TOTAL DOSE (40 CFR PART 190)

4.3.1 CONTROLS:

The annual (calendar year) dose or dose commitment to any MEMBER OF THE PUBLIC due to releases of radioactivity and to radiation from uranium fuel cycle sources shall be limited to less than or equal to 25 mrems to the whole body or any organ, except the thyroid, which shall be limited to less than or equal to 75 mrems.

4.3.2 APPLICABILITY: At all times.

4.3.3 ACTION:

With the calculated doses from the release of radioactive materials in liquid effluents exceeding twice the limits of Section 4.2.1 (Dose - Controls), prepare and submit to the Commission within 30 days a Special Report that defines the corrective actions to be taken to reduce subsequent releases to prevent recurrence of exceeding the above limits and include scheduling for achieving conformance with the above limits. Calculations which include direct radiation contributions from the unit and from any radwaste storage shall be performed to determine total dose to a member of the public. This Special Report, as defined in 10 CFR 20.405(c) shall include an analysis that estimates the radiation exposure (dose) to a MEMBER OF THE PUBLIC from uranium fuel cycle sources, including all effluent pathways and direct radiation, for the calendar year that includes the releases covered by this report. It shall also describe levels of radiation and concentrations of radioactive material involved, and the cause of the exposure levels or concentrations. If the estimated dose(s) exceeds the above limits, and if the release condition resulting in violation of 40 CFR 190 has not already been corrected, the Special Report shall include a request for a variance in accordance with the provisions of 40 CFR 190. Submittal of the report is considered a timely request, and a variance is granted until staff action on the request is complete.

4.3.4 SURVEILLANCE REQUIREMENTS:

1. Cumulative dose contributions from liquid and gaseous effluents for the current calendar quarter and the current calendar year shall be determined in accordance with SURVEILLANCE REQUIREMENT S.1.2.1 at least once every 31 days, in accordance with the methodology and parameters of Section 1.7 of the ODCM.

2. Cumulative dose contributions from direct radiation from the unit and from radwaste storage shall be determined from environmental dosimeter data at least quarterly.

4.3.5 BASES:

This control is provided to meet the dose limitations of 40 CFR 190 that have been incorporated into 10 CFR 20 by 46FR18525. The specification requires the

preparation and submittal of a Special Report whenever the calculated doses due to releases of radioactivity and to radiation from uranium fuel cycle sources exceed 25 mrems to the whole body or any organ, except the thyroid, which shall be limited to less than or equal to 75 mrems. It is highly unlikely that the resultant dose to a MEMBER OF THE PUBLIC will exceed the dose limits of 40 CFR 190 if the plant remains within twice the dose design objectives of Appendix I, and if direct radiation doses are kept small. The Special Report will describe a course of action that should result in the limitation of the annual dose to a MEMBER OF THE PUBLIC to within the 40 CFR 190 limits. For the purposes of the Special Report, it may be assumed that the dose contributions from other uranium fuel cycle sources is negligible. If the dose to any MEMBER OF THE PUBLIC is estimated to exceed the requirements of 40 CFR 190, the Special Report with a request for a variance, (provided the release conditions resulting in violation of 40 CFR 190 have not already been corrected), in accordance with the provisions of 40 CFR 190.11 and 10 CFR 20.405c, is considered to be a timely request and fulfills the requirements of 40 CFR 190 until NRC staff action is completed. The variance only relates to the limits of 40 CFR 190, and does not apply in any way to the other requirements for dose limitation of 10 CFR 20, as addressed in Section 4.1.1 (Radioactive Liquid Effluents - Controls) and Section 5.2.1 (Dose Rate - Controls). An individual is not considered a MEMBER OF THE PUBLIC during any period in which he/she is engaged in carrying out any operation that is part of the nuclear fuel cycle.

Table 4-1

Radioactive Liquid Waste Sampling and Analysis Program

Liquid Release Type	Sampling Frequency	Minimum Analysis Frequency	Type of Activity Analysis	Lower Limit of Detection (LLD) (μCi/ml) (a)
Batch Release (b)				
Batch Waste Release Tanks	P Each Batch	P Each Batch	Principal Gamma and I-131	5.0E-07 1.0E-06
	P One Batch/M	M	Dissolved and Entrained Gases (Gamma Emitters)	1.0E-05
	P Each Batch	M Composite (c)	H-3 Gross Alpha	1.0E-05 1.0E-07
	P Each Batch	Q Composite (c)	Sr-89 Sr-90 Fe-55	5.0E-08 1.0E-06
Continuous Release (e)				
Retention Tank	Continuous (e)	W Composite (c)	Principal Gamma and I-131	5.0E-07 1.0E-06
	Continuous (e)	W Composite (c)	Dissolved and Entrained Gasses (Gamma Emitters)	1.0E-05
	Continuous (e)	M Composite (c)	H-3 Gross Alpha	1.0E-05 1.0E-07
	Continuous (e)	Q Composite (c)	Sr-89 Sr-90 Fe-55	5.0E-08 1.0E-06
Service Water (CV Fan and SFP Hx lines)	M or S Grab (f)	M or S Grab (f)	Principal Gamma and I-131	5.0E-07 1.0E-06
	(f)	(f)	Dissolved and Entrained Gasses (Gamma Emitters)	1.0E-05
	(f)	(f)	H-3 Gross Alpha	1.0E-05 1.0E-07
	(f)	(f)	Sr-89 Sr-90 Fe-55	5.0E-08 1.0E-06

Table 4-1

Table Notation

(a) The LLD is the smallest concentration of radioactive material in a sample that will yield a net count above system background that will be detected with 95% probability with only 5% probability of falsely concluding that a blank observation represents a "real" signal. The LLD is defined as an *a priori* (before the fact) limit representing the capability of a measurement system and not as an *a posteriori* (after the fact) limit for a particular measurement, the minimum detectable activity (MDA).

For a particular measurement system (which may include radiochemical separation):

$$LLD \equiv \frac{(4.66)(S_b)}{(Y)(E)(V)(2.22\ E+06)[\exp(-\lambda t)]}$$

Where:

LLD = the lower limit of detection as defined above as µCi per unit mass or volume

S_b = the standard deviation of the background counting rate or of the counting rate of a blank sample as appropriate as counts per disintegration

V = the sample size in units of mass or volume

E = the counting efficiency

Y = the fractional radiochemical yield when applicable 2.22E+06 is the number of disintegrations per minute per µCi

λ = the decay constant

t = the time elapsed since sample time

The value of S_b used in the calculation of the LLD for a particular measurement system shall be based on the actual observed variance of the background counting rate or the counting rate of the blank samples, as appropriate, rather than on an unverified theoretically predicted variance. In calculating the LLD for a radionuclide determined by gamma-ray spectrometry, the background shall include the typical contribution of other radionuclides normally present in the samples. Typical values of E, V, and Y should be used in the calculation.

The background count rate is calculated from the background counts that are determined to be within +/- one FWHM energy band about the energy of the gamma ray peak used for the quantitative analysis for this radionuclide.

(b) A batch release is the discharge of liquid wastes of a discrete volume. Prior to sampling for analysis, each batch shall be isolated then thoroughly mixed according to the following:

- A & B Monitor Tanks shall be mixed by recirculating for at least 2 hours.
- The High Conductivity Waste Tank (HCWT) shall be mixed by running the pump and air blower for at least 10 minutes. HCWT isolation does not include periodic pumpdown of the AVT sample sink sump.
- Steam Generator batch releases during shutdown cannot be adequately mixed by recirculating. A sample shall be taken during mid-release and analyzed.
- The outside Condensate Storage Tank cannot be adequately mixed by recirculating. A sample shall be taken during mid-release and analyzed.
- The sludge lance trailer shall be mixed by recirculating for at least 30 minutes.

(c) A composite sample is one in which the quantity of liquid sampled is proportional to the quantity of liquid waste discharged and in which the method of sampling employed results in a specimen which is representative of the liquids released. Decay corrections are calculated from the midpoint of the sampling period.

(d) The principal gamma emitters for which the LLD specification will apply are exclusively the following radionuclides:

Mn-54, Fe-59, Co-58, Co-60, Zn-65, Cs-134, Cs-137 and Ce-141 (Ce-141 shall be measured to a LLD of 5.0E-06).

This list does not mean that only these nuclides are to be detected and reported. Other nuclides which are measurable and identifiable, together with the above nuclides, shall also be identified and reported. Nuclides which are below the LLD for the analyses should be reported as less than the LLD and should not be reported as being present at the LLD level. The less than values should not be used in the required dose calculations.

(e) A continuous release is the discharge of liquid wastes of a non-discrete volume; e.g., from a volume or system that has an input flow during the continuous release. Decay corrections will be calculated based on all samples collected during the release.

(f) Service water samples shall be taken and analyzed once per 12 hours if alarm setpoint is reached on continuous monitor. Service water sample frequency for H-3, gross alpha, Sr-89, Sr-90, and Fe-55 will be increased to produce a composite whenever principal gamma emitters are detected. The analysis frequency will be monthly for H-3 and gross alpha, and quarterly for Sr-89, Sr-90, and Fe-55 whenever principal gamma emitters are detected.

4.4 LIQUID EFFLUENTS RELEASE POINTS

There are three normal release points for liquid radioactive effluents from the plant that empty into the discharge canal. These are the Radwaste Treatment Discharge, Retention Tank discharge and the All Volatile Treatment Discharge. Each of these is a monitored release line that can be isolated before the release reaches the discharge canal. There is also a release point for the service water lines used for cooling the heat exchangers that is a monitored release line but is not isolatable. If there is an alarm on the service water monitor, it is necessary to sample each heat exchanger separately to determine which has a leak and then isolate the affected heat exchanger. The pressure of the service water system flow would normally force water from the clean service water side into the contaminated side of the heat exchanger. Dilution of liquid effluent is provided by the discharge canal. The discharge canal flow is nominally 1.7E+05 gpm for each circulating water pump. During operating periods, two circulating water pumps are in operation. During shutdown periods, one circulating water pump is operated. If neither circulating water pump is operable, dilution is provided by operation of one to three service water pumps which provide nominally 5.3E+03 gpm each.

4.5 LIQUID EFFLUENTS MONITOR SETPOINTS

Alarm and/or trip setpoints for radiation monitors on each liquid effluent line are required. Precautions, limitations and setpoints applicable to the operation of Ginna Station liquid effluent monitors are provided in plant procedure P-9 *RADIATION MONITORING SYSTEM*. Setpoint values are calculated to assure that alarm and trip actions occur prior to exceeding ten times the effluent concentration of Appendix B, Table 2, Column 2 of 10 CFR 20.1001 - 20.2402 at the release point to the unrestricted area. For added conservatism, liquid effluent release rates are administratively set so that only fractions of the applicable maximum effluent concentrations can be reached in the discharge canal.

The Calculated alarm and trip action setpoints for each radioactive liquid effluent line monitor and flow determination must satisfy the following equation:

$$\frac{cf}{F+f} \leq C$$

Equation (1)

Where:

C = the effluent concentration which implements ten times 10 CFR 20 limit for unrestricted areas, in µCi/ml.

c = the setpoint of the radioactivity monitor measuring the radioactivity concentration in the discharge line prior to dilution and subsequent release, in µCi/ml.

F = the dilution water flow as determined prior to the release point, in volume per unit time.

f = the liquid waste flow as measured at the discharge point, in volume per unit time, in the same units as F.

Liquid effluent batch releases from Ginna Station are discharged through a liquid waste disposal monitor. The liquid waste stream (f) is diluted by (F) in the plant discharge canal before it enters Lake Ontario.

The limiting batch release concentration (c) corresponding to the liquid waste monitor setpoint is calculated from the above expression. Since the value of (f) is very small in comparison to (F), and tritium cannot be accounted for, the expression becomes:

$$c \leq \frac{CF}{f} \times 0.4\ (1 - TCF)$$

Equation (2)

Where:

C = 10 x the allowable concentration of Cs-137 as given in Appendix B, Table 2, Column 2 of 10 CFR 20, 1 x 10^{-5}. This value is normally more restrictive than the calculated mixed isotopic release concentration. A weighted average, excluding Sb-125, from 1998 data indicated a release concentration of 1.15 x 10^{-5} µCi/ml. (See DA-RP-99-078). This should be reviewed as an annual basis, and the more conservative value between the two be utilized.

F = the dilution flow assuming operation of only 1 circulating water pump (170,000 gpm).

c = the limiting batch release concentration corresponding to the liquid monitor setpoint

f = the maximum waste effluent discharge rate through the designated pathway.

0.4 = a conservatism based on the possibility of 2 liquid discharges occurring simultaneously, minus 0.2 (Total Instrumental Uncertainty)
eg: (limit - 0.2 TIU/2)

TCF = the Tritium Correction Factor, based on the maximum concentration of diluted RCS H-3, divided by H-3 E.C.L. The maximum UFSAR RCS tritium concentration is 3.5 µCi/ml. The monitor setpoint against gamma emitters must be reduced proportional to the ratio of tritium in the waste stream, to which the monitor will not respond.

The limiting release concentration (c) is then converted to a set-point count rate by the use of the monitor calibration factor determined per the individual monitor calibration procedure. The expression becomes:

$$Setpoint\ (cpm) = \frac{c\ (\mu Ci/ml)}{Cal\ Factor\ (\mu Ci/ml/cpm)}$$

Equation (3)

Example (Liquid Radwaste Monitor R-18):

Assuming, for example, that the maximum pump effluent discharge rate (f) is 90 gpm and the RCS tritium concentration is 3 µCi/ml, then the limiting batch release concentration (c) would be determined as follows:

$$c\ (\mu Ci/ml) \leq \frac{1.E-05\ (\mu Ci/ml) \times 170{,}000\ (gpm)}{90\ gpm} \times 0.4 \times \left[1 - \frac{\frac{3}{1890}}{1E-2}\right]$$

$$c \leq 6.39E-3\ (\mu Ci/ml)$$

The monitor R-18 alarm and trip setpoint (in cpm) is then determined utilizing the monitor calibration factor calculated in plant procedure CPI-MON-R18. Assuming a calibration factor of

$$1.2E-9\ \frac{(\mu Ci/ml)}{cpm}$$

and a limiting batch release concentration determined above, the alarm and trip setpoint for monitor R-18 would be:

$$\frac{6.39E-3\ (\mu Ci/ml)}{1.2E-9\ \frac{\mu Ci/ml}{cpm}} = 5.33E+05\ cpm \qquad above\ background$$

The setpoint values for the containment Fan Cooler monitor (R-16), Spent Fuel Pit Heat Exchanger Service Water Monitors (R-20A and R-20B), Steam Generator Blowdown Monitor

(R-19), the Retention Tank Monitor (R-21, and the All volatile Treatment Waste Discharge Monitor (R-22) are calculated in a similar manner using equation (2), substituting appropriate values of (f) and the corresponding calibration factor.

Effluent Monitor Warning alarm setpoints are set at one-half of the trip setpoint. With all calculations equal this is a warning that 20% of the release limit has been reached at a single release point.

4.6 LIQUID EFFLUENT RELEASE CONCENTRATIONS

Liquid batch releases are controlled individually and each batch release is authorized based upon sample analysis and the existing dilution flow in the discharge canal. Plant procedures establish the methods for sampling and analysis of each batch prior to release. A release rate limit is calculated for each batch based upon analysis, dilution flow and all procedural conditions being met before it is authorized for release. The waste effluent stream entering the discharge canal is continuously monitored and the release will be automatically terminated if the preselected monitor setpoint is exceeded. A release may continue subject to grab sample analysis and monitoring in accordance with Table 6.1-1.

The equation used to calculate activity is:

Gamma Spectroscopy

$$\frac{\mu Ci}{g}_{mAct.} \equiv \frac{\text{peak area counts - background counts}}{(C\ Time)(Eff)(Vol)(Decay)(3.7\ E+04)}$$

Equation (4)

4.7 LIQUID EFFLUENT DOSE

The dose contribution received by the maximally exposed individual from the ingestion of Lake Ontario fish and drinking water is determined using the following methodology. These calculations will assume a near field dilution factor of 1.0 in evaluating the fish pathway dose, and an average annual dilution factor of 200 between the plant discharge and the Ontario Water District drinking water intake located approximately 2220 meters northeast (53 degrees) of the discharge canal. The average annual dilution factor of 200 was derived from the drift and dispersion study documented in reference 10.4.

Dose contributions from shoreline recreation, boating and swimming have been shown to be negligible in the Appendix I dose analysis, reference 10.5, and do not need to be routinely evaluated. Shoreline sediment samples downstream from the plant will be collected at least semi-annually for the Radiological Environmental Monitoring Program, as a conservatism. Presence of radioactivity above background will result in calculation of dose contribution from these pathways. There is no known human consumption of shellfish from Lake Ontario; therefore, this pathway is not taken into consideration in dose calculations.

The dose contribution to an individual will be determined to ensure that it complies with the specification of Section 4.2.1 (Dose - Controls). Offsite receptor doses will be determined for the limiting age group and organ, unless census data show that actual offsite individuals are the limiting age group.

The following expression is used to calculate ingestion pathway dose contributions for the total release period from all radionuclides identified in liquid effluents released to unrestricted areas:

$$D_\tau \equiv \sum_i \left[A_{i\tau} \sum_j \Delta t_j \, C_{ij} F_j \right]$$

Equation (5)

Where:

D_τ = the cumulative dose commitment to the total body or any organ, t, from the liquid effluents for the summation of the total time period in mrem.

$\sum_i$ *is for total number of hours of release.*

Δt_j = the length of the jth time period over which C_{ij} and F_j are averaged for all liquid releases in hours.

C_{ij} = the average concentration of radionuclide i in undiluted liquid effluent during time period t_j from any liquid release in µCi/ml.

$A_{i\tau}$ = the site-related ingestion dose commitment factor to the total body or any organ, τ, for each identified principal gamma and beta emitter in mrem/hr per µCi/ml. See equation (6).

F_j = the discharge canal dilution factor for C_{ij} during any liquid effluent release, defined as the ratio of the maximum undiluted liquid waste flow during release to unrestricted receiving waters. The dilution factor will depend on the number of circulation pumps operating and, during icing conditions, the percentage opening of the recirculating gate. Reference curves are presented in plant procedure CH-RETS-LIQ-RELEASE.

$$A_{i\tau} = k_o \left(U_w / D_w + U_F \; BF_i\right) DF_{i\tau}$$

Equation (6)

Where:

$A_{i\tau}$ = the site-related ingestion dose commitment factor to the total body or to any organ, τ, for each identified principal gamma and beta emitter in mrem/hr per µCi/ml.

k_o = the units conversion factor, 1.14E+05 = 1.0E+06 pCi/µCi x 1.0E+03 ml/kg ÷ 8760 hr/yr

U_W = a receptor person's water consumption by age group from Table E-5 of Regulatory Guide 1.109

D_W = the dilution factor from the near field area of the release point to potable water intake. The site specific dilution factor is 200. This factor is 1.0 for the fish ingestion pathway.

U_F = a receptor person's fish consumption by age group from Table E-5 of Regulatory Guide 1.109

BF_i = a bioaccumulation factor for nuclide, i, in fish in pCi/kg per pCi/L, from Table A-1 of Regulatory Guide 1.109

$DF_{i\tau}$ is the dose conversion factor for the ingestion of nuclide, i, for a receptor person in pre-selected organ, t, in mrem/pCi, from Tables E-11, E-12, E-13, E-14 of Regulatory Guide 1.109

The monthly dose contribution from releases for which radionuclide concentrations are determined by periodic composite sample analysis may be approximated by assuming an average monthly concentration based on the previous monthly or quarterly composite analysis. However, in the Annual Radioactive Effluent Release Report the calculated dose contributions from these radionuclides shall be based on the actual composite analysis.

Example:

Computing the dose to the whole body via the fish and drinking water pathways, assuming an initial Cs-137 discharge concentration of 3.0E-04 µCi/ml:

Given the following discharge factors for example, where:

Δt_i = 1 hour, the duration of the release

C_{ij} = 3.0E-04 µCi/ml

F_j = $\frac{\text{liquid waste flow}}{\text{(dilution flow)(z)}} = \frac{20 \text{ gpm}}{170{,}000 \text{ gpm}} = 1.2\text{E-}04$

z = Near field dilution = 1.0 for Ginna

D_W = 200

and, taking the following values from Regulatory Guide 1.109 which concern the critical receptor, which is considered to be the child in this case:

U_W = 510 l/year

U_F = 6.9 kg/year

BF_i = 2000 pCi/kg per pCi/l

DF_i = 4.62E-05 mrem/pCi

Then, the site-related ingestion dose commitment factor, $A_{i\tau}$, is calculated as follows:

$$A_{i,T}\ \frac{mrem/hr}{\mu Ci/ml} \equiv k_o\ (U_W/D_W + U_F\ BF_i)\ DF_i$$

$$\equiv 1.14\ E+05\ [\frac{510}{200} + (6.9)(2000)]4.62\ E-05$$

$$A_{i,T} \equiv 7.27\ E+04\ mrem/hr\ per\ \mu Ci/ml$$

And, the whole body dose to the child is then:

$$D_T\ mrem = (A_{i,T})\ (\Delta t_j)\ (C_j)\ (F_j)$$

$$\equiv (7.27\ E+04)(1)(3.0\ E-04)(1.2\ E-04)$$

$$D_T \equiv 2.6\ E-03\ mrem\ to\ the\ whole\ body\ from\ Cs-137$$

The dose contribution from any other isotopes would then need to be calculated and all the isotopic contributions summed.

5.0 RADIOACTIVE GASEOUS EFFLUENTS

5.1 DELETED

5.2 DOSE RATE

5.2.1 CONTROLS

The instantaneous dose rate due to radioactive materials released in gaseous effluents from the site to areas at or beyond the SITE BOUNDARY shall be limited to the following values:

1. The dose rate for noble gases shall be ≤ 500 mrem/yr to the total body and ≤ 3000 mrem/yr to the skin, and

2. The dose rate for I-131, I-133, tritium, and for all radioactive materials in particulate form with half-lives greater than 8 days shall be ≤ 1500 mrem/yr to any organ.

5.2.2 APPLICABILITY: At all times.

Note: For unplanned release of gaseous wastes, compliance with Section 5.2.1 (Dose Rate - Controls) may be calculated using annual average X/Q. Compliance with Section 5.2.1 (Dose Rate - Controls) shall be determined by considering the applicable ventilation system flow rates. These flow rates shall be determined at the frequency required by Table 6.2-2.

5.2.3 ACTION:

If the calculated dose rate of radioactive materials released in gaseous effluents from the site exceeds the limits of Section 5.2.1 (Dose Rate - Controls), measures shall be initiated to restore releases to within limits. The effluent continuous monitors listed in Table 6.2-1 that have provisions for the automatic termination of gas decay tank, shutdown purge or mini-purge releases, shall be used to limit releases within the values established in Section 5.2.1 (Dose Rate - Controls) when monitor setpoint values are exceeded.

5.2.4 SURVEILLANCE REQUIREMENTS:

1. The dose rate due to noble gases in gaseous effluents shall be determined to be within the above limits in accordance with the methodology and parameters of Section 5.7 of the ODCM.

2. The dose rate due to radioactive materials, other than noble gases, in gaseous effluents shall be determined to be within the above limits in accordance with the methodology and parameters of Section 5.7 of the ODCM by obtaining representative samples and performing analyses in accordance with the sampling and analysis program specified in Table 5-1.

5.2.5 BASES:

This control is provided to ensure that the dose at any time at and beyond the SITE BOUNDARY from gaseous effluents will be within the annual dose limits of 10 CFR 20, Appendix B, Table 2, Column 1. These limits provide reasonable assurance that radioactive material discharged in gaseous effluents will not result in the exposure of a MEMBER OF THE PUBLIC in an UNRESTRICTED AREA, either within or outside the SITE BOUNDARY, to annual average concentrations exceeding the limits specified in Appendix B, Table 2 of 10 CFR 20. For MEMBERS OF THE PUBLIC who may at times be within the SITE BOUNDARY, the occupancy of the MEMBER OF THE PUBLIC will usually be sufficiently low to compensate for any increase in the atmospheric diffusion factor above that for the SITE BOUNDARY. Examples of calculations for such MEMBERS OF THE PUBLIC, with the appropriate occupancy factors, shall be given in the ODCM. The specified release rate limits restrict, at all times, the corresponding gamma and beta dose rates above background to a MEMBER OF THE PUBLIC at or beyond the SITE BOUNDARY to less than or equal to 500 mrems/year to the whole body or to less than or equal to 3000 mrems/year to the skin. These release rate limits also restrict, at all times, the corresponding thyroid dose rate above background to a child via the inhalation pathway to less than or equal to 1500 mrems/year.

5.3 DOSE (10 CFR 50, Appendix I)

5.3.1 CONTROLS:

The dose due to noble gases released in gaseous effluents to areas at or beyond the SITE BOUNDARY shall be limited to the following:

1. During any calendar quarter to ≤5 mrad for gamma radiation and to ≤10 mrad for beta radiation.

2. During any calendar year to ≤10 mrad for gamma radiation and to ≤20 mrad for beta radiation.

5.3.2 APPLICABILITY: At all times

5.3.3 ACTION:

Whenever the calculated dose to a MEMBER OF THE PUBLIC resulting from noble gases exceeds the limits of Section 5.3.1 (Dose - Controls), a Special Report shall be submitted to the Commission within 30 days which includes the following information:

1. Identification of the cause for exceeding the dose limit.

2. Corrective actions taken and/or to be taken to reduce releases of radioactive material in gaseous effluents to assure that subsequent releases will be within the above limits.

5.3.4 ACTION:

During any month when the calculated dose to a MEMBER OF THE PUBLIC exceeds 1/48th the annual limits of Section 5.3.1 (Dose - Controls), (0.2 mrad gamma or 0.4 mrad beta), projected cumulative dose contributions from gaseous effluents shall be determined for that month and at least once every 31 days for the next 3 months.

5.3.5 SURVEILLANCE REQUIREMENTS:

Cumulative dose contributions for the current calendar quarter and current calendar year for noble gases shall be determined in accordance with the methodology and parameters of Section 2.8 of the ODCM at least once every 31 days.

5.3.6 BASES:

This control is provided to implement the requirements of Sections II.B, III.A, and IV.A of Appendix I, 10 CFR 50. The control implements the guides set forth in Section I.B of Appendix I. The ACTION statements provide the required operating

flexibility and at the same time implement the guides set forth in Section IV.A of Appendix I to assure that the release of radioactive material in gaseous effluents to UNRESTRICTED AREAS will be kept "as low as reasonably achievable". The SURVEILLANCE REQUIREMENTS implement the requirements in Section III.A of Appendix I that conformance with the guides of Appendix I be shown by calculational procedures based on models and data such that the actual exposure of a MEMBER OF THE PUBLIC through appropriate pathways is unlikely to be substantially underestimated. The dose calculation methodology and parameters established in the ODCM for calculating the doses due to the actual release rates of radioactive noble gases in gaseous effluents are consistent with the methodology provided in Regulatory Guide 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR 50, Appendix I", Revision I, October 1977 and Regulatory Guide 1.111, "Methods for Estimating Atmospheric Dispersion of Gaseous Effluents in Routine Releases from Light-Water Cooled Reactors", Revision I, July 1977. The ODCM equations for determining air doses at the SITE BOUNDARY are based on historical average atmospheric conditions.

5.3.7 CONTROLS:

The dose to a MEMBER OF THE PUBLIC from I-131, I-133, tritium, and for all radioactive materials in particulate form with half-lives greater than eight days released with gaseous effluents from the site shall be limited to the following:

1. during any calendar quarter to ≤ 7.5 mrem to any organ.

2. during any calendar year to ≤ 15 mrem to any organ.

5.3.8 APPLICABILITY: At all times.

5.3.9 ACTION:

Whenever the calculated dose to a MEMBER OF THE PUBLIC resulting from radionuclides other than noble gases exceeds the limits of Section 5.3.7 (Controls), a Special Report shall be submitted to the Commission within 30 days which includes the following information:

1. Identification of the cause for exceeding the dose limit.

2. Corrective actions taken and/or to be taken to reduce releases of radioactive material in gaseous effluents to assure that subsequent releases will be within the above limits.

5.3.10 ACTION:

During any month when the calculated dose to a MEMBER OF THE PUBLIC exceeds 1/48th the annual limit of Section 5.3.7 (Controls), (0.3 mrem), projected

cumulative dose contributions from gaseous effluents shall be determined for that month and at least once every 31 days for the next 3 months.

5.3.11 SURVEILLANCE REQUIREMENTS

Cumulative dose contributions for the current calendar quarter and current calendar year for Iodine-131, Iodine-133, tritium, and radionuclides in particulate form with half-lives greater than 8 days shall be determined in accordance with methodology and parameters of Section 5.8 of the ODCM at least once every 31 days.

5.3.12 BASES:

This control is provided to implement the requirements of Sections II.C, III.A, and IV.A of Appendix I, 10 CFR 50. The control implements the guides set forth in Section II.C of Appendix I. The ACTION statements provide the required operating flexibility and at the same time implement the guides set forth in Section IV.A of Appendix I to assure that the release of radioactive material in gaseous effluents to UNRESTRICTED AREAS will be kept "as low as reasonably achievable". The SURVEILLANCE REQUIREMENTS implement the requirements in Section III.A of Appendix I that conformance with the guides of Appendix I be shown by calculational procedures based on models and data such that the actual exposure of a MEMBER OF THE PUBLIC through appropriate pathways is unlikely to be substantially underestimated. The dose calculation methodology and parameters established in the ODCM for calculating the doses due to the actual release rates of the subject materials in gaseous effluents are consistent with the methodology provided in Regulatory Guide 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR 50, Appendix I", Revision I, October 1977 and Regulatory Guide 1.111, "Methods for Estimating Atmospheric Dispersion of Gaseous Effluents in Routine Releases from Light-Water Cooled Reactors", Revision I, July 1977. These equations also provide for determining the actual doses based upon the historical average atmospheric conditions. The release rate controls for Iodine-131, Iodine-133, tritium, and radionuclides in particulate form with half-lives greater than 8 days are dependent upon the existing radionuclide pathways to man in the areas at or beyond the SITE BOUNDARY. The pathways examined in development of the calculations were:

1. Individual inhalation of airborne radionuclides
2. Deposition of radionuclides onto green leafy vegetation with subsequent consumption by man
3. Deposition of radionuclides onto grassy areas where milk animals and meat producing animals graze, followed by human consumption of that milk and meat

4. Deposition of radionuclides on the ground followed by subsequent human exposure

5.4 TOTAL DOSE (40 CFR 190)

5.4.1 CONTROLS:

The annual (calendar year) dose or dose commitment to any MEMBER OF THE PUBLIC due to releases of radioactivity and to radiation from uranium fuel cycle sources shall be limited to less than or equal to 25 mrems to the whole body or any organ, except the thyroid, which shall be limited to less than or equal to 75 mrems.

5.4.2 APPLICABILITY: At all times.

5.4.3 ACTION:

With the calculated doses from the release of radioactive materials in gaseous effluents exceeding twice the limits of Sections 5.3.1 and 5.3.7 (Controls), prepare and submit to the Commission within 30 days a Special Report that defines the corrective actions to be taken to reduce subsequent releases to prevent recurrence of exceeding the above limits and include scheduling for achieving conformance with the above limits. Calculations which include direct radiation contributions from the unit and from any radwaste storage shall be performed to determine total dose to a MEMBER OF THE PUBLIC. This Special Report, as defined in 10 CFR 20.405(c) shall include an analysis that estimates the radiation exposure (dose) to a MEMBER OF THE PUBLIC from uranium fuel cycle sources, including all effluent pathways and direct radiation, for the calendar year that includes the releases covered by this report. It shall also describe levels of radiation and concentrations of radioactive material involved, and the cause of the exposure levels or concentrations. If the estimated dose(s) exceeds the above limits, and if the release condition resulting in violation of 40 CFR 190 has not already been corrected, the Special Report shall include a request for a variance in accordance with the provisions of 40 CFR 190. Submittal of the report is considered a timely request, and a variance is granted until staff action on the request is complete.

5.4.4 ACTION:

This report shall include an analysis which demonstrates that radiation exposure to all MEMBERS OF THE PUBLIC from the plant are less than the 40 CFR 190 limits. Otherwise, the report shall request a variance from the commission to permit releases to exceed 40 CFR Part 190. Submittal of the report is considered a timely request by the NRC, and a variance is granted until staff action on the request is complete.

5.4.5 SURVEILLANCE REQUIREMENTS:

1. Cumulative dose contributions from liquid and gaseous effluents shall be determined in accordance with Sections 5.3.5 and 5.3.11 (Surveillance Requirements) at least once every 31 days, in accordance with the methodology and parameters of Section 2.8 of the ODCM.

2. Cumulative dose contributions from direct radiation from the unit and from radwaste storage including ISFSI, shall be determined from environmental dosimeter data at least quarterly.

5.4.6 BASES:

This control is provided to meet the dose limitations of 40 CFR 190 that have been incorporated into 10 CFR 20 by 46FR18525. The specification requires the preparation and submittal of a Special Report whenever the calculated doses due to releases of radioactivity and to radiation from uranium fuel cycle sources exceed 25 mrems to the whole body or any organ, except the thyroid, which shall be limited to less than or equal to 75 mrems. It is highly unlikely that the resultant dose to a MEMBER OF THE PUBLIC will exceed the dose limits of 40 CFR 190 if the plant remains within twice the dose design objectives of Appendix I, and if direct radiation doses are kept small. Cumulative direct radiation dose from environmental dosimeters shall be used to ensure that dose limits of 10CFR72.104 are met. The Special Report will describe a course of action that should result in the limitation of the annual dose to a MEMBER OF THE PUBLIC to within the 40 CFR 190 limits. For the purposes of the Special Report, it may be assumed that the dose contributions from other uranium fuel cycle sources is negligible. If the dose to any MEMBER OF THE PUBLIC is estimated to exceed the requirements of 40 CFR 190, the Special Report with a request for a variance, (provided the release conditions resulting in violation of 40 CFR 190 have not already been corrected), in accordance with the provisions of 40 CR 190.11 and 10 CFR 20.405c, is considered to be a timely request and fulfills the requirements of 40 CFR 190 until NRC staff action is completed. The variance only relates to the limits of 40 CFR 190, and does not apply in any way to the other requirements for dose limitation of 10 CFR 20, as addressed in Section 4.1.1 (Radioactive Liquid Effluents - Controls) and Section 5.2.1 (Dose Rate - Controls). An individual is not considered a MEMBER OF THE PUBLIC during any period in which he/she is engaged in carrying out any operation that is part of the nuclear fuel cycle.

Table 5-1

Radioactive Gaseous Waste Sampling and Analysis Program

Gaseous Release Type	Sampling Frequency	Minimum Analysis Frequency	Type of Activity Analysis	Lower Limit of Detection (LLD) (µCi/cc) (a)
Containment Purge	P Each Purge (b,c) Grab Sample	P	Principal Gamma Emitters (e) H-3	1.0E-04 1.0E-06
Auxiliary Building Ventilation	M (b) Grab Sample	M (b)	Principal Gamma Emitters (e) H-3	1.0E-04 1.0E-06
All Release Types as listed above	Continuous (d)	W (b,i) Charcoal ple	I-131 I-133	1.0E-12 1.0E-10
	Continuous (d)	W (b,i) Particulate Sample	Principal Gamma Emitters (e)	1.0E-11
	Continuous (d)	M Composite Particulate Sample	Gross Alpha	1.0E-11
	Continuous (d)	Q Composite Particulate Sample	Sr-89 Sr-90	1.0E-11
Air Ejector	M (b,f) Grab Sample	M (b, f)	Principal Gamma Emitters (e) I-131 (h) H-3 (g)	1.0E-04 1.0E-12 1.0E-06
All Release Types listed above	Continuous (d)	Noble Gas Monitor	Beta or Gamma	1.0E-06
Gas Decay Tank	P Each Tank Grab Sample	P Each Tank	Principal Gamma Emitters (e)	1.0E-04

Table 5-1

Table Notation

(a) The lower limit of detection (LLD) is defined in Table Notation (a) of Table 4-1.

(b) Analyses shall also be performed when the monitor on the continuous sampler reaches its setpoint.

(c) Tritium grab samples shall be taken at least three times per week when the reactor cavity is flooded.

(d) The ratio of the sample flow rate to the sampled stream flow rate shall be known for the time period covered by each dose or dose rate calculation made in accordance with Sections 5.2.1, 5.3.1, and 5.3.7 (Controls).

(e) The principal gamma emitters for which the LLD specification will apply are exclusively the following radionuclides:

- Kr-85m, Xe-133, Xe-133m and Xe-135 for gaseous emissions
- I-131, Mn-54, Fe-59, Co-58, Co-60, Zn-65, Mo-99, Cs-134, Cs-137, Ce-141 and Ce-144 for particulate emissions.

This list does not mean that only these nuclides are to be detected and reported. Other nuclides which are measurable and identifiable, together with the above nuclides, shall also be identified and reported. Nuclides which are below the LLD for the analyses should not be reported as being present at the LLD level for that nuclide. When unusual circumstances result in LLDs higher than required, the reasons shall be documented in the Annual Radioactive Effluent Release Report.

(f) Air ejector samples are not required during cold or refueling shutdowns.

(g) Air ejector tritium sample is not required if the secondary coolant activity is less than 1.0E-04 µCi/gm.

(h) Air ejector iodine samples shall be taken and analyzed weekly if the secondary coolant activity exceeds 1.0E-04 µCi/gm.

(i) Analyses shall be completed within 48 hours after changing, or after removal from sampler. Sampling shall also be performed at least once per 24 hours for at least 7 days following each shutdown, startup, or THERMAL POWER change exceeding 15% RATED THERMAL POWER within a 1-hour period and analyses shall be completed within 48 hours of changing. When samples collected for 24 hours are analyzed, the corresponding LLDs may be increased by a factor of 10. This requirement for increased sample frequency does not apply if: (1) analysis shows that the DOSE EQUIVALENT I-131 concentration in the reactor coolant has not increased more than a factor of 3; and (2) the noble gas monitor shows that effluent

activity has not increased more than a factor of 3.

5.5 GASEOUS EFFLUENT RELEASE POINTS

There are three release points continuously monitored for noble gases, containment vent, plant vent and air ejector. The containment vent and plant vent are also continuously monitored for radioiodines and particulates. Since the air ejector is a steam release point, continuous radioiodine and particulate monitoring is not required when the secondary coolant activity is less than 1.0E-04 µCi/gm. Flow rates through the vents are measured periodically. During shutdown, temporary trailers may be brought on site that also require monitoring and characterization of their releases, such as the CO_2 decon trailer.

Quarterly plant measurements of one week duration for the particulate and iodine released in the steam by the air ejector demonstrate that sampling this pathway for particulate and iodine is not necessary since these releases are less than 0.1% of the Plant Vent. The releases are correlated to blowdown activity for determining activity in steam releases. During shutdown and startup, special systems are in use that may release small amounts of radioactivity in steam releases. This is accounted for by using operational data and activity in the source of the steam. Grab samples are obtained when practicable.

If an unmonitored release point is identified, a calculation is performed to determine the radioactivity that is released. The calculation includes a conservative estimate of source term if sample data is not available, and a conservative estimate of flow rate and duration if measurement of flow and duration are not available. If the release is continuous, it is included in the monthly report that accounts for releases from the site for calculating doses to the general public.

5.6 GASEOUS EFFLUENT MONITOR SETPOINTS

Alarm and/or trip setpoints for specified radiation monitors are required on each noble gas effluent line from the plant. Precautions, limitations and setpoints applicable to the operation of Ginna Station gaseous effluent monitors are provided in plant procedure P-9. Setpoints are conservatively established for each ventilation noble gas monitor so that dose rates in unrestricted areas corresponding to 10 CFR Part 50 Appendix I limits will not be exceeded. Setpoints shall be determined so that dose rates from releases of noble gases will comply with Section 5.2.1 (Dose Rate - Controls).(1). Table 5-2 provides the gaseous and particulate meteorological assumption used in development of the P-9 setpoints.

The calculated alarm and trip action setpoints for each radioactive gaseous effluent monitor must satisfy the following equation:

$$c_v \leq \frac{\sum_i Q_{iv}}{(f)(k)(K)}$$

Equation (7)

Where:

c_V = setpoint in cpm
Q_{iV} = release rate limit by specific nuclide (i) in µCi/sec from vent (v)
f = discharge flow rate in cfm
k = units conversion factor in cc/sec/cfm
K = calibration factor in µCi/cc/cpm]

The general methodology for establishing plant ventilation monitor setpoints is based upon a vent concentration limit in µCi/cc derived from site specific meteorology and vent release characteristics.

Additional radiation monitor alarm and/or trip setpoints are calculated for radiation monitors measuring radioiodines, radioactive materials in particulate form and to radionuclides other than noble gases. Setpoints are determined to assure that dose rates from the release of these effluents shall comply with Section 5.2.1 (Dose Rate - Controls)(2)

The release rate limit for noble gases shall be calculated by the following equation for total body dose:

$$Q_v\ [uCi/sec] \le \sum_i Q_{iv} \frac{500\ mrem/yr}{(X/Q)_v \sum_i K_i Q_{iv}}$$

Equation (8)

Note: An occupancy factor of 1 is assumed. This may be modified following reviews of the area in question and by the following equation for skin doses:

$$Q_v\ [uCi/sec] \le \sum_i Q_{iv} \frac{3000\ mrem/yr}{(X/Q)_v \sum_i (L_i + 1.1\,M_i)\ Q_{iv}}$$

Equation (9)

Where:

Q_{iV} = the release rate of radionuclide (i) from vent (v) which results in a dose rate of 500 mrem/yr to the whole body or 3000 mrem/yr to the skin of the critical receptor in µCi/ sec.

K_i = the total body dose factor due to gamma emissions for each identified noble gas radionuclide in mrem/yr per µCi/m^3 from Table 5-3.

L_i = the skin dose factor due to beta emissions for each identified noble gas radionuclide in mrem/yr per µCi/m^3 from Table 5-3.

M_i = the air dose factor due to gamma emissions for each identified noble gas radionuclide in mrad/yr per µCi/m^3 from Table 5-3. Unit conversion constant of 1.1 mrem/mrad converts air dose to skin dose.

$(X/Q)_V$ = the highest calculated annual average dispersion parameter for estimating the dose to the critical offsite receptor from vent release point (v) in sec/m^3. The $(X/Q)_V$ is calculated by the method described in Regulatory Guide 1.111.

Noble gas monitor setpoints are conservatively set according to procedure P-9, *RADIATION MONITORING SYSTEM,* to correspond to fractions of the applicable 10 CFR Part 20 dose limits for unrestricted areas. Fractions are small enough to

assure the timely detection of any simultaneous discharges from multiple release points before the combined downwind site boundary concentration could exceed allowable limits. Additional conservatism is provided by basing these setpoints upon instantaneous downwind concentrations. Release rates during the remainder of a given year, combined with any infrequent releases at setpoint levels, would result in only a very small fraction of the 10 CFR Part 20 annual limits.

Historically, xenon-133 has been the principal fission product noble gas released from all vents and is appropriate for use as the reference isotope for establishing monitor setpoints. The whole-body dose will be limiting, and the Xe-133 release rate limit is calculated by substituting the appropriate values into equation (8). After the release rate limit for Xe-133 is determined for each vent, the corresponding vent concentration limits are calculated based on applicable vent flow rates. During periods of high make-up water usage, argon-41 from air saturated make-up water becomes the principle radiogas of concern and may be used as the reference isotope for establishing setpoints. Calibration factors in µCi/cc per cpm are used to convert limiting vent concentrations to count rates.

Example: Plant Vent Monitor, R-14

Using Xe-133 as the controlling isotope for the setpoint and assuming a measured activity of 2.66E-04 µCi/cc and a ratemeter reading of 4750 cpm above background, the efficiency can be calculated, using a measured vent flow of 7.45E+04 cfm, K_i from Table 5-3 of 2.94E+02 and a $(X/Q)_V$ for the site boundary of 2.7E-06, the Release Rate Limit is calculated and then the setpoint determined.

$$\text{Xe-133 efficiency} = \frac{\text{Activity}}{\text{Net ratemeter reading}}$$

$$\text{Xe-133 efficiency} = \frac{2.66\ E-04}{4750} \equiv 5.67\ E-08\ \frac{uCi/cc}{cpm}$$

Using Equation 8:

$$Q_{i,r} \leq \frac{500}{(2.94\ E+02)(2.7\ E-06)} \leq 6.3\ E+05\ uCi/sec$$

$$\text{Release Rate Limit } Q_{i,r} \leq \frac{500\ mrem/yr}{(K_i)(X/Q)_v}$$

Using Equation 7:

$$Setpoint\ c \leq \frac{\theta_{sv}}{(f)(k)(K)}$$

$$c \leq \frac{6.3E+05\ uCi/sec}{(7.45\ E+04\ cfm)\left(472\ \frac{cc/sec}{cfm}\right)\left(5.61\ E-08\ \frac{uCi/cc}{cpm}\right)}$$

$$c \leq 3.32\ E+05\ cpm$$

Per procedure P-9, R-14 is set at 0.4 of this value or 1.28E+05 cpm for normal operation. 40% of the release rate limit is a conservatism based on the possibility of two release points simultaneously at their setpoints for a total of 80% of the release rate limit.

Effluent Monitor Warning alarm setpoints are set at one-half of the trip setpoint. With all calculations equal this is a warning that 20% of the release limit has been reached at a single release point.

Table 5-2

Meteorological Data and Locations of Receptors for Set Point Calculations

Process Monitors					
Monitor (Radioisotope)	**Geographic Location (Dist./Direction)**	**Release Point (vent)**	**X/Q (sec/m^3)**	**D/Q (m^{-2})**	**Flow (cfm)**
R-10A (Radioiodine)	0.5 - 1-mile E	Containment		1.99E-8	12,520
R-10B (Radioiodine)	0.5 - 1-mile ESE	Plant		7.41E-9	81,650
R-11 (Cs-137)	0.5 - 1-mile E	Containment		1.99E-8	12,520
R-12 (Xe-133)	0.5 - 1-mile NNE	Containment	2.15E-6		12,520
R-13 (Cs-137)	0.5 - 1-mile ESE	Plant		7.41E-9	81,650
R-14 (Xe-133)	0.5 - 1-mile ESE	Plant	2.43E-7		81,650
R-15 (Xe-133)	0.5-1-mile NNE	Air Ejector	3.01E-6		720
Accident Monitors					
Monitor (Radioisotope)	**Geographic Location (Dist./Direction)**	**Release Point (vent)**	**X/Q (sec/m^3)**	**D/Q (m^{-2})**	**Flow (cfm)**
R-12A (Radioiodine)	0.5-1-mile E	Containment		1.99E-8	12,520
R-12A (ParticulateCs-137)	0.5-1-mile E	Containment		1.99E-8	12,520
R-12A (Noble Gas Xe-133)	0.5-1-mile NNE	Containment	2.15E-6		12,520
R-14A (Radioiodine)	0.5-1-mile ESE	Plant		7.41E-9	81,650
R-14A (Particulate Cs-137)	0.5-1-mile ESE	Plant		7.41E-9	81,650
R-14A (Noble Gas Xe-133)	0.5-1-mile ESE	Plant	2.43E-7		81,650
R-48 (RCS Accident Mix)	0.5-1-mile NNE	Air Ejector	3.01E-6		720

Table 5-2
(continued...)

Further details found in procedure P-9.

I-131, I-133, H-3 and particulates with half lifes greater than 8 days utilizes the following equation:

$$\bar{Q}_{iv} \leq \frac{1500\ mrem/year}{(D/Q)_v P_i}$$

For Noble Gases:

$$\bar{Q}_{iv} \leq \frac{500\ mrem/year}{(\bar{X}/Q)_v K_i}$$

P_i = Food and ground pathways in m^2 mrem/year per µCi/sec

K_i = mrem/year per µCi/m^3

Q_{iV} = Release rate in units of µCi/sec

5.7 GASEOUS EFFLUENT DOSE RATE

Gaseous effluent monitor setpoints as described in Section 5.6 of this manual are established at concentrations which permit some margin for corrective action to betaken before exceeding offsite dose rates corresponding to 10 CFR Part 20 limitations. Plant procedures establish the methods for sampling and analysis for continuous ventilation releases and for containment purge releases. Plant procedures also establish the methods for sampling and analysis prior to gas decay tank releases. The instantaneous dose rate in unrestricted areas due to unplanned releases of airborne radioactive materials may be calculated using annual average X/Q's. Dose rates shall be determined using the following expressions:

For noble gases:

$$D_V = \sum_i \left[(L_i + 1.1\, M_i)\, (X/Q)_V\, Q_{iV} \right] \leq 3000 \ mrem/yr$$

Equation (11)

Total gamma and beta dose to the skin

$$D_V = \sum_i \left[K_i (X/Q)_V\, Q_{iV} \right] \leq 500 \ mrem/yr$$

Equation (12)

total body dose

For I-131, I-133, tritium and all radioactive materials in particulate form with half-lives greater than 8 days:

$$D_V = \sum_i P_i\, W_V\, Q_{iV} \leq 1500 \ mrem/yr \ to \ critical \ organ$$

Equation (13)

Where:

K_i = the total body dose factor due to gamma emissions for each identified noble gas radionuclide (*i*) in mrem/yr per µCi/m^3 from Table 5-2.

L_i = the skin dose factor due to beta emissions for each identified noble gas radionuclide (*i*) in mrem/yr per µCi/m^3 from Table 5-3.

M_i = the air dose factor due to gamma emissions for each identified noble gas radionuclide (*i*) in mrad/yr per µCi/m^3 from Table 5-3. Unit conversion constant of 1.1 mrem/mrad converts air dose to skin dose.

P_i = the dose parameter for radionuclide (*i*) other than noble gases for the inhalation pathway, in mrem/yr per µCi/m^3. The dose factors are based on the critical individual organ and the child age group. P_i is further defined as: $P_i = (10^6 pCi/uCi)(BR)(DFA_i)$ where BR is the breathing rate for a child in m^3/yr and DFA_i is the dose factor for the child in mrem/pCi.

$(X/Q)_V$ = the highest calculated annual average relative concentration for any area at or beyond the unrestricted area boundary in sec/m^3.

W_V = the highest annual average dispersion parameter for estimating the dose to the critical receptor in sec/m^3 for the inhalation pathway and in m^{-2} for the food and ground pathways.

Q_{iV} = the release rate of radionuclide (*i*) from vent (v) in µCi/sec.

5.8 GASEOUS EFFLUENT DOSES

The air dose in unrestricted areas due to noble gases released in gaseous effluents from the site shall be determined using the following expressions:

During any calendar year, for gamma air dose:

$$D_{v\gamma} = 3.17\ E\text{-}08 \sum_i \left[M_i\ (\overline{X/Q})_v\ Q_{iv} \right] \leq 10\ mrad$$

Equation (14)

During any calendar quarter, for gamma air dose:

$$D_{v\gamma} = 3.17\ E\text{-}08 \sum_i \left[M_i\ (\overline{X/Q})_v\ Q_{iv} \right] \leq 5\ mrad$$

Equation (14A)

During any calendar year for beta air dose:

$$D_{v\beta} = 3.17\ E\text{-}08 \sum_i \left[N_i\ (\overline{X/Q})_v\ Q_{iv} \right] \leq 20\ mrad$$

(Equation 15)

During any calendar quarter, for beta air dose:

$$D_{v\beta} = 3.17\ E\text{-}08 \sum_i \left[N_i\ (\overline{X/Q})_v\ Q_{iv} \right] \leq 10\ mrad$$

(Equation 15A)

Where:

M_i = the air dose factor due to gamma emissions for each identified noble gas radionuclide in mrad/yr per µCi/m^3 from Table 5-3

N_i = the air dose factor due to beta emissions for each identified noble gas radionuclide in mrad/yr per µCi/m^3 from Table 5-3

$(X/Q)_V$ = for vent releases. The highest calculated annual average relative concentration for any area at or beyond the unrestricted area boundary in sec/m^3.

D_γ = the total gamma air dose from gaseous effluents in mrad.

D_β = the total beta air dose from gaseous effluents in mrad.

Q_{iV} = the release of noble gas radionuclides, i, in gaseous effluents from vents in µCi. Releases shall be cumulative over the time period.

3.17E-08 = the inverse of the number of seconds in a year

The dose to an individual from I-131, I-133, tritium and all radioactive materials in particulate form with half-lives greater than 8 days in gaseous effluents released from the site to unrestricted areas shall be determined using the following expression:

dose during any calendar year:

$$D_I = 3.17\ E-08 \sum_i \left[R_i\ W_V\ Q_V\right] \leq 15\ mrem$$

Equation (16)

dose during any calendar quarter:

$$D_I = 3.17\ E-08 \sum_i \left[R_i\ W_V\ Q_V\right] \leq 7.5\ mrem$$

(Equation 16A)

Where:

D_I = the total dose from I-131, I-133, tritium and all radioactive materials in particulate form with half-lives greater than 8 days in gaseous effluents in mrem.

R_i = the dose factor for each identified radionuclide (i) in m^{-2} mrem/yr per µCi/sec or mrem/ yr per $\mu Ci/m^3$ from Table 5-5.

W_V = the annual average dispersion parameter for estimating the dose to an individual at the critical location in sec/m^3 for the inhalation pathway and in

m^{-2} for the food and ground pathways.

Q_{iV} = the release of I-131, I-133, tritium and all radioactive materials in particulate form in gaseous effluents with half-lives greater than 8 days in µCi. Releases shall be cumulative over the desired time period as appropriate.

Table 5-3

Dose Factors to the Child For Noble Gases and Daughters*

Radio-nuclides	Total Body Dose Factor K_i (mrem/yr per $\mu Ci/m^3$)	Skin Dose Factor L_i (mrem/yr per $\mu Ci/m^3$)	Gamma Air Dose Factor M_i (mrad/yr per $\mu Ci/m^3$)	Beta Air Dose Factor N_i (mrad/yr per $\mu Ci/m^3$)
Kr-83m	7.56E-02**	----	1.93E+01	2.88E+02
Kr-85m	1.17E+03	1.46E+03	1.23E+03	1.97E+03
Kr-85	1.61E+01	1.34E+03	1.72E+01	1.95E+03
Kr-87	5.92E+03	9.73E+03	6.17E+03	1.03E+04
Kr-88	1.47E+04	2.37E+03	1.52E+04	2.93E+03
Kr-89	1.66E+04	1.01E+04	1.73E+04	1.06E+04
Kr-90	1.56E+04	7.29E+03	1.63E+04	7.83E+03
Xe-131m	9.15E+01	4.76E+02	1.56E+02	1.11E+03
Xe-133	2.94E+02	3.06E+02	3.53E+02	1.05E+03
Xe-133m	2.51E+02	9.94E+02	3.27E+02	1.48E+03
Xe-135m	3.12E+03	7.11E+02	3.36E+03	7.39E+02
Xe-135	1.81E+03	1.86E+03	1.92E+03	2.46E+03
Xe-137	1.42E+03	1.22E+04	1.51E+03	1.27E+04
Xe-138	8.83E+03	4.13E+03	9.21E+03	4.75E+03
Ar-41	8.84E+03	2.69E+03	9.30E+03	3.28E+03

* The listed dose factors are for radionuclides that may be detected in gaseous effluents. These dose factors for noble gases and daughter nuclides are taken from Table B-1 of Regulatory Guide 1.109 (Reference 3). A semi-infinite cloud is assumed.

** $7.56E\text{-}02 = 7.56 \times 10^{-2}$

Table 5-4

Dose Parameters for Radionuclides and Radioactive Particulate, Gaseous Effluents*

Radio-nuclides	P_i Inhalation Pathways (mrem/yr per µCi/m^3)	P_i Food & Ground Pathways (m^2 x mrem/yr per µCi/sec)	Radio-nuclides	P_i Inhalation Pathways (mrem/yr per µCi/m^3)	P_i Food & Ground Pathways (m^2 x mrem/yr per µCi/sec)
H-3	6.5E+02	2.4E+03	Cd-115m	7.0E+04	4.8E+07
C-14	8.9E+03	1.3E+09	Sn-126	1.2E+06	1.1E+09
Cr-51	3.6E+02	1.1E+07	Sb-125	1.5E+04	1.1E+09
Mn-54	2.5E+04	1.1E+09	Te-127m	3.8E+04	7.4E+10
Fe-59	2.4E+04	7.0E+08	Te-129m	3.2E+04	1.3E+09
Co-58	1.1E+04	5.7E+08	Te-132	1.0E+03	7.2E+07
Co-60	3.2E+04	4.6E+09	Cs-134	7.0E+05	5.3E+10
Zn-65	6.3E+04	1.7E+10	Cs-136	1.3E+05	5.4E+09
Rb-86	1.9E+05	1.6E+10	Cs-137	6.1E+05	4.7E+10
Sr-89	4.0E+05	1.0E+10	Ba-140	5.6E+04	2.4E+08
Sr-90	4.1E+07	9.5E+10	Ce-141	2.2E+04	8.7E+07
Y-91	7.0E+04	1.9E+09	Ce-144	1.5E+05	6.5E+08
Zr-95	2.2E+04	3.5E+08	Np-239	2.5E+04	2.5E+06
Nb-95	1.3E+04	3.6E+08	I-131	1.5E+07	1.1E+12
Mo-99	2.6E+02	3.3E+08	I-133	3.6E+06	9.6E+09
Ru-103	1.6E+04	3.4E+10	Unidentified	4.1E+07	9.5E+10
Ru-106	1.6E+05	4.4E+11	----	----	----
Ag-110m	3.3E+04	1.5E+10	----	----	----

* The listed dose parameters are for radionuclides that may be detected in gaseous effluents. These and additional dose parameters for isotopes not included in Table 5-4 may be calculated using the methodology described in NUREG-0133, Section 5.2.1 (Reference 2).

Table 5-5

Pathway Dose Factors Due to Radionuclides Other Than Noble Gases*

Radio-nuclides	Inhalation Pathway R_i (mrem/yr per $\mu Ci/m^3$)	Meat Pathway R_i (m^2 x mrem/yr per μCi/sec)	Ground Plane Pathway R_i (m^2 x mrem/yr per μCi/sec)	Cow-Milk-Child Pathway R_i (m^2 x mrem/yr per μCi/sec)	Leafy Vegetables Pathway R_i (m^2 x mrem/yr per μCi/sec)
H-3	1.12E+03	2.33E+02	0	2.38E+03	2.47E+02
Cr-51	1.70E+04	4.98E+05	5.31E+06	5.75E+06	1.63E+06
Mn-54	1.57E+06	7.60E+06	1.56E+09	3.70E+07	5.38E+07
Fe-59	1.27E+06	6.49E+08	3.09E+08	4.01E+08	1.10E+08
Co-58	1.10E+06	9.49E+07	4.27E+08	7.01E+07	4.55E+07
Co-60	7.06E+06	3.61E+08	2.44E+10	2.25E+08	1.54E+08
Zn-65	9.94E+05	1.05E+09	8.28E+08	1.99E+10	2.24E+08
Sr-89	2.15E+06	4.89E+08	2.42E+04	1.28E+10	5.39E+09
Sr-90	1.01E+08	1.01E+10	0	1.19E+10	9.85E+10
Zr-95	2.23E+06	6.09E+08	2.73E+08	8.76E+05	1.13E+08
I-131	1.62E+07	2.60E+09	1.01E+07	4.95E+11	2.08E+10
I-133	3.84E+06	6.45E+01	1.43E+06	4.62E+09	3.88E+08
Cs-134	1.01E+06	1.42E+09	7.70E+09	6.37E+10	1.96E+09
Cs-136	1.71E+05	5.06E+07	1.64E+08	6.61E+09	1.60E+08
Cs-137	9.05E+05	1.27E+09	1.15E+10	5.75E+10	1.80E+09
Ba-140	1.74E+06	5.00E+07	2.26E+07	2.75E+08	2.03E+08
Ce-141	5.43E+05	1.45E+07	1.48E+07	1.43E+07	8.99E+07

* Additional dose factors for isotopes not included in Table 5-5 may be calculated using the methodology described in NUREG-0133, Section 5.3.1(reference 2).

6.0 RADIOACTIVE EFFLUENT MONITORING INSTRUMENTATION

6.1 LIQUID EFFLUENT MONITORS

6.1.1 CONTROLS

The radioactive liquid effluent monitoring instrumentation channels shown in Table 6.1-1 shall be OPERABLE with their Alarm/Trip setpoints set to ensure that the limits of Section 4.1.1 (Radioactive Liquid Effluents - Controls) are not exceeded. The Alarm/Trip setpoints of these channels shall be determined and adjusted in accordance with the methodology and parameters in the ODCM.

6.1.2 APPLICABILITY: At all times.

Note: The Radioactive Effluent Monitoring Instrumentation may be removed from service for short periods of time without the instrumentation being considered inoperable for monthly/quarterly testing. Preventative/ corrective maintenance or calibrations require instrumentation to be declared inoperable.

6.1.3 ACTION:

With a radioactive liquid effluent monitoring instrumentation channel Alarm/ Trip setpoint less conservative than required by the above control, immediately suspend the release of radioactive liquid effluents monitored by the affected channel, or declare the channel inoperable, or change the setpoint so it is acceptably conservative.

6.1.4 ACTION:

With less than the minimum number of radioactive liquid effluent monitoring instrumentation channels OPERABLE, take the ACTION shown in Table 6.1-1. Restore the minimum number of instrumentation channels to OPERABLE status within 30 days or explain in the next Annual Radioactive Effluent Release Report, pursuant to Section 6.2 of the ODCM, why this inoperability was not corrected in a timely manner.

6.1.5 SURVEILLANCE REQUIREMENTS

Each radioactive liquid effluent monitoring instrumentation channel shall be demonstrated OPERABLE by performance of the CHANNEL CHECK, SOURCE CHECK, CHANNEL CALIBRATION, and CHANNEL FUNCTIONAL TEST at the frequencies shown in Table 6.1-2.

6.1.6 BASES

The radioactive liquid effluent instrumentation is provided to monitor and control, as applicable, the releases of radioactive materials in liquid effluents during actual or potential releases of liquid effluents. The Alarm/Trip setpoints for these instruments shall be calculated and adjusted in accordance with the methodology and parameters in the ODCM to ensure that the Alarm/Trip will occur prior to exceeding the limits of 10 CFR 20.

The OPERABILITY and use of this instrumentation is consistent with the requirements of General Design Criteria 60, 63 and 64 of Appendix A to 10 CFR 50.

Table 6.1-1

Radioactive Liquid Effluent Monitoring Instrumentation

Gross Activity Monitors (Liquid)		**Minimum Channels OPERABLE**	**Action**
a.	Containment Fan Coolers (R-16)	1	1
b.	Liquid Radwaste (R-18)	1	2
c.	Steam Generator Blowdown (R-19)	1(a)	3
d.	Spent Fuel Pool Heat Exchanger (R-20A, R-20B)	1	1
e.	Turbine Building Floor Drains (R-21)	1	1
f.	High Conductivity Waste (R-22)	1	2

Table 6.1-1
Table Notation

(a) Not required when steam generator blowdown is being recovered, i.e. not released.

Action 1 If the number of OPERABLE channels is less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue provided that at least once per 24 hours grab samples are analyzed for isotopic concentration or gross radioactivity (beta or gamma) at a lower limit of detection (LLD) of at most 1.0E-07 μCi/gm.

Action 2 If the number of OPERABLE channels is less than required by the minimum Channels OPERABLE requirement, effluent releases from the tank may continue, provided that prior to initiating a release:

Note: When counting 2 independent samples for agreement, doubling the acceptance criterion for low (< 6.0E-05 μCi/ml) activity samples from 10% to 20% results in a consequence at the release point of < 1%. The expanded acceptable criterion for low activity samples is employed to compensate for increased impact of sampling and counting error on acceptance.

1. At least two independent samples of the tank's contents, taken at least 60 minutes apart, are analyzed and agree within 10% of total activity, (20% if total activity minus noble gases < 6.0E-05 μCi/ml), and
2. At least two technically qualified members of the Facility Staff independently review and approve the analytical results, and
3. At least two technically qualified members of the Facility Staff independently verify the discharge line valving.

Action 3 When Steam Generator Blowdown is being released (not recycled) and the number of channels OPERABLE is less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue provided grab samples are analyzed for isotopic concentration at a lower limit of detection (LLD) of at most 1.0E-07 μCi/gram:

1. At least once per 8 hours when the concentration of the secondary coolant is > 0.01 μCi/gram (DOSE EQUIVALENT I-131).
2. At least once per 24 hours when the concentration of the secondary coolant is ≤ 0.01 μCi/gram (DOSE EQUIVALENT I-131).

Table 6.1-2

Radioactive Liquid Effluent Monitoring SURVEILLANCE REQUIREMENTS

Gross Activity Monitor (Liquid)	Channel Check	Source Check	Functional Test	Channel Calibration
a. Containment Fan Coolers (R-16)	D(e)	M(c)	Q(b)	R(d)
b. Liquid Radwaste (R-18)	D(e)	M(c)	Q(a)	R(d)
c. Steam Generator Blowdown (R-19)	D(e)	M(c)	Q(a)	R(d)
d. Spent Fuel Pool Heat Exchanger (R-20A, R-20B)	D(e)	M(c)	Q(b)	R(d)
e. Retention Tank (R-21)	D(e)	M(c)	Q(a)	R(d)
f. High Conductivity Waste (R-22)	D(e)	M(c)	Q(a)	R(d)
g. Dilution Flow Rate Determination	N.A.	N.A.	N.A.	R(f)

Table 6.1-2

Table Notation

(a) The FUNCTIONAL Test shall also demonstrate that automatic isolation of this pathway and control room alarm will occur if any of the following conditions exist:
1. Instrument indicates measured levels above the alarm and/or trip setpoint.
2. Power failure. (Verified in same functional test as Alarm/Trip setpoint due to normally energized relay)

(b) The FUNCTIONAL Test shall also demonstrate that control room alarm occurs if any of the following conditions exist.
1. Instrument indicates measured levels above the alarm setpoint.
2. Power failure. (Verified in same functional test as Alarm setpoint due to normally energized relay)

(c) This check may require the use of an external source due to high background in the sample chamber.

(d) Source used for the CHANNEL CALIBRATION shall be traceable to the National Institute for Standards and Technology (NIST) or shall be obtained from suppliers (e.g., Analytics) that provide sources traceable to other officially designated standards agencies.

(e) Applies only during releases via this pathway.

(f) Flow rate for the discharge canal dilution, which is applied to all liquid effluent pathways, shall be determined at the frequency specified.

6.2 GASEOUS EFFLUENT MONITORS

6.2.1 CONTROLS

The radioactive gaseous effluent monitoring instrumentation channels shown in Table 6.2-1 shall be OPERABLE with their Alarm/Trip setpoints set to ensure that the limits of Control Section 5.2.1 (Dose Rate - Controls) are not exceeded. The Alarm/ Trip setpoints of these channels meeting Control Section 5.2.1 (Dose Rate - Controls) shall be determined and adjusted in accordance with the methodology and parameters in the ODCM.

6.2.2 APPLICABILITY: As shown in Table 6.2-1

Note: The Radioactive Effluent Monitoring Instrumentation may be removed from service for short periods of time without the instrumentation being considered inoperable for weekly grab filter or cartridge changes or monthly/quarterly testing, with the exception of the R-10A, R-11, R-12 skid. Preventative/corrective maintenance, calibrations, and moving filter replacements require instrumentation to be declared inoperable.

6.2.3 ACTION:

With a radioactive gaseous effluent monitoring instrumentation channel Alarm/Trip setpoint less conservative than required by the above specification, immediately declare the channel inoperable.

6.2.4 ACTION:

With less than the minimum number of radioactive gaseous effluent monitoring instrumentation channels OPERABLE, take the ACTION shown in Table 6.2-1. Restore the minimum number of instrumentation channels to OPERABLE status within 30 days or, if not, explain in the next Annual Radioactive Effluent Release Report, pursuant to Section 6.2 of the ODCM, why this inoperability was not corrected in a timely manner.

6.2.5 SURVEILLANCE REQUIREMENTS

Each radioactive gaseous effluent monitoring instrumentation channel shall be demonstrated OPERABLE by performance of the CHANNEL CHECK, SOURCECHECK, CHANNEL CALIBRATION, and CHANNEL FUNCTIONAL TEST at the frequencies shown in Table 6.2-2.

6.2.6 BASES

The radioactive gaseous effluent instrumentation is provided to monitor and control, as applicable, the releases of radioactive materials in gaseous effluents during actual or potential releases of gaseous effluents. The Alarm/Trip setpoints

for these instruments shall be calculated and adjusted in accordance with the methodology and parameters in the ODCM to ensure that the Alarm/Trip will occur prior to exceeding the limits of 10 CFR 20. The OPERABILITY and use of this instrumentation is consistent with the requirements of General Design Criteria 60, 63, and 64 of Appendix A to 10 CFR 50.

Table 6.2-1

Radioactive Gaseous Effluent Monitoring Instrumentation

	Plant Ventilation (a)(h)	**Minimum Channels OPERABLE**	**Action**
a.	Iodine sampler (R-10B or R-14AIODN)	1 (i)	1
b.	Particulate Sampler (R-13 or R-14APART)	1 (i)	1
c.	Noble Gas Activity (R-14 or R-14AGAS)	1 (b)	2
d.	Containment Noble Gas Activity (R-12) or Containment Particulate Sampler (R-11)	1 (d,e)	3
	Containment Purge (c)(h)	**Minimum Channels OPERABLE**	**Action**
a.	Iodine Sampler (R-10A or R-12AIODN)	1 (i)	1
b.	Particulate Sampler (R-11 or R-12APART)	1 (f)	5
c.	Noble Gas Activity (R-12 or R-12AGAS)	1 (f)	5
	Air Ejector Monitor (g)(h)	**Minimum Channels OPERABLE**	**Action**
Noble Gas Activity (R-15 or R-47)		1	4

Table 6.2-1

Table Notation

(a) Required at all times.

(b) Only radiation monitor R-14 has an isolation signal. If R-14AGAS is being used to monitor batch gas releases, the contents of the tank(s) may be released to the environment provided that prior to initiating the release:
1. At least two independent samples of the tank's contents are analyzed, and
2. At least two technically qualified members of the facility staff independently verify the release rate calculations and discharge valve lineup.

(c) Required in MODES 5 and 6.

(d) The mini-purge system allows the release of Containment atmosphere through the plant vent. 10 CFR 100 type releases via mini-purge are limited by an isolation signal generated from Safety Injection. 10 CFR 20 releases through the mini-purge are considered to be similar to other plant ventilation releases and are monitored by R-14, R-13 and R-10B. R-14A may be used as a substitute for R-14 since automatic isolation is available from the R-11 or R-12 monitors if the activity in Containment increases. Therefore, either R-11 or R-12 is required to sample Containment during a mini-purge release. Automatic isolation of mini-purge for 10 CFR part 20 type releases is considered unnecessary due to the low flow associated with mini-purge, the continuous monitoring from R-11 or R-12 and the original measurement before the purge begins. To ensure the Containment sample monitored by R-11 or R-12 is representative of the containment atmosphere, at least one containment recirculation fan is required to be in operation during mini-purge operation.

(e) If the R-10A, R-11, R-12 skid is not OPERABLE, it is possible to substitute the R-10B,R-13, R-14 skid when the R-14A skid is OPERABLE. The setpoints for the R-10A, R-11, R-12 skid would be used. There would be no automatic containment isolation capability from the radioactive effluent monitoring instrumentation when using R-10B, R-13, R-14 skid for containment leakage measurements. This cannot be used if Containment Ventilation Isolation is required.

(f) If containment ventilation isolation instrumentation is required by LCO 3.3.5 for core alteration or movement of irradiated fuel in containment, R-12A skid cannot be used in place of the R-10A, R-11, R-12 skid.

(g) Required only when Air Ejector is operating.

(h) Gaseous effluent monitors are not considered inoperable due to changes in ventilation flow. Reduced flow in the ventilation makes the monitor setpoint more conservative.

(i) Minimum channels OPERABLE for Plant Vent Iodine, Plant Vent Particulate, and Containment Purge Iodine, refers to the sample collection system - not the radiation monitor.

Action 1 If the number of OPERABLE channels is less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue provided iodine and particulate samples are continuously collected with alternate sampling equipment as required in Table 6.2-1. This should be completed within one hour.

Action 2 If the number of OPERABLE channels is less than required by the Minimum Channels OPERABLE requirement, continuous effluent releases via this pathway may continue provided grab samples are taken and analyzed for isotopic activity at least once per 8 hours. No batch gas releases are to be made with operable channels less than required minimum channels operable.

Action 3 If the number of OPERABLE channels is less than required by the Minimum Channels OPERABLE requirement, or at least one containment recirc fan cooler is not in operation, within 1 hour terminate any mini-purge release in process.

Action 4 If the number of OPERABLE Channels is less than required by the Minimum Channels OPERABLE requirement and the Secondary Activity is $\leq$ 1.0E-04 µCi/gm, effluent releases may continue via this pathway provided grab samples are analyzed for isotopic concentration at least once per 24 hours. If the secondary activity is > 1.0E-04 µCi/gm, effluent releases via this pathway may continue for up to 31 days provided grab samples are taken every 8 hours and analyzed within 24 hours.

Action 5 If the number of OPERABLE channels is less than required by the Minimum Channels Operable requirement, terminate the purge within 1 hour. Also refer to LCO 3.3.5 if core alterations or movement of irradiated fuel in containment is in progress.

Table 6.2-2

Radioactive Gaseous Effluent Monitoring SURVEILLANCE REQUIREMENTS

	Plant Ventilation	**Channel Check**	**Source Check**	**Functional Test**	**Channel Calibration**
a.	Iodine Sampler (R-10B)	W(e)	N.A.	N.A.	R(c)
b.	Iodine Sampler (R-14AIODN)	W(e)	N.A.	N.A.	R(c)
c.	Particulate Sampler (R-13)	W(e)	N.A.	N.A.	R(c)
d.	Particulate Sampler (R-14APART)	W(e)	N.A.	N.A.	R(c)
e.	Noble Gas Activity (R-14)	D(e)	M	Q(a)	R(c)
f.	Noble Gas Activity (R-14AGAS)	D(e)	M	Q(b)	R(c)
g.	Flow Rate Determination	N.A.	N.A.	N.A.	R(d)
	Containment Purge	**Channel Check**	**Source Check**	**Functional Test**	**Channel Calibration**
a.	Iodine Sampler (R-10A)	W(e)	N.A.	N.A.	R(c)
b.	Iodine Sampler (R-12AIODN)	W(e)	N.A.	N.A.	R(c)
c.	Particulate Sampler (R-11)	W(e)	M	Q(a)	R(c)
d.	Particulate Sampler (R-12APART)	W(e)	M	Q(b)	R(c)
e.	Noble Gas Activity (R-12)	D(e)	M	Q(a)	R(c)
f.	Noble Gas Activity (R-12AGAS)	D(e)	M	Q(b)	R(c)
g.	Flow Rate Determination	N.A.	N.A.	N.A.	6Y(d)
	Air Ejector Monitor	**Channel Check**	**Source Check**	**Functional Test**	**Channel Calibration**
a.	Noble Gas Activity (R-15)	D(e)	M	Q(b)	R(c)
b.	Noble Gas Activity (R-47)	D(e)	M	Q(b)	R(c)
c.	Flow Rate Determination	N.A.	N.A.	N.A.	R(f)

Table 6.2-2

Table Notation

(a) The FUNCTIONAL TEST shall also demonstrate that automatic isolation of this pathway and control room alarm occur if any of the following conditions exist:
1. Instrument indicates measured levels above the alarm and/or trip setpoint.
2. Power failure. (Verified in same functional test as Alarm/Trip Setpoint due to normally energized relay)

(b) The FUNCTIONAL TEST shall also demonstrate that control room alarm occurs if any of the following conditions exist:
1. Instrument indicates measured levels above the alarm setpoint.
2. Power failure. (Verified in same functional test as Alarm Setpoint due to normally energized relay)

(c) Source used for the Channel Calibration shall be traceable to the National Institute for Standards and Technology (NIST) or shall be obtained from suppliers (e.g., Amersham) that provide sources traceable to other officially designated standards agencies.

(d) Flow rate for main plant ventilation exhaust and containment purge exhaust are calculated by the flow capacity of ventilation exhaust fans in service and shall be determined at the frequency specified.

(e) Applies only during releases via this pathway.

(f) Flow rate of the Air Ejector vent shall be determined with the plant in operation, at the frequency specified.

6.3 RADIATION ACCIDENT MONITORING INSTRUMENTATION

6.3.1 CONTROLS:

The radiation accident monitoring instrumentation channels shown in Table 6.3-1 shall be OPERABLE according to the following schedule:

6.3.2 APPLICABILITY:

1. Containment Purge (R-12A) - Modes 5 and 6 when the purge flanges are removed.
2. Plant Vent (R-14A) - All modes
3. Air Ejector (R-47 and R-48) - When air ejector is operating
4. A Main Steam Line (R-31) - Modes 1, 2, and 3
5. B Main Steam Line (R-32) - Modes 1, 2, and 3

Note: The Radiation Accident Monitoring Instrumentation may be removed from service for short periods of time without the instrumentation being considered inoperable for weekly grab filter or cartridge changes. Preventative maintenance and calibrations require instrumentation to be declared inoperable.

6.3.4 ACTION:

With less than the minimum number of radiation accident monitoring instrumentation channels OPERABLE, take the ACTION shown in Table 6.3-1.

6.3.5 SURVEILLANCE REQUIREMENTS:

1. Each radiation accident monitoring instrumentation channel shall be demonstrated OPERABLE by performance of the CHANNEL CHECK and CHANNEL CALIBRATION at the frequencies shown in Table 6.3-2.

6.3.6 BASES:

Radiation accident monitoring instrumentation is provided to monitor, as applicable, the releases of radioactive materials in gaseous effluents during actual or potential releases of gaseous effluents. The Alarm setpoints for these instruments shall be calculated and adjusted in accordance with the methodology and parameters in the ODCM to ensure that the Alarm will occur prior to exceeding the limits of 10 CFR 20. The OPERABILITY and use of this instrumentation is consistent with the requirements of General Design Criteria 60, 63, and 64 of Appendix A to 10 CFR 50.

Table 6.3-1

Radiation Accident Monitoring Instrumentation

	Instrument	Minimum Channels Operable	Action
a.	Containment Purge Beta Particulate (R-12APART)	1(a)	1
	Containment Purge Iodine (R-12AIODN) Containment Purge Gas (R-12AGAS)	1(a)	1
		1(a)	1
b.	Plant Vent Beta Particulate (R-14APART) Plant Vent Iodine (R-14AIODN) Plant Vent Gas (R-14AGAS)	1	1
		1	1
		1	1
c.	Air Ejector Low-range Gas (R-47)	1	1,2
	Air Ejector/Gland Seal Exhaust High-range Gas (R-48)	1	1
d.	A Main Steam Line (R-31)	1	1
e.	B Main Steam Line (R-32)	1	1

Table 6.3-1

Table Notation

(a) Only when the shutdown purge flanges are removed; otherwise, instrumentation kept in STANDBY mode.

Action 1 With the number of OPERABLE channels less than required by the Minimum Channels OPERABLE requirements, either restore the inoperable channel(s) to OPERABLE status within 30 days of the event, or if not restored, prepare and submit, within the following 14 days, a Special Report to the Commission outlining the action taken, the cause of the inoperability and the plans and schedule for restoring the system to OPERABLE status. If the channel(s) is inoperable greater than 7 days but less than 30 days, report the cause of the inoperability and the actions taken in the Annual Radioactive Effluent Release Report.

Action 2 R-47 is relied upon to trend and quantify primary-to-secondary leakage. If R-47 is not OPERABLE with the air ejector in service, then enter procedures CH-RETS-RMS-INOP and CY-AP-120-3402.

Table 6.3-2

Radiation Accident Monitoring Surveillance Requirements

Radiation Accident Monitoring Instrumentation	Channel Check	Channel Calibration
a. Containment Purge (R-12A)	M	R(a)
b. Plant Vent (R-14A)	M	R(a)
c. Air Ejector (R-47)	M	R(a)
d. Air Ejector/Gland Seal Exhaust (R-48)	M	R(a)
e. A Main Steam Line (R-31)	M	R(a)
f. B Main Steam Line (R-32)	M	R(a)

(a) Source used for the CHANNEL CALIBRATION shall be traceable to the National Institute for Standards and Technology (NIST) or shall be obtained from suppliers (e.g., Analytics) that provide sources traceable to other officially designated standards agencies.

6.4 AREA RADIATION MONITORS

6.4.1 SURVEILLANCE REQUIREMENTS:

CHANNEL CALIBRATION, CHANNEL CHECK, and a FUNCTIONAL TEST of the area radiation monitors shall be performed as specified in Table 6-4.

Table 6-4

Area Radiation Monitor Surveillance Requirements

Instrument			Channel Check	Functional Test	Channel Calibration
a.	Control Room	R-1	D	Q	R
b.	Containment	R-2	D	Q	R
c.	Radiochemistry Lab	R-3	D	Q	R
d.	Charging Pump Room	R-4	D	Q	R
e.	Spent Fuel Pool	R-5	D	Q	R
f.	Nuclear Sample Room	R-6	D	Q	R
g.	Incore Detector Area	R-7	D	Q	R
h.	Drumming Station	R-8	D	Q	R
i.	Letdown Line Monitor	R-9	D	Q	R
j.	Component Cooling Water Heat Exchanger *	R-17	D	Q	R
k.	AVT D Mixed Bed	R-26	N.A.	Q	N.A.
l.	Nuclear Sample Room Wide Range Monitor	R-33	N.A.	Q	N.A.
m.	Containment Spray Pump Wide Range Area Monitor	R-34	N.A.	Q	N.A.
n.	PASS Panel Wide Range Area Monitor	R-35	N.A.	Q	N.A.

* While not an area monitor by strict definition, it serves as an indicator of internal leakage and provides an isolation signal for the component cooling system.

7.0 RADWASTE TREATMENT

7.1 LIQUID RADWASTE TREATMENT SYSTEM

7.1.1 CONTROLS:

The Liquid Radwaste Treatment System shall be OPERABLE and appropriate portions of the system shall be used to reduce releases of radioactivity when the projected doses due to the liquid effluent to UNRESTRICTED AREAS would exceed 0.06 mrem to the whole body or 0.2 mrem to any organ in a 31 day period.

7.1.2 APPLICABILITY: At all times.

7.1.3 ACTION:

With radioactive liquid waste being discharged without treatment and in excess of the above limits and any portion of the Liquid Radwaste Treatment System which could reduce the radioactive liquid waste discharged not in operation, prepare and submit to the Commission within 30 days a Special Report that includes the following information:

1. Explanation of why liquid radwaste was being discharged without treatment, identification of any inoperable equipment or subsystems, and the reason for the inoperability.
2. Action(s) taken to return the inoperable equipment to OPERABLE status, and
3. Summary description of action(s) taken to prevent recurrence.

7.1.4 SURVEILLANCE REQUIREMENTS:

1. Doses due to liquid releases to UNRESTRICTED AREAS shall be projected at least once per 31 days in accordance with the methodology and parameters in the ODCM when Liquid Radwaste Treatment Systems are not being fully utilized.
2. The installed Liquid Radwaste Treatment System shall be considered OPERABLE by meeting Section 4.1.1 (Radioactive Liquid Effluents - Controls) and Section 4.2.1 (Dose - Controls).

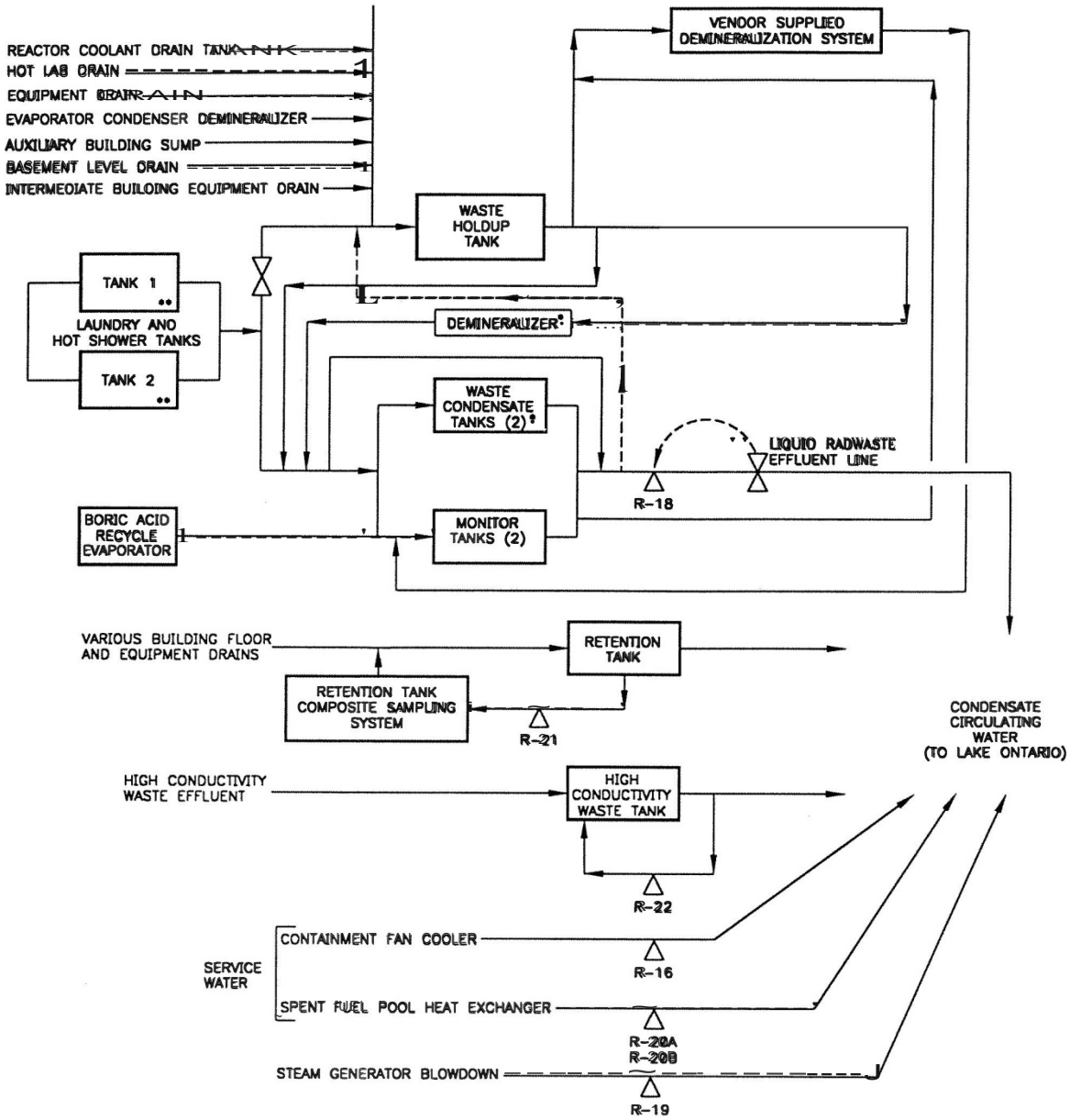
7.1.5 BASES:

The OPERABILITY of the Liquid Radwaste Treatment System ensures that this system will be available for use whenever liquid effluents require treatment prior to release to the environment. The requirement that the appropriate portions of this system be used when specified provides assurance that the releases of radioactive materials in liquid effluents will be kept "as low as is reasonably achievable". This specification implements the requirements of 10 CFR 50.36a,

General Design Criterion 60 of Appendix A to 10 CFR 50, and the design objective given in Section II.D of Appendix I to 10 CFR 50. The specified limits governing the use of the appropriate portions of the Liquid Radwaste Treatment System were specified as a suitable fraction of the dose design objectives set forth in Section II.A of Appendix A to 10 CFR 50 for liquid effluents.

Figure 7-1

Liquid Radwaste Treatment Systems Effluent Paths and Controls



* USE OF THE DEMINERALIZER AND WASTE CONDENSATE TANKS WAS DISCONTINUED IN 1990.

** USE OF THE LAUNDRY WAS DISCONTINUED IN 1994.

7.2 GASEOUS RADWASTE TREATMENT SYSTEM

7.2.1 CONTROLS

The Gaseous Radwaste Treatment System and the Ventilation Exhaust Treatment System shall be OPERABLE and appropriate portions of these systems shall be used to reduce releases of radioactivity when the projected doses in 31 days due to gaseous effluent releases to areas at and beyond the SITE BOUNDARY would exceed:

1. 0.2 mrad to air from gamma radiation, or
2. 0.4 mrad to air from beta radiation, or
3. 0.3 mrem to any organ of a MEMBER OF THE PUBLIC

7.2.2 APPLICABILITY: At all times.

7.2.3 ACTION:

With radioactive gaseous waste being discharged without treatment and in excess of the above limits, prepare and submit to the Commission within 30 days a Special Report that includes the following information:

1. Explanation of why gaseous radwaste was being discharged without treatment, identification of any inoperable equipment or subsystems, and the reason for the inoperability,
2. Action(s) taken to restore the inoperable equipment to OPERABLE status, and
3. Summary description of action(s) taken to prevent recurrence.

7.2.4 SURVEILLANCE REQUIREMENTS:

1. Doses due to gaseous releases to areas at and beyond the SITE BOUNDARY shall be projected at least once per 31 days in accordance with the methodology and parameters in the ODCM when Gaseous Radwaste Treatment Systems are not being fully utilized.
2. The installed GASEOUS RADWASTE TREATMENT SYSTEM and VENTILATION EXHAUST TREATMENT SYSTEM shall be considered OPERABLE by meeting Sections 5.2.1, 5.3.1, and 5.3.7 (Controls).

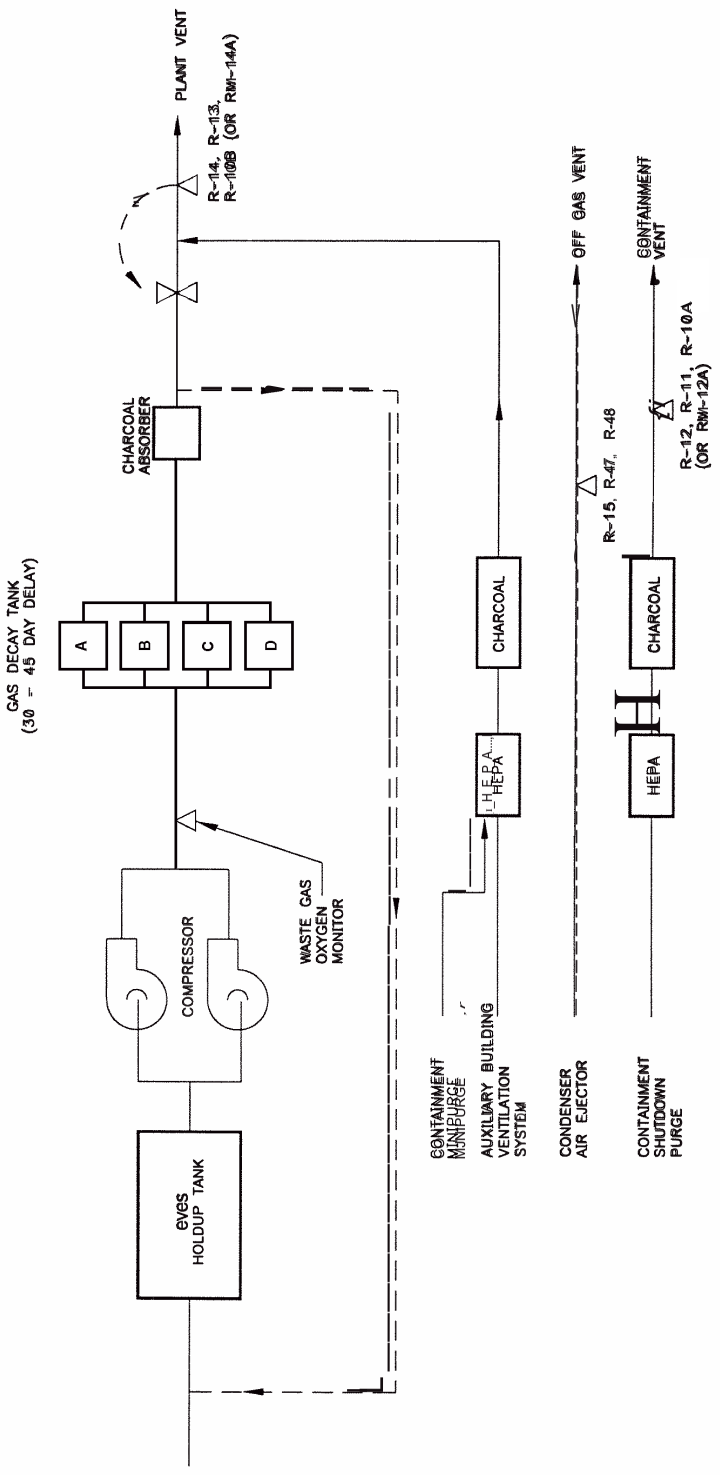
7.2.5 BASES:

The OPERABILITY of the Gaseous Radwaste Treatment System and the Ventilation Exhaust Treatment System ensures that the systems will be available for use whenever gaseous effluents require treatment prior to release to the environment. The requirement that the appropriate portions of these systems be used, when specified, provides reasonable assurance that the releases of radioactive materials in gaseous effluents will be kept "as low as is reasonably achievable". This Control implements the requirements of 10 CFR 50.36a,

General Design Criterion 60 of Appendix A to 10 CFR 50, and the design objectives given in Section II.D of Appendix I to 10 CFR 50. The specified limits governing the use of appropriate portions of the systems were specified as a suitable fraction of the dose design objectives set forth in Sections II.B and II.C of Appendix I to 10 CFR 50, for gaseous effluents.

Figure 7-2

Gaseous Radwaste Treatment Systems Effluent Paths and Controls



7.3 SOLID RADWASTE SYSTEM

7.3.1 CONTROLS**:**

1. The solid radwaste system shall be used as applicable in accordance with the Process Control Program for the solidification and packaging of radioactive waste to ensure meeting the requirements of 10 CFR 71 prior to shipment of radioactive wastes from the site.

7.3.2 APPLICABILITY: At all times.

7.3.3 ACTION:

If the packaging requirements of 10 CFR 71 are not satisfied, suspend shipments of deficiently packaged solid radioactive wastes from the site until appropriate corrective measures have been taken.

7.4 CONFIGURATION CHANGES

7.4.1 CONTROLS:

Major changes to the Radioactive Waste Treatment Systems, (Liquid, Solid, and Gaseous), shall be reported to the Commission by the inclusion of a suitable discussion or by reference to a suitable discussion of each change in the Annual Radioactive Effluent Release Report for the period in which the changes were made. Major changes to Radioactive Waste Treatment Systems, (Liquid, Gaseous and Solid), shall include the following:

1. Changes in process equipment, components and structures from those in use (e.g., deletion of evaporators and installation of demineralizers);

2. Changes in the design of Radioactive Waste Treatment Systems that could significantly alter the characteristics and/or quantities of effluents released;

3. Changes in system design which may invalidate the accident analysis (e.g., changes in tank capacity that would alter the curies released).

Note: The Radioactive Waste Treatment Systems, are those systems used to minimize the total activity released from the site.

Note: Changing the filters used, replacement resins or minor modifications (pipe or valve dimensions or manufacturers) due to maintenance activities would not be considered a major change.

7.4.2 APPLICABILITY: At all times.

7.4.2 ACTION:

The discussion of each change shall contain:

1. a summary, in accordance with 10 CFR 50.59, of the evaluation that led to the determination that the change could be made;
2. sufficient detailed information to support the reason for the change;
3. a detailed description of the equipment, components and processes involved and the interfaces with other plant systems;
4. an evaluation of the change which shows the predicted releases of radioactive materials in liquid and gaseous effluents from those previously predicted;
5. an evaluation of the change which shows the expected maximum exposures to individuals in all UNRESTRICTED AREAS and to the MEMBERS OF THE PUBLIC from those previously estimated;
6. documentation of the fact that the change was reviewed and found acceptable by the Plant Operations Review Committee.

7.5 PROCESS CONTROL PROGRAM

a. The Process Control Program (PCP) shall be a document outlining the method of processing wet or dry solid wastes and for solidification of liquid wastes. It shall include the process parameters and evaluation methods used to assure meeting the requirements or 10 CFR Part 71 prior to shipment of containers of radioactive waste from the site.

b. Licensee may make changes to the PCP and shall submit to the Commission with the Radioactive Effluent Release Report for the period in which any change(s) is made a copy of the new PCP and a summary containing:

   1. sufficiently detailed information to support the rationale for the change;

   2. a determination that the change will not reduce the overall conformance of the solidified waste product to existing criteria for solid wastes; and

   3. documentation of the fact that the change has been reviewed and found acceptable by the onsite review function.

c. Licensee initiated changes shall become effective after review and acceptance by the Plant Operation Review Committee.

8.0 RADIOLOGICAL ENVIRONMENTAL MONITORING

8.1 MONITORING PROGRAM

8.1.1 CONTROLS:

The Radiological Environmental Monitoring Program (REMP) shall be conducted as specified in Table 8-1 at the locations given in Figures 8-1, 8-2, 8-3 and 8-4.

8.1.2 APPLICABILITY: At all times.

8.1.3 ACTION:

1. If the radiological environmental monitoring program is not conducted as specified in Table 8-1, prepare and submit to the Commission, in the Annual Radiological Environmental Operating Report, a description of the reasons for not conducting the program as required and the plans for preventing a recurrence. Deviations are permitted from the required sampling schedule if specimens are unobtainable due to hazardous conditions, seasonal availability, or to malfunction of automatic sampling equipment. If the latter, efforts shall be made to complete corrective action prior to the end of the next sampling period. Sampling periods for this specification are usually of one week duration. If continuous water sampling equipment is out of service, the 120 minute aliquot sampling period does not mean that grab samples must be taken every 120 minutes, but one grab sample once each week is sufficient until the automatic sampling equipment is restored to service.

2. If the level of radioactivity as a result of plant effluents in an environmental sampling medium at one or more of the locations specified exceeds the reporting levels of Table 8-4 when averaged over any calendar quarter, prepare and submit to the Commission within 30 days from receipt of the laboratory analysis a Special Report that identifies the cause(s) for exceeding the limit(s) and defines the corrective actions to be taken to reduce radioactive effluents so that the potential annual dose* to a MEMBER OF THE PUBLIC is less than the calendar year limits of Sections 4.2.1, 5.3.1, and 5.3.7 (Controls).

   When more than one of the radionuclides in Table 8-4 are detected in the sampling medium, this report shall be submitted if:

$$\frac{\text{concentration (1)}}{\text{limit level (1)}} + \frac{\text{concentration (2)}}{\text{limit level (2)}} + \cdots \geq 1.0$$

   When radionuclides other than those in Table 8-4 are detected and are the result of plant effluents, this report shall be submitted if the potential annual dose to a MEMBER OF THE PUBLIC from all radionuclides is greater than

the calendar year limit of Sections 4.2.1, 5.3.1, and 5.3.7 (Controls). This report is not required if the measured level of radioactivity was not the result of plant effluents; however, in such an event, the condition shall be reported and described in the Annual Radiological Environmental Operating Report.

The methodology and parameters used to estimate the potential annual dose to a MEMBER OF THE PUBLIC shall be indicated in this report.

4. With milk or fresh leafy vegetable samples unavailable from one or more of the sampling locations indicated on Figure 8-2, a discussion shall be included in the Annual Radiological Environmental Operating Report which identifies the cause for the unavailability of samples and identifies locations for obtaining replacement samples. In selecting replacement samples, consider the implications of collecting samples outside the normal REMP ingestion pathway. In particular, recognize that perennial vegetation from relatively undisturbed areas is likely to have higher concentrations of Cs-137 than vegetation grown in soil that is regularly disturbed by cultivation and harvesting activities. If a milk or leafy vegetable sample location becomes unavailable, the location from which samples were unavailable may then be deleted provided that a comparable location is added to the radiological environmental monitoring program as described in the ODCM, unless no other sample location is available.

8.1.4 SURVEILLANCE REQUIREMENTS:

The radiological environmental samples shall be collected pursuant to Table 8-1 from the specific locations given in the table and figure(s) given in the ODCM, and shall be analyzed pursuant to the requirements of Table 8-1 and the detection capabilities required by Table 8-3.

8.1.5 BASES:

The REMP required by this Control provides representative measurements of radiation and of radioactive materials in those exposure pathways and for those radionuclides that lead to the highest potential radiation exposures to MEMBERS OF THE PUBLIC resulting from plant operation. This monitoring program implements Section IV.B.2 of Appendix I to10 CFR 50, and thereby supplements the RETS by verifying that the measurable concentrations of radioactive materials and levels of radiation are not higher than expected on the basis of the effluent measurements and the modeling of the environmental exposure pathways. Guidance for this monitoring program is provided by the Radiological Assessment Branch Technical Position on Environmental Monitoring, Revision 1, November 1979.

Table 8-1

Radiological Environmental Monitoring Program

EXPOSURE PATHWAY AND/OR SAMPLE	NUMBER OF SAMPLES & SAMPLE LOCATIONS (a)	SAMPLING AND COLLECTION FREQUENCY	TYPE AND FREQUENCY OF ANALYSIS
1. AIRBORNE			
a. Radioiodine	5 indicator (Samplers 2,4,7,9,11) 1 control (Sampler 8)	Continuous operation of sampler with sample collection at least weekly (a)	Radioiodine canister. Analyze within 7 days of collection for I-131.
b. Particulate	9 indicator 3 control	Same as above	Particulate sampler. Analyze for gross beta radioactivity ≥ 24 hours following filter change.(c) Perform gamma isotopic analysis on each sample for which gross beta activity is > 10 times the mean of offsite samples. Perform gamma isotopic analysis on composite (by location) sample at least once per 92 days.(d)
2. DIRECT RADIATION (b)	30 indicator 9 control (11 placed greater than 5 miles from plant site)	Dosimeters at least quarterly	Gamma dose quarterly.
3. WATERBORNE			
a. Surface (e)	1 control (Shoremont) 1 indicator (Condenser Water Discharge)	Composite* sample collected over a period of ≤ 31 days.(f)	Gross beta and gamma isotopic analysis of each composite sample. Tritium analysis of one composite sample at least once per 92 days. (d)
b. Drinking	1 indicator (Ontario Water District Intake)	Same as above (f)	Same as above
c. Shoreline Sediment	1 control (Shoremont) 1 indicator (Ontario Water District - Bear Creek)	Semi-annually	Gamma isotopic analysis of each sample (d)

* Composite sample to be collected by collecting an aliquot at intervals not exceeding 2 hours.

EXPOSURE PATHWAY AND/OR SAMPLE	NUMBER OF SAMPLES & SAMPLE LOCATIONS (a)	SAMPLING AND COLLECTION FREQUENCY	TYPE AND FREQUENCY OF ANALYSIS
4. INGESTION			
a. Milk	2 Supplemental (June through October)	At least once per 15 days	Gamma isotopic and I-131 analysis of each sample.(d,g)
	2 Supplemental (November through May)	At least once per 31 days	Gamma isotopic and I-131 analysis of each sample.(d,g)
b. Fish	4 control 4 indicator (Off shore at Ginna)	Twice during fishing season including at least four species	Gamma isotopic analysis on edible portions of each sample.(d,g)
c. Food Products	1 control 1 indicator (On site)	Annual at time of harvest. Sample from two of the following: 1. apples 2. cherries 3. Other crops grown on site by contract farmer	Gamma isotopic analysis on edible portion of each sample.(d,g)
	1 control 1 indicator (Nearest offsite garden within 5 miles in the highest D/Q meteorological sector or onsite garden)	At time of harvest. One sample of: 1. broad leaf vegetation* 2. other vegetable	Gamma isotopic analysis on edible portion of each sample.(d,g)

* leaves from 3 different plant species composited

Table 8-1

Table Notation

(a) Specific parameters of distance and direction sector from the centerline of the reactor, and additional description where pertinent, shall be provided for each and every sample location in Table 8-2 in a table and figures in the ODCM. Deviations are permitted from the required sampling schedule if specimens are unobtainable due to circumstances such as hazardous conditions, seasonal unavailability, inclement weather, and malfunction of automatic sampling equipment. If specimens are unavailable due to sampling equipment malfunction, effort shall be made to complete corrective action prior to the end of the next sampling period. All deviations from the sampling schedule shall be documented in the next Annual Radiological Environmental Operating Report. It is recognized that, at times, it may not be possible or practicable to continue to obtain samples of the media of choice at the most desired location or time. In these instances suitable alternative media and locations may be chosen for the particular pathway in question and appropriate substitutions made within 30 days in the radiological environmental monitoring program as described in the ODCM. Submit in the next Annual Radioactive Effluent Release Report documentation for a change in the ODCM including a revised figure(s) and table for the ODCM reflecting the new location(s) with supporting information identifying the cause of the unavailability of samples for the pathway and justifying the selection of the new location(s) for obtaining samples.

(b) One or more instruments, such as a pressurized ion chamber, for measuring and recording dose rate continuously may be used in place of, or in addition to, integrating dosimeters. For the purposes of this table, a dosimeter is considered to be one phosphor; two or more phosphors in one packet are considered to be two or more dosimeters. Film badges shall not be used for measuring direct radiation. The 39 stations is not an absolute number. The number of direct radiation monitoring stations may be reduced according to geographical limitations; e.g., some sectors may be over water so that the number of dosimeters may be reduced accordingly. The frequency of analysis or readout for dosimetry systems will depend upon the characteristics of the specific system used and should be selected to obtain optimum dose information with minimal fading.

(c) Airborne particulate sample filters shall be analyzed for gross beta radioactivity 24 or more hours after sampling to allow for radon and thoron daughter decay. If gross beta activity in air particulate samples is greater than 10 times the yearly mean of control samples, gamma isotopic analysis shall be performed on the individual samples.

(d) Gamma isotopic analysis means the identification and quantification of gamma-emitting radionuclides that may be attributable to the effluents from the facility.

(e) The "control sample" shall be taken at a distance beyond significant influence of the discharge. The "indicator sample" shall be taken in an area beyond but near the mixing zone.

(f) A composite sample is one in which the quantity (aliquot) of liquid sampled is proportional to the quantity of flowing liquid and in which the method of sampling employed results in a specimen that is representative of the liquid flow. In this program composite sample aliquots shall be collected at time intervals that are very short (e.g., hourly) relative to the compositing period (e.g., monthly) in order to assure obtaining a representative sample.

(g) The dose shall be calculated for the maximum organ and age group, using the methodology and parameters in the OCDM.

8.2 ENVIRONMENTAL MONITOR SAMPLE LOCATIONS

All sample locations are specified on Table 8-2, a list of direction and distance to sample points. Indicator and control samples required by the environmental program are noted by an I or a C.

Figure 8-1 shows the onsite* sample locations for airborne particulates, radioiodine and direct radiation. Also indicated on Figure 8-1 is the onsite vegetable garden, as well as the placement of post-accident dosimeters, locations 2 -7 and 13 -24. Dosimeter locations 2, 4,5,6, 7 are co-located with the air monitor samplers. The onsite garden is located in the SE sector near the closest resident who is the real maximally exposed individual, rather than in the ESE sector which has the highest D/Q.

Figure 8-2 gives the location of the milk herds near the plant. On this map is also included the Ontario Water District intake pumping station where lake water is sampled prior to treatment.

Figure 8-3 shows the offsite control locations for direct radiation as measured by dosimeters.

Figure 8-4 shows the offsite sample locations for airborne particulates, and radioiodine. Sample stations 9 and 11 are situated near population centers, Webster and Williamson, located approximately 7 miles from the Ginna Site. Dosimeter locations 8 - 12 are co-located with air monitor samplers.

* Onsite refers to the area surrounding the Ginna Plant bounded by Ginna property lines. Offsite refers to the area beyond the immediate Ginna property.
** Air Sampler #3 was relocated in 2018 for reliable electric power source. TLD#3 remains in its original location for consistency of direct radiation trending.

Table 8-2

Location, Direction, and Distances to Sample Points

Air Sample Locations					
Station	**Type**	**Coordinates (Latitude, N)**	**Coordinates (Longitude, W)**	**Direction (degrees)**	**Distance (meters)**
2	I	43.27798	77.30450	84	360
3	I	43.27667	77.30646	120	220
4	I	43.27561	77.30600	134	320
5	I	43.27602	77.30913	186	180
6	I	43.27614	77.31198	236	300
7	I	43.27724	77.31177	259	240
8	C	43.22860	77.54403	254	19840
9	I	43.21872	77.42007	234	11150
10	C	43.16360	77.32606	186	12730
11	I	43.22327	77.18756	122	11540
12	C	43.26818	76.99870	92	25170
13	I	43.27091	77.31103	193	770
Water Sample Locations					
Station	**Type**	**Coordinates (Latitude, N)**	**Coordinates (Longitude, W)**	**Direction (degrees)**	**Distance (meters)**
Shoremont	C	43.27561	77.64368	270	27150
Ontario Water District Intake	I	43.28963	77.28704	53	2220
Circulation Water Intake	S	43.28725	77.30928	358	1070
Circulation Water Discharge	I	43.27861	77.30857	13	110
Deer Creek	S	Points down-stream from Outfall 006	Points downstream from Outfall 006	N/A	N/A
Milk Sample Locations					
Station	**Type**	**Coordinates (Latitude, N)**	**Coordinates (Longitude, W)**	**Direction (degrees)**	**Distance (meters)**
Farm A	S	43.24196	77.21978	119	8240
Farm B	S	43.17035	77.12589	129	19030

Produce Samples

Description	Type	Coordinates (Latitude, N)	Coordinates (Longitude, W)	Direction (degrees)	Distance (meters)
Onsite Gardens	I	43.27278	77.30413	145	660
		43.27627	77.30389	111	430
		43.27727	77.30140	94	610
Purchased from farms > 10 miles	C	--	--	--	--

Fish Samples		Sediment Samples	
Description	**Type**	**Description**	**Type**
Discharge Plume	I	OWD Shoreline	I
Lake Ontario > 10 miles West of Ginna	C	Shoremont (> 10 miles)	C
		Lake Ontario Benthic	S

Dosimeter Sample Locations

Station	Type	Coordinates (Latitude, N)	Coordinates (Longitude, W)	Direction (degrees)	Distance (meters)
2	I	43.27798	77.30450	84	360
3	I	43.27643	77.30366	108	440
4	I	43.27561	77.30600	134	320
5	I	43.27602	77.30913	186	180
6	I	43.27614	77.31198	236	300
7	I	43.27724	77.31177	259	240
8	C	43.22860	77.54403	254	19840
9	I	43.21872	77.42007	234	11150
10	C	43.16360	77.32606	186	12730
11	I	43.22327	77.18756	122	11540
12	C	43.26818	76.99870	92	25170
13	I	43.27889	77.31157	303	260
14	I	43.28032	77.31886	290	860
15	I	43.27708	77.32016	266	920
16	I	43.27310	77.31993	241	1030

Dosimeter Sample Locations (Continued)					
Station	**Type**	**Coordinates (Latitude, N)**	**Coordinates (Longitude, W)**	**Direction (degrees)**	**Distance (meters)**
17	I	43.27347	77.31162	206	510
18	I	43.27122	77.31082	192	730
19	I	43.27346	77.30868	178	460
20	I	43.27202	77.30650	163	650
21	I	43.27279	77.30408	144	660
22	I	43.27284	77.29960	125	920
23	I	43.27564	77.29969	107	780
24	I	43.27797	77.29993	87	730
25	C	43.23026	77.46891	248	14000
26	C	43.18249	77.43311	224	14600
27	C	43.16017	77.37563	203	14120
28	C	43.14851	77.18617	145	17450
29	C	43.23817	77.14423	108	14050
30	C	43.23687	77.05909	103	20760
31	I	43.26868	77.39841	262	7330
32	I	43.25309	77.37582	243	6070
33	I	43.22451	77.37458	222	7950
34	I	43.22582	77.34687	208	6520
35	I	43.21207	77.33044	193	7490
36	I	43.22840	77.30405	176	5480
37	I	43.22933	77.28251	158	5770
38	I	43.23135	77.25186	138	6910
39	I	43.25321	77.23025	113	6930
40	I	43.28071	77.22961	87	6440
63	I	43.27892	77.32344	228	740
64	I	43.27320	77.31571	277	1190

Table 8-2 Notes:
Latitude and longitude coordinates are based on World Geodetic System of 1984 (WGS84) datum.
Directions and Distance are noted from the centerline of thereactor
I = Indicator Sample
C = Control or background sample
S = Supplemental sample

Figure 8-1

Location of Onsite Air Monitors and Dosimeters

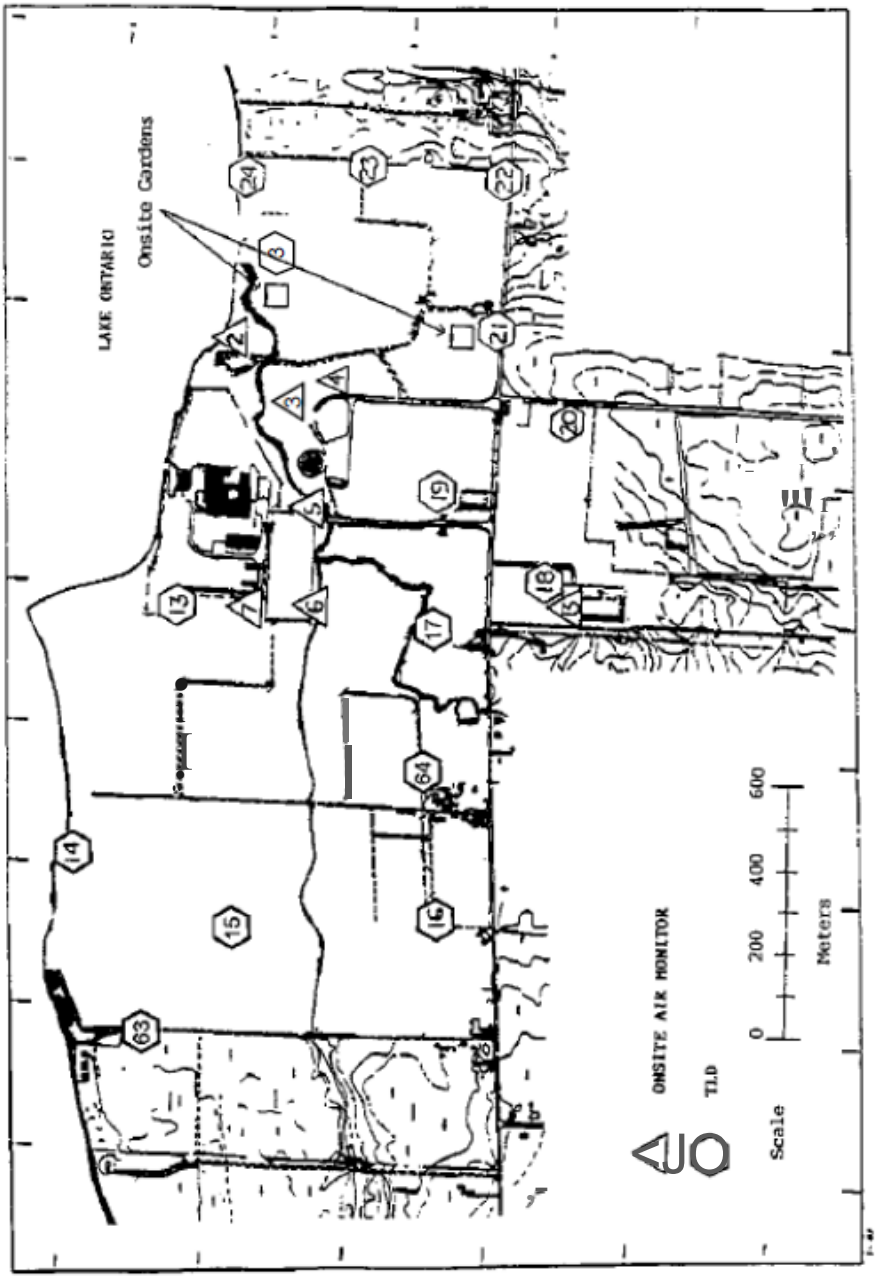


Figure 8-2

Location of Farms for Milk Samples and Ontario Water District Intake

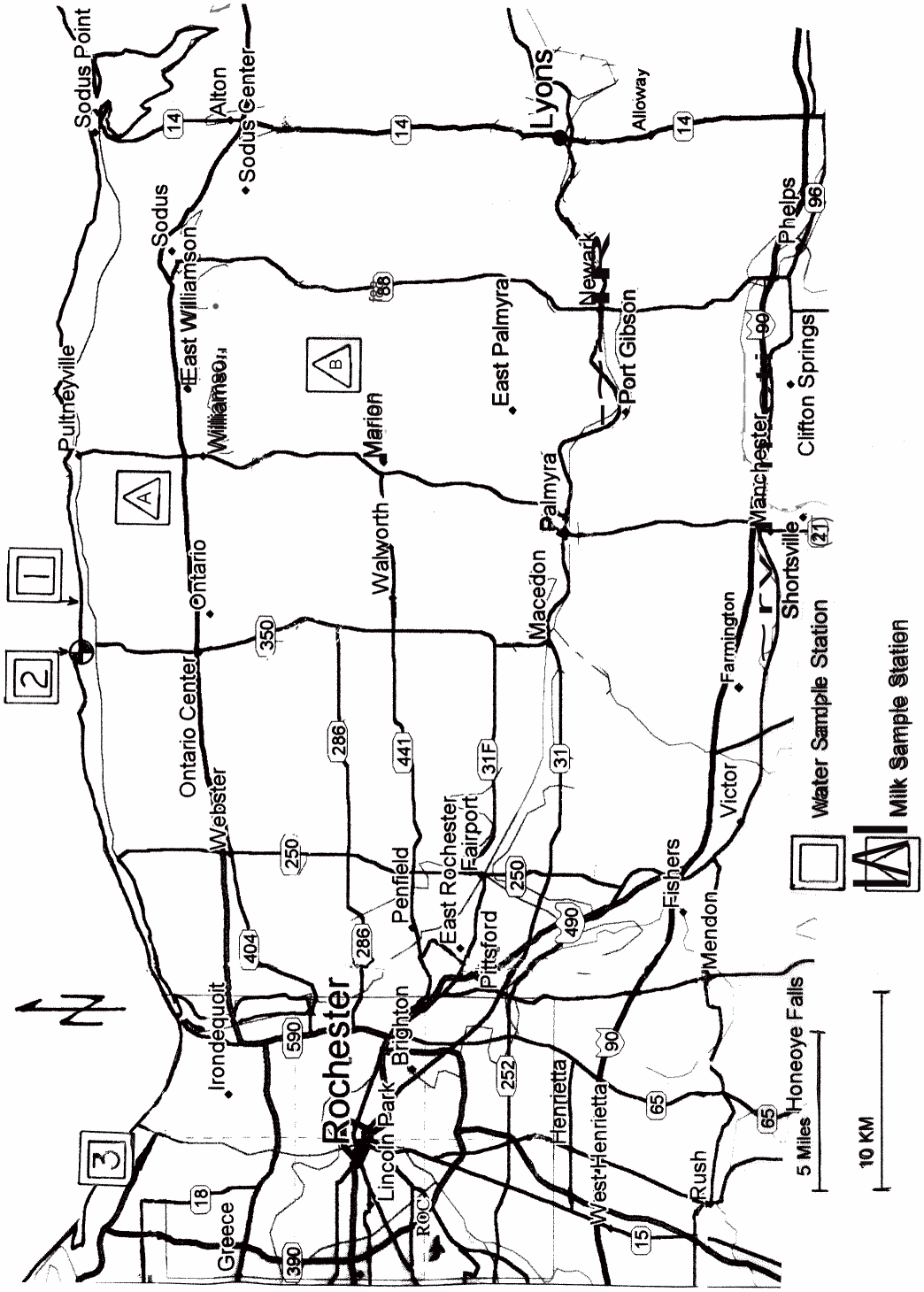


Figure 8-3

Location of Offsite Dosimeters

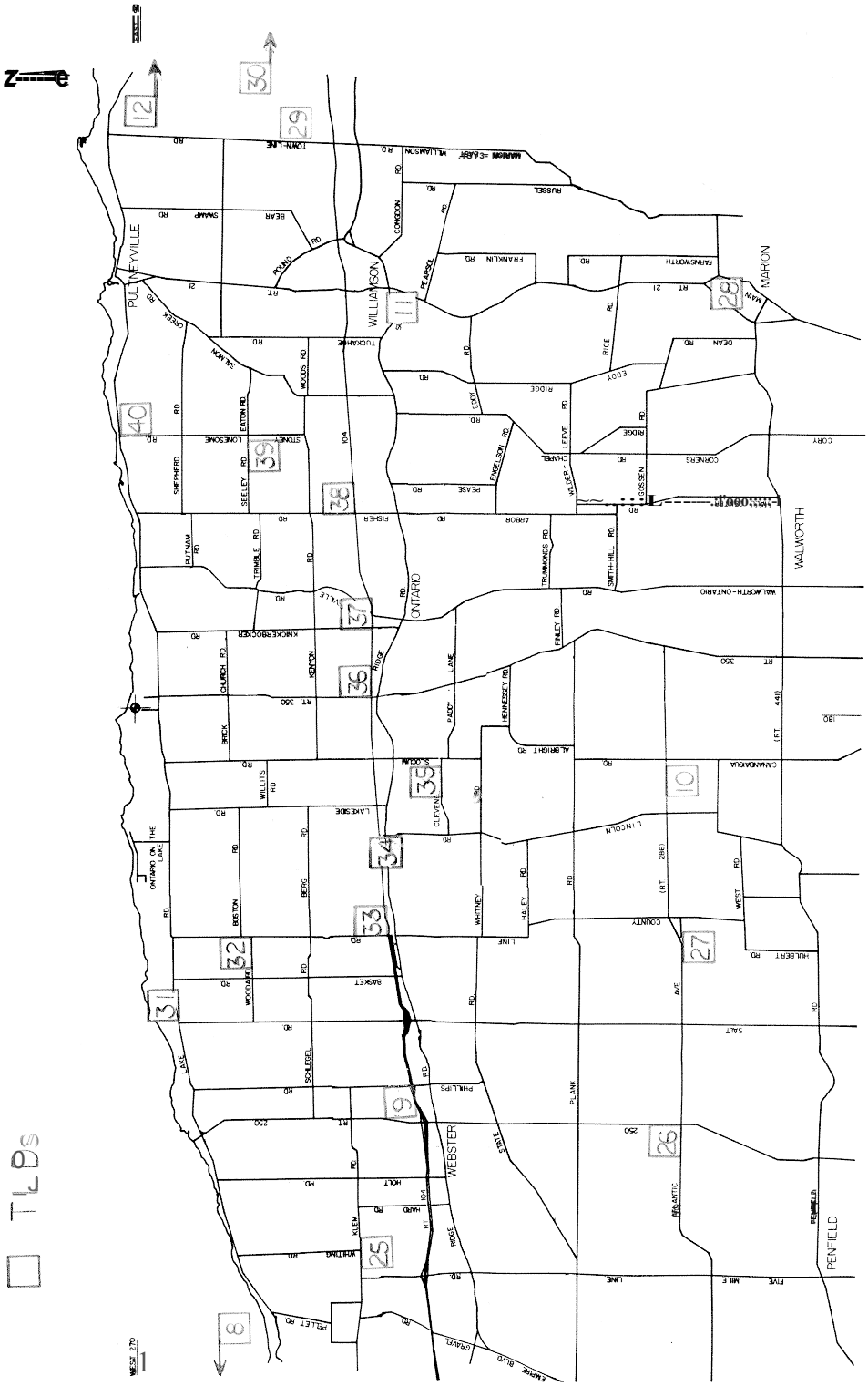


Figure 8-4

Location of Offsite Air Monitors

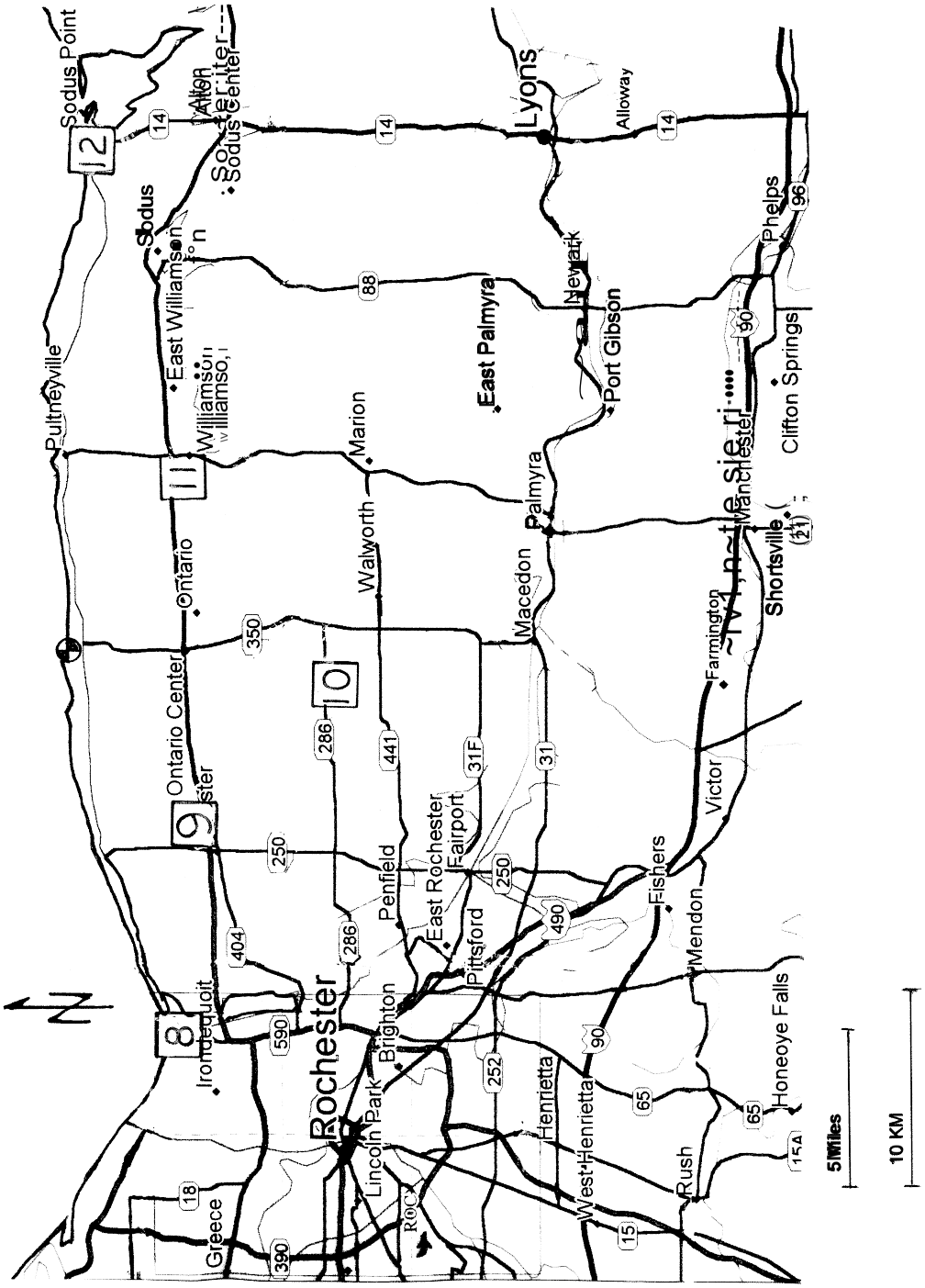


Table 8-3

Detection Capabilities for Environmental Sample Analysis Lower Limit of Detection (LLD)

Analysis	Water (pCi/l)	Airborne Particulate Or Gas (pCi/m^3)	Fish (pCi/kg) wet	Milk (pCi/l)	Food Products (pCi/kg) wet	Shoreline Sediment (pCi/kg) dry
gross beta	4(a)	1.0E-02				
3-H	2000 (1000)(a)					
54-Mn	15		130			
59-Fe	30		260			
58, 60-Co	15		130			
65-Zn	30		260			
95-Zr-Nb	15(b)					
131-I	1	7.0E-02		1	60	
134, 137-Cs	15(10)(a), 18	1.0E-02	130	15	60	150
140-Ba-La	15(b)			15(b)		

Table 8-3

Table Notation

(a) LLD for drinking water
(b) Total for parent and daughter

The LLD shall be calculated as described in Notation (a) to Table 4-1

Table 8-4

Reporting Levels for Radioactivity Concentrations in Environmental Samples

Analysis	Water (pCi/l)	Airbourne Particulate or Gas (pCi/m^3)	Fish (pCi/kg,wet)	Milk (pCi/l)	Broad Leaf Vegetables (pCi/kg, wet)
H-3	2.0E+04				
Mn-54	1000		3.0E+04		
Fe-59	400		1.0E+04		
Co-58	1000		3.0E+04		
Co-60	300		1.0E+04		
Zn-65	300		2.0E+04		
Zr-Nb-95	400(a)				
I-131	2	0.9		3	1.0E+02
Cs-134	30	10	1.0E+03	60	1.0E+03
Cs-137	50	20	2.0E+03	70	2.0E+03
Ba-La-140	200(a)			300	

Table 8-4

Table Notation

(a) Total for parent and daughter

Decay correction in analysis of environmental samples is taken from the end of the sampling time not from the midpoint of the sample period.

Table 8-5

D/Q and X/Q 5 Year Average 1995 - 1999
Plant Vent

Distance to section boundary in meters:										
Direction	**804m**	**1609m**	**2416m**	**3218m**	**4022m**	**4827m**	**5632m**	**6436m**	**7240m**	**8045m**
D/Q										
N	1.74E-09	8.20E-10	5.54E-10	3.36E-10	2.45E-10	1.85E-10	1.41E-10	1.13E-10	1.01E-10	3.86E-10
NNE	1.18E-09	6.28E-10	3.99E-10	2.75E-10	2.02E-10	1.53E-10	1.29E-10	9.54E-11	8.50E-11	2.26E-10
NE	1.74E-09	1.84E-09	6.26E-10	3.86E-10	2.83E-10	2.14E-10	1.64E-10	1.32E-10	1.09E-10	9.17E-11
ENE	2.99E-09	1.43E-09	8.56E-10	5.76E-10	4.25E-10	3.14E-10	2.39E-10	1.91E-10	1.58E-10	1.32E-10
E	5.11E-09	2.20E-09	1.23E-09	7.96E-10	5.69E-10	4.17E-10	5.09E-10	6.34E-10	4.74E-10	4.00E-10
ESE	7.41E-09	3.19E-09	1.67E-09	1.13E-09	9.34E-10	9.18E-10	7.27E-10	5.16E-10	4.26E-10	3.54E-10
SE	4.14E-09	1.93E-09	9.91E-10	7.32E-10	7.05E-10	5.40E-10	4.00E-10	3.05E-10	2.52E-10	2.09E-10
SSE	1.32E-09	6.71E-10	3.72E-10	2.68E-10	2.58E-10	1.88E-10	1.38E-10	2.76E-10	8.94E-11	7.48E-11
S	2.15E-09	1.29E-09	7.37E-10	6.54E-10	4.95E-10	3.58E-10	2.61E-10	2.02E-10	1.67E-10	1.39E-10
SSW	2.57E-09	1.48E-09	8.43E-10	5.50E-10	4.00E-10	3.95E-10	2.87E-10	2.22E-10	1.83E-10	1.52E-10
SW	2.88E-09	1.53E-09	8.50E-10	5.66E-10	4.79E-10	4.41E-10	3.20E-10	2.49E-10	2.05E-10	1.71E-10
WSW	2.21E-09	1.18E-09	6.93E-10	4.73E-10	3.57E-10	3.04E-10	4.38E-10	3.39E-10	2.80E-10	2.33E-10
W	9.54E-10	5.40E-10	3.27E-10	2.21E-10	1.61E-10	1.20E-10	1.76E-10	2.71E-10	2.25E-10	1.87E-10
WNW	1.29E-10	9.58E-11	6.87E-11	4.91E-11	1.18E-10	2.83E-11	2.23E-11	1.82E-11	1.51E-11	1.27E-11
NW	4.80E-10	3.03E-10	2.03E-10	1.41E-10	1.05E-10	8.01E-11	6.25E-11	5.05E-11	4.20E-11	3.52E-11
NNW	1.37E-09	7.06E-10	4.40E-10	3.01E-10	2.21E-10	1.73E-10	1.29E-10	1.03E-10	8.59E-11	7.19E-11

Direction	804m	1609m	2416m	3218m	4022m	4827m	5632m	6436m	7240m	8045m
X/Q										
N	8.56E-08	9.42E-08	9.19E-08	8.10E-08	6.99E-08	6.15E-08	5.38E-08	5.41E-08	6.17E-08	1.20E-07
NNE	7.17E-08	8.06E-08	8.23E-08	7.45E-08	7.21E-08	5.83E-08	5.28E-08	4.81E-08	6.98E-08	1.33E-07
NE	8.27E-08	9.48E-08	9.36E-08	8.33E-08	7.23E-08	6.94E-08	5.63E-08	5.05E-08	4.57E-08	4.18E-08
ENE	1.05E-07	1.16E-07	1.06E-07	8.89E-08	7.41E-08	6.26E-08	5.35E-08	4.66E-08	4.13E-08	3.70E-08
E	1.91E-07	1.81E-07	1.53E-07	1.16E-07	9.09E-08	7.32E-08	8.82E-08	7.67E-08	6.51E-08	5.61E-08
ESE	2.43E-07	2.13E-07	1.70E-07	1.35E-07	1.11E-07	9.27E-08	7.19E-08	5.86E-08	4.96E-08	4.27E-08
SE	1.47E-07	1.38E-07	1.15E-07	1.12E-07	9.67E-08	7.43E-08	5.79E-08	5.33E-08	5.21E-08	3.44E-08
SSE	6.06E-08	6.56E-08	5.66E-08	5.38E-08	4.55E-08	3.40E-08	2.64E-08	2.16E-08	1.83E-08	1.58E-08
S	1.06E-07	1.49E-07	1.27E-07	9.80E-08	7.10E-08	5.27E-08	4.09E-08	3.34E-08	2.83E-08	2.42E-08
SSW	1.06E-07	1.59E-07	1.54E-07	1.04E-07	7.61E-08	6.96E-08	5.35E-08	4.35E-08	3.68E-08	3.16E-08
SW	1.06E-07	1.39E-07	1.43E-07	1.18E-07	1.01E-07	9.76E-08	7.60E-08	6.22E-08	5.27E-08	4.53E-08
WSW	1.13E-07	1.40E-07	1.33E-07	1.23E-07	1.20E-07	1.30E-07	1.47E-07	1.20E-07	1.02E-07	8.78E-08
W	7.19E-08	1.07E-07	9.56E-08	7.99E-08	6.66E-08	5.67E-08	9.77E-08	9.14E-08	7.77E-08	6.68E-08
WNW	6.07E-09	1.64E-08	1.96E-08	1.87E-08	1.68E-08	1.49E-08	1.33E-08	1.20E-08	1.08E-08	9.88E-09
NW	1.99E-08	3.49E-08	3.64E-08	3.24E-08	2.80E-08	2.42E-08	2.11E-08	1.86E-08	1.66E-08	1.50E-08
NNW	6.23E-08	6.98E-08	6.67E-08	5.74E-08	4.86E-08	4.15E-08	3.58E-08	3.20E-08	2.80E-08	2.53E-08

Table 8-6

D/Q and X/Q 5 Year Average 1995 – 1999
Containment Vent

Distance to section boundary in meters:										
Direction	**804m**	**1609m**	**2416m**	**3218m**	**4022m**	**4827m**	**5632m**	**6436m**	**7240m**	**8045m**
D/Q										
N	1.88E-08	5.95E-09	2.88E-09	1.85E-09	1.31E-09	9.45E-10	6.86E-10	5.31E-10	4.42E-10	3.90E-10
NNE	1.86E-08	5.88E-09	2.85E-09	1.83E-09	1.29E-09	9.35E-10	6.79E-10	5.25E-10	4.39E-10	3.90E-10
NE	1.99E-08	6.30E-09	3.05E-09	1.96E-09	1.38E-09	1.00E-09	7.27E-10	5.62E-10	4.64E-10	3.86E-10
ENE	1.98E-08	6.28E-09	3.04E-09	1.95E-09	1.38E-09	1.08E-09	7.24E-10	5.60E-10	4.62E-10	3.84E-10
E	1.99E-08	6.30E-09	3.05E-09	1.96E-09	1.38E-09	1.00E-09	7.41E-10	5.75E-10	4.75E-10	3.95E-10
ESE	1.78E-08	5.66E-09	2.74E-09	1.77E-09	1.27E-09	9.19E-10	6.67E-10	5.16E-10	4.11E-10	3.54E-10
SE	1.01E-08	3.23E-09	1.57E-09	1.05E-09	7.51E-10	5.43E-10	3.94E-10	3.05E-10	2.52E-10	2.09E-10
SSE	3.66E-09	1.18E-09	5.75E-10	3.92E-10	2.85E-10	2.06E-10	1.50E-10	1.16E-10	9.56E-11	7.94E-11
S	6.65E-09	2.14E-09	1.07E-09	7.06E-10	4.99E-10	3.60E-10	2.62E-10	2.02E-10	1.67E-10	1.39E-10
SSW	7.05E-09	2.28E-09	1.17E-09	7.53E-10	5.35E-10	3.95E-10	2.87E-10	2.22E-10	1.83E-10	1.52E-10
SW	7.77E-09	2.50E-09	1.22E-09	7.94E-10	5.98E-10	4.43E-10	3.22E-10	2.49E-10	2.05E-10	1.71E-10
WSW	1.04E-08	3.32E-09	1.61E-09	1.04E-09	7.44E-10	5.64E-10	4.39E-10	3.39E-10	2.80E-10	2.33E-10
W	8.42E-09	2.68E-09	1.30E-09	8.33E-10	5.89E-10	4.27E-10	3.46E-10	2.72E-10	2.25E-10	1.87E-10
WNW	2.68E-09	1.18E-09	4.16E-10	2.67E-10	1.89E-10	1.36E-10	9.92E-11	7.67E-11	6.34E-11	5.27E-11
NW	5.20E-09	1.66E-09	8.05E-10	5.16E-10	3.65E-10	2.64E-10	1.92E-10	1.48E-10	1.23E-10	1.02E-10
NNW	1.13E-08	3.58E-09	1.74E-09	1.12E-09	7.88E-10	5.70E-10	4.14E-10	3.20E-10	2.65E-10	2.20E-10

Direction	804m	1609m	2416m	3218m	4022m	4827m	5632m	6436m	7240m	8045m
X/Q										
N	1.73E-06	6.24E-07	3.58E-07	2.44E-07	1.52E-07	1.42E-07	1.15E-07	9.67E-08	9.34E-08	9.86E-08
NNE	2.15E-06	7.57E-07	4.37E-07	3.01E-07	2.26E-07	1.78E-07	1.46E-07	1.24E-07	1.26E-07	1.48E-07
NE	1.94E-06	7.00E-07	3.99E-07	2.70E-07	2.00E-07	1.55E-07	1.25E-07	1.05E-07	9.02E-08	7.88E-08
ENE	1.20E-06	4.40E-07	2.46E-07	1.64E-07	1.19E-07	9.14E-08	7.26E-08	6.03E-08	5.17E-08	4.50E-08
E	1.05E-06	3.91E-07	2.18E-07	1.44E-07	1.03E-07	7.84E-08	6.58E-08	5.39E-08	4.59E-08	3.96E-08
ESE	8.27E-07	3.15E-07	1.83E-07	1.24E-07	8.99E-08	6.76E-08	5.27E-08	4.32E-08	3.67E-08	3.16E-08
SE	5.82E-07	2.44E-07	1.56E-07	1.17E-07	8.36E-08	6.27E-08	4.88E-08	4.00E-08	3.39E-08	2.92E-08
SSE	3.27E-07	1.42E-07	8.76E-08	6.27E-08	4.44E-08	3.31E-08	2.57E-08	2.09E-08	1.77E-08	1.52E-08
S	5.09E-07	2.29E-07	1.40E-07	8.96E-08	6.92E-08	4.71E-08	3.65E-08	2.98E-08	2.52E-08	2.16E-08
SSW	4.64E-07	2.44E-07	1.61E-07	1.03E-07	7.31E-08	5.49E-08	4.27E-08	3.49E-08	2.95E-08	2.54E-08
SW	4.99E-07	2.52E-07	1.95E-07	1.36E-07	1.00E-07	7.59E-08	5.94E-08	4.87E-08	4.13E-08	3.56E-08
WSW	9.88E-07	3.99E-07	2.57E-07	1.99E-07	1.61E-07	1.37E-07	1.11E-07	9.16E-08	7.79E-08	6.73E-08
W	9.24E-07	3.62E-07	2.15E-07	1.49E-07	1.10E-07	8.62E-08	8.29E-08	6.83E-08	5.82E-08	5.03E-08
WNW	3.25E-07	1.26E-07	7.51E-08	5.22E-08	3.92E-08	3.08E-08	2.51E-08	2.11E-08	1.83E-08	1.60E-08
NW	5.27E-07	1.98E-07	1.14E-07	7.80E-08	5.78E-08	4.50E-08	3.62E-08	3.03E-08	2.62E-08	2.29E-08
NNW	9.39E-07	3.46E-07	1.98E-07	1.34E-07	9.89E-08	7.65E-08	6.13E-08	5.12E-08	4.41E-08	3.85E-08

Table 8-7

D/Q and X/Q 5 Year Average 1995 - 1999
Air Ejector

Distance to section boundary in meters:										
Direction	**804m**	**1609m**	**2416m**	**3218m**	**4022m**	**4827m**	**5632m**	**6436m**	**7240m**	**8045m**
D/Q										
N	2.02E-08	6.38E-09	3.09E-09	1.98E-09	1.40E-09	1.01E-09	7.34E-10	5.68E-10	4.69E-10	3.90E-10
NNE	2.07E-08	6.55E-09	3.17E-09	2.03E-09	1.44E-09	1.04E-09	7.54E-10	5.83E-10	4.81E-10	4.00E-10
NE	2.11E-08	6.66E-09	3.22E-09	2.07E-09	1.46E-09	1.06E-09	7.67E-10	5.93E-10	4.89E-10	4.07E-10
ENE	2.05E-08	6.49E-09	3.14E-09	2.01E-09	1.42E-09	1.03E-09	7.47E-10	5.77E-10	4.77E-10	3.96E-10
E	2.04E-08	6.46E-09	3.13E-09	2.01E-09	1.42E-09	1.02E-09	7.43E-10	5.75E-10	4.75E-10	3.95E-10
ESE	1.84E-08	5.80E-09	2.81E-09	1.80E-09	1.27E-09	9.19E-10	6.67E-10	5.16E-10	4.26E-10	3.54E-10
SE	1.08E-08	3.43E-09	1.66E-09	1.06E-09	7.51E-10	5.43E-10	3.94E-10	3.05E-10	2.52E-10	2.09E-10
SSE	4.12E-09	1.30E-09	6.30E-10	4.04E-10	2.85E-10	2.06E-10	1.50E-10	1.16E-10	9.56E-11	7.94E-11
S	7.19E-09	2.27E-09	1.10E-09	7.06E-10	4.99E-10	3.60E-10	2.62E-10	2.02E-10	1.67E-10	1.39E-10
SSW	7.89E-09	2.49E-09	1.21E-09	7.74E-10	5.47E-10	3.95E-10	2.87E-10	2.22E-10	1.83E-10	1.52E-10
SW	8.85E-09	2.80E-09	1.35E-09	8.68E-10	6.13E-10	4.43E-10	3.22E-10	2.49E-10	2.05E-10	1.71E-10
WSW	1.21E-08	3.82E-09	1.85E-09	1.18E-09	8.37E-10	6.05E-10	4.39E-10	3.39E-10	2.80E-10	2.33E-10
W	9.68E-09	3.06E-09	1.48E-09	9.49E-10	6.71E-10	4.85E-10	3.52E-10	2.72E-10	2.25E-10	1.87E-10
WNW	3.28E-09	1.04E-09	5.54E-10	3.22E-10	2.51E-10	1.64E-10	1.19E-10	9.22E-11	7.62E-11	6.33E-11
NW	5.88E-09	1.86E-09	8.99E-10	5.77E-10	4.07E-10	2.94E-10	2.14E-10	1.65E-10	1.37E-10	1.13E-10
NNW	1.22E-08	3.84E-09	1.86E-09	1.19E-09	8.43E-10	6.09E-10	4.42E-10	3.42E-10	2.82E-10	2.35E-10

Direction	804m	1609m	2416m	3218m	4022m	4827m	5632m	6436m	7240m	8045m
X/Q										
N	2.34E-06	8.13E-07	4.56E-07	3.06E-07	2.24E-07	1.72E-07	1.37E-07	1.13E-07	9.72E-08	8.43E-08
NNE	3.01E-06	1.02E-06	5.81E-07	3.94E-07	2.91E-07	2.25E-07	1.80E-07	1.49E-07	1.28E-07	1.11E-07
NE	2.48E-06	8.70E-07	4.88E-07	3.27E-07	2.40E-07	1.84E-07	1.47E-07	1.21E-07	1.04E-07	9.01E-08
ENE	1.51E-06	5.37E-07	2.94E-07	1.92E-07	1.39E-07	1.05E-07	8.25E-08	6.79E-08	5.79E-08	5.01E-08
E	1.28E-06	4.52E-07	2.44E-07	1.58E-07	1.13E-07	8.50E-08	6.65E-08	5.46E-08	4.65E-08	4.01E-08
ESE	9.59E-07	3.28E-07	1.75E-07	1.13E-07	8.09E-08	6.08E-08	4.75E-08	3.90E-08	3.31E-08	2.85E-08
SE	7.73E-07	2.65E-07	1.42E-07	9.20E-08	6.57E-08	4.95E-08	3.87E-08	7.93E-05	2.70E-08	2.33E-08
SSE	4.47E-07	1.54E-07	8.18E-08	5.27E-08	3.75E-08	2.80E-08	2.18E-08	1.79E-08	1.52E-08	1.68E-08
S	6.59E-07	2.27E-07	1.21E-07	7.75E-08	5.49E-08	4.11E-08	3.20E-08	2.61E-08	2.21E-08	1.90E-08
SSW	6.43E-07	2.22E-07	1.19E-07	7.73E-08	5.52E-08	4.16E-08	3.25E-08	2.67E-08	2.26E-08	1.95E-08
SW	7.75E-07	2.65E-07	1.45E-07	9.61E-08	6.96E-08	5.31E-08	4.19E-08	3.46E-08	2.95E-08	2.55E-08
WSW	1.49E-06	5.11E-07	2.86E-07	1.91E-07	1.40E-07	1.08E-07	8.58E-08	7.11E-08	6.08E-08	5.27E-08
W	1.29E-06	4.52E-07	2.51E-07	1.67E-07	1.22E-07	9.30E-08	7.37E-08	6.09E-08	5.21E-08	4.51E-08
WNW	5.27E-07	1.88E-07	1.05E-07	6.99E-08	5.10E-08	3.91E-08	3.10E-08	2.56E-08	2.19E-08	1.90E-08
NW	7.90E-07	2.79E-07	1.54E-07	1.02E-07	7.39E-08	5.63E-08	4.45E-08	3.67E-08	3.14E-08	2.71E-08
NNW	1.28E-06	4.51E-07	2.49E-07	1.64E-07	1.19E-07	9.06E-08	7.15E-08	5.90E-08	5.04E-08	4.36E-08

8.3 LAND USE CENSUS

8.3.1. CONTROL

A Land Use Census shall be conducted annually between June 1 and October 1, and shall identify within a distance of 5 miles the location in each of the 16 meteorological sectors of the nearest milk animal, the nearest residence, and the nearest garden of greater than 500 square feet producing broad leaf vegetation. (In lieu of a garden census, broad leaf vegetation sampling of at least three different kinds of vegetation may be performed in an onsite garden located in the meteorological sector with the highest average annual growing season deposition parameter (D/Q) OR another location with a higher D/Q than the location of the maximally exposed individual.)

8.3.2 APPLICABILITY: At all Times.

8.3.3 ACTION:

- With a Land Use Census identifying a location(s) that yields a calculated dose or dose commitment greater than the values currently being calculated in Section 5.3.11 (Surveillance Requirements) of the ODCM, identify the new location(s) in the next Annual Radioactive Effluent Release Report.

- With a Land Use Census identifying a location(s) that yields a calculated dose or dose commitment (via the same exposure pathway) 20% greater than at a location from which samples are currently being obtained in accordance with Section 8.1.1 (Radiological Environmental Monitoring - Controls), add the new location(s) within 30 days to the REMP described in the ODCM, if permission from the owner to collect samples can be obtained and sufficient sample volume is available. The sampling location(s), excluding Control location(s), having the lowest calculated dose or dose commitment(s), via the same exposure pathway, may be deleted from this monitoring program after October 31 of the year in which this Land Use Census was conducted. Submit in the next Annual Radioactive Effluent Release Report documentation for a change in the ODCM including a revised figure(s) and table(s) for the ODCM reflecting the new location(s) with information supporting the change in sampling location(s).

8.3.4 SURVEILLANCE REQUIREMENTS

The Land Use Census shall be conducted between June 1 and October 1 of each year using a method that will best provide the necessary information such as by door-to-door survey, vehicular survey, aerial survey, or by consulting local agricultural authorities. The results of the Land Use Census shall be included in the Annual Radiological Environmental Operating Report pursuant to Section 9.1 of the ODCM.

8.3.5 BASES:

This specification is provided to ensure that changes in the use of areas at or beyond the SITE BOUNDARY are identified and that modifications to the REMP given in the ODCM are made if required by the results of this census. Information from methods such as the door-to door survey, vehicular survey, aerial survey, or from consulting with local agricultural authorities shall be used. This census satisfies the requirements of SectionIV.B.3 of Appendix I to 10 CFR 50. Restricting the census to gardens of greater than 500 square feet provides assurance that significant exposure pathways via leafy vegetables will be identified and monitored, since a garden of this size is the minimum required to produce the quantity (26 kg/year) of leafy vegetables assumed in Regulatory Guide 1.109 for consumption by a child. To determine this minimum garden size, the following assumptions were made: (1) 20% of the garden was used for growing broad leaf vegetation (i.e., similar to lettuce and cabbage), and (2) there was a vegetation yield of 2 kg/m^2.

8.4 INTERLABORATORY COMPARISON PROGRAM

8.4.1 CONTROL

Analyses shall be performed on all radioactive materials supplied as part of an Interlaboratory Comparison Program, that correspond to samples required by the REMP, and that has been approved by the Commission, if such a program exists.

8.4.2 APPLICABILITY: At all times.

8.4.3 ACTION:

With analyses not performed as required above, report the corrective actions taken to prevent recurrence to the Commission in the Annual Radiological Environmental Operating Report pursuant to Section 8.4.1 (Interlaboratory Comparison Program – Control) of the ODCM.

8.4.4 SURVEILLANCE REQUIREMENTS

The Interlaboratory Comparison Program is described in and implemented by procedure CH-QC-INTERLAB. A summary of the results obtained as part of the above required Interlaboratory Comparison Program shall be included in the Annual Radiological Environmental Operating Report pursuant to Section 8.4.1 (Interlaboratory Comparison Program – Control) of the ODCM.

8.4.5 BASES:

The requirement for participation in an approved Interlaboratory Comparison Program is provided to ensure that independent checks on the precision and accuracy of the measurements of radioactive materials in environmental sample matrices are performed as part of the Quality Assurance program for environmental monitoring in order to demonstrate that the results are valid for the purposes of Section IV.B.2 of Appendix I to10 CFR 50.

9.0 REPORTING REQUIREMENTS

9.1 Annual Radiological Environmental Operating Report

An Annual Radiological Environmental Operating Report covering the operation of the unit during the previous calendar year shall be submitted prior to May 15 of each year. The Annual Radiological Environmental Operating Report shall include summaries, interpretations, and analysis of trends of the results of the radiological environmental surveillance activities for the report period, including a comparison with background (control) samples and previous environmental surveillance reports and an assessment of the observed impacts of the plant operation on the environment. The report shall also include the results of the Land Use Census as required.

This report shall include any new location(s) identified by the Land Use Census which yield a calculated dose or dose commitment greater than those forming the basis of Section 8.1.1 (Radiological Environmental Monitoring - Controls) The report shall also contain a discussion which identifies the causes of the unavailability of milk or leafy vegetable samples and identifies locations for obtaining replacement samples in accordance with Section 8.1.1 (Radiological Environmental Monitoring - Controls).

The Annual Radiological Environmental Operating Report shall include the results of analysis of all radiological environmental samples and of all environmental radiation measurements taken during the period pursuant to the locations specified in the tables and figures of Section 5.0 of the ODCM, the summarized and tabulated results of these analyses and measurements shall be in the format of Table 9-1, derived from the Radiological Assessment Branch Technical Position, Revision 1, November 1979. In the event that some results are not available for inclusion with the report, the report shall be submitted noting and explaining the reasons for the missing results. The missing data shall be submitted as soon as possible in a supplementary report.

The report shall also include the following:

a. a summary description of the radiological environmental monitoring program including a map of all sampling locations keyed to a table giving distances and directions from the reactor centerline; and

b. the results of the licensee participation in an Interlaboratory Comparison Program, and the corrective actions taken if the specified program is not being performed as required by Section 8.4.1 (Interlaboratory Comparison Program – Control).

c. a discussion of all deviations from the sampling schedule specified in Table 8-1.

d. a discussion of any environmental sample measurements that exceed the reporting levels but are not the result of plant effluents, as required in the second ACTION of Section 8.1.3.

e. a discussion of all analyses in which the required LLD was not achievable.

9.2 ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

The Radioactive Effluent Release Report covering the operation of the unit during the previous calendar year of operation shall be submitted prior to May 15 each year. This report shall include a summary, on a quarterly basis, of the quantities of radioactive liquid and gaseous effluents and solid waste released as outlined in Regulatory Guide 1.21, Revision 1, with data summarized on a quarterly basis following the format of the Appendix thereof. For solid wastes, the format for Table 3 in Appendix B shall be supplemented with three additional categories: classes of solid wastes (as defined by 10 CFR 61), type of container (e.g. LSA, Type A, Type B, etc.) and solidification agent or absorbent (e.g., Portland cement).

The Radioactive Effluent Release Report shall include an assessment of radiation doses from the radioactive liquid and gaseous effluents released from the unit during each of the previous four calendar quarters as outlined in Regulatory Guide 1.21, Revision 1. In addition, the site boundary maximum noble gas gamma air and beta air doses shall be evaluated. The assessment of radiation doses shall be performed in accordance with Controls 1.2 and 2.3. This same report shall include an annual summary of hourly meteorological data collected over the previous calendar year. The Radioactive Effluent Release Report shall include a discussion which identifies the circumstances which prevented any required detection limits for effluent sample analyses being met. This report shall also include an assessment of the radiation doses from radioactive gaseous and liquid effluents to MEMBERS OF THE PUBLIC due to their activities inside the SITE BOUNDARY during the report period. The assessment of radiation doses shall be performed in accordance with the methodology and parameters in the ODCM.

The Annual Radioactive Effluent Release Report shall also include an assessment of radiation doses to the likely maximum exposed MEMBER OF THE PUBLIC from reactor operation, including doses from effluent releases and direct radiation, for the previous calendar year to demonstrate compliance with 40 CFR 190.

This report shall include a list and description of unplanned releases from the site to UNRESTRICTED AREAS of radioactive materials in gaseous and liquid effluents made during the reporting period.

This report shall include any changes made during the reporting period to the Offsite Dose Calculation Manual (ODCM). Licensee may make changes to this ODCM and shall submit to the Commission, with the Radioactive Effluent Release Report for the period in which any change(s) is made, a copy of the new ODCM and a summary containing:

a. sufficiently detailed information to support the rationale for the change;

b. a determination that the change will not reduce the accuracy or reliability of dose calculations or setpoint determinations; and

c. documentation of the fact that the change has been reviewed and found acceptable by the Plant Operations Review Committee.

Licensee initiated changes shall become effective after review and acceptance by the Plant Operations Review Committee on a date specified by the licensee.

This report shall include any changes made during the reporting period to the Process Control Program (PCP). This report shall include a discussion of any major changes to the radioactive waste treatment systems.

The Radiological Environmental Operating Report and the Annual Radioactive Effluent Release Report will be prepared and submitted to the U.S. Nuclear Regulatory Commission, Document Control Desk, Washington, D.C. 20555 and a copy to the Regional Administrator of the USNRC, Region I.

9.3 SPECIAL REPORTS

Guidance is given for each of these reports in the applicable Control. The following general guidelines are included here for calculating dose to an exposed individual or the MEMBERS OF THE PUBLIC for preparation of Special Reports:

a. The maximally exposed real MEMBER OF THE PUBLIC will generally be the same individual considered in the ODCM.

b. Dose contributions to the maximally exposed individual need only be considered to be those resulting from the Ginna plant itself. All other uranium fuel cycle facilities or operations are of sufficient distance to contribute a negligible portion of the individual's dose.

c. For determining the total dose to the maximally exposed individual from the major gaseous and liquid effluent pathways and from direct radiation, dose evaluation techniques used in preparing the Special Report will be those described in the ODCM, or other applicable methods where appropriate.

d. The contribution from direct radiation may be estimated by effluent dispersion modeling or calculated from the results of the environmental monitoring program for direct radiation.

Table 9-1

Radiological Environmental Monitoring Program Summary

R.E. GINNA NUCLEAR POWER PLANT
Docket No. 50-244 WAYNE, NEW YORK

Pathway Sampled Unit Of Measurement		Type And Total Number Of Analyses	LLD	Indicator Locations Mean (a) Range	Location With Highest Annual Mean		Control Locations Mean (a) Range
					Name, Distance And Direction	Mean (a) Range	
Air:	Particulate (pCi/Cu.M.)	Gross Beta					
		Gamma Scan					
	Iodine	Gamma Scan					
Direct Radiation:	Dosimetry (mrem/quarter)	Gamma					
Water:	Drinking (pCi/liter)	Gross Beta					
		Gamma Scan					
		Iodine					
	Surface (pCi/liter)	Gross Beta					
		Gamma Scan					
		Iodine					
	Shoreline Sediment	Gamma Scan					
Milk:	(pCi/liter)	Iodine					
		Gamma Scan					
Fish:		Gamma Scan					
Vegetation:		Gamma Scan					

(a) Mean and range based on detectable measurements only. Fraction of detectable measurements at specified locations in parentheses.

10.0 REFERENCES

10.1 R. E. Ginna Nuclear Power Plant Unit No. 1, Appendix A to Operating License No.DPR-18, Technical Specifications, Rochester Gas and Electric Corporation, Docket 50-244

10.2 USNRC, Preparation of Radiological Effluent Technical Specifications for Nuclear Power Plants, NUREG-0133 (October, 1978).

10.3 USNRC, Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I, Regulatory Guide 1.109, Revision 1 (October 1977).

10.4 "R.E. Ginna Nuclear Power Plant Tracer Dilution Study for the Town of Ontario Municipal Drinking Water Intake," HydroQual, Inc. (May 28, 2010).

10.5 R. E. Ginna Nuclear Power Plant, Calculations to Demonstrate Compliance with the Design Objectives of 10 CFR Part 50, Appendix I, Rochester Gas and Electric Corporation, (June, 1977).

10.6 USNRC, Methods for Estimating Atmospheric Transport and dispersion of Gaseous Effluents in Routine Releases from Light-Water-Cooled Reactors, Regulatory Guide 1.111, Revision 1 (July, 1977).

10.7 R. E. Ginna Nuclear Power Plant, Incident Evaluation, Ginna Steam Generator Tube Failure Incident January 25, 1982, Rochester Gas and Electric Corporation, (April12, 1982).

10.8 Pelletier, C. A., et. al., Sources of Radioiodine at Pressurized Water Reactors, EPRI NP-939 (November 1978).

10.9 NUREG-1301, Offsite Dose Calculation Manual Guidance: Standard Radiological Effluent Controls for pressurized Water Reactors.

10.10 International Commission on Radiological Protection, Publication 30 Supplement to Part I, "Limits for Intake of Radionuclides by Workers" (July 1978).

10.11 International Commission on Radiological Protection (ICRP) Publication 2, "Permissible Dose For Internal Radiation," 1959.

10.12 Nuclear Regulatory Commission Reg. Guide 1.21, "Measuring, Evaluating, and Reporting Radioactive Material in Liquid and Gaseous Effluents and Solid Waste," Revision 1, June 1974.

10.13 Nuclear Regulatory Commission Regulatory Guide 1.113, "Estimating Aquatic Dispersion of Effluents from Accidental and Routine Reactor Releases for the Purpose of Implementing Appendix I," Revision 1, April 1977.

10.14 Title 10 Code of Federal Regulation Part 20 (10 CFR 20), Standards for Protection Against Radiation.

10.15 Title 10 Code of Federal Regulation Part 61 (10 CFR 61), Licensing Requirements for Land Disposal of Radioactive Waste.

10.16 Title 10 Code of Federal Regulation Part 71 (10 CFR 71), Packaging and Transportation of Radioactive Material.

10.17 Title 40 Code of Federal Regulation Part 141 (40 CFR 141), National Primary Drinking Water Standards.

10.18 Title 40 Code of Federal Regulation Part 190 (40 CFR 190), Environmental Radiation Protection Standards for Nuclear Power Operations.

ENCLOSURE 2

ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

2024

Constellation

R.E. Ginna Nuclear Power Plant



Annual Radiological Environmental Operating Report

2024

Document Number: 50-244

TABLE OF CONTENTS

1.0 LIST OF ACRONYMS AND DEFINITIONS 3
2.0 EXECUTIVE SUMMARY 4
2.1 Summary of Conclusions: 5
3.0 INTRODUCTION 6
4.0 SITE DESCRIPTION AND SAMPLE LOCATIONS 7
5.0 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM REQUIREMENTS 8
6.0 MAPS OF COLLECTION SITES 15
7.0 REPORTING LEVELS FOR RADIOACTIVITY CONCENTRATIONS IN ENVIRONMENTAL SAMPLES 19
8.0 SAMPLING PROGRAM, PROGRAM MODIFICATION AND INTEPRETATION OF RESULTS 20
8.1 Environmental Direct Radiation Dosimetry Results 20
8.2 Air Particulate and Radioiodine Sample Results 21
8.3 Waterborne Sample Results 22
8.4 Ingestion Pathway Sample Results 25
9.0 LAND USE CENSUS 26
10.0 SAMPLE DEVIATIONS, ANOMALIES AND UNAVAILABILITY 27
11.0 OTHER SUPPLEMENTAL INFORMATION 28
11.1 NEI 07-07 Onsite Radiological Groundwater Monitoring Program 28
11.2 Corrections to Previous Reports 28
12.0 BIBLIOGRAPHY 29

TABLES

Table 1, Radiological Environmental Monitoring Program – Direct Radiation 8
Table 2, Radiological Environmental Monitoring Program – Airborne 9
Table 3, Radiological Environmental Monitoring Program – Waterborne 10
Table 4, Radiological Environmental Monitoring Program – Ingestion 12
Table 5, REMP Sampling Locations – Direct Radiation 13
Table 6, Reporting Levels for Radioactivity Concentrations in Environmental Samples 19
Table 7, Maximum Values for the Limit of Detection 19
Table 8: Land Use Census – Nearest Receptors within 5 miles 27
Table 9: Sample Deviation Summary 28
Table 10: Sample Name, Description, Units 31
Table 11: Concentration of Tritium Gamma Emitters, and Gross Beta in Surface and Drinking Water 32
Table 12: Concentration of Gamma Emitters in the Flesh of Edible Fish 35
Table 13: Concentration of Gamma Emitters in Sediment 36
Table 14: Concentration of Iodine-131 in Filtered Air (Charcoal Cartridges) 37
Table 15: Concentration of Beta Emitters in Air Particulates – Onsite Samples 39
Table 16: Concentration of Beta Emitters in Air Particulates – Offsite Samples 42
Table 17: Concentration of Gamma Emitters in Air Particulates 44
Table 18: Concentration of Gamma Emitters in Vegetation Samples 46

Table 19: Concentration of Gamma Emitters (Including I-131) in Milk 47
Table 20: Typical MDA Ranges for Gamma Spectroscopy 48
Table 21: CGS Cross Check Intercomparison Results 53
Table 22: Interlaboratory Split Sample Results 61
Table 23: Interlaboratory Split Sample Results (Air Particulate Beta) 69
Table 24: Direct Radiation Dose 72

FIGURES

Figure 1, Potential Exposure Pathways to Members of the Public due to Plant Operations [7] 6
Figure 2, Map of New York State and Lake Ontario Showing Location of R.E. Ginna Nuclear Power Plant 15
Figure 3, REMP Sample Locations (Onsite) 16
Figure 4, REMP Sample Locations (Offsite – TLDs and Milk Farms) 17
Figure 5, REMP Sample Locations (Offsite – Water Samples, TLDs, and Milk Farms) 18
Figure 6, REMP Air Sample Gross Beta Control and Indicator Averages (2014 – 2024) 21
Figure 7, REMP Water Sample Gross Beta Control and Indicator Averages (2014 – 2024) 23
Figure 8, REMP Groundwater Tritium Sample Results 23
Figure 9, Drinking Water Gross Beta Indicators VS Controls Averages 24
Figure 10, REMP Drinking Water Indicator and Controls Against EPA Limit 24

ATTACHMENTS

Attachment 1, Data Table Summary 31
Attachment 2, Complete Data Tables for All Analysis Results Obtained In 2024 32
Attachment 3, Cross Check Intercomparison Program 49
Attachment 4, Environmental Direct Radiation Dosimetry Results 72

1.0 LIST OF ACRONYMS AND DEFINITIONS

1. Airborne Activity Sampling: Continuous sampling of air through the collection of particulates and radionuclides on filter media.

2. ARERR: Annual Radioactive Effluent Release Report

3. AREOR: Annual Radiological Environmental Operating Report

4. BWR: Boiling Water Reactor

5. Composite Sample: A series of single collected portions (aliquots) analyzed as one sample. The aliquots making up the sample are collected at time intervals that are very short compared to the composite period.

6. Control: A sampling station in a location not likely to be affected by plant effluents due to its distance and/or direction from the station.

7. Curie (Ci): A measure of radioactivity; equal to 3.7×10^{10} disintegrations per second, or 2.22×10^{12} disintegrations per minute.

8. Direct Radiation Monitoring: The measurement of radiation dose at various distances from the plant is assessed using Thermoluminescent Dosimeters (TLD), Optically Stimulated Luminescence Dosimeters (OSLD) and pressurized ionization chambers.

9. EPA: Environmental Protection Agency

10. GPI: Groundwater Protection Initiative

11. Grab Sample: A single discrete sample drawn at one point in time.

12. Indicator: A sampling location that is likely to be affected by plant effluents due to its proximity and/or direction from the plant.

13. Ingestion Pathway: The ingestion pathway includes milk, fish, drinking water and garden produce. Also sampled (under special circumstances) are other media such as vegetation or animal products when additional information about radionuclides is needed.

14. ISFSI: Independent Spent Fuel Storage Installation

15. Lower Limit of Detection (LLD): An *a priori* measure of the detection capability of a radiochemistry measurement based on instrument setup, calibration, background, decay time, and sample volume. An LLD is expressed as an activity concentration. The MDA is used for reporting results. LLD are specified by a regulator, such as the NRC and are typically listed in the ODCM.

16. MDA: Minimum Detectable Activity. For radiochemistry instruments, the MDA is the *a posteriori* minimum concentration that a counting system detects. The smallest concentration or activity of radioactive material in a sample that will yield a net count above instrument background and that is detected with 95% probability, with only five % probability of falsely concluding that a blank observation represents a true signal.

17. MDC: Minimum Detectable Concentration. Essentially synonymous with MDA for the purposes of radiological monitoring.

18. Mean: The sum of all the values in a distribution divided by the number of values in the distribution, synonymous with average.

19. Microcurie: 3.7 x 10^4 disintegrations per second, or 2.22 x10^6 disintegrations per minute.

20. N/A: Not Applicable

21. NEI: Nuclear Energy Institute

22. NIST: National Institute of Standards and Technology.

23. NRC: Nuclear Regulatory Commission

24. ODCM: Offsite Dose Calculation Manual

25. OSLD: Optically Stimulated Luminescence Dosimeter

26. pCi/L: picocuries / Liter

27. PWR: Pressurized Water Reactor

28. REMP: Radiological Environmental Monitoring Program

29. TLD: Thermoluminescent Dosimeter

2.0 EXECUTIVE SUMMARY

R.E. Ginna Nuclear Power Plant's (Ginna) Radiological Environmental Monitoring Program (REMP) was established prior to the station becoming operational to provide information on background radiation present in the area. The goal of Ginna's REMP is to evaluate the impact of the station on the environment. Environmental samples from different media are monitored as part of the program in accordance with specifications detailed in the Offsite Dose Calculation Manual (ODCM). The program compares data from Indicator locations near the plant, to Control locations farther away from the site to assess operation impacts.

The Annual Radiological Environmental Operating Report (AREOR) provides data obtained through analyses of environmental samples collected at Ginna for the reporting period of January 1st through December 31st, 2024. During that time period 1,517 analyses were performed on 1,027 samples. In assessing all the data gathered for this report and comparing these results with preoperational data and/or 10-year average values, it was concluded that the operation of Ginna did not result in detectable plant related radionuclides in the environment.

2.1 Summary of Conclusions:

No measurable activities above background levels were detected. All values were consistent with historical results, which indicate no adverse radiological environmental impacts associated with the operation of Ginna. Naturally occurring radionuclides are present in the Earth's crust and atmosphere and exists in detectable quantities throughout the world. It is common to detect naturally occurring radionuclides in many of the samples collected for REMP. Some examples of naturally occurring radionuclides that are frequently seen in samples are potassium-40, beryllium-7, actinium-228 (present as a decay product of radium-228), and radium-226. Additionally, some relatively long-lived anthropogenic radioisotopes, such as strontium-90 and cesium-137, are also seen in some REMP samples; these radionuclides exist in measurable quantities throughout the world as a result of fallout from historic atmospheric nuclear weapons testing. Detailed information on the exposure of the U.S. population to ionizing radiation can be found in National Council on Radiation Protection (NCRP) Report No. 160 [1].

3.0 INTRODUCTION

The REMP provides data on measurable levels of radiation and radioactive materials in the environment. This program also evaluates the relationship between quantities of radioactive materials released from the plant and resultant doses to individuals from principal pathways of exposure. In this capacity, REMP provides a check on the effluent release program and dispersion modeling to ensure that concentrations in the environment due to radioactive effluents conform to the "As Low as Is Reasonably Achievable" (ALARA) design objectives of 10 CFR 50, Appendix I [2], and implements the requirements of Section IV.B.2 and IV.B.3 of Appendix I. REMP is designed to conform to the Nuclear Regulatory Commission (NRC) Regulatory Guide 4.1 [3], NUREG 1301/1302 [4] [5], and the 1979 NRC Branch Technical Position [6].

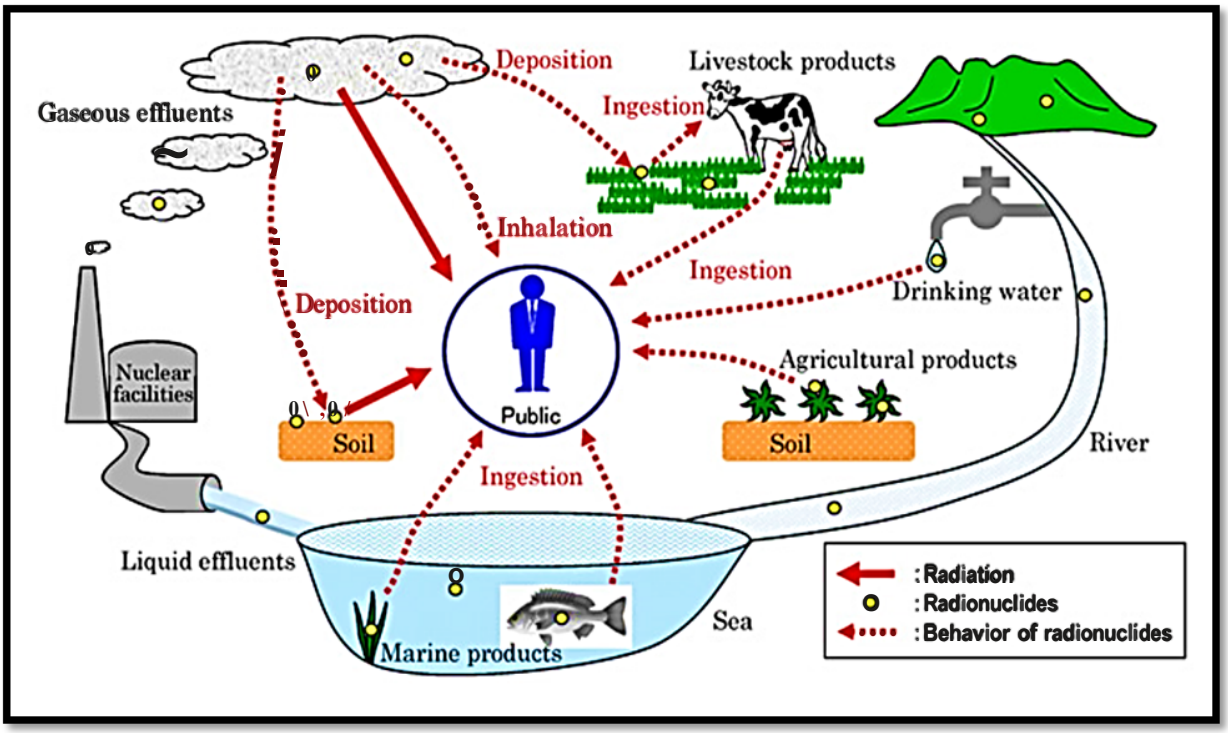


Figure 1, Potential Exposure Pathways to Members of the Public due to Plant Operations [7]

Quality assurance aspects of the sampling program and TLD/OSLD data collection are conducted in accordance with Regulatory Guides 4.15 [8] and 4.13 [9]. REMP also adheres to the requirements of the ODCM. This governing document dictates the environmental sampling, sample analysis protocols, data reporting and quality assurance requirements for the environmental monitoring program.

The AREOR provides summaries of the environmental data from exposure pathways, interpretations of the data, and analyses of trends of the results. Routinely monitored pathways include ingestion, inhalation, and direct radiation. Routes of exposure are based on site specific information such as meteorology, receptor locations, and water usage around the plant.

4.0 SITE DESCRIPTION AND SAMPLE LOCATIONS

Ginna is a commercial nuclear power plant that achieved initial criticality in 1969. Ginna is in Ontario, New York (approximate population is 10,000) which the closest metropolitan area being Rochester (20 miles) with an approximate population of 211,000. The closes resident to Ginna is in the SSE sector at 610 meters away from the reactor.

Ginna sampling media are selected based on site specific information such as meteorology, receptor locations, and water usage around the plant. Sampling and analysis frequencies are documented in the Offsite Dose Calculation Manual and site procedures.

5.0 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM REQUIREMENTS

Table 1, Radiological Environmental Monitoring Program – Direct Radiation

Requirement	Sample Location Description, Distance, and Direction	Sampling Collection/ Frequency	Type and Frequency of Analyses
Direct Radiation 41 Routine monitoring stations with two or more dosimeters placed as follows: An inner ring of stations, one in each compass sector in the general area of the site boundary (excluding sectors over Lake Ontario). An outer ring of stations, one in each compass sector at approximately 5 miles from the site; and Special interest areas, such as population centers, nearby recreation areas, and control stations	See Table 5	Quarterly	Gamma dose / Quarterly

Table 2, Radiological Environmental Monitoring Program – Airborne

Requirement	**Sample Location Description, Distance, and Direction**					**Sampling Collection/ Frequency**	**Type and Frequency of Analyses**
	Station	Description	Distance		Direction		
			Meters	Miles	Sector		
Airborne Radioiodine and Particulates Samples from 12 locations: Seven locations close to the site boundary in different sectors of the highest calculated annual average ground level D/Q. Five offsite locations including one from the vicinity of a community having the highest calculated annual average D/Q (Williamson) and one sample from a Control Location approximately 16 miles from the station in the least predominant wind direction (Seabreeze).	2	Manor House Yard	360	0.22	E	Continuous sampler operation with sample collection weekly	Particulate sampler; analyzed for gross beta radioactivity ≥ 24 hours following filter change / Weekly. Perform gamma isotopic analysis on each sample when gross beta activity is > 10 times the yearly mean of control samples Perform gamma isotopic analysis on composite samples Quarterly. Radioiodine canister I-131 analysis Weekly.
	3	North of Training Center Parking Lot	220	0.14	ESE		
	4	East of Training Center Parking Lot	320	0.20	SE		
	5	Creek Bridge	180	0.11	SSE		
	6	Onsite – SW of Plant Parking Lot	300	0.19	SW		
	7	Onsite – Utility Pole West Plant Fence	240	0.15	WSW		
	8	Seabreeze	19,840	12.33	WSW		
	9	Webster	11,150	6.93	SW		
	10	Walworth	12,730	7.91	S		
	11	Williamson	11,540	7.17	ESE		
	12	Sodus Point	25,170	15.64	E		
	13	Substation 13	770	0.48	SSW		

Table 3, Radiological Environmental Monitoring Program – Waterborne

Requirement	**Sample Location Description, Distance, and Direction**				**Sampling Collection/ Frequency**	**Type and Frequency of Analyses**
Surface Water 12 samples upstream (control) and 40 of samples downstream (indicator)	Description	Distance		Direction	Composite sample over one-month collected weekly.	Gamma Isotopic / Tritium / gross beta Monthly
		Meters	Miles	Sector		
	Circulating Water – Inlet	1070	0.66	N		
	Circulating Water – Outlet	110	0.07	NNE		
	Deer Creek	Upstream of Outfall 006	Downstream of Outfall 006	ESE		
	Mill Creek	Upstream of Outfall 006	Upstream of Outfall 006	SSW		
Drinking Water 27 samples upstream (control) and 14 samples downstream (indicator)	Description	Distance		Direction	Composite sample over one-month collected weekly.	Gamma Isotopic / Tritium / gross beta Monthly
		Meters	Miles	Sector		
	Ontario Water District	2,220	1.38	ENE		
	Monroe County Water Authority	27,150	16.87	W		
	Webster Water Facility	6,580	4.09	W		
Groundwater One control location upgradient from the plant and 11 indicator locations.	Description	Distance		Direction	Grab samples Quarterly	Tritium Quarterly, gamma isotopic annually / every two-years / every 5-years
		Meters	Miles	Sector		
	GW01	629	0.39	WSW		
	GW03	123	0.08	NNW		
	GW04	125	0.08	NNW		
	GW06	117	0.07	NNE		
	GW08	87	0.05	NNE		
	GW10	69	0.04	E		
	GW11	82	0.05	SE		
	GW12	1,180	0.73	W		
	GW13	266	0.17	NE		

	GW14	108	0.07	S		
	GW15	247	0.15	E		
	GW16	431	0.27	ESE		
Sediment Shoreline Two samples upstream (control) and three samples downstream (indicator)	Description	Distance		Direction	Semiannual	Gamma isotopic / Semiannual
		Meters	Miles	Sector		
	East Sector	2,200	1.37	E		
	North Sector	1,070	0.66	N		
	Greece	25,600	15.91	W		

Table 4, Radiological Environmental Monitoring Program – Ingestion

Requirement	**Sample Location Description, Distance, and Direction**				**Sampling Collection/ Frequency**	**Type and Frequency of Analyses**
Milk: 36 samples taken from two supplemental farm locations as no milk farms are within 5 km distance.	Description	Distance		Direction	Semimonthly when animals are on pasture, monthly during other months	Gamma isotopic and I-131 analysis semimonthly when animals are on pasture, monthly during other months.
		Meters	Miles	Sector		
	Fieldcraft Farm	8,240	5.12	ESE		
	Schultz Farm	19,030	11.82	SE		
Fish and Invertebrates: Seven samples of each commercially and recreationally important species in vicinity of site discharge. Eight samples of same species in areas not influenced by plant discharge.	Description	Distance		Direction	Semiannually	Gamma isotopic analysis on edible portions, each sample.
		Meters	Miles	Sector		
	Indicator	2,200	1.37	ENE		
	Control	25,600	15.9	W		
Food Products (Produce): 14 samples of produce from any area that is irrigated by water in which liquid plant wastes have been discharged. Three broad leaf vegetation grown nearest each of two different offsite locations of highest predicated annual average ground level D/Q if milk sampling is not performed and eight samples collected from the control location.	Description	Distance		Direction	At time of harvest, monthly, during growing season	Gamma isotopic each sample.
		Meters	Miles	Sector		
	Onsite Garden (E)	610	0.38	E		
	Onsite Garden (ESE)	430	0.27	ESE		
	Onsite Garden (SSE)	660	0.41	SSE		
	Control	Various	Various	Various		

Table 5, REMP Sampling Locations – Direct Radiation

Site	Location Type	Sector	Distance (meters)	Description
2	Inner	E	360	Onsite-Manor House Yard
3	Inner	ESE	440	Onsite-In field approximately 200 ft SE of station #2
4	Inner	SE	320	Onsite- East of Training Center Parking Lot
5	Inner	SSE	180	Onsite-Between creek and plant entry road
6	Inner	SW	300	Onsite-SW side of plant parking lot
7	Inner	WSW	240	Onsite-utility pole along West plant fence
8	Outer	WSW	19,840	Topper Drive-Irondequoit, Seabreeze Substation #51
9	Outer	SW	11,150	Phillips Road-Webster, intersection with Highway #104, Substation #74
10	Outer	S	12,730	Atlantic Avenue-Walworth, Substation #230
11	Outer	ESE	11,540	W. Main Street-Williamson, Substation #207
12	Outer	E	25,170	12 Seaman Avenue-Sodus Point-Off Lake Road by Sewer district, Substation #209
13	ISFSI	WNW	260	Onsite - South of Meteorological Tower
14	Inner	WNW	860	NW corner of field along lake shore
15	Inner	W	920	Field access road, west of orchard, approximately 3000' West of plant
16	Inner	WSW	1,030	SW Corner of orchard, approximately 3000' West of plant, approximately 200' North of Lake Road
17	Inner	SSW	510	Utility pole in orchard, approximately 75" North of Lake Road
18	Inner	SSW	730	Substation 13A fence, North Side
19	Inner	S	460	On NW corner of house 100' East of plant access road
20	Inner	SSE	650	Approximately 150' West of Ontario Center Road and approximately 170' South of Lake Road
21	Inner	SE	660	North side of Lake Road, approximately 200' East of Ontario Center Road
22	Inner	SE	920	North side of Lake Road, SE, property corner
23	Inner	ESE	780	East property line, midway between Lake Road and Lake shore
24	Inner	E	730	Lake shore near NE corner of property
25	Outer	WSW	14,000	Substation #73, Klem Road, adjacent to 897 Klem Road
26	Outer	SW	14,600	Service Center, Plank Road, West of 250
27	Outer	SSW	14,120	Atlantic Avenue at Knollwood Drive utility pole, North side of road

Table 5, REMP Sampling Locations – Direct Radiation

Site	Location Type	Sector	Distance (meters)	Description
28	Outer	SE	17,450	Substation #193, Marion, behind Stanton Ag. Service, North Main Street
29	Outer	ESE	14,050	Substation #208, Town Line Road (CR-118), 1000 ' North of Route 104
30	Outer	ESE	20,760	District Office, Sodus, on pole, West side of bldg.
31	Outer	W	7,330	Lake Road, pole 20' North of road, 500' East of Salt Road
32	Outer	WSW	6,070	Woodard Road at County Line Road, pole @ Northwest corner.
33	Outer	SW	7,950	County Line Road at RR tracks, pole approximately 100' East along tracks
34	Outer	SSW	6,520	Pole at Route 104, Lincoln Road, SW Corner.
35	Outer	SSW	7,490	Transmission Right of Way, North of Clevenger Road on pole.
36	Outer	S	5,480	Substation #205, Route 104, East of Ontario Center Road, North side of fence.
37	Outer	SSE	5,770	Railroad Avenue, pole at 2048
38	Outer	SE	6,910	Fisher Road at RR Tracks, pole East of road
39	Outer	ESE	6,930	Seeley Road, Pole South side 100' West of intersection with Stony Lonesome Road
40	Outer	E	6,440	Lake Road at Stoney Lonesome Road, pole at SE corner
63	Inner	SW	740	Westside of warehouse access road
64	Inner	W	1,190	Westside of direct road, adjacent to orchard

6.0 MAPS OF COLLECTION SITES

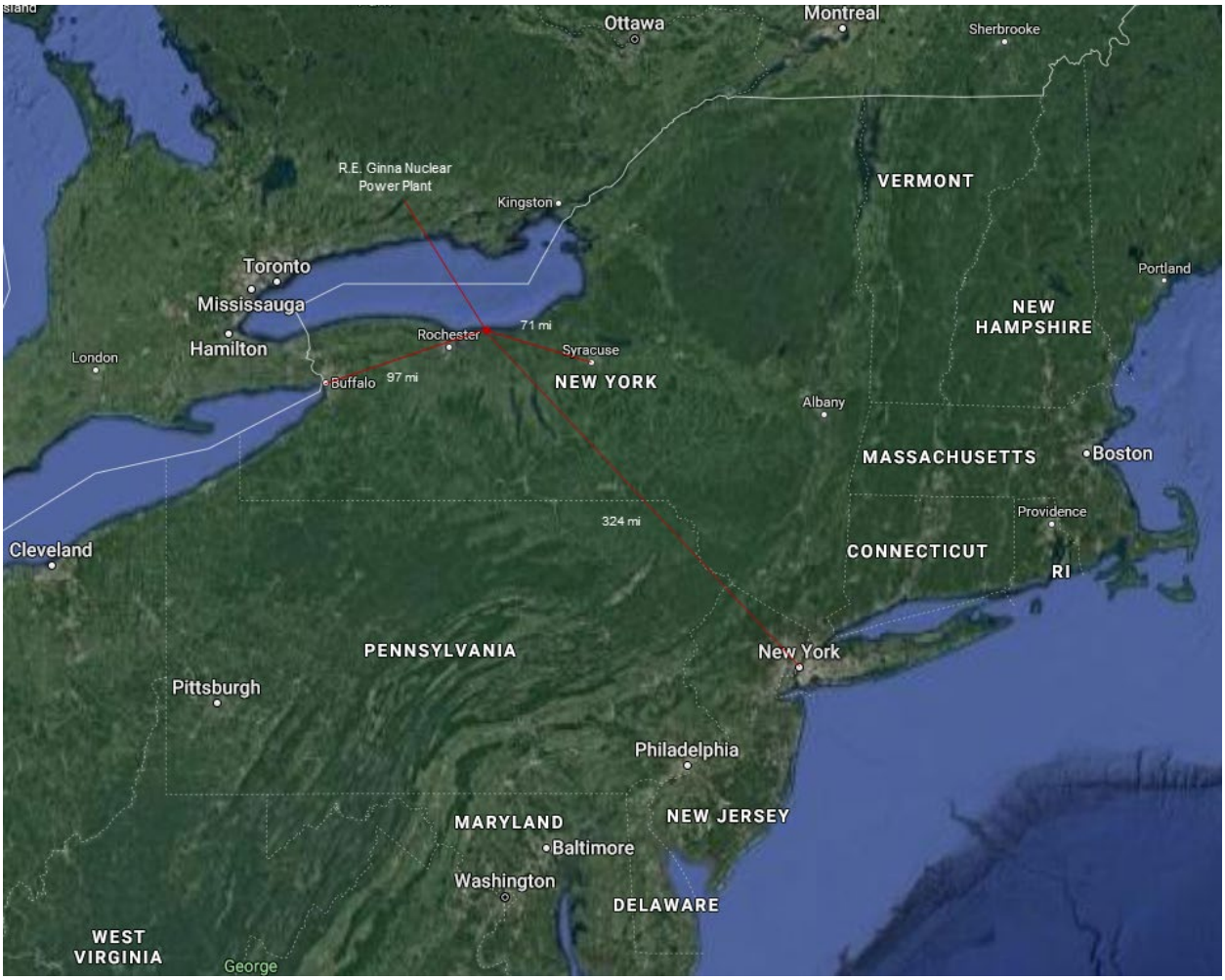


Figure 2, Map of New York State and Lake Ontario Showing Location of R.E. Ginna Nuclear Power Plant

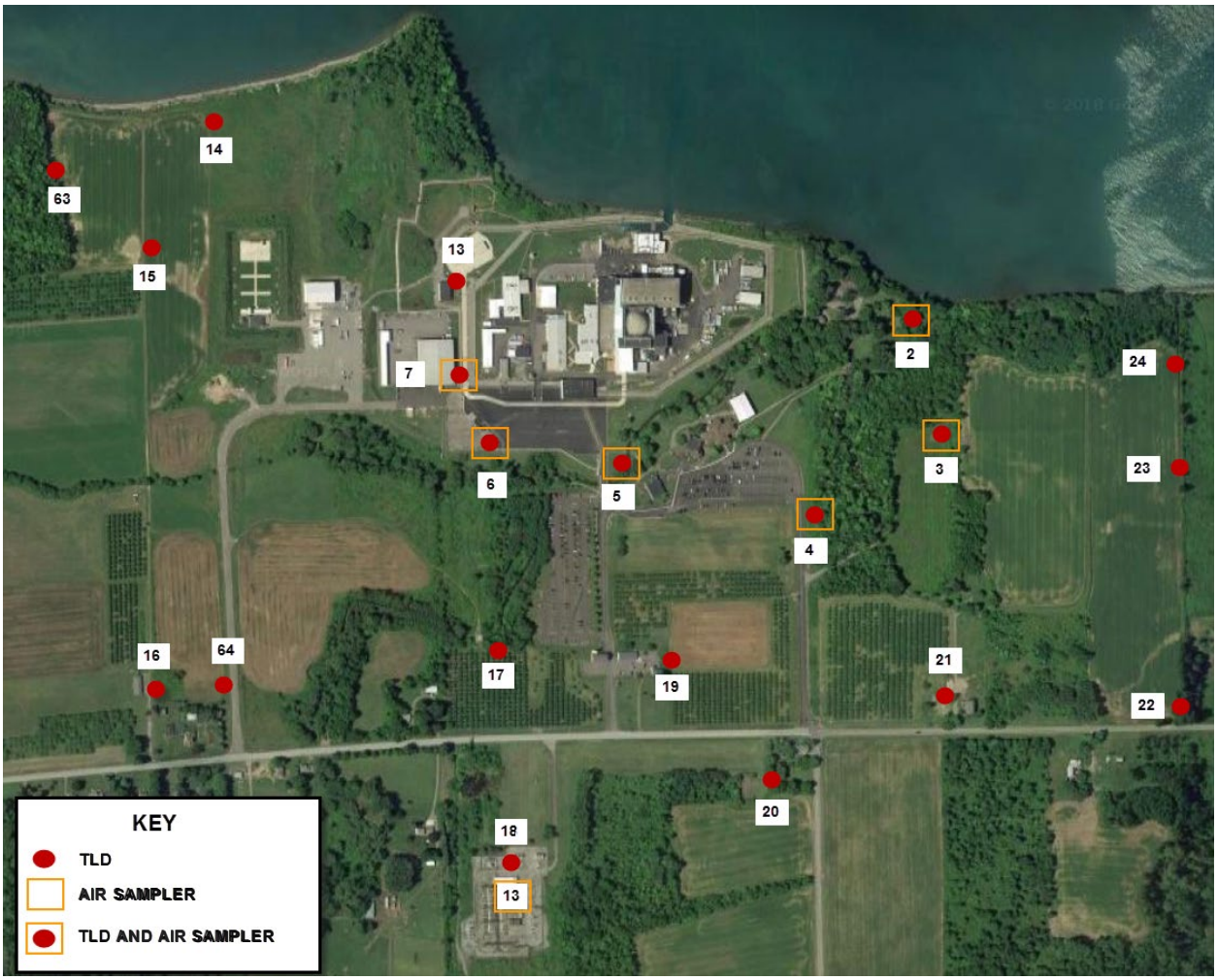


Figure 3, REMP Sample Locations (Onsite)



Figure 4, REMP Sample Locations (Offsite – TLDs and Milk Farms)



Figure 5, REMP Sample Locations (Offsite – Water Samples, TLDs, and Milk Farms)

7.0 REPORTING LEVELS FOR RADIOACTIVITY CONCENTRATIONS IN ENVIRONMENTAL SAMPLES

Table 6, Reporting Levels for Radioactivity Concentrations in Environmental Samples

Radionuclide	Water (pCi/L)	Air Particulates or Gases (pCi/m^3)	Fish (pCi/Kg-wet)	Milk (pCi/L)	Food Products (pCi/Kg-wet)
H-3	20,000 [1]				
Mn-54	1,000		30,000		
Fe-59	400		10,000		
Co-58	1,000		30,000		
Co-60	300		10,000		
Zn-65	300		20,000		
Zr-Nb-95	400				
I-131	2 [2]	0.9		3	100
Cs-134	30	10	1,000	60	1,000
Cs-137	50	20	2,000	70	2,000
Ba-La-140	200			300	

Table 7, Maximum Values for the Limit of Detection

Radionuclide	Water (pCi/L)	Air Particulates or Gases (pCi/m^3)	Fish (pCi/Kg-wet)	Milk (pCi/L)	Food Products (pCi/Kg-wet)	Sediment (pCi/Kg-dry)
Gross Beta	4.0	0.01				
H-3	2,000 [3]					
Mn-54	15		130			
Fe-59	30		260			
Co-58, Co-60	15		130			
Zn-65	30		260			
Zr-Nb-95	15					
I-131	1 [4]	0.07		1	60	
Cs-134	15	0.05	130	15	60	150
Cs-137	18	0.06	150	18	80	180
Ba-La-140	15			15		

[1] For drinking water samples: If no drinking water pathway exists, a value of 30,000 pCi/L may be used.
[2] If no drinking water pathway exists, a value of 20 pCi/l may be used
[3] If no drinking water pathway exists, a value of 3,000 pCi/L may be used. Some states may require a lower LLD for drinking water sources- per 40 CFR 141 Safe drinking water ACT.
[4] If no drinking water pathway exists, a value of 15 pCi/l may be used

8.0 SAMPLING PROGRAM, PROGRAM MODIFICATION AND INTEPRETATION OF RESULTS

At most nuclear stations, data was collected prior to plant operation to determine background radioactivity levels in the environment. Annual data is routinely compared to preoperational and/or 10-year average values to determine if changes in the environs are present. Strict comparison is difficult to make due to fallout from historical nuclear weapon testing. Cesium-137 can be routinely found in environmental samples as a results of above ground nuclear weapons testing. It is important to note, levels of Cs-137 in environment are observed to fluctuate, for example as silt distributions shift due to natural erosion and transport processes, Cs-137 may or may not be observed in sediment samples. Results from samples collected and analyzed during the year, 2024, are described below.

In the following sections, results from direct radiation, air, water, and food products analyzed as part of REMP in 2024 will be discussed. Sampling program descriptions and deviations will also be discussed.

8.1 Environmental Direct Radiation Dosimetry Results

Dose is measured as net exposure (field reading less transit reading) normalized to 91-day quarters. Data is treated and analyzed consistent with ANSI/HPS N13.37-2014, which compares the measured dose for each location to the baseline background dose for that location. Environmental dose rates vary by location, depending on geological and land use considerations, and remain relatively constant for any given location (unless land use changes). Baseline background doses have been determined for both quarterly and annual measurements at each location using historical field measurements.

ANSI/HPS N13.37-2014 uses the concept of minimum differential dose (MDD), which is the minimum facility-related dose that can be detected above background. Due to natural background variations and measurement sensitivities and uncertainties, minimum differential dose is not zero. MDD is calculated based on statistical performance of the dosimetry system in the environment and is site specific.

Normalized doses that exceed the minimum differential dose value above the Baseline Background Dose are considered to indicate facility-related dose; a quality assurance review is performed to verify that any results indicating facility-related dose are accurate.

During the calendar year 2024, a total of 41 locations were monitored and data analyzed in accordance with the requirements in Table 1, Radiological Environmental Monitoring Program – Direct Radiation. Attachment 4, Environmental Direct Radiation Dosimetry results, provides the annual direct radiation dosimetry analysis.

There was no direct radiation dose detected from the facility. All TLD measurements were analyzed, and none were found to have radiation levels that had increased over normal background radiation levels.

8.2 Air Particulate and Radioiodine Sample Results

Air particulate filters and charcoal canisters were collected from locations specified in Table 2, Radiological Environmental Monitoring Program – Airborne. During the calendar year 2024, a total of 608 samples were collected and analyzed for gross beta, gamma emitters and iodine. Particulate samplers are used to continuously collect airborne particulates on a filter. The samples are analyzed for gross beta activity following filter changeout, which occurs weekly. Gamma isotopic analysis is also performed on the samples collected at each location and is analyzed quarterly. Radioiodine (I-131) analysis is performed weekly on radioiodine sample cartridges.

All air particulate and radioiodine samples were below detection limits.

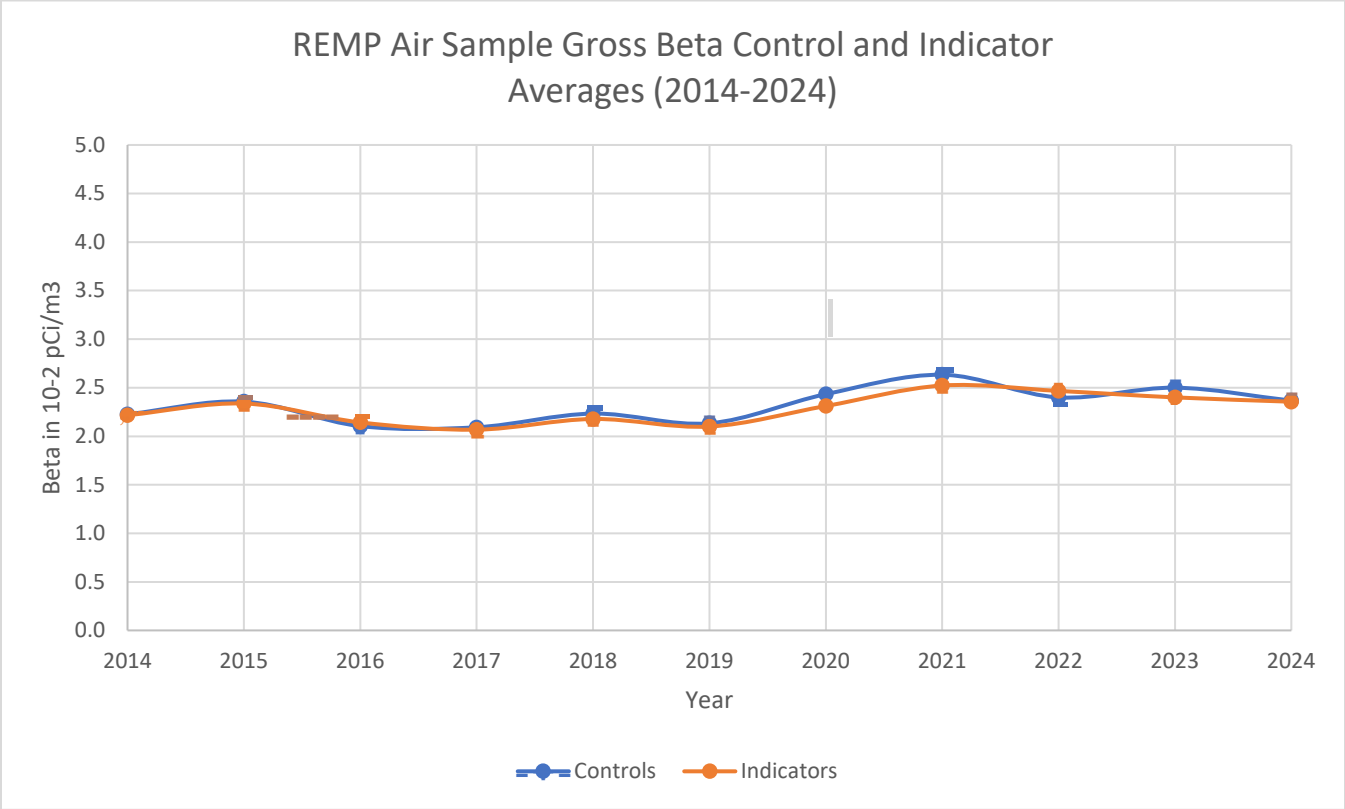


Figure 6, REMP Air Sample Gross Beta Control and Indicator Averages (2014 – 2024)

Air particulate results from this monitoring period, 2024, were compared to the previous 10 years, as shown in Figure 6, and there were no significant changes.

8.3 Waterborne Sample Results

8.3.1 Surface Water (i.e., Bay, Lake etc.)

Composite water samples are collected monthly at the upstream control location and at the downstream indicator locations. Monthly composite samples are analyzed for gamma emitters. Aliquots from the monthly composites are combined to form a quarterly composite which is then analyzed for tritium. During the calendar year 2024, a total of 52 surface water samples were collected and analyzed in accordance with the requirements in the ODCM and shown in Table 3, Radiological Environmental Monitoring Program – Waterborne. No samples tested positive for detectable amounts of radioactivity. Tritium concentrations in surface water were well below the EPA tritium drinking water limit of 20,000 pCi/L.

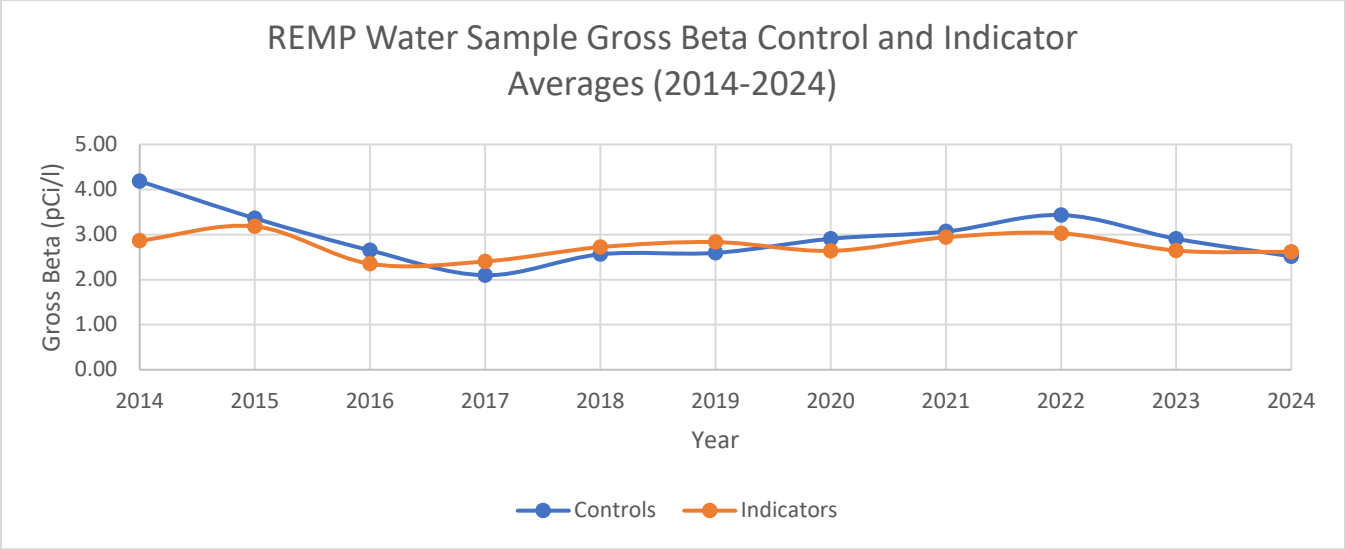


Figure 7: REMP Water Sample Gross Beta Control and Indicator Averages (2014 – 2024)

8.3.2 REMP Groundwater

Groundwater samples were collected from control location upgradient from the plant and indicator locations near the plant. During the calendar year 2024, a total of 30 groundwater water samples were collected from offsite monitoring wells and analyzed in accordance with the requirements in the ODCM and shown in Table 3: Radiological Environmental Sampling Program – Exposure Pathway - Waterborne. One control sample and a total of 29 indicator samples were collected. These samples were analyzed for tritium quarterly and gamma annually / one every two years / once every five-years.

No samples contained positive radioactivity and all tritium concentrations in groundwater monitoring well locations were well below the EPA tritium drinking water limit of 20,000 pCi/L. Tritium values below are quarterly values.

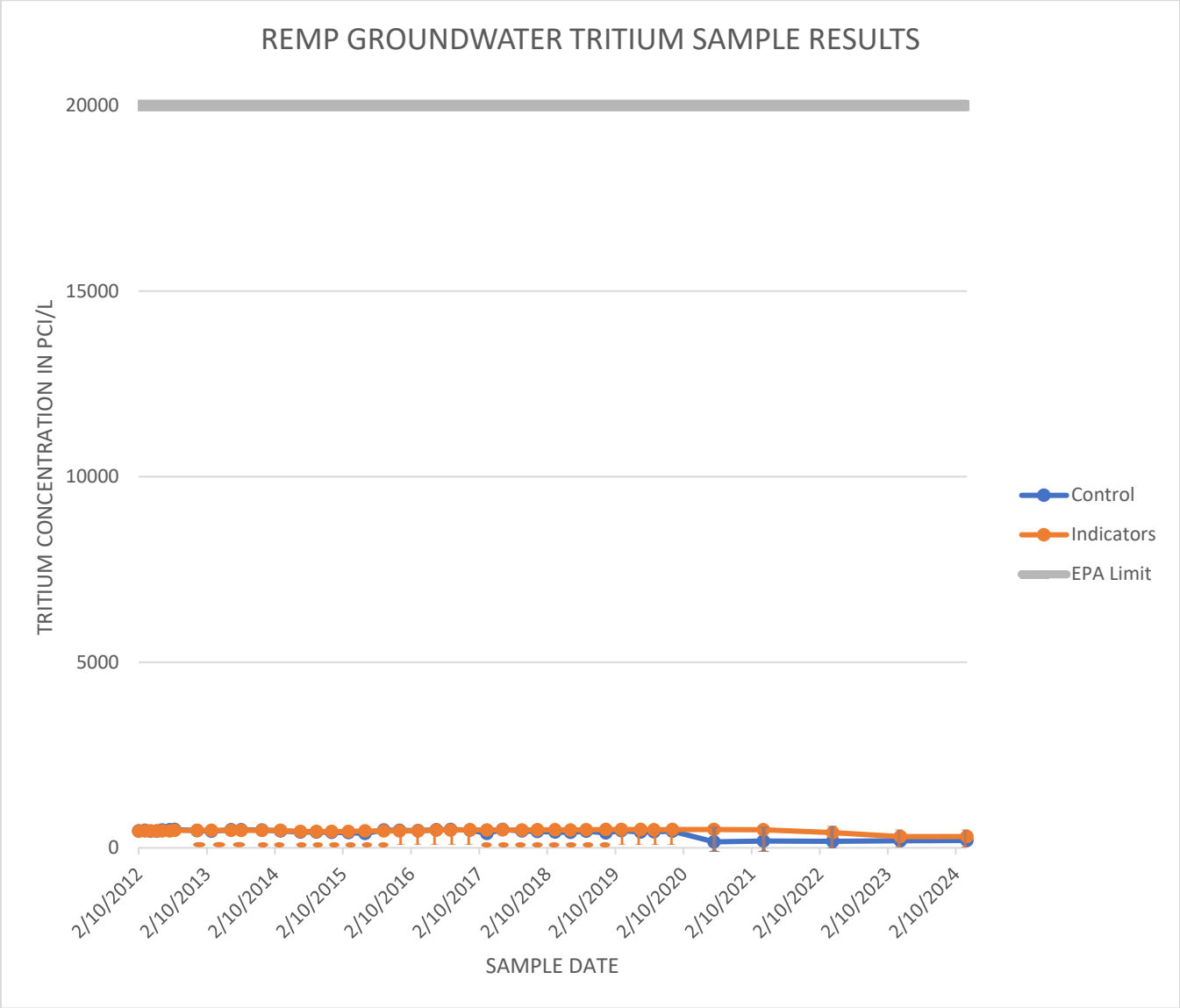


Figure 8: REMP Groundwater Tritium Sample Results

8.3.3 Drinking Water

A total of 41 drinking water samples were obtained in 2024. These samples were analyzed for gross beta, gamma isotopic, and tritium monthly in accordance with requirements in the ODCM and shown in Table 3, Radiological Environmental Monitoring Program – Waterborne. No sample results contained detectable amounts of radioactivity. All drinking water samples were well below the EPA drinking water limit for tritium of 20,000 pCi/L.

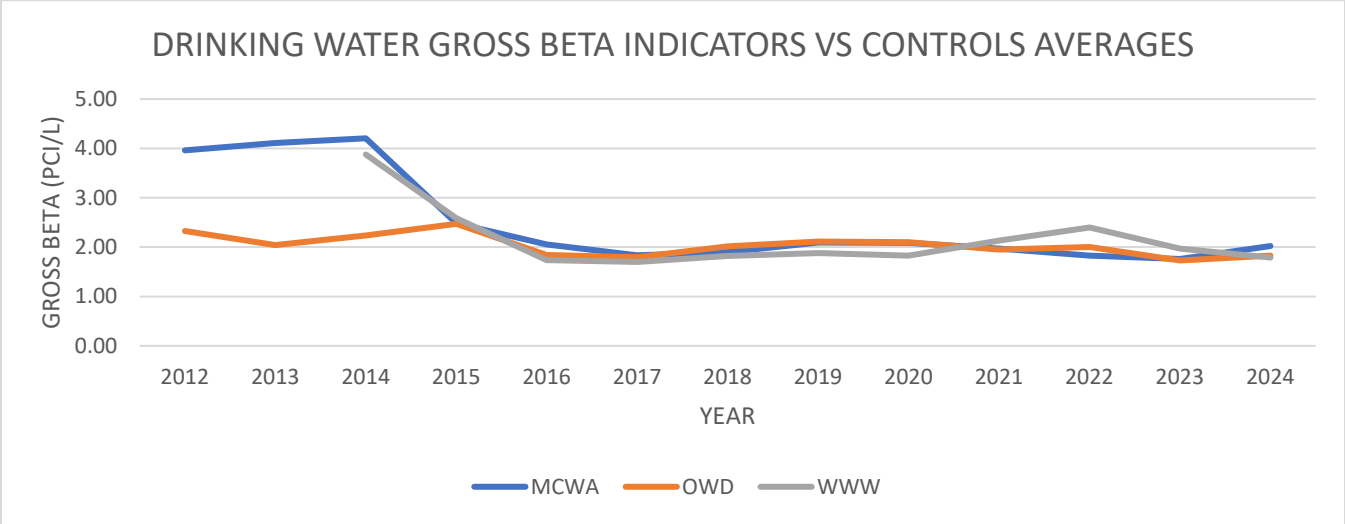


Figure 9: Drinking Water Gross Beta Indicators VS Controls Averages

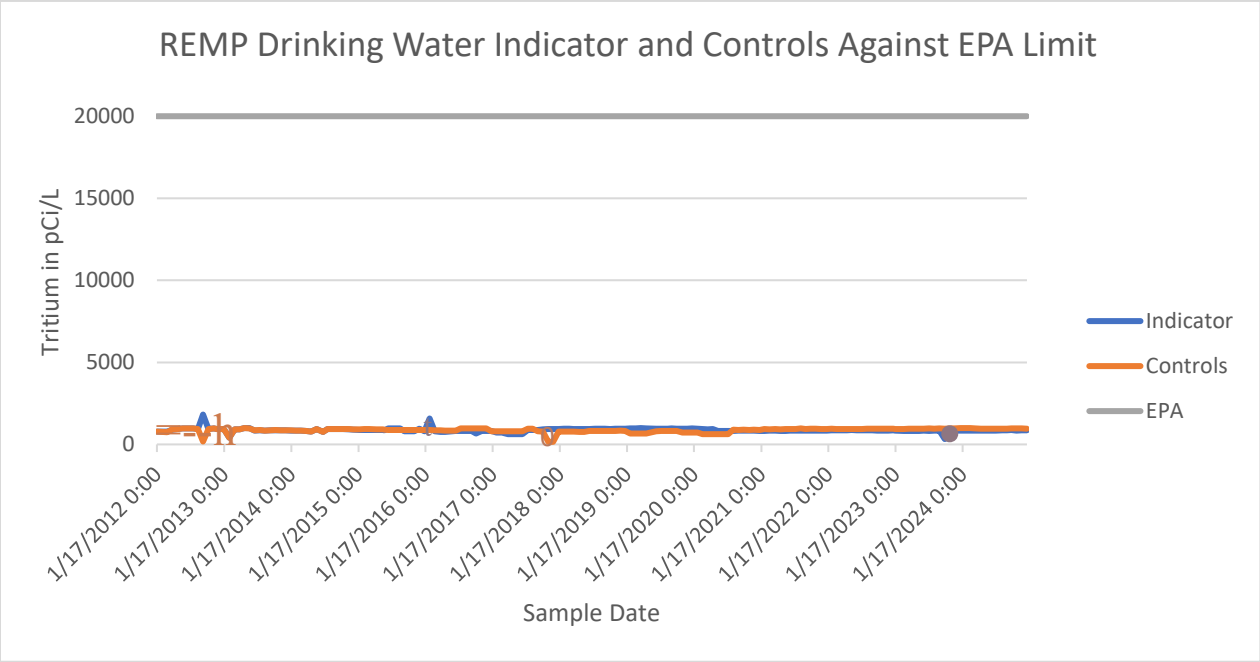


Figure 10: REMP Drinking Water Indicator and Controls Against EPA Limit

8.3.4 Sediment from Shoreline

Shoreline sediment collections were made in May and December 2024 and analyzed for gamma-emitting isotopes. Samples are collected at both indicator and control locations. A total of 5 shoreline samples were analyzed in accordance with requirements in the ODCM and shown in Table 3, Radiological Environmental Monitoring Program – Waterborne.

No shoreline sediment results contained detectable amounts of radioactivity.

8.4 Ingestion Pathway Sample Results

8.4.1 Milk

Milk samples from milking animals were collected at two locations outside of the five km requirement. Ginna elected to maintain sampling these two farm locations as supplemental samples to ensure the milk ingestion pathway was included in the REMP. Samples were analyzed for gamma isotopic and iodine species semimonthly during pasture feed season and monthly during the other months on stored feed.

No milk sample results contained detectable amounts of radioactivity.

8.4.2 Fish and Invertebrates

A total of 15 fish and invertebrate samples were collected in 2024. These samples were analyzed for gamma emitting radionuclides in the edible portions (excluding head, tail, bones) in accordance with requirements of the ODCM and summarized in Table 4, Radiological Environmental Monitoring Program - Ingestion. These samples are collected from the indicator and control areas as required by the ODCM.

No fish or invertebrate sample results contained detectable amounts of radioactivity.

8.4.3 Food Products

A total of 25 produce samples (tomatoes, potatoes, leafy greens, zucchini, onions, apples, grapes, pears) were analyzed in 2024, for gamma emitting radionuclides in accordance with requirements of the ODCM, as summarized in Table 4, Radiological Environmental Monitoring Program - Ingestion.

No food product sample results contained detectable amounts of radioactivity.

8.4.4 Leafy Vegetation

In accordance with the ODCM and as described in Table 4, Radiological Environmental Monitoring Program - Ingestion, 3 broad leaf vegetation samples were collected from growing locations nearest site boundary in areas of highest predicted annual average ground level D/Q. Samples are collected and analyzed for gamma isotopic and iodine-131 from the indicator and control locations during growing season. It is common to detect Cs-137 in broadleaf samples at both indicator and control locations. Cs-137 can be attributed to offsite sources such as weapons testing, Chernobyl, and Fukushima events. While Cs-137 is periodically found in vegetation samples, the historical relationship between the indicator and control locations demonstrate that the plant is not the source of the activity detected.

No leafy vegetation sample results contained detectable amounts of radioactivity.

9.0 LAND USE CENSUS

An annual land use census is required by the Offsite Dose Calculation Manual and is performed to ensure that changes in the use of areas at or beyond the site boundary are identified and modifications to REMP are made if required by changes in land use. The land use census satisfies the requirements of Section IV.B.3 of Appendix I to 10 CFR 50 [2]. NUREG-1301/1302 Control 3.12.2 specifies that "a Land Use Census shall be conducted and shall identify within a distance of 8 km (5 mi.) the location in each of the 16 meteorological sectors of the nearest milk animal, the nearest residence and the nearest garden of greater than 50 m^2 (500 ft^2) producing broad leaf vegetation. Per NUREG-1301/1302, Broad leaf vegetation sampling of at least three different kinds of vegetation may be performed at the SITE BOUNDARY in each of two different direction sectors with the highest predicted D/Qs in lieu of the garden census.

A Land Use Census was conducted during the calendar year, 2024, within the growing season to identify changes in land use, receptor locations, and new exposure pathways. The results for the 2024 Land Use Census are listed in Table 8, Land Use Census – Nearest Receptors within 5 miles.

In summation, the highest D/Q locations for the nearest garden, nearest residence, and nearest milk animal did not change following the 2024 census.

Table 8: Land Use Census – Nearest Receptors within 5 miles				
Sector	**Direction**	**Nearest Residence (Meters)**	**Nearest Milk Animal (Meters)**	**Nearest Garden (Meters)**
A	N			
B	NNE			
C	NE			
D	ENE			
E	E	1,170		610
F	ESE	1,660		430
G	SE	840	8,240	
H	SSE	610		660
J	S	1,500		
K	SSW	620		
L	SW	740		
M	WSW	900		
N	W	1,330		
P	WNW			
Q	NW			
R	NNW			

10.0 SAMPLE DEVIATIONS, ANOMALIES AND UNAVAILABILITY

Sampling and analysis are performed for media types addressed in the Offsite Dose Calculation Manual. Sampling and analysis challenges may be experienced due to a multitude of reasons including environmental factors, loss of TLDs/OSLDs, contamination of samples, etc. To aid classification of sampling and analysis challenges experienced in 2024, the following three terms are used to describe the issues: Sample Anomalies, Sample Deviation, and Unavailable Samples.

Media that experienced downtime (i.e., air or water samplers not working or removed from service for maintenance, air samplers or water samplers unavailable due to power outages, etc.) during a surveillance period are classified a “Sample Deviation”. “Sample Anomalies” are defined as errors that were introduced to a sample once it arrived in the laboratory, errors that prevents the sample from being analyzed as it normally would or may have altered the outcome of the analysis (i.e., cross contamination, human error).

“Sample Unavailability” is defined as sample collection with no available sample (i.e., food crop not productive yield, TLD loss, etc.).

All required samples were collected and analyzed as scheduled except for the following:

Table 9: Sample Deviation Summary

Sample Type and Analysis	Location	Collection Date or Period	Reason for not conducting REMP sampling as required by ODCM	Plans for preventing reoccurrence
Air	ES02	4/15/24	Sample Deviation	Inclement weather
Air	ES02	5/28/24	Sample Deviation	Inclement Weather
Air	ES02	7/9/24	Sample Deviation	New Power Supply Installation
Air	ES04	5/22/24	Sample Deviation	Inclement Weather
Air	ES06	10/30/24	Sample Deviation	Inclement Weather
Air	ES07	1/22/24	Sample Deviation	Inclement Weather
Air	ES13	6/4/24	Sample Deviation	Inclement Weather
Air	All	12/17/24	Sample Unavailability	FedEx Lost Samples in Transit
TLD	TLD32	7/15/24	Sample Deviation	New Sample Housing Built
Drinking Water	OWD	4/29/24	Sample Deviation	Compositor Maintenance
Drinking Water	OWD	7/1/24	Sample Deviation	Compositor Maintenance

11.0 OTHER SUPPLEMENTAL INFORMATION

11.1 NEI 07-07 Onsite Radiological Groundwater Monitoring Program

Ginna has developed a Groundwater Protection Initiative (GPI) program in accordance with NEI 07-07, Industry Ground Water Protection Initiative – Final Guidance Document. The purpose of the GPI is to ensure timely detection and an effective response to situations involving inadvertent radiological releases to groundwater to prevent migration of licensed radioactive material off-site and to quantify impacts on decommissioning. It is important to note, samples and results taken in support of NEI 07-07 on-site groundwater monitoring program are separate from the Radiological Environmental Monitoring Program (REMP). Results of the NEI 07-07 Radiological Groundwater Monitoring Program for onsite groundwater wells are provided in the ARERR.

11.2 Corrections to Previous Reports

There are no corrections necessary to any previously submitted reports.

12.0 BIBLIOGRAPHY

[1] NCRP, "Report No. 160, Ionizing Radiation Exposure of the Population of the United States," National Council on Radiation Protection, Bethesda, 2009.

[2] "10 CFR 50, "Domestic Licensing of Production and Utilization Facilities"," US Nuclear Regulatory Commission, Washington, DC.

[3] "Regulatory Guide 4.1, "Radiological Environmental Monitoring for Nuclear Power Plants", Revision 2," Nuclear Regulatory Commission, 2009.

[4] "NUREG-1301, “Offsite Dose Calculation Manual Guidance: Standard Radiological Effluent Controls for Pressurized Water Reactors,” .," Nuclear Regulatory Commission, April 1991.

[5] "NUREG-1302, “Offsite Dose Calculation Manual Guidance: Standard Radiological Effluent Controls for Boiling Water Reactors,”," Nuclear Regulatory Commission, April 1991.

[6] "Branch Technical Position, Revision 1," NRC000096, Submitted March 30, 2012, November 1979.

[7] "Japan Atomic Energy Agency," 06 November 2020. [Online]. Available: https://www.jaea.go.jp/english/04/ntokai/houkan/houkan_02.html.

[8] "Regulatory Guide 4.15, Quality Assurance for Radiological Monitoring Programs (Inception through Normal Operations to License Termination) -- Effluent Streams and the Environment," Nuclear Regulatory Commission, July, 2007.

[9] "Regulatory Guide 4.13, Performance, Testing, and Procedural Specifications for Thermoluminescence Dosimetry: Environmental Applications, Revision 2," Nuclear Regulatory Commission, June, 2019.

[10] "NUREG/CR-2919, “XOQDOQ Computer Program for the Meteorological Evaluation of Routine Effluent Releases at Nuclear Power Stations,”," Nuclear Regulatory Commission, September, 1982.

[11] "Measurements of Radionuclides in the environment Sampling and Analysis of plutonium in soil," Nuclear Regulatory Commission, 1974.

[12] "Ionizing Radiation Exposure of the Population of the United States," Bethesda, MD, 2009.

[13] Nuclear Regulatory Commission, 30 June 2015. [Online]. Available: http://www.nrc.gov/reading-rm/basic-ref/students/animated-pwr.html. [Accessed October 2020].

[14] "ICRP Publication 60, “ICRP Publication 60: 1990 Recommendations of the International Commission on Radiological Protection, 60,” Annals of the ICRP Volume 21/1-3,," International Commission on Radiation Protection, October, 1991.

[15] "NRC Resource Page," [Online]. Available: http://www.nrc.gov/about-nrc/radiation.html. [Accessed 10 November 2020].

[16] "NUREG-0133, Preparation of Effluent Technical Specifications for Nuclear Power Plants," Nuclear Regulatory Commission, 1987.

[17] "Regulatory Guide 1.109, “Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Demonstrating Compliance with 10 CFR Part 50, Appendix I,," Nuclear Regulatory Commission, October, 1977.

[18] [Online]. Available: http://hps.org/hpspublications/radiationfactsheets.html. [Accessed 2020].

[19] "NEI 07-07, “Industry Ground Water Protection Initiative—Final Guidance Document,”," Nuclear Energy Institute, Washington, D.C..

[20] "ANSI 13.37, Environmental Dosimetry- Criteria for System Design and Implementation," Health Physics Society (HPS), May, 2019.

[21] "40 CFR Part 141, “National Primary Drinking Water Regulations,”," US Environmental Protection Agency, Washington, DC..

[22] Nuclear Regulatory Commission, 25 June 2015. [Online]. Available: http://www.nrc.gov/reading-rm/basic-ref/students/animated-bwr.html. [Accessed October 2020].

[23] "NEI 07-07, “Industry Ground Water Protection Initiative—Final Guidance Document,” Rev. 1," Nuclear Energy Institute, Washington, D.C., 2019.

[24] Nuclear Regulatory Commission, 25 June 2015. [Online]. Available: http://www.nrc.gov/reading-rm/basic-ref/students/animated-bwr.html. [Accessed October 2020].

[25] [Online]. Available: http://hps.org/hpspublications/radiationfactsheets.html. [Accessed 2020].

[26] "Japan Atomic Energy Agency," 06 November 2020. [Online]. Available: https://www.jaea.go.jp/english/04/ntokai/houkan/houkan_02.html.

[27] "NRC Resource Page," [Online]. Available: http://www.nrc.gov/about-nrc/radiation.html. [Accessed 10 November 2020].

[28] "NUREG-0133, Preparation of Effluent Technical Specifications for Nuclear Power Plants," Nuclear Regulatory Commission, 1987.

[29] Nuclear Regulatory Commission, 30 June 2015. [Online]. Available: http://www.nrc.gov/reading-rm/basic-ref/students/animated-pwr.html. [Accessed October 2020].

[30] "Regulatory Guide 4.13, Performance, Testing, and Procedural Specifications for Thermoluminescence Dosimetry: Environmental Applications, Revision 2," Nuclear Regulatory Commission, June, 2019.

[31] "Regulatory Guide 4.15, Quality Assurance for Radiological Monitoring Programs (Inception through Normal Operations to License Termination) -- Effluent Streams and the Environment," Nuclear Regulatory Commission, July, 2007.

[32] "10 CFR 50 - Domestic Licensing of Production and Utilization Facilities," US Nuclear Regulatory Commission, Washington, DC.

[33] "40 CFR 190 - Environmental Radiation Protection Standards for Nuclear Power Operation," US Environmental Protection Agency, Washington, DC.

[34] "NUREG-0324 - XOQDOQ, Program for the Meteorological Evaluation of Routine Effluent Releases at Nuclear Power Stations," Nuclear Regulatory Commission, September, 1977.

[35] "NCRP Report No. 160 - Ionizing Radiation Exposure of the Population of the United States," National Council on Radiation Protection and Measurements, Bethesda, MD, 2009.

[36] "Regulatory Guide 1.109 - Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Demonstrating Compliance with 10 CFR Part 50, Appendix I," Nuclear Regulatory Commission, October, 1977.

[37] "40 CFR 141 - National Primary Drinking Water Regulations," US Environmental Protection Agency, Washington, DC..

[38] "10 CFR 20 - Standards for Protection Against Radiation," US Nuclear Regulatory Commission, Washington, DC.

Attachment 1, Data Table Summary
Table 10, Sample Name, Description, Units

Medium or Pathway Sampled (Units)	Type, Total Number of Analyses performed (e.g., I-131, 400)	Lower Limit of Detection (LLD)	Indicator Mean[5]; (f^6). Range[1]	Location with Highest Annual Mean		Control Mean[1] (f^2). Range[1]	Number of Nonroutine Reported Measurements
				Name Distance and Direction	Mean[1] (f^2) Range[1]		
Air Particulates (pCi/m^3)	Gross Beta, 608 Gamma, 48	0.5 4.2	2.4 (0.6 – 6.4) -- (--)	ES03 220m ESE -- (--)	2.5 (0.9 – 6.2) -- (--)	2.4 (0.8 – 6.0) -- (--)	0
Airborne Radioiodine (pCi/m^3)	I-131, 307	0.037	-- (--)	--	-- (--)	-- (--)	0
Direct Radiation (mrem/qtr.)	Gamma, 164	N/A	16.2 (12.8 – 50.7)	TLD13 770m SSW	43.4 (27.7 – 50.7)	14.1 (12.5 – 16.1	0
Milk (pCi/L)	Gamma, 36	0.8	-- (--)	--	-- (--)	-- (--)	0
Vegetation (pCi/kg-wet)	Gamma, 25	26	-- (--)	--	-- (--)	-- (--)	0
Surface Water (pCi/L)	Gamma, 93 Tritium, 93 Gross Beta, 93	5.1 2000 --	-- (--) -- (--) 2.54 (1.15 – 7.00)	-- -- Deer Creek – ESE	-- (--) -- (--) 4.69 (3.00 – 7.00)	-- (--) -- (--) 2.82 (1.27 – 5.55)	0
Fish (pCi/kg-wet)	Gamma, 15	11	-- (--)	--	-- (--)	-- (--)	0
Sediment (pCi/kg-dry)	Gamma, 5	78	-- (--)	--	-- (--)	-- (--)	0

[5] Mean and range are based on detectable measurements only.
[6] Fraction of detectable measurements at specified locations is indicated in parentheses.

Attachment 2, Complete Data Table for All Analysis Results Obtained In 2024

Table 11, Concentration of Tritium, Gamma Emitters and Gross Beta, in Surface and Drinking Water (Results in units of pCi/L +/- 2σ)

Sample Code	Sample Date	Cs-137	Tritium	Gamma Emitters[2]	Gross Beta	
CIRC-IN Circulating Water Inlet - N	1/3/2024	< 5.1	< 841	*	1.63 ±	0.76
	1/29/2024	< 5.1	< 844	*	1.72 ±	0.78
	2/27/2024	< 5.1	< 840	*	2.40 ±	0.85
	3/25/2024	< 5.1	< 841	*	2.86 ±	0.80
	4/22/2024	< 5.1	< 845	*	1.89 ±	0.78
	5/20/2024	< 5.1	< 841	*	2.15 ±	0.79
	6/17/2024	< 5.1	< 845	*	2.79 ±	0.76
	7/15/2024	< 5.1	< 846	*	2.12 ±	0.71
	8/12/2024	< 5.1	< 866	*	1.38 ±	0.76
	9/10/2024	< 5.1	< 865	*	2.05 ±	0.75
	10/7/2024	< 5.1	< 874	*	1.15 ±	0.79
	11/4/2024	< 5.1	< 848	*	2.00 ±	0.77
	12/3/2024	< 5.1	< 856	*	1.91 ±	0.76
	12/30/2024	< 5.1	< 856	*	1.78 ±	0.76
CIRC-OUT Circulating Water Outlet - N	1/29/2024	< 5.1	< 840	*	2.08 ±	0.79
	2/27/2024	< 5.1	< 844	*	1.50 ±	0.71
	3/25/2024	< 5.1	< 838	*	2.01 ±	0.79
	4/22/2024	< 5.1	< 840	*	1.97 ±	0.81
	5/20/2024	< 5.1	< 838	*	3.00 ±	0.84
	6/17/2024	< 5.1	< 837	*	2.49 ±	0.77
	7/15/2024	< 5.1	< 845	*	2.03 ±	0.76
	8/12/2024	< 5.1	< 841	*	1.94 ±	0.75
	9/10/2024	< 5.1	< 870	*	2.22 ±	0.77
	10/7/2024	< 5.1	< 862	*	1.55 ±	0.77
	11/4/2024	< 5.1	< 873	*	1.18 ±	0.73
	12/3/2024	< 5.1	< 850	*	1.83 ±	0.76
	12/30/2024	< 5.1	< 854	*	1.35 ±	0.73
	1/29/2024	< 5.1	< 858	*	2.08 ±	0.79
DC Deer Creek – ESE	1/8/2024	< 5.1	< 841	*	6.79 ±	2.99
	2/6/2024	< 5.1	< 848	*	3.00 ±	1.81
	3/4/2024	< 5.1	< 843	*	7.00 ±	2.21
	4/9/2024	< 5.1	< 860	*	3.06 ±	1.98
	5/7/2024	< 5.1	< 848	*	3.53 ±	1.90
	6/3/2024	< 5.1	< 848	*	4.92 ±	1.92
	7/1/2024	< 5.1	< 855	*	3.16 ±	1.84
	8/26/2024	< 5.1	< 876	*	4.50 ±	1.98
	9/23/2024	< 5.1	< 881	*	6.18 ±	2.08
	10/21/2024	< 5.1	< 855	*	4.28 ±	2.08
	11/18/2024	< 5.1	< 865	*	4.01 ±	2.04
	12/16/2024	< 5.1	< 866	*	5.87 ±	2.11

Table 11, Concentration of Tritium, Gamma Emitters and Gross Beta, in Surface and Drinking Water (Results in units of pCi/L +/- 2σ)

Sample Code	Sample Date	Cs-137	Tritium	Gamma Emitters[2]	Gross Beta
MCWA Monroe County Water/Shoremont, Greece – W[1]	1/2/2024	< 5.1	< 840	*	2.31 ± 0.80
	1/30/2024	< 5.1	< 837	*	1.84 ± 0.74
	2/26/2024	< 5.1	< 830	*	1.38 ± 0.74
	3/25/2024	< 5.1	< 841	*	1.27 ± 0.76
	4/22/2024	< 5.1	< 837	*	1.98 ± 0.77
	5/20/2024	< 5.1	< 841	*	2.38 ± 0.76
	6/17/2024	< 5.1	< 848	*	1.72 ± 0.73
	7/15/2024	< 5.1	< 843	*	2.85 ± 0.82
	8/12/2024	< 5.1	< 869	*	2.40 ± 0.78
	9/10/2024	< 5.1	< 863	*	2.51 ± 0.84
	10/7/2024	< 5.1	< 885	*	1.74 ± 0.78
	11/4/2024	< 5.1	< 848	*	1.49 ± 0.74
	12/2/2024	< 5.1	< 857	*	2.74 ± 0.83
	12/30/2024	< 5.1	< 854	*	2.31 ± 0.80
ML Mill Creek – SW[1]	1/8/2024	< 5.1	< 843	*	4.05 ± 1.98
	2/6/2024	< 5.1	< 850	*	5.10 ± 1.98
	3/4/2024	< 5.1	< 843	*	5.18 ± 2.07
	4/9/2024	< 5.1	< 863	*	1.57 ± 1.86
	5/7/2024	< 5.1	< 848	*	2.10 ± 1.79
	6/3/2024	< 5.1	< 846	*	3.62 ± 1.81
	7/1/2024	< 5.1	< 860	*	4.73 ± 1.96
	8/26/2024	< 5.1	< 873	*	3.54 ± 1.89
	9/23/2024	< 5.1	< 880	*	5.55 ± 2.02
	10/21/2024	< 5.1	< 854	*	2.70 ± 1.96
	11/18/2024	< 5.1	< 864	*	2.57 ± 1.92
	12/16/2024	< 5.1	< 861	*	4.21 ± 1.98
W Webster (Supplemental)	1/30/2024	< 5.1	< 842	*	1.97 ± 0.78
	2/26/2024	< 5.1	< 830	*	1.89 ± 0.74
	3/25/2024	< 5.1	< 837	*	2.06 ± 0.79
	4/22/2024	< 5.1	< 839	*	2.03 ± 0.81
	5/20/2024	< 5.1	< 838	*	1.98 ± 0.77
	6/17/2024	< 5.1	< 843	*	1.84 ± 0.72
	7/15/2024	< 5.1	< 848	*	1.95 ± 0.75
	8/12/2024	< 5.1	< 863	*	1.95 ± 0.75
	9/9/2024	< 5.1	< 861	*	2.14 ± 0.77
	10/7/2024	< 5.1	< 885	*	1.04 ± 0.74
	11/4/2024	< 5.1	< 848	*	1.07 ± 0.73
	12/2/2024	< 5.1	< 857	*	1.69 ± 0.75
	12/30/2024	< 5.1	< 857	*	1.72 ± 0.76
	1/30/2024	< 5.1	< 842	*	1.97 ± 0.78

Table 11, Concentration of Tritium, Gamma Emitters and Gross Beta, in Surface and Drinking Water (Results in units of pCi/L +/- 2σ)

Sample Code	Sample Date	Cs-137	Tritium	Gamma Emitters[2]	Gross Beta		
OWD Ontario Water District - NE	1/30/2024	< 5.1	< 839	*	1.55	±	0.75
	2/26/2024	< 5.1	< 841	*	2.21	±	0.77
	3/25/2024	< 5.1	< 833	*	1.92	±	0.78
	4/22/2024	< 5.1	< 836	*	1.72	±	0.79
	5/20/2024	< 5.1	< 840	*	1.98	±	0.77
	6/17/2024	< 5.1	< 837	*	1.84	±	0.72
	7/15/2024	< 5.1	< 845	*	1.81	±	0.74
	8/12/2024	< 5.1	< 847	*	2.11	±	0.77
	9/9/2024	< 5.1	< 865	*	1.55	±	0.72
	10/7/2024	< 5.1	< 861	*	1.29	±	0.76
	11/4/2024	< 5.1	< 885	*	1.88	±	0.79
	12/2/2024	< 5.1	< 845	*	1.74	±	0.76
	12/30/2024	< 5.1	< 855	*	1.55	±	0.74
	1/30/2024	< 5.1	< 856	*	1.55	±	0.75

[1] Control Location
[2] All Non-Natural Gamma Emitters < MDA.

Table 12, Concentration of Gamma Emitters in the Flesh of Edible Fish
(Results in units of pCi/kg (wet) +/- 2σ)

Sample Code	Sample Date	Sample Type	Gamma Emitters (Cs-137)
CONTROL[1]	4/10/2024	Trout	*
Local Sites in Control Sectors	4/10/2024	Brown Trout	*
	4/10/2024	Lake Trout	*
	4/10/2024	Lake Trout	*
	5/15/2024	King Salmon	*
	7/4/2024	King Salmon	*
	7/4/2024	Brown Trout	*
	7/4/2024	Lake Trout	*
	9/26/2024	Coho Salmon	
NORTH	3/25/2024	American Shad	*
North Sector	3/25/2024	Brown Trout	*
	3/25/2024	Carp	*
	3/25/2024	Smallmouth Bass	*
	9/27/2024	Smallmouth Bass	*
	9/27/2024	Walleye	
NNE	10/28/2024	Chinook Salmon	*
North North East Sector	10/28/2024	Coho Salmon	*

[1] Control Locations include Greece, NY and Irondequoit, NY.

Table 13, Concentration of Gamma Emitters in Sediment
(Results in units of pCi/kg (wet) +/- 2σ)

Sample Code	Sample Date	Gamma Emitters (Cs-137)
EAST	5/3/2024	*
East Sector	5/28/2024	*
NORTH	12/10/2024	*
North Sector		
GREECE[1]	5/28/2024	*
Control	12/10/2024	*

[1] Control Location

Table 14, Concentration of Iodine-131 in Filtered Air (Charcoal Cartridges)
(Results in units of 10^{-2} pCi/m^3 +/- 2σ)

Stop Date	STATION-02 Manor House Yard	STATION-04 Training Center Parking Lot	STATION-07 West Fence Line	STATION-08[1] Seabreeze	STATION-09 Webster	STATION-11 Williamson
1/8/2024	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037
1/16/2024	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037
1/22/2024	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037
1/29/2024	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037
2/5/2024				< 0.037	< 0.037	< 0.037
2/6/2024	< 0.037	< 0.037	< 0.037			
2/12/2024	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037
2/19/2024	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037
2/26/2024	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037
3/4/2024	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037
3/11/2024	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037
3/18/2024				< 0.037	< 0.037	< 0.037
3/19/2024	< 0.037	< 0.037	< 0.037			
3/25/2024	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037
4/2/2024	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037
4/9/2024	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037
4/15/2024	[2]	< 0.037	< 0.037	< 0.037	< 0.037	
4/16/2024						< 0.037
4/22/2024	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037
4/29/2024	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037
5/6/2024				< 0.037	< 0.037	< 0.037
5/7/2024	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037
5/13/2024				< 0.037	< 0.037	< 0.037
5/14/2024	< 0.037	< 0.037	< 0.037			
5/20/2024				< 0.037	< 0.037	
5/21/2024	< 0.037	< 0.037	< 0.037			< 0.037
5/28/2024	[2]	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037
6/4/2024	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037
6/11/2024	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037
6/17/2024	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037
6/25/2024	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037
7/1/2024	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037
7/9/2024	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037
7/15/2024				< 0.037	< 0.037	< 0.037
7/16/2024	< 0.037	< 0.037	< 0.037			
7/23/2024	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037
7/29/2024				< 0.037	< 0.037	< 0.037
7/30/2024	< 0.037	< 0.037	< 0.037			
8/6/2024	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037
8/13/2024	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037
8/20/2024	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037
8/27/2024	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037

Table 14, Concentration of Iodine-131 in Filtered Air (Charcoal Cartridges)
(Results in units of 10^{-2} pCi/m^3 +/- 2σ)

Stop Date	STATION-02 Manor House Yard	STATION-04 Training Center Parking Lot	STATION-07 West Fence Line	STATION-08[1] Seabreeze	STATION-09 Webster	STATION-11 Williamson
9/3/2024	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037
9/10/2024	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037
9/17/2024	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037
9/23/2024	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037
10/1/2024	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037
10/8/2024	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037
10/14/2024	< 0.037	< 0.037	< 0.037	< 0.037		< 0.037
10/15/2024					< 0.037	
10/22/2024	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037
10/29/2024	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037
11/4/2024				< 0.037	< 0.037	< 0.037
11/5/2024	< 0.037	< 0.037	< 0.037			
11/12/2024	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037
11/19/2024	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037
11/25/2024	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037
12/3/2024	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037
12/10/2024	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037
12/16/2024				[3]		
12/17/2024	[3]	[3]	[3]		[3]	[3]
12/23/2024	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037
12/30/2024	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037

[1]Control Location
[2]Sampler Malfunction / Low Flow / Lost Sample
[3]Samples lost during shipment

Table 15, Concentration of Beta Emitters in Air Particulates – Onsite Samples
(Results in units of 10^{-2} pCi/m^3 +/- 2σ Uncertainty)

Stop Date	STATION-02 Manor House Yard	STATION-03 East Field	STATION-04 Training Center Parking Lot	STATION-05 Creek Bridge	STATION-06 Main Parking Lot	STATION-07 West Fence Line	STATION-13 Substation 13
1/8/2024	1.58 ± 0.13	1.80 ± 0.16	1.70 ± 0.15	1.81 ± 0.16	1.57 ± 0.15	0.81 ± 0.17	1.53 ± 0.15
1/16/2024	2.42 ± 0.12	2.49 ± 0.15	2.37 ± 0.14	2.47 ± 0.14	2.33 ± 0.14	1.46 ± 0.15	2.58 ± 0.14
1/22/2024	2.81 ± 0.15	2.93 ± 0.19	2.51 ± 0.17	2.69 ± 0.18	2.82 ± 0.18	2.16 ± 0.38	
1/23/2024							2.89 ± 0.17
1/29/2024	1.86 ± 0.12	2.19 ± 0.16	1.99 ± 0.14	1.96 ± 0.14	2.08 ± 0.14	1.31 ± 0.16	1.83 ± 0.15
2/5/2024							2.01 ± 0.14
2/6/2024	1.94 ± 0.11	2.15 ± 0.14	1.93 ± 0.13	2.13 ± 0.14	1.93 ± 0.13	1.10 ± 0.14	
2/12/2024	1.94 ± 0.14	2.04 ± 0.17	1.97 ± 0.16	2.20 ± 0.17	1.94 ± 0.16	1.24 ± 0.19	1.99 ± 0.15
2/19/2024	1.97 ± 0.12	2.18 ± 0.15	2.14 ± 0.15	2.07 ± 0.14	2.09 ± 0.14	1.16 ± 0.16	2.13 ± 0.15
2/26/2024	2.49 ± 0.13	2.72 ± 0.17	2.52 ± 0.16	2.67 ± 0.16	2.51 ± 0.15	1.62 ± 0.17	2.84 ± 0.16
3/4/2024	1.98 ± 0.13	2.05 ± 0.16	1.66 ± 0.14	2.07 ± 0.15	1.89 ± 0.14	1.24 ± 0.17	2.04 ± 0.15
3/11/2024	1.25 ± 0.10	1.31 ± 0.13	1.34 ± 0.13	1.37 ± 0.13	1.31 ± 0.12	0.83 ± 0.15	1.32 ± 0.13
3/18/2024							2.93 ± 0.17
3/19/2024	2.58 ± 0.13	2.76 ± 0.16	2.32 ± 0.14	2.73 ± 0.15	2.63 ± 0.15	1.62 ± 0.16	
3/25/2024	1.71 ± 0.13	1.79 ± 0.16	1.58 ± 0.15	1.78 ± 0.15	1.59 ± 0.15	0.98 ± 0.17	1.69 ± 0.14
4/2/2024	2.00 ± 0.11	2.15 ± 0.14	2.11 ± 0.14	2.10 ± 0.13	2.16 ± 0.14	1.25 ± 0.15	2.12 ± 0.14
4/9/2024	0.72 ± 0.09	0.86 ± 0.12	0.92 ± 0.11	0.91 ± 0.11	0.83 ± 0.11	0.56 ± 0.13	0.89 ± 0.11
4/15/2024	[1]	1.91 ± 0.16	1.96 ± 0.15	2.05 ± 0.15	2.00 ± 0.16	1.33 ± 0.17	1.94 ± 0.16
4/22/2024	1.33 ± 0.11	1.42 ± 0.14	1.34 ± 0.13	1.40 ± 0.13	1.31 ± 0.13	0.89 ± 0.15	1.49 ± 0.13
4/29/2024	2.05 ± 0.12	2.25 ± 0.16	2.30 ± 0.15	2.25 ± 0.15	2.26 ± 0.15	1.39 ± 0.16	2.23 ± 0.15
5/6/2024							1.07 ± 0.12
5/7/2024	1.08 ± 0.11	1.19 ± 0.12	1.12 ± 0.11	1.18 ± 0.11	1.15 ± 0.11	0.72 ± 0.13	
5/13/2024							1.25 ± 0.13
5/14/2024	1.26 ± 0.11	1.26 ± 0.14	1.32 ± 0.13	1.31 ± 0.13	1.30 ± 0.13	0.82 ± 0.15	
5/20/2024							1.91 ± 0.15
5/21/2024	1.91 ± 0.12	1.96 ± 0.15	[1]	2.09 ± 0.15	1.98 ± 0.15	1.27 ± 0.16	
5/28/2024	[1]	2.13 ± 0.16	1.99 ± 0.15	2.08 ± 0.15	2.00 ± 0.15	1.45 ± 0.17	2.19 ± 0.15

Table 15, Concentration of Beta Emitters in Air Particulates – Onsite Samples
(Results in units of 10^{-2} pCi/m^3 +/- 2σ Uncertainty)

Stop Date	STATION-02 Manor House Yard	STATION-03 East Field	STATION-04 Training Center Parking Lot	STATION-05 Creek Bridge	STATION-06 Main Parking Lot	STATION-07 West Fence Line	STATION-13 Substation 13
6/4/2024	2.42 ± 0.15	2.62 ± 0.17	2.75 ± 0.20	2.53 ± 0.16	2.53 ± 0.16	1.58 ± 0.18	[1]
6/11/2024	1.50 ± 0.11	1.60 ± 0.14	1.81 ± 0.16	1.65 ± 0.14	1.55 ± 0.13	1.27 ± 0.16	1.21 ± 0.24
6/17/2024	1.72 ± 0.14	2.07 ± 0.18	1.76 ± 0.17	1.94 ± 0.17	1.96 ± 0.17	1.26 ± 0.20	1.81 ± 0.27
6/25/2024	2.93 ± 0.14	3.03 ± 0.17	3.13 ± 0.16	3.26 ± 0.16	3.00 ± 0.14	1.99 ± 0.17	2.99 ± 0.25
7/1/2024	1.52 ± 0.13	1.69 ± 0.16	1.65 ± 0.16	1.69 ± 0.16	1.09 ± 0.13	1.60 ± 0.18	1.71 ± 0.26
7/9/2024	1.90 ± 0.26	3.17 ± 0.16	3.08 ± 0.16	3.13 ± 0.16	3.12 ± 0.13	3.03 ± 0.15	2.91 ± 0.23
7/15/2024						2.93 ± 0.16	2.73 ± 0.28
7/16/2024	2.56 ± 0.14	2.86 ± 0.17	2.71 ± 0.16	2.90 ± 0.16	2.93 ± 0.14		
7/23/2024	2.27 ± 0.13	2.59 ± 0.16	2.51 ± 0.16	2.29 ± 0.15	2.49 ± 0.13	2.37 ± 0.15	2.27 ± 0.21
7/29/2024						2.62 ± 0.16	2.41 ± 0.27
7/30/2024	2.83 ± 0.21	2.78 ± 0.16	2.82 ± 0.16	2.66 ± 0.20	2.89 ± 0.14		
8/6/2024	3.47 ± 0.23	3.73 ± 0.18	3.37 ± 0.16	3.45 ± 0.22	3.40 ± 0.15	3.75 ± 0.18	3.65 ± 0.25
8/13/2024	1.53 ± 0.17	1.74 ± 0.13	1.45 ± 0.12	1.38 ± 0.15	1.36 ± 0.11	1.54 ± 0.13	1.56 ± 0.20
8/20/2024	2.64 ± 0.20	2.61 ± 0.16	2.41 ± 0.14	2.32 ± 0.18	2.37 ± 0.13	2.79 ± 0.16	2.51 ± 0.24
8/27/2024	3.87 ± 0.24	3.86 ± 0.18	3.64 ± 0.17	3.34 ± 0.21	3.53 ± 0.15	3.96 ± 0.18	3.47 ± 0.29
9/3/2024	2.50 ± 0.20	2.38 ± 0.15	2.43 ± 0.14	2.33 ± 0.18	2.19 ± 0.13	2.50 ± 0.15	2.38 ± 0.29
9/10/2024	2.13 ± 0.20	2.28 ± 0.15	2.17 ± 0.14	2.11 ± 0.18	2.03 ± 0.13	2.29 ± 0.15	2.46 ± 0.24
9/17/2024	5.97 ± 0.29	6.15 ± 0.23	5.98 ± 0.21	5.67 ± 0.25	5.62 ± 0.19	6.18 ± 0.23	6.16 ± 0.34
9/23/2024	5.40 ± 0.30	5.37 ± 0.23	5.02 ± 0.21	4.96 ± 0.26	5.23 ± 0.20	5.45 ± 0.23	5.32 ± 0.35
10/1/2024	2.24 ± 0.18	2.23 ± 0.13	2.16 ± 0.13	2.12 ± 0.15	2.14 ± 0.12	2.22 ± 0.13	2.23 ± 0.21
10/8/2024	2.60 ± 0.20	2.73 ± 0.16	2.77 ± 0.15	2.50 ± 0.18	2.45 ± 0.13	2.83 ± 0.16	2.78 ± 0.25
10/14/2024	1.86 ± 0.19	1.93 ± 0.15	1.93 ± 0.14	1.77 ± 0.17	1.77 ± 0.12	1.94 ± 0.14	2.01 ± 0.23
10/22/2024	2.92 ± 0.20	3.11 ± 0.15	2.96 ± 0.14	2.96 ± 0.17	2.82 ± 0.13	3.03 ± 0.15	3.17 ± 0.24
10/29/2024	2.90 ± 0.21	2.98 ± 0.16	2.80 ± 0.15	2.81 ± 0.18	3.10 ± 0.20	3.05 ± 0.16	2.99 ± 0.25
11/4/2024							3.62 ± 0.29
11/5/2024	3.17 ± 0.22	3.36 ± 0.17	3.34 ± 0.16	3.49 ± 0.21	2.12 ± 0.15	3.47 ± 0.17	
11/12/2024	2.29 ± 0.20	2.33 ± 0.14	2.20 ± 0.13	2.15 ± 0.14	2.21 ± 0.13	2.32 ± 0.15	2.29 ± 0.21
11/19/2024	2.76 ± 0.22	2.83 ± 0.16	2.67 ± 0.15	2.77 ± 0.17	2.58 ± 0.13	2.70 ± 0.15	2.62 ± 0.25
11/25/2024	2.12 ± 0.22	2.13 ± 0.16	2.14 ± 0.15	2.09 ± 0.16	2.10 ± 0.14	2.31 ± 0.16	2.18 ± 0.26

Table 15, Concentration of Beta Emitters in Air Particulates – Onsite Samples
(Results in units of 10^{-2} pCi/m^3 +/- 2σ Uncertainty)

Stop Date	STATION-02 Manor House Yard	STATION-03 East Field	STATION-04 Training Center Parking Lot	STATION-05 Creek Bridge	STATION-06 Main Parking Lot	STATION-07 West Fence Line	STATION-13 Substation 13
12/3/2024	2.48 ± 0.18	2.40 ± 0.13	2.32 ± 0.12	2.32 ± 0.14	2.17 ± 0.11	2.45 ± 0.13	2.56 ± 0.21
12/10/2024	3.05 ± 0.22	3.03 ± 0.16	2.73 ± 0.14	2.84 ± 0.16	2.68 ± 0.13	3.04 ± 0.16	3.12 ± 0.25
12/17/2024	[2]	[2]	[2]	[2]	[2]	[2]	[2]
12/23/2024	3.02 ± 0.24	3.08 ± 0.18	2.77 ± 0.16	2.22 ± 0.18	2.69 ± 0.15	2.72 ± 0.17	3.19 ± 0.28
12/30/2024	2.63 ± 0.21	2.75 ± 0.15	2.49 ± 0.14	2.51 ± 0.15	2.37 ± 0.13	2.53 ± 0.15	2.63 ± 0.24

[1]Sampler malfunction / low flow.
[2]Samples lost in transit.

Table 16, Concentration of Beta Emitters in Air Particulates - Offsite Samples
(Results in units of 10^{-2} pCi/m^3 +/- 2σ Uncertainty)

Stop Date	STATION-08[1] Seabreeze		STATION-09 Webster		STATION-10[1] Walworth		STATION-11 Williamson		STATION-12[1] Sodus Point	
1/8/2024	1.53	0.15	1.45	0.14	1.45	0.15	1.59	0.14	1.73	0.14
1/16/2024	2.42	0.14	2.36	0.13	2.24	0.14	2.33	0.13	2.33	0.13
1/22/2024	2.91	0.18	2.67	0.17	2.77	0.18	2.76	0.16	2.76	0.16
1/30/2024	1.80	0.13	1.47	0.11	1.70	0.12	1.64	0.11	1.83	0.12
2/5/2024	2.17	0.16	1.95	0.15	2.05	0.16	1.96	0.15	1.98	0.15
2/12/2024	1.97	0.14	1.92	0.14	1.79	0.14	1.88	0.13	1.83	0.13
2/19/2024	2.11	0.15	1.95	0.14	1.96	0.15	2.01	0.13	1.96	0.13
2/26/2024	2.79	0.16	2.57	0.15	2.60	0.16	2.24	0.14	2.31	0.14
3/4/2024	2.19	0.15	1.73	0.13	2.08	0.15	2.06	0.14	2.08	0.14
3/11/2024	1.44	0.13	1.54	0.13	1.21	0.12	1.23	0.11	1.30	0.11
3/18/2024	2.97	0.17	2.61	0.15	2.76	0.16	2.75	0.15	2.86	0.15
3/25/2024	1.60	0.13	1.58	0.13	1.68	0.14	1.54	0.12	1.33	0.12
4/2/2024	2.20	0.13	2.00	0.13	1.97	0.13	1.99	0.12	2.12	0.12
4/9/2024	0.91	0.11	0.89	0.11	0.82	0.11	0.85	0.10	0.89	0.10
4/15/2024	2.10	0.16	2.04	0.15						
4/16/2024					1.99	0.14	1.88	0.13	1.82	0.13
4/22/2024	1.56	0.13	1.42	0.12	1.54	0.15	1.39	0.13	1.42	0.13
4/29/2024	2.31	0.15	2.21	0.14	2.26	0.15	2.19	0.14	2.31	0.14
5/6/2024	1.04	0.12	1.12	0.11	1.02	0.12	1.08	0.11	0.99	0.11
5/13/2024	1.13	0.12	1.29	0.12	1.23	0.13	1.12	0.11	1.15	0.11
5/20/2024	2.07	0.15	1.98	0.14	1.91	0.14				
5/21/2024							2.11	0.13	1.94	0.12
5/28/2024	2.25	0.14	2.09	0.13	2.25	0.15	2.10	0.14	1.98	0.14
6/4/2024	2.47	0.16	2.37	0.15	2.21	0.15	2.37	0.15	2.49	0.15
6/11/2024	1.64	0.14	1.61	0.13	1.57	0.14	1.68	0.13	1.63	0.13
6/17/2024	1.94	0.16	1.86	0.16	1.85	0.16	1.72	0.15	1.61	0.14
6/25/2024	2.83	0.14	3.02	0.15	3.40	0.17	2.81	0.14	2.84	0.14
7/1/2024	1.71	0.13	1.60	0.15	1.76	0.17	1.64	0.14	1.67	0.14
7/9/2024	2.91	0.13	2.91	0.15	2.89	0.15	3.04	0.14	2.75	0.14
7/15/2024	2.73	0.15	3.04	0.17	2.98	0.18	2.62	0.16	2.66	0.16
7/23/2024	2.27	0.12	2.37	0.13	2.31	0.14	2.20	0.13	2.17	0.12
7/29/2024	2.41	0.14	2.54	0.16	2.82	0.16	2.84	0.16	2.68	0.15
8/6/2024	3.31	0.14	3.32	0.16	3.56	0.18	3.52	0.17	3.43	0.16
8/13/2024	1.48	0.11	1.52	0.12	1.67	0.13	1.57	0.12	1.54	0.11
8/20/2024	2.43	0.13	2.41	0.15	2.68	0.16	2.50	0.15	2.66	0.14
8/27/2024	3.51	0.15	3.66	0.18	3.52	0.17	3.45	0.17	3.37	0.15
9/3/2024	2.49	0.13	2.62	0.16	2.50	0.15	2.37	0.15	2.35	0.14
9/10/2024	2.06	0.12	2.21	0.15	2.05	0.14	1.89	0.13	2.23	0.13
9/17/2024	5.74	0.19	6.43	0.23	5.88	0.22	5.97	0.22	6.04	0.20
9/24/2024	4.52	0.17	4.71	0.20	4.61	0.20	4.26	0.19	4.33	0.17

Table 16, Concentration of Beta Emitters in Air Particulates - Offsite Samples
(Results in units of 10^{-2} pCi/m^3 +/- 2σ Uncertainty)

Stop Date	STATION-08[1] Seabreeze		STATION-09 Webster		STATION-10[1] Walworth		STATION-11 Williamson		STATION-12[1] Sodus Point	
10/1/2024	2.22	0.13	2.40	0.15	2.35	0.15	2.26	0.14	2.19	0.13
10/8/2024	2.77	0.14	3.11	0.17	2.72	0.16	2.74	0.15	2.43	0.13
10/14/2024	1.79	0.12			1.86	0.14	1.73	0.14	1.68	0.12
10/15/2024			1.69	0.13						
10/22/2024	2.90	0.13	3.39	0.17	2.89	0.15	2.72	0.14	2.91	0.13
10/29/2024	2.89	0.14	3.14	0.17	2.96	0.16	2.96	0.16	2.76	0.14
11/4/2024	3.34	0.16	3.62	0.19	3.67	0.19	3.27	0.18	3.01	0.16
11/12/2024	2.20	0.12	2.41	0.14	2.20	0.13	2.24	0.13	2.27	0.12
11/19/2024	2.59	0.13	2.90	0.16	2.58	0.15	2.55	0.15	2.62	0.14
11/25/2024	2.16	0.13	2.22	0.16	2.29	0.16	2.02	0.15	2.08	0.14
12/2/2024	2.65	0.13	2.54	0.14	2.51	0.14	2.33	0.13	2.30	0.12
12/10/2024	2.25	0.11	2.57	0.15	2.95	0.16	2.69	0.15	2.72	0.13
12/16/2024	[2]									
12/17/2024			[2]		[2]		[2]		[2]	
12/23/2024	2.63	0.13	2.83	0.17	2.96	0.17	3.07	0.17	2.72	0.15
12/30/2024	2.37	0.13	2.35	0.15	2.27	0.14	2.33	0.14	2.41	0.13

[1]Control Location
[2]Samples lost in transit

Table 17, Concentration of Gamma Emitters in Air Particulates
(Results in units of 10^{-3} pCi/m^3 +/- 2σ)

Location	Description	Sample Date	Gamma Emitters (Cs-137)	Gamma Emitters (I-131)
STATION-02	Manor House Yard	4/2/2024	< 4.2	< 0.037
		7/1/2024	< 4.2	< 0.037
		10/1/2024	< 4.2	< 0.037
		12/30/2024	< 4.2	< 0.037
STATION-03	North of Training Center Parking Lot	4/2/2024	< 4.2	< 0.037
		7/1/2024	< 4.2	< 0.037
		10/1/2024	< 4.2	< 0.037
		12/30/2024	< 4.2	< 0.037
STATION-04	Training Center Parking Lot	4/2/2024	< 4.2	< 0.037
		7/1/2024	< 4.2	< 0.037
		10/1/2024	< 4.2	< 0.037
		12/30/2024	< 4.2	< 0.037
STATION-05	Creek Bridge	4/2/2024	< 4.2	< 0.037
		7/1/2024	< 4.2	< 0.037
		10/1/2024	< 4.2	< 0.037
		12/30/2024	< 4.2	< 0.037
STATION-06	Main Parking Lot	4/2/2024	< 4.2	< 0.037
		7/1/2024	< 4.2	< 0.037
		10/1/2024	< 4.2	< 0.037
		12/30/2024	< 4.2	< 0.037
STATION-07	West Fence Line	4/2/2024	< 4.2	< 0.037
		7/1/2024	< 4.2	< 0.037
		10/1/2024	< 4.2	< 0.037
		12/30/2024	< 4.2	< 0.037
STATION-08[1]	Seabreeze	4/2/2024	< 4.2	< 0.037
		7/1/2024	< 4.2	< 0.037
		10/1/2024	< 4.2	< 0.037
		12/30/2024	< 4.2	< 0.037
STATION-09	Webster	4/2/2024	< 4.2	< 0.037
		7/1/2024	< 4.2	< 0.037
		10/1/2024	< 4.2	< 0.037
		12/30/2024	< 4.2	< 0.037
STATION-10[1]	Walworth	4/2/2024	< 4.2	< 0.037
		7/1/2024	< 4.2	< 0.037
		10/1/2024	< 4.2	< 0.037
		12/30/2024	< 4.2	< 0.037

Table 17, Concentration of Gamma Emitters in Air Particulates
(Results in units of 10^{-3} pCi/m^3 +/- 2σ)

Location	Description	Sample Date	Gamma Emitters	
			(Cs-137)	(I-131)
STATION-11	Williamson	4/2/2024	< 4.2	< 0.037
		7/1/2024	< 4.2	< 0.037
		10/1/2024	< 4.2	< 0.037
		12/30/2024	< 4.2	< 0.037
STATION-12[1]	Sodus Point	4/2/2024	< 4.2	< 0.037
		7/1/2024	< 4.2	< 0.037
		10/1/2024	< 4.2	< 0.037
		12/30/2024	< 4.2	< 0.037
STATION-13	Substation 13	4/2/2024	< 4.2	< 0.037
		7/1/2024	< 4.2	< 0.037
		10/1/2024	< 4.2	< 0.037
		12/30/2024	< 4.2	< 0.037

[1] Control Location

Table 18, Concentration of Gamma Emitters in Vegetation Samples
(Results in units of pCi/kg (wet) +/- 2σ)

Sample Code	Sample Date	Sample Type	Gamma Emitters (Cs-137)	(I-131)
CONTROL[1]	8/25/2024	Tomatoes		
Local Sites in Control Sectors	8/25/2024	Potatoes	< 26	< 42
	8/25/2024	Leafy Greens	< 26	< 42
	8/25/2024	Zucchini	< 26	< 42
	8/25/2024	Onions	< 26	< 42
	9/29/2024	Apples	< 26	< 42
	9/29/2024	Grapes	< 26	< 42
	9/29/2024	Pears	< 26	< 42
			< 26	< 42
EAST	7/23/2024	Leafy Greens		
East Sector	8/13/2024	Potatoes		
	9/4/2024	Apples	< 26	< 42
	9/19/2024	Grapes	< 26	< 42
SSE	7/23/2024	Leafy Greens		
South South East Sector	7/23/2024	Tomatoes	< 26	< 42
	8/13/2024	Potatoes	< 26	< 42
	8/13/2024	Onions	< 26	< 42
	9/4/2024	Pears	< 26	< 42
	9/19/2024	Apples	< 26	< 42
INDICATOR	7/24/2024	Zucchini		
Vegetation General Indicator Sector	7/24/2024	Leafy Greens	< 26	< 42
	8/5/2024	Tomatoes	< 26	< 42
	8/13/2024	Potatoes	< 26	< 42
	9/4/2024	Grapes	< 26	< 42
	8/13/2024	Onions	< 26	< 42
	8/13/2024	Tomatoes	< 26	< 42

[1] Control Location

Table 19, Concentration of Gamma Emitters (including I-131) in Milk
(Results in units of pCi/Liter +/- 2σ)

Sample Code	Sample Date	Gamma Emitters	
		Cs-137	(I-131)
FARM_A			
(FIELD CRAFT) ESE Supplemental	1/22/2024	< 6.9	< 0.8
	2/21/2024	< 6.9	< 0.8
	3/19/2024	< 6.9	< 0.8
	4/16/2024	< 6.9	< 0.8
	5/13/2024	< 6.9	< 0.8
	6/10/2024	< 6.9	< 0.8
	6/24/2024	< 6.9	< 0.8
	7/8/2024	< 6.9	< 0.8
	7/22/2024	< 6.9	< 0.8
	8/5/2024	< 6.9	< 0.8
	8/19/2024	< 6.9	< 0.8
	9/3/2024	< 6.9	< 0.8
	9/16/2024	< 6.9	< 0.8
	9/30/2024	< 6.9	< 0.8
	10/14/2024	< 6.9	< 0.8
	10/28/2024	< 6.9	< 0.8
	11/12/2024	< 6.9	< 0.8
	12/9/2024	< 6.9	< 0.8
FARM_B			
(SCHULTZ[1]) South Sodus Control	1/22/2024	< 6.9	< 0.8
	2/21/2024	< 6.9	< 0.8
	3/19/2024	< 6.9	< 0.8
	4/16/2024	< 6.9	< 0.8
	5/13/2024	< 6.9	< 0.8
	6/10/2024	< 6.9	< 0.8
	6/24/2024	< 6.9	< 0.8
	7/8/2024	< 6.9	< 0.8
	7/22/2024	< 6.9	< 0.8
	8/5/2024	< 6.9	< 0.8
	8/19/2024	< 6.9	< 0.8
	9/3/2024	< 6.9	< 0.8
	9/16/2024	< 6.9	< 0.8
	9/30/2024	< 6.9	< 0.8
	10/14/2024	< 6.9	< 0.8
	10/28/2024	< 6.9	< 0.8
	11/12/2024	< 6.9	< 0.8
	12/9/2024	< 6.9	< 0.8

[1] Control Location

Table 20, Typical MDA Ranges for Gamma Spectrometry

Selected Nuclides	Air Particulates (10-3 pCi/m3)	Surface Water, Drinking Water (pCi/L)	Fish (pCi/kg) Wet	Groundwater (pCi/L)	Milk (pCi/L)	Oysters (pCi/kg)	Shoreline Sediment (pCi/kg) Dry	Soil (pCi/kg) Dry	Vegetation (pCi/kg) Wet
K-40	5.65 - 24.6	16 - 182	2,747 - 4,505	21.5 -66.4	1,286 - 1,529	1,269 - 2,069	781 - 13,761	789 - 10,713	1980-5174
Mn-54	0.32 - 1.16	2.7 - 5.6	9.8 - 19.6	2.86 - 5.14	3.6 - 6.6	10.8 - 16.4	41.4 - 67.1	37.4 - 91.9	11.8-26.3
Fe-59	1.01 - 8.52	5.6 - 13.2	31.6 - 93.2	6.04 - 11.7	9.2 - 15.9	29.3 - 56.7	142 - 251	96.4 – 389	28.2-61.3
Co-58	0.38 - 2.07	2.7 - 5.6	10.9 - 28.3	2.86 - 5.27	3.7 - 6.3	10.5 - 19.3	53.7 - 82.9	44.6 – 133	11.6-26.3
Co-60	0.28 - 1.09	2.8 - 5.5	10.9 - 24.3	3.01 - 5.38	4.1 - 7.2	11.7 - 17.0	38.6 - 57.9	32.8 - 85.8	13.5-32.2
Zn-65	0.81 - 3.10	5.5 - 11.4	23.3 - 57.2	6.41 - 14.4	9.4 - 16.1	22.0 - 43.3	112 - 198	96.4 – 275	29.3-60.1
Ag-110m	0.33 – 1.06	2.42 - 4.96	8.2 – 18.1	2.79 - 5.06	3.26- 5.64	8.7 - 16.0	36.6 - 175	40.7 – 99.4	11-23.6
Zr-95	0.72 - 3.88	4.7 - 10.2	20.0 - 47.1	5.62 - 8.75	5.8 - 11.5	19.0 - 34.0	93.5 - 151	84.6 – 261	21.5-44.2
Nb-95	0.56 - 4.91	2.9 - 6.0	13.7 - 42.7	3.3 - 5.88	3.9 - 6.5	13.9 - 24.3	82.1 - 157	61.5 – 227	13-26.9
Ru-106	3.00 - 12.1	23.8 - 48.1	77.1 - 197	25.6 - 45.3	29.3 - 51.8	88.0 - 141	327.0 – 570	314.0 – 840	105-227
I-131[1]	2.73 - 914	0.52 - 11.7	21.4 - 2,340	4.87 - 9.04	0.5 - 7.03	22.4 - 107	470 - 2,040	139 - 8,060	15.1-35.7
Cs-134	0.47 - 0.88	3.2 - 5.7	7.8 - 16.0	2.92 - 5.48	4.09 - 4.82	9.7 - 16.5	43.3 - 82.4	33.4 - 109	11.4-23.8
Cs-137	0.46 - 0.88	3.7 - 5.9	3.8 - 17.5	2.97 - 5.43	4.08 - 5.29	10.0 - 16.7	38.4 - 65.4	39.1 - 135	13.1-30.8
La-140	2.01 – 116	5.05 - 11.5	15.9 - 444	4.87 - 10.3	4.89 - 6.28	24.1 - 80.4	368 - 773	136 - 1,820	12.6-39
Ba-140	2.01 - 116	5.05 - 11.5	15.9 - 444	5.86 - 26.0	4.89 - 6.28	24.1 - 80.4	368 – 773	136 - 1,820	17.5-105
Ce-144	1.12 - 3.27	16.8 - 36.7	38.1 - 70.9	17.8 - 32.0	20.5 - 31.0	42.6 - 72.6	208 - 279	191 - 414	71.5-132
Cr-51	4.90 - 45.0	23.2 - 50.6	93.0 - 395	26.7 - 42.1	30.4 - 46.8	97.0 - 199	711 - 1,110	489 - 1,810	104-196
Na-22	0.34 - 1.33	2.7 - 6.0	12.1 - 28.0	2.78 - 5.94	4.9 - 8.5	13.4 - 19.5	46.4 - 77.4	36.4 - 92.4	4.4-56.6

[1] The MDA range for I-131 on a charcoal cartridge is typically 5.22 x 10-3 to 1.37 x 10-2 pCi/m3

Attachment 3, Cross Check Intercomparison Program

Participation in cross check intercomparison studies is mandatory for laboratories performing analyses of REMP samples satisfying the requirements in the ODCM. Intercomparison studies provide a consistent and effective means to evaluate the accuracy and precision of analyses performed by a laboratory. Study results should fall within specified control limits and results that fall outside the control limits are investigated and corrected.

Constellation Generation Solutions (CGS) Laboratory participated in the following proficiency testing studies provided by Environmental Resource Associates (ERA) and Eckert Ziegler Analytics (EZA) in 2024. The Laboratory's intercomparison program results for 2024 are summarized below.

Attachment 3 is a summary of (CGS) laboratory's quality assurance program. It consists of Table 21 which is a compilation of the results of the CGS laboratory's participation in an interlaboratory comparison program with (ERA) located in Arvada, Colorado and (EZA) located in Atlanta, Georgia. It also includes a compilation of the results of the (CGS) Laboratory's participation in a split sample program with Teledyne Brown Engineering located in Knoxville, Tennessee.

The CGS laboratory's intercomparison results, are in full agreement when they were evaluated using designated acceptance ranges and the Resolution Test Criteria in accordance with the Constellation Radiochemistry Quality Control procedure, except as noted in the Pass/Fail column and described below. The CGS laboratory's results are provided with their analytical uncertainties of 2 sigma. When evaluating with the Resolution Test a one sigma uncertainty is used to determine Pass or Fail and noted accordingly. Co-located air samplers provide the opportunity to perform interlaboratory comparisons of beta particulate and radioiodine filters that due to the nature of the sample precludes them from splitting for analysis. Results of E1-2 analyzed by CGS and E1-2Q analyzed by TBE for beta particulates are provided at the end of this table for review and are generally in good agreement. The radioiodine samples collected alongside the beta particulate filters were analyzed and all were below MDA so there are no results to compare for that parameter.

All CGS results reported passed their respective acceptance ranges and Resolution Test Criteria with the following two exceptions for the interlaboratory crosschecks:

- RAD-137 I-131 water study on 04/08/2024 on Detector 6 (D6) failed high at 29.7 pCi/L for a true value of 25.1 pCi/L with an acceptance range of 21.7 – 28.5 pCi/L. Sample was performed using a new detector and the study had very low area counts. Three runs in total were performed and the other two values would have passed, with results on all other detectors were successful. Further review of the data indicated all the Ba-133 results in the other RAD-137 water study were in acceptable range. In that study, Ba-133 is meant to approximate I-131 results as it has an energy very close to I-131 in the spectrum.

- E14044 Filter study on 12/05/24 failed low for Cs-134 on D6 reporting 91.3 +/- 3.25 pCi for a true value of 116 pCi. This study also had unusually low area counts in this range of the spectrum. The result did pass the acceptance range of 81.2 – 150.8 pCi, however due to the extremely low activity level, count times were extended significantly to capture other isotopes with lower yields resulting in very low uncertainties for higher yield isotopes. Regarding Cs-134, the uncertainty was less than 5% and at the level of recovery observed, the result failed the resolution test. Routine analysis is normally performed to achieve 15% +/- 5 %. Reviewing all other studies performed on this detector showed successful performance for Cs-134 and all other isotopes. The evaluation of detector performance is ongoing to identify inherent bias or variability at low count rates as is observed in environmental samples.

The vendor laboratories used by CGS for subcontracting and interlaboratory comparison samples, GEL Laboratories and Teledyne Brown Engineering (TBE), also participate in the ERA and EZA interlaboratory comparison program. A presentation of their full data report is provided in their Annual Environmental Quality Assurance Program Reports, (Ref 39,40). In summary, Gel and TBE reported results met vendor and laboratory acceptance ranges with the following exceptions described here.

For TBE, the following three studies reported data that did not meet the specified acceptance criteria and were addressed through the TBE Corrective Action Program. Investigations of the failures are described as follows:

- TBE Crosschecks failed high for MRAD-40 Gross Beta at 42.1 pCi/Filter. The true value was 22.2 and the acceptable range was 13.5-33.5 pCi/Filter. All QC associated with the original sample was acceptable and no anomalies were found. This sample was used as the WG duplicate with a result of 42.5 pCi. Both were counted on the same detector. Upon comparison to historical sample data, the alpha activity of this ERA submitted sample was the highest assigned result, and the beta activity was the lowest. Therefore, the alpha-to-beta crosstalk was more significant than normal, causing the beta activity to report falsely high data. The counting room laboratory staff will adjust the alpha-to-beta crosstalk via correction calculation measures when high alpha is observed. Subsequent study MRAD-41 for Gross Beta filter returned acceptable results.

- RAD-137 Gross Alpha in water failed low at 35.2 pCi/L. The true value was 52.6 pCi/L and the acceptable range was 39.6 – 65.6 pCi/L. A repeat study was analyzed and failed high at 40.3 pCi/L and the acceptable range was 21.5 – 38.5 pCi/L. Investigation showed higher than usual solids in the ERA study, out of the usual range of client samples received by the lab. Also, a different attenuation curve, Th-230, was used for the crosscheck than had been used historically. This curve was less representative of client samples. The lab review of data also showed that a replicate run of the sample would have passed but the lab chose the wrong replicate to report. The lab has gone to a lower volume of sample and resumed using the Am-241 attenuation curve which more closely mirrors client samples and subsequent crosschecks are reporting acceptable.

- Quarter 1-2024 gamma results for Co-60 (air filter) and Ce-141 (soil) both failed high. The reported result for the filter Co-60 was 168+/- 12.7 and the known value was 126+/-2.1; the reported results for the soil Ce-141 was 0.106 and the known value was 0.0714+/-0.0013 pCi/g. The root cause investigation showed successful results for the filter on another detector. All QC associated with this sample was acceptable. The soil was recounted on another detector and Ce-141 result of 0.085 was acceptable and generally the same for other geometries. All QC associated with this sample was acceptable. No effective corrective action can be taken at this time. Historically, the Filter Co-60 and soil Ce-141 results have been well within TBE QC acceptance ranges. TBE has successfully passed cross-check results, and it appears that these two results are anomalous. If there is a recurrence, a root cause investigation will be done promptly.

For the GEL Laboratory, the following six studies reported data that did not meet the specified acceptance criteria and were addressed through the GEL's internal nonconformance system. A summary is found below:

- RAD-136 water Sr-90 failed high, while I-131 failed low.
    - Strontium-90: The Group Leader has reviewed the method to identify the bias. The method LCS trend was reviewed, and no anomalies were identified. The calibration used for the analysis was compared to the new calibration performed recently and the original reported data was processed with both calibrations for comparison. Data still maintained a high bias but was within the limits of the study. A sample of known Strontium concentration was analyzed, and the results were processed using the new calibration. The result was within the mid-range of the acceptance limits. Instrument run logs were reviewed and there was no indication of possible bias from a previously counted sample.
    - Iodine-131: The laboratory has reviewed the data and found no errors. All batch QC samples, including a duplicate, met acceptance criteria. The carrier yields were found to be slightly higher than typically seen in this method, possibly contributing to the low bias in the result. The laboratory will continue to investigate all steps of the analytical process.

- RAD-137 water Sr-90 and I-131 studies both failed low.
    - Strontium-90: The unacceptable result was analyzed by a modified method of 905.0 and recovered 83% of the known value which is acceptable for the laboratory's LCS. The PT sample was also analyzed by EPA DW method 905.0 and achieved an acceptable result recovering 94% of the assigned value. The RPD between the methods was 12%. The laboratory is evaluating calibration, yield determination, techniques, reagents, carriers, and each step of the process for areas of improvement.
    - Iodine-131: The laboratory has reviewed the data and no errors were noted. All batch QC samples, including an in-batch duplicate, met acceptance criteria. It was noted that the carrier yields were found to be slightly higher than are typically seen in this method including the reference sample used to calculate the LCS, potentially contributing to the low bias in the result.
- RAD-138 Sr-90 and I-131 on water failed low.
    - Strontium-90: The laboratory conducted an in-depth review of all available data and did not identify any specific errors or anomalies that could explain the performance evaluation failure. The instrument calibrations were reviewed for possible significant areas of variance when compared to previous calibrations and none were noted. The quality department conducted direct observations of the analytical processes noting minor areas of improvement during precipitations and column separations. A definitive root cause was not isolated during the investigation.
    - Iodine-131: The laboratory has reviewed the data and found no errors. All batch QC samples, including an in-batch duplicate, met the acceptance criteria. As part of the investigation, the quality department observed the preparation process. During the review, it was identified that a reagent may have been improperly diluted, potentially contributing to the low bias observed in the results. This procedural discrepancy has been noted as a probable cause requiring corrective action.

The laboratory has since successfully completed a single-blind spiked sample, achieving results within the acceptance criteria for both Sr-90 and I-131.

Table 21: CGS Cross Check Intercomparison Results

Study Date	Study ID	Units	Radionuclide	Reported Value	Assigned Value	Acceptance		Performance Evaluation
						Lower Limit	Upper Limit	
3/14/2024	E14036 Milk	pCi/L	I-131	96.7	90.8	63.6	118	Pass
		pCi/L	Cs-134	182	198	139	257	Pass
		pCi/L	Cs-137	181	171	120	222	Pass
		pCi/L	Ce-141	88.1	85	59.5	111	Pass
		pCi/L	Cr-51	281	230	161	299	Pass
		pCi/L	Mn-54	187	183	128	238	Pass
		pCi/L	Fe-59	93.6	86.5	60.6	112	Pass
		pCi/L	Co-60	152	158	111	205	Pass
		pCi/L	Zn-65	161	176	123	229	Pass
3/14/2024	E14037 Water	pCi/L	Beta Cs-137	238	231	162	300	Pass
3/14/2024	E14038 Charcoal	pCi	I-131	75.9	90.2	63.1	117	Pass
3/14/2024	E14038 Charcoal	pCi	I-131	79.0	90.2	63.1	117	Pass
3/14/2024	E14038 Charcoal	pCi	I-131	77.1	90.2	63.1	117	Pass
3/14/2024	E14038 Charcoal	pCi	I-131	77.3	90.2	63.1	117	Pass
4/8/2024	RAD-137 Water	pCi/L	I-131	27.1	25.1	21.7	28.5	Pass
4/8/2024	RAD-137 Water	pCi/L	I-131	25.1	25.1	21.7	28.5	Pass
4/8/2024	RAD-137 Water	pCi/L	I-131	27.5	25.1	21.7	28.5	Pass
4/8/2024	RAD-137 Water	pCi/L	I-131	29.7	25.1	21.7	28.5	Fail [1]
4/8/2024	RAD-137 Water	pCi/L	Beta Cs-137	36.6	46.5	33.9	59.1	Pass

Table 21: CGS Cross Check Intercomparison Results

Study Date	Study ID	Units	Radionuclide	Reported Value	Assigned Value	Acceptance		Performance Evaluation
						Lower Limit	Upper Limit	
4/8/2024	RAD-137 Water	pCi/L	Cs-134	55.9	57.8	42.8	72.8	Pass
		pCi/L	Cs-137	190	186	149	223	Pass
		pCi/L	Co-60	98.8	98.8	79.7	118	Pass
		pCi/L	Zn-65	228	240	188	292	Pass
4/8/2024	RAD-137 Water	pCi/L	Cs-134	60.7	57.8	42.8	72.8	Pass
		pCi/L	Cs-137	185	186	149	223	Pass
		pCi/L	Co-60	97.7	98.8	79.7	118	Pass
		pCi/L	Zn-65	233	240	188	292	Pass
4/8/2024	RAD-137 Water	pCi/L	Cs-134	59.8	57.8	42.8	72.8	Pass
		pCi/L	Cs-137	190	186	149	223	Pass
		pCi/L	Co-60	97.2	98.8	79.7	118	Pass
		pCi/L	Zn-65	240	240	188	292	Pass
4/8/2024	RAD-137 Water	pCi/L	Cs-134	58.6	57.8	42.8	72.8	Pass
		pCi/L	Cs-137	185	186	149	223	Pass
		pCi/L	Co-60	102	98.8	79.7	118	Pass
		pCi/L	Zn-65	227	240	188	292	Pass
6/13/2024	E14101 Soil	pCi/g	Cs-134	0.406	0.408	0.286	0.530	Pass
		pCi/g	Cs-137	0.402	0.451	0.316	0.586	Pass
6/13/2024	E14101 Soil	pCi/g	Cs-134	0.372	0.408	0.286	0.530	Pass
6/13/2024	E14101 Soil	pCi/g	Cs-137	0.365	0.451	0.316	0.586	Pass

Table 21: CGS Cross Check Intercomparison Results

Study Date	Study ID	Units	Radionuclide	Reported Value	Assigned Value	Acceptance		Performance Evaluation
						Lower Limit	Upper Limit	
6/13/2024	E14039 Water	pCi/L	Beta Cs-137	265	262	183	341	Pass
6/13/2024	E14040 Water	pCi/L	Ce-141	45.4	37.5	26.3	48.8	Pass
		pCi/L	Co-60	402	391	274	508	Pass
		pCi/L	Cr-51	250	291	204	378	Pass
		pCi/L	Cs-134	237	242	169	315	Pass
		pCi/L	Cs-137	233	229	160	298	Pass
		pCi/L	Fe-59	183	174	122	226	Pass
		pCi/L	Mn-54	209	204	143	265	Pass
		pCi/L	Zn-65	89.6	99.1	69.4	129	Pass
6/13/2024	E14040 Water	pCi/L	Ce-141	40	37.5	26.3	48.8	Pass
		pCi/L	Co-60	397	391	274	508	Pass
		pCi/L	Cr-51	286	291	204	378	Pass
		pCi/L	Cs-134	238	242	169	315	Pass
		pCi/L	Cs-137	237	229	160	298	Pass
		pCi/L	Fe-59	183	174	122	226	Pass
		pCi/L	Mn-54	212	204	143	265	Pass
		pCi/L	Zn-65	95.4	99.1	69.4	129	Pass
6/13/2024	E14041 Filter	pCi	Ce-141	25.4	25.2	17.6	32.8	Pass
		pCi	Co-60	258	262	183	341	Pass

Table 21: CGS Cross Check Intercomparison Results

Study Date	Study ID	Units	Radionuclide	Reported Value	Assigned Value	Acceptance		Performance Evaluation
						Lower Limit	Upper Limit	
6/13/2024	E14041 Filter	pCi	Cr-51	211	195	137	254	Pass
		pCi	Cs-134	137	162	113	211	Pass
		pCi	Cs-137	159	153	107	199	Pass
		pCi	Fe-59	132	117	81.9	152	Pass
		pCi	Mn-54	143	137	95.9	178	Pass
		pCi	Zn-65	71.0	66.4	46.5	86.3	Pass
6/13/2024	E14042A Filter	pCi	Beta Cs-137	249	220	154	286	Pass
9/12/2024	E14043 Filter	pCi	Beta Cs-137	242	221	84.7	157	Pass
9/12/2024	E14102 Soil	pCi/g	Cs-134	0.318	0.336	0.235	0.437	Pass
		pCi/g	Cs-137	0.287	0.295	0.207	0.384	Pass
9/12/2024	E14102 Soil	pCi/g	Cs-134	0.299	0.336	0.235	0.437	Pass
		pCi/g	Cs-137	0.269	0.295	0.207	0.384	Pass
9/12/2024	E14102 Soil	pCi/g	Cs-134	0.305	0.336	0.235	0.437	Pass
		pCi/g	Cs-137	0.277	0.295	0.207	0.384	Pass
9/12/2024	E14102 Soil	pCi/g	Cs-134	0.312	0.336	0.235	0.437	Pass
		pCi/g	Cs-137	0.282	0.295	0.207	0.384	Pass

Table 21: CGS Cross Check Intercomparison Results

Study Date	Study ID	Units	Radionuclide	Reported Value	Assigned Value	Acceptance		Performance Evaluation
						Lower Limit	Upper Limit	
9/16/2024	MRAD-41 Filter	pCi	Cs-134	499	581	377	712	Pass
9/16/2024	MRAD-41 Filter	pCi	Cs-137	880	848	696	1110	Pass
		pCi	Co-60	865	839	713	1070	Pass
		pCi	Zn-65	269	239	196	365	Pass
10/4/2024	RAD-139 Water	pCi/L	Cs-134	79.6	80.2	63.0	97.4	Pass
		pCi/L	Cs-137	49.7	46.3	23.3	69.3	Pass
10/4/2024	RAD-139 Water	pCi/L	Co-60	47.9	45.3	31.6	59.0	Pass
		pCi/L	Zn-65	108	114	75.0	153	Pass
10/4/2024	RAD-139 Water	pCi/L	Cs-134	79.8	80.2	63.0	97.4	Pass
		pCi/L	Cs-137	46.0	46.3	23.3	69.3	Pass
		pCi/L	Co-60	49.4	45.3	31.6	59.0	Pass
		pCi/L	Zn-65	106	114	75.0	153	Pass
10/4/2024	RAD-139 Water	pCi/L	Cs-134	79.4	80.2	63.0	97.4	Pass
		pCi/L	Cs-137	46.3	46.3	23.3	69.3	Pass
		pCi/L	Co-60	47.5	45.3	31.6	59.0	Pass
		pCi/L	Zn-65	106	114	75.0	153	Pass
10/4/2024	RAD-139 Water	pCi/L	I-131	26.4	26.3	22.7	29.9	Pass
10/4/2024	RAD-139 Water	pCi/L	I-131	26.3	26.3	22.7	29.9	Pass
12/5/2024	E14044 Filter	pCi	Ce-141	75.7	74.8	52	97	Pass

Table 21: CGS Cross Check Intercomparison Results

Study Date	Study ID	Units	Radionuclide	Reported Value	Assigned Value	Acceptance		Performance Evaluation
						Lower Limit	Upper Limit	
12/5/2024	E14044 Filter	pCi	Co-58	105	97.9	69	127	Pass
		pCi	Cr-60	220	219	153	285	Pass
		pCi	Cr-51	182	185	130	241	Pass
		pCi	Cs-134	97.9	116	81	151	Pass
		pCi	Cs-137	144	144	101	187	Pass
		pCi	Fe-59	130	107	75	139	Pass
		pCi	Mn-54	113	104	73	135	Pass
		pCi	Zn-65	164	155	109	202	Pass
12/5/2024	E14044 Filter	pCi	Ce-141	69.3	74.8	52	97	Pass
		pCi	Co-58	93.7	97.9	69	127	Pass
		pCi	Cr-60	196	219	153	285	Pass
		pCi	Cr-51	166	185	130	241	Pass
		pCi	Cs-134	91.3	116	81	151	Fail [1]
		pCi	Cs-137	135	144	101	187	Pass
		pCi	Fe-59	113	107	75	139	Pass
		pCi	Mn-54	106	104	73	135	Pass
		pCi	Zn-65	146	155	109	202	Pass
12/5/2024	E14044 Filter	pCi	Ce-141	66.6	74.8	52	97	Pass
		pCi	Co-58	92.4	97.9	69	127	Pass
		pCi	Cr-60	204	219	153	285	Pass
		pCi	Cr-51	175	185	130	241	Pass
		pCi	Cs-134	95.7	116	81	151	Pass

Table 21: CGS Cross Check Intercomparison Results

Study Date	Study ID	Units	Radionuclide	Reported Value	Assigned Value	Acceptance		Performance Evaluation
						Lower Limit	Upper Limit	
12/5/2024	E14044 Filter	pCi	Cs-137	139	144	101	187	Pass
		pCi	Fe-59	119	107	75	139	Pass
		pCi	Mn-54	102	104	73	135	Pass
		pCi	Zn-65	139	155	109	202	Pass
12/5/2024	E14045 Water	pCi/L	Beta Cs-137	257	240	168	312	Pass
12/5/2024	E14046 Charcoal	pCi	I-131	58.0	65.3	45.7	84.9	Pass
		pCi	I-131	59.3	65.3	45.7	84.9	Pass
		pCi	I-131	59.4	65.3	45.7	84.9	Pass
12/5/2024	E14047 Milk	pCi/L	Ce-141	74.7	71.6	50.1	93.1	Pass
		pCi/L	Co-58	95.2	93.7	65.6	122	Pass
		pCi/L	Co-60	211	210	147	273	Pass
		pCi/L	Cr-51	164	177	124	230	Pass
		pCi/L	Cs-134	114	111	77.7	144	Pass
		pCi/L	Cs-137	150	138	96.6	179	Pass
		pCi/L	Fe-59	112	102	71.4	133	Pass
		pCi/L	I-131	50.1	51.0	35.7	66.3	Pass
		pCi/L	Mn-54	106	99.5	69.7	129	Pass
		pCi/L	Zn-65	141	149	104	194	Pass
12/5/2024	E14047 Milk	pCi/L	Ce-141	77.8	71.6	50.1	93.1	Pass
		pCi/L	Co-58	96.9	93.7	65.6	122	Pass

Table 21: CGS Cross Check Intercomparison Results

Study Date	Study ID	Units	Radionuclide	Reported Value	Assigned Value	Acceptance		Performance Evaluation
						Lower Limit	Upper Limit	
12/5/2024	E14047 Milk	pCi/L	Co-60	208	210	147	273	Pass
		pCi/L	Cr-51	205	177	124	230	Pass
		pCi/L	Cs-134	110	111	77.7	144	Pass
		pCi/L	Cs-137	140	138	96.6	179	Pass
		pCi/L	Fe-59	100	102	71.4	133	Pass
		pCi/L	I-131	45.5	51.0	35.7	66.3	Pass
		pCi/L	Mn-54	109	99.5	69.7	129	Pass
		pCi/L	Zn-65	136	149	104	194	Pass
12/5/2024	E14047 Milk	pCi/L	Ce-141	71.9	71.6	50.1	93.1	Pass
		pCi/L	Co-58	89.7	93.7	65.6	122	Pass
		pCi/L	Co-60	232	210	147	273	Pass
		pCi/L	Cr-51	180	177	124	230	Pass
		pCi/L	Cs-134	113	111	77.7	144	Pass
		pCi/L	Cs-137	149	138	96.6	179	Pass
		pCi/L	Fe-59	112	102	71.4	133	Pass
		pCi/L	I-131	63.3	51.0	35.7	66.3	Pass
		pCi/L	Mn-54	105	99.5	69.7	129	Pass
		pCi/L	Zn-65	148	149	104	194	Pass

[1] See Discussion at the beginning of Attachment 3

Table 22: Interlaboratory Split Sample Results

Sample Type	Location	Sample Date	Analysis	Result Units	CGS Results w 2σ		TBE Split Results w 2σ	Pass/Fail (Split)
Water	Q9-1	1/31/2024	Gross Beta	pCi/L	1.45	0.769	1.97E ± 1.27	Pass
Water	Q9-1	1/31/2024	LLI	pCi/L	<MDA		<MDA	Pass
Water	Q9-1	1/31/2024	Gamma	pCi/L	<MDA		<MDA	Pass
Water	Q9-1	1/31/2024	Tritium	pCi/L	<MDA		<MDA	Pass
Water	Q9-1	2/28/2024	Gross Beta	pCi/L	1.28	0.770	2.5±1.25	Pass
Water	Q9-1	2/28/2024	LLI	pCi/L	<MDA		<MDA	Pass
Water	Q9-1	2/28/2024	Gamma	pCi/L	<MDA		<MDA	Pass
Water	Q9-1	2/28/2024	Tritium	pCi/L	<MDA		<MDA	Pass
Water	Q9-1	3/27/2024	Gross Beta	pCi/L	1.39	0.722	2.92±1.26	Pass
Water	Q9-1	3/27/2024	LLI	pCi/L	<MDA		<MDA	Pass
Water	Q9-1	3/27/2024	Gamma	pCi/L	<MDA		<MDA	Pass
Water	Q9-1	3/27/2024	Tritium	pCi/L	<MDA		<MDA	Pass
Water	Q9-1	5/1/2024	Gross Beta	pCi/L	1.42	0.711	2.00±1.3	Pass
Water	Q9-1	5/1/2024	LLI	pCi/L	<MDA		<MDA	Pass
Water	Q9-1	5/1/2024	Gamma	pCi/L	<MDA		<MDA	Pass
Water	Q9-1	5/1/2024	Tritium	pCi/L	<MDA		<MDA	Pass
Water	Q9-1	5/29/2024	Gross Beta	pCi/L	<MDA		2.79±1.4	Pass
Water	Q9-1	5/29/2024	LLI	pCi/L	<MDA		<MDA	Pass
Water	Q9-1	5/29/2024	Gamma	pCi/L	<MDA		<MDA	Pass
Water	Q9-1	5/29/2024	Tritium	pCi/L	<MDA		<MDA	Pass

Table 22: Interlaboratory Split Sample Results

Sample Type	Location	Sample Date	Analysis	Result Units	CGS Results w 2σ		TBE Split Results w 2σ	Pass/Fail (Split)
Water	Q9-1	6/26/2024	Gross Beta	pCi/L	1.37	0.753	3.39±1.52	Pass
Water	Q9-1	6/26/2024	LLI	pCi/L	<MDA		<MDA	Pass
Water	Q9-1	6/26/2024	Gamma	pCi/L	<MDA		<MDA	Pass
Water	Q9-1	6/26/2024	Tritium	pCi/L	<MDA		<MDA	Pass
Water	Q9-1	8/1/2024	Gross Beta	pCi/L	1.52	0.789	<MDA	Pass
Water	Q9-1	8/1/2024	LLI	pCi/L	<MDA		<MDA	Pass
Water	Q9-1	8/1/2024	Gamma	pCi/L	<MDA		<MDA	Pass
Water	Q9-1	8/1/2024	Tritium	pCi/L	<MDA		<MDA	Pass
Water	Q9-1	8/29/2024	Gross Beta	pCi/L	1.93	0.781	3.66±1.43	Pass
Water	Q9-1	8/29/2024	LLI	pCi/L	<MDA		<MDA	Pass
Water	Q9-1	8/29/2024	Gamma	pCi/L	<MDA		<MDA	Pass
Water	Q9-1	8/29/2024	Tritium	pCi/L	<MDA		<MDA	Pass
Water	Q9-1	10/3/2024	Gross Beta	pCi/L	1.60	0.762	<MDA	Pass
Water	Q9-1	10/3/2024	LLI	pCi/L	<MDA		<MDA	Pass
Water	Q9-1	10/3/2024	Gamma	pCi/L	<MDA		<MDA	Pass
Water	Q9-1	10/3/2024	Tritium	pCi/L	<MDA		<MDA	Pass
Water	Q9-1	10/30/2024	Gross Beta	pCi/L	1.97	0.788	2.68±1.62	Pass
Water	Q9-1	10/30/2024	LLI	pCi/L	<MDA		<MDA	Pass
Water	Q9-1	10/30/2024	Gamma	pCi/L	<MDA		<MDA	Pass
Water	Q9-1	10/30/2024	Tritium	pCi/L	<MDA		<MDA	Pass

Table 22: Interlaboratory Split Sample Results

Sample Type	Location	Sample Date	Analysis	Result Units	CGS Results w 2σ		TBE Split Results w 2σ	Pass/Fail (Split)
Water	Q9-1	12/4/2024	Gross Beta	pCi/L	1.58	0.768	<MDA	Pass
Water	Q9-1	12/4/2024	LLI	pCi/L	<MDA		<MDA	Pass
Water	Q9-1	12/4/2024	Gamma	pCi/L	<MDA		<MDA	Pass
Water	Q9-1	12/4/2024	Tritium	pCi/L	<MDA		<MDA	Pass
Water	Q9-1	1/2/2024	Gross Beta	pCi/L	<MDA		<MDA	Pass
Water	Q9-1	1/2/2024	LLI	pCi/L	<MDA		<MDA	Pass
Water	Q9-1	1/2/2024	Gamma	pCi/L	<MDA		<MDA	Pass
Water	Q9-1	1/2/2024	Tritium	pCi/L	<MDA		<MDA	Pass
Milk	G2-1	1/18/2024	Gamma	pCi/L	<MDA		<MDA	Pass
Milk	G2-1	1/18/2024	LLI	pCi/L	<MDA		<MDA	Pass
Milk	G2-1	2/14/2024	Gamma	pCi/L	<MDA		<MDA	Pass
Milk	G2-1	2/14/2024	LLI	pCi/L	<MDA		<MDA	Pass
Milk	G2-1	3/7/2024	Gamma	pCi/L	<MDA		<MDA	Pass
Milk	G2-1	3/7/2024	LLI	pCi/L	<MDA		<MDA	Pass
Milk	G2-1	3/20/2024	Gamma	pCi/L	<MDA		<MDA	Pass
Milk	G2-1	3/20/2024	LLI	pCi/L	<MDA		<MDA	Pass
Milk	G2-1	4/4/2024	Gamma	pCi/L	<MDA		<MDA	Pass
Milk	G2-1	4/4/2024	LLI	pCi/L	<MDA		<MDA	Pass

Table 22: Interlaboratory Split Sample Results

Sample Type	Location	Sample Date	Analysis	Result Units	CGS Results w 2σ		TBE Split Results w 2σ	Pass/Fail (Split)
Milk	G2-1	4/18/2024	Gamma	pCi/L	<MDA		<MDA	Pass
Milk	G2-1	4/18/2024	LLI	pCi/L	<MDA		<MDA	Pass
Milk	G2-1	5/1/2024	Gamma	pCi/L	<MDA		<MDA	Pass
Milk	G2-1	5/1/2024	LLI	pCi/L	<MDA		<MDA	Pass
Milk	G2-1	5/15/2024	Gamma	pCi/L	<MDA		<MDA	Pass
Milk	G2-1	5/15/2024	LLI	pCi/L	<MDA		<MDA	Pass
Milk	G2-1	5/29/2024	Gamma	pCi/L	<MDA		<MDA	Pass
Milk	G2-1	5/29/2024	LLI	pCi/L	<MDA		<MDA	Pass
Milk	G2-1	6/13/2024	Gamma	pCi/L	<MDA		<MDA	Pass
Milk	G2-1	6/13/2024	LLI	pCi/L	<MDA		<MDA	Pass
Milk	G2-1	6/26/2024	Gamma	pCi/L	<MDA		<MDA	Pass
Milk	G2-1	6/26/2024	LLI	pCi/L	<MDA		<MDA	Pass
Milk	G2-1	7/10/2024	Gamma	pCi/L	<MDA		<MDA	Pass
Milk	G2-1	7/10/2024	LLI	pCi/L	<MDA		<MDA	Pass
Milk	G2-1	7/24/2024	Gamma	pCi/L	<MDA		<MDA	Pass
Milk	G2-1	7/24/2024	LLI	pCi/L	<MDA		<MDA	Pass
Milk	G2-1	8/8/2024	Gamma	pCi/L	<MDA		<MDA	Pass
Milk	G2-1	8/8/2024	LLI	pCi/L	<MDA		<MDA	Pass

Table 22: Interlaboratory Split Sample Results

Sample Type	Location	Sample Date	Analysis	Result Units	CGS Results w 2σ		TBE Split Results w 2σ	Pass/Fail (Split)
Milk	G2-1	8/22/2024	Gamma	pCi/L	<MDA		<MDA	Pass
Milk	G2-1	8/22/2024	LLI	pCi/L	<MDA		<MDA	Pass
Milk	G2-1	9/5/2024	Gamma	pCi/L	<MDA		<MDA	Pass
Milk	G2-1	9/5/2024	LLI	pCi/L	<MDA		<MDA	Pass
Milk	G2-1	9/19/2024	Gamma	pCi/L	<MDA		<MDA	Pass
Milk	G2-1	9/19/2024	LLI	pCi/L	<MDA		<MDA	Pass
Milk	G2-1	10/3/2024	Gamma	pCi/L	<MDA		<MDA	Pass
Milk	G2-1	10/3/2024	LLI	pCi/L	<MDA		<MDA	Pass
Milk	G2-1	10/17/2024	Gamma	pCi/L	<MDA		<MDA	Pass
Milk	G2-1	10/17/2024	LLI	pCi/L	<MDA		<MDA	Pass
Milk	G2-1	10/30/2024	Gamma	pCi/L	<MDA		<MDA	Pass
Milk	G2-1	10/30/2024	LLI	pCi/L	<MDA		<MDA	Pass
Milk	G2-1	11/13/2024	Gamma	pCi/L	<MDA		<MDA	Pass
Milk	G2-1	11/13/2024	LLI	pCi/L	<MDA		<MDA	Pass
Milk	G2-1	11/26/2024	Gamma	pCi/L	<MDA		<MDA	Pass
Milk	G2-1	11/26/2024	LLI	pCi/L	<MDA		<MDA	Pass

Table 22: Interlaboratory Split Sample Results

Sample Type	Location	Sample Date	Analysis	Result Units	CGS Results w 2σ		TBE Split Results w 2σ	Pass/Fail (Split)
Milk	G2-1	12/11/2024	Gamma	pCi/L	<MDA		<MDA	Pass
Milk	G2-1	12/11/2024	LLI	pCi/L	<MDA		<MDA	Pass
Filter Composite	E1-2	3/27/2024	Gamma	pCi/m3	<MDA		<MDA	Pass
Filter Composite	E1-2	6/26/2024	Gamma	pCi/m3	<MDA		<MDA	Pass
Filter Composite	E1-2	10/3/2024	Gamma	pCi/m3	<MDA		<MDA	Pass
Filter Composite	E1-2	1/2/2025	Gamma	pCi/m3	<MDA		<MDA	Pass
Vegetation	H1-2	6/19/2024	Gamma	pCi/Kg	<MDA		<MDA	Pass
Vegetation	H1-2	7/17/2024	Gamma	pCi/Kg	<MDA		<MDA	Pass
Vegetation	H1-2	8/14/2024	Gamma	pCi/Kg	<MDA		<MDA	Pass
Vegetation	H1-2	9/11/2024	Gamma	pCi/Kg	<MDA		<MDA	Pass
Vegetation	B10-2	8/14/2024	Gamma	pCi/Kg	<MDA		<MDA	Pass
Vegetation	B10-2	8/14/2024	Strontium 90	pCi/Kg	<MDA		<MDA	Pass
Fish	INDP	10/16/2024	Gamma	pCi/Kg	<MDA		<MDA	Pass
Fish	INDP	10/16/2024	Strontium 90	pCi/Kg	<MDA		<MDA	Pass
Sediment	J2-1	10/29/24	Gamma	pCi/Kg	<MDA		<MDA	Pass

Table 22: Interlaboratory Split Sample Results

Sample Type	Location	Sample Date	Analysis	Result Units	CGS Results w 2σ		TBE Split Results w 2σ	Pass/Fail (Split)
Water	WA1	6/28/2024	Gamma	pCi/L	<MDA		<MDA	Pass
Water	WA2	6/28/2024	Gamma	pCi/L	<MDA		<MDA	Pass
Oysters	IA3	6/19/2024	Gamma	pCi/Kg	<MDA		<MDA	Pass
Oysters	IA6	6/19/2024	Gamma	pCi/Kg	<MDA		<MDA	Pass
Bottom Sediment	WBS4	6/19/2024	Gamma	pCi/Kg	<MDA		<MDA	Pass
Bottom Sediment	WBS2	6/19/2024	Gamma	pCi/Kg	<MDA		<MDA	Pass
Vegetation	IB10	7/22/2024	Gamma	pCi/Kg	<MDA		<MDA	Pass
Vegetation	IB11	7/22/2024	Gamma	pCi/Kg	<MDA		<MDA	Pass
Vegetation	IB12	7/22/2024	Gamma	pCi/Kg	<MDA		<MDA	Pass
Vegetation	East	7/23/2024	Gamma	pCi/Kg	<MDA		<MDA	Pass
Milk	Farm A	09/03/2024	Gamma	Gamma	pCi/L		<MDA	Pass
Milk	Farm A	09/03/2024	Gamma	LLI	pCi/L		<MDA	Pass
Milk	Farm B	09/03/2024	Gamma	Gamma	pCi/L		<MDA	Pass
Milk	Farm B	09/03/2024	Gamma	LLI	pCi/L		<MDA	Pass
Milk	#55	09/09/2024	Gamma	Gamma	pCi/L		<MDA	Pass
Milk	#55	09/09/2024	Gamma	LLI	pCi/L		<MDA	Pass

Table 22: Interlaboratory Split Sample Results

Sample Type	Location	Sample Date	Analysis	Result Units	CGS Results w 2σ		TBE Split Results w 2σ	Pass/Fail (Split)
Fish (Spanish Mackerel)	IA1	8/14/2024	Gamma	pCi/kg	<MDA		<MDA	Pass
Filter Composite	CC-A1	9/30/2024	Gamma	pCi/m3	<MDA		<MDA	Pass
Filter Composite	CC-A2	9/30/2024	Gamma	pCi/m3	<MDA		<MDA	Pass
Filter Composite	CC-A3	9/30/2024	Gamma	pCi/m3	<MDA		<MDA	Pass
Filter Composite	CC-A4	9/30/2024	Gamma	pCi/m3	<MDA		<MDA	Pass
Filter Composite	CC-A5	9/30/2024	Gamma	pCi/m3	<MDA		<MDA	Pass
Filter Composite	CC-SFA1	9/30/2024	Gamma	pCi/m3	<MDA		<MDA	Pass
Filter Composite	CC-SFA2	9/30/2024	Gamma	pCi/m3	<MDA		<MDA	Pass
Filter Composite	CC-SFA3	9/30/2024	Gamma	pCi/m3	<MDA		<MDA	Pass
Filter Composite	CC-SFA4	9/30/2024	Gamma	pCi/m3	<MDA		<MDA	Pass

Table 23: Interlaboratory Split Sample Results (Air Particulate Beta)

Media	Location	Sample Date	Beta	pCi/M^3	(CGS) E1-2	±2σ	(TBE) E1-2Q	±2σ
Filter	E1-2 / E1-2Q	1/04/2024	Beta	pCi/M^3	2.46E-02	2.37E-03	8.99E-03	4.65E-03
Filter	E1-2 / E1-2Q	1/11/2024	Beta	pCi/M^3	1.73E-02	2.05E-03	1.40E-02	3.83E-03
Filter	E1-2 / E1-2Q	1/18/2024	Beta	pCi/M^3	3.39E-02	2.68E-03	2.02E-02	4.34E-03
Filter	E1-2 / E1-2Q	1/25/2024	Beta	pCi/M^3	2.64E-02	2.37E-03	1.61E-02	4.20E-03
Filter	E1-2 / E1-2Q	1/31/2024	Beta	pCi/M^3	1.25E-02	2.06E-03	9.29E-03	4.01E-03
Filter	E1-2 / E1-2Q	2/08/2024	Beta	pCi/M^3	1.83E-02	1.99E-03	1.23E-02	3.41E-03
Filter	E1-2 / E1-2Q	2/14/2024	Beta	pCi/M^3	2.28E-02	2.63E-03	1.23E-02	4.54E-03
Filter	E1-2 / E1-2Q	2/22/2024	Beta	pCi/M^3	2.14E-02	2.04E-03	1.11E-02	3.42E-03
Filter	E1-2 / E1-2Q	2/28/2024	Beta	pCi/M^3	2.37E-02	2.56E-03	1.91E-02	4.75E-03
Filter	E1-2 / E1-2Q	3/07/2024	Beta	pCi/M^3	1.32E-02	1.75E-03	7.60E-03	3.15E-03
Filter	E1-2 / E1-2Q	3/14/2024	Beta	pCi/M^3	1.86E-02	2.21E-03	1.42E-02	4.18E-03
Filter	E1-2 / E1-2Q	3/20/2024	Beta	pCi/M^3	2.06E-02	2.49E-03	1.57E-02	4.26E-03
Filter	E1-2 / E1-2Q	3/27/2024	Beta	pCi/M^3	1.31E-02	1.99E-03	1.16E-02	3.61E-03
Filter	E1-2 / E1-2Q	4/04/2024	Beta	pCi/M^3	1.63E-02	1.89E-03	9.42E-03	3.57E-03
Filter	E1-2 / E1-2Q	4/11/2024	Beta	pCi/M^3	1.61E-02	2.01E-03	8.08E-03	3.54E-03
Filter	E1-2 / E1-2Q	4/18/2024	Beta	pCi/M^3	1.99E-02	2.21E-03	1.01E-02	3.83E-03
Filter	E1-2 / E1-2Q	4/25/2024	Beta	pCi/M^3	1.54E-02	2.04E-03	1.09E-02	3.67E-03
Filter	E1-2 / E1-2Q	5/01/2024	Beta	pCi/M^3	2.45E-02	2.63E-03	1.75E-02	4.61E-03
Filter	E1-2 / E1-2Q	5/9/2024	Beta	pCi/M^3	1.41E-02	1.70E-03	1.12E-02	3.37E-03
Filter	E1-2 / E1-2Q	5/15/2024	Beta	pCi/M^3	8.08E-03	2.05E-03	8.46E-03	3.71E-03
Filter	E1-2 / E1-2Q	5/23/2024	Beta	pCi/M^3	1.40E-02	1.84E-03	1.16E-02	3.49E-03
Filter	E1-2 / E1-2Q	5/29/2024	Beta	pCi/M^3	1.94E-02	2.38E-03	1.13E-02	4.37E-03
Filter	E1-2 / E1-2Q	6/06/2024	Beta	pCi/M^3	1.87E-02	1.98E-03	1.80E-02	3.94E-03
Filter	E1-2 / E1-2Q	6/13/2024	Beta	pCi/M^3	1.08E-02	1.82E-03	1.02E-02	3.70E-03
Filter	E1-2 / E1-2Q	6/20/2024	Beta	pCi/M^3	2.35E-02	2.41E-03	2.06E-02	4.41E-03
Filter	E1-2 / E1-2Q	6/26/2024	Beta	pCi/M^3	2.63E-02	2.67E-03	1.65E-02	4.74E-03

Table 23: Interlaboratory Split Sample Results (Air Particulate Beta)

Media	Location	Sample Date	Beta	pCi/M^3	(CGS) E1-2	±2σ	(TBE) E1-2Q	±2σ
Filter	E1-2 / E1-2Q	7/03/2024	Beta	pCi/M^3	1.48E-02	1.93E-03	9.09E-03	3.78E-03
Filter	E1-2 / E1-2Q	7/10/2024	Beta	pCi/M^3	2.61E-02	2.43E-03	1.64E-02	4.38E-03
Filter	E1-2 / E1-2Q	7/18/2024	Beta	pCi/M^3	2.29E-02	2.15E-03	1.56E-02	3.79E-03
Filter	E1-2 / E1-2Q	7/24/2024	Beta	pCi/M^3	2.28E-02	2.55E-03	1.21E-02	4.55E-03
Filter	E1-2 / E1-2Q	8/01/2024	Beta	pCi/M^3	2.36E-02	2.15E-03	2.03E-02	4.15E-03
Filter	E1-2 / E1-2Q	8/08/2024	Beta	pCi/M^3	2.62E-02	2.44E-03	1.50E-02	4.32E-03
Filter	E1-2 / E1-2Q	8/15/2024	Beta	pCi/M^3	1.77E-02	2.14E-03	2.14E-02	4.43E-03
Filter	E1-2 / E1-2Q	8/22/2024	Beta	pCi/M^3	1.88E-02	2.21E-03	1.43E-02	4.01E-03
Filter	E1-2 / E1-2Q	8/29/2024	Beta	pCi/M^3	4.12E-02	2.87E-03	2.95E-02	4.85E-03
Filter	E1-2 / E1-2Q	9/05/2024	Beta	pCi/M^3	2.04E-02	2.30E-03	1.30E-02	4.17E-03
Filter	E1-2 / E1-2Q	9/12/2024	Beta	pCi/M^3	2.38E-02	2.37E-03	2.02E-02	4.26E-03
Filter	E1-2 / E1-2Q	9/19/2024	Beta	pCi/M3	3.26E-02	2.63E-03	2.60E-02	4.61E-03
Filter	E1-2 / E1-2Q	9/26/2024	Beta	pCi/M3	2.24E-02	2.24E-03	2.01E-02	4.39E-03
Filter	E1-2 / E1-2Q	10/03/2024	Beta	pCi/M3	1.13E-02	1.89E-03	8.26E-03	3.65E-03
Filter	E1-2 / E1-2Q	10/10/2024	Beta	pCi/M3	2.69E-02	2.40E-03	2.19E-02	4.66E-03
Filter	E1-2 / E1-2Q	10/17/2024	Beta	pCi/M3	2.76E-02	2.41E-03	1.72E-02	4.17E-03
Filter	E1-2 / E1-2Q	10/24/2024	Beta	pCi/M3	3.73E-02	2.72E-03	3.39E-02	5.17E-03
Filter	E1-2 / E1-2Q	10/30/2024	Beta	pCi/M3	1.96E-02	2.45E-03	1.57E-02	4.58E-03
Filter	E1-2 / E1-2Q	11/07/2024	Beta	pCi/M3	2.42E-02	2.15E-03	2.10E-02	3.89E-03
Filter	E1-2 / E1-2Q	11/13/2024	Beta	pCi/M3	2.03E-02	2.46E-03	1.69E-02	4.76E-03
Filter	E1-2 / E1-2Q	11/20/2024	Beta	pCi/M3	2.63E-02	2.45E-03	2.30E-02	4.50E-03
Filter	E1-2 / E1-2Q	11/26/2024	Beta	pCi/M3	2.04E-02	2.36E-03	1.41E-02	4.52E-03
Filter	E1-2 / E1-2Q	12/04/2024	Beta	pCi/M3	2.38E-02	2.15E-03	2.08E-02	4.08E-03
Filter	E1-2 / E1-2Q	12/11/2024	Beta	pCi/M3	2.87E-02	2.53E-03	2.21E-02	4.54E-03
Filter	E1-2 / E1-2Q	12/19/2024	Beta	pCi/M3	1.89E-02	1.93E-03	1.45E-02	3.56E-03
Filter	E1-2 / E1-2Q	12/26/2024	Beta	pCi/M3	2.01E-02	2.20E-03	1.65E-02	4.20E-03

Table 23: Interlaboratory Split Sample Results (Air Particulate Beta)

Media	Location	Sample Date	Beta	pCi/M^3	(CGS) E1-2	±2σ	(TBE) E1-2Q	±2σ
Filter	E1-2 / E1-2Q	1/2/2025	Beta	pCi/M3	1.69E-02	2.05E-03	1.08E-02	3.80E-03

See discussion at the beginning of Attachment 3 describes the interlaboratory split program.

Attachment 4, Environmental Direct Radiation Dosimetry Results

Table 24, Direct Radiation Dose

Monitoring Location	Quarterly Baseline, B_Q (mrem)	B_Q + MDD_Q (mrem)	Normalized Quarterly Monitoring Data, M_Q (mrem)				Quarterly Facility Dose, $F_Q=M_Q-B_Q$ (mrem, or "ND" if $F_Q \leq MDD_Q$)				Annual Baseline, B_A (mrem)	B_A + MDD_A (mrem)	Annual Monitoring Data, M_A (mrem)	Annual Facility Dose, $F_A=M_A-B_A$ (mrem, or "ND" if $F_A \leq MDD_A$)
			1	2	3	4	1	2	3	4				
2	15.2	20.7	15.0	18.6	16.2	16.5	ND	ND	ND	ND	60.7	80.3	66.3	ND
3	15.6	21.4	15.3	18.0	16.8	15.9	ND	ND	ND	ND	62.3	81.9	66.0	ND
4	14.3	20.0	14.2	16.8	15.5	15.4	ND	ND	ND	ND	57.3	76.2	61.9	ND
5	14.9	20.2	14.4	18.3	15.3	15.3	ND	ND	ND	ND	59.7	75.6	63.3	ND
6	12.6	18.4	12.3	15.1	13.3	13.2	ND	ND	ND	ND	50.3	70.2	53.9	ND
7	14.3	20.0	13.5	17.7	16.1	15.8	ND	ND	ND	ND	57.1	76.1	63.2	ND
8	13.7	18.6	13.4	15.7	14.3	14.3	ND	ND	ND	ND	54.6	70.7	57.6	ND
9	13.4	18.5	13.3	15.5	15.2	14.4	ND	ND	ND	ND	53.7	71.4	58.3	ND
10	12.7	17.3	12.5	13.6	14.0	13.1	ND	ND	ND	ND	50.8	66.0	53.2	ND
11	13.0	18.2	12.7	14.2	14.2	13.8	ND	ND	ND	ND	52.0	69.3	54.9	ND
12	14.1	19.0	14.6	15.8	16.1	14.9	ND	ND	ND	ND	56.6	72.5	61.4	ND
13	28.0	47.7	25.2	48.3	48.8	50.7	ND	0.6	1.1	3.0	112.2	188.4	173.0	ND
14	14.6	20.6	13.7	16.6	16.0	15.4	ND	ND	ND	ND	58.5	77.5	61.7	ND
15	15.6	21.1	15.3	18.5	17.5	16.8	ND	ND	ND	ND	62.4	80.2	68.1	ND
16	15.3	20.7	15.0	18.4	16.6	16.1	ND	ND	ND	ND	61.3	78.6	66.0	ND
17	14.6	19.8	14.1	16.6	16.9	15.5	ND	ND	ND	ND	58.3	74.7	63.1	ND
18	12.5	17.3	12.5	15.1	13.1	13.1	ND	ND	ND	ND	50.2	66.7	53.7	ND
19	12.6	17.7	11.6	14.6	12.8	12.8	ND	ND	ND	ND	50.2	68.7	51.7	ND
20	14.7	19.6	14.9	16.5	15.4	14.6	ND	ND	ND	ND	58.8	76.4	61.3	ND
21	14.3	19.3	13.5	16.8	14.8	14.9	ND	ND	ND	ND	57.3	73.0	60.1	ND
22	13.4	18.3	14.1	16.2	14.0	14.5	ND	ND	ND	ND	53.6	70.0	58.7	ND
23	15.1	20.6	14.2	17.2	15.9	15.7	ND	ND	ND	ND	57.2	82.8	63.1	ND
24	14.9	20.1	15.4	18.2	15.6	16.2	ND	ND	ND	ND	59.4	76.2	65.4	ND

Table 24, Direct Radiation Dose

Monitoring Location	Quarterly Baseline, B_Q (mrem)	B_Q + MDD_Q (mrem)	Normalized Quarterly Monitoring Data, M_Q (mrem)				Quarterly Facility Dose, $F_Q=M_Q-B_Q$ (mrem, or "ND" if $F_Q \leq MDD_Q$)				Annual Baseline, B_A (mrem)	B_A + MDD_A (mrem)	Annual Monitoring Data, M_A (mrem)	Annual Facility Dose, $F_A=M_A-B_A$ (mrem, or "ND" if $F_A \leq MDD_A$)
			1	2	3	4	1	2	3	4				
25	13.1	18.2	13.8	15.0	15.3	14.1	ND	ND	ND	ND	52.2	68.4	58.2	ND
26	12.3	17.2	12.1	14.0	13.5	13.1	ND	ND	ND	ND	49.3	66.5	52.8	ND
27	13.3	18.7	13.3	14.8	15.0	14.3	ND	ND	ND	ND	53.2	70.7	57.4	ND
28	13.3	18.5	13.3	15.4	14.5	13.8	ND	ND	ND	ND	53.0	69.6	57.1	ND
29	13.1	18.1	13.6	15.2	14.0	13.5	ND	ND	ND	ND	52.3	67.2	56.4	ND
30	12.2	17.5	12.5	14.5	13.0	12.5	ND	ND	ND	ND	48.8	67.7	52.5	ND
31	15.0	20.5	14.4	18.1	16.6	15.8	ND	ND	ND	ND	59.9	76.7	65.0	ND
32	13.3	18.6	13.6	17.3	14.3	13.9	ND	ND	ND	ND	53.2	70.6	59.1	ND
33	13.0	18.6	13.1	15.0	13.6	13.6	ND	ND	ND	ND	52.0	72.1	55.4	ND
34	15.3	21.0	16.7	17.7	16.5	16.5	ND	ND	ND	ND	61.1	78.2	67.4	ND
35	14.8	20.2	15.4	16.5	16.3	15.2	ND	ND	ND	ND	59.4	76.7	63.4	ND
36	13.1	17.8	14.0	14.9	14.5	14.1	ND	ND	ND	ND	52.4	68.8	57.4	ND
37	12.8	18.1	14.1	15.7	14.0	14.2	ND	ND	ND	ND	51.1	70.0	58.0	ND
38	14.7	19.8	15.0	16.0	15.6	15.7	ND	ND	ND	ND	56.0	78.4	62.3	ND
39	14.5	19.7	14.6	16.9	15.4	15.8	ND	ND	ND	ND	57.8	74.8	62.7	ND
40	12.8	19.4	13.6	15.5	13.7	13.2	ND	ND	ND	ND	51.0	66.6	56.0	ND
63	15.0	20.0	14.6	17.4	15.8	14.9	ND	ND	ND	ND	59.8	76.2	62.6	ND
64	15.6	23.5	15.8	18.5	17.0	16.2	ND	ND	ND	ND	62.4	80.6	67.5	ND

MDD_Q = Quarterly Minimum Differential Dose in mrem
MDD_A = Annual Minimum Differential Dose in mrem
ND = Not Detected, where $M_Q \leq (B_Q+MDD_Q)$ or $M_A \leq (B_A+MDD_A)$