ATTACHMENT 2

ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

JANUARY 1, 2018 – DECEMBER 31, 2018

R.E. Ginna Nuclear Power Plant, LLC

ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT: JANUARY 1, 2018 – DECEMBER 31, 2018

MAY 2019

R.E. Ginna Nuclear Power Plant
1503 Lake Road
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1. EXECUTIVE SUMMARY

The Radiological Environmental Monitoring Program (REMP) is a comprehensive surveillance program, which is implemented to assess the impact of site operations on the environment and compliance with 10 CFR 50 Appendix I and 40 CFR 190. Samples are collected from the aquatic and terrestrial pathways applicable to the site. The aquatic pathways include Lake Ontario fish, surface waters, groundwater, and lakeshore sediment. The terrestrial pathways include airborne particulate and radioiodine, milk, food products, and direct radiation.

Results of the monitoring program for the 2018 operational period for R.E. Ginna Nuclear Power Plant are included in this report. This report presents a synopsis of the REMP (Table 1), summary of the detectable activity analytical results (Table 2), sampling locations (Appendix A), compilation of the analytical data (Appendix B), results of the Quality Assurance Program (Appendix C), and results of the Land Use Survey (Appendix D). Interpretation of the data and conclusions are presented in the body of this report.

The results of the REMP verify that the effluent releases did not impact the environment with a measurable concentration of radioactive materials and/or levels of radiation that are higher than expected. The 2018 results for all pathways sampled were consistent with the previous five-year historical results and exhibited no adverse trends. The results of the REMP continue to demonstrate that the operation of the plant does not result in a measurable dose to a member of the general population, or adversely impact the environment as a result of radiological effluents. The program continues to demonstrate that the dose to a member of the public, as a result of the operation of R.E. Ginna Nuclear Power Plant, remains significantly below the federally required dose limits specified in 10 CFR 20 and 40 CFR 190.

2. INTRODUCTION

2.1 Station Description

The R.E. Ginna Nuclear Power Plant (Ginna), owned by Exelon Generation, is an operating nuclear generating facility consisting of one pressurized water reactor. Ginna achieved criticality in September 1969 and commenced commercial operation in July 1970. The location of the plant in relation to local metropolitan areas is depicted in Appendix A, Figure A-1.

2.2 Program Description and Background

The Annual Radiological Environmental Operating Report (AREOR) is published in accordance with Section 8.0 of the Offsite Dose Calculation Manual (ODCM, Ref. 1) and the Plant's Technical Specifications (Ref. 2). This report describes the REMP, and its implementation as required by the ODCM. The environmental surveillance data collected during this reporting period were compared with that generated in previous periods whenever possible to evaluate the environmental radiological impact of the R.E. Ginna Nuclear Power Plant. Results of the monitoring program for the pre-operational and previous operational periods through 2017 have been reported in a series of previously released documents.

The REMP is implemented to measure radioactivity in the aquatic and terrestrial pathways. The aquatic pathways include Lake Ontario fish, surface waters, groundwater, and lakeshore sediment. Measurement results of the samples representing these pathways contained only natural background radiation or low concentrations of Cs-137 resulting from past atmospheric nuclear weapons testing. Terrestrial pathways monitored included airborne particulate and radioiodine, milk, food products, and direct radiation.

2.3 Program Objectives

The objectives of the REMP for the R.E. Ginna Nuclear Power Plant are:

a. Measure and evaluate the effects of plant operation on the environment.

b. Monitor background radiation levels in the environs of the Ginna site.

c. Demonstrate compliance with the environmental conditions and requirements of applicable state and federal regulations, including the ODCM and 40 CFR 190.

d. Provide information by which the general public can evaluate environmental aspects of the operation of R.E. Ginna Nuclear Power Plant.

3. PROGRAM DESCRIPTION

3.1 Sample Collection and Analysis

The locations of the individual sampling stations are listed in Table A-1 and shown in Figures A-2 and A-3. All samples were collected and analyzed by Exelon personnel or its contractors in accordance with Ginna procedures (Ref. 3).

During 2018, 1348 samples were collected for analysis by gross beta counting, tritium, and/or gamma spectroscopy. These included 89 surface water samples, 16 fish samples, 6 sediment samples, 624 air particulate samples, 312 air iodine samples, 28 vegetation samples, 38 milk samples, 71 groundwater samples, and 164 dosimeter measurements. Deviations from the REMP sampling schedule are described in section 3.5. This monitoring program satisfied the minimum number of samples required by the ODCM for all pathways.

R.E. Ginna Nuclear Power Plant's Chemistry personnel collected all REMP samples. Analysis was performed at either Ginna's onsite laboratory (groundwater samples), Environmental Dosimetry Company in Sterling Massachusetts (direct radiation samples), or Exelon Industrial Services – Ft. Smallwood Environmental Laboratory in Baltimore, Maryland (surface and drinking water, aquatic organisms, shoreline sediment, air particulate filters, air iodine, and vegetation samples). A summary of the content of the REMP and the results of the data collected for indicator and control locations are provided in Tables 1 and 2.

3.2 Data Interpretation

Many results in environmental monitoring occur at or below the minimum detectable activity (MDA). In this report, all results below the relevant MDA are reported as being "not detected." Typical MDA values are listed in Appendix B, Table B-10.

3.3 Quality Assurance Program

Appendix C provides a summary of Exelon Industrial Services (EIS) – Ft. Smallwood Environmental Laboratory's quality assurance program for 2018. It consists of Table C-1, which represents a compilation of the results of the EIS – Ft. Smallwood Environmental Laboratory's participation in an inter-comparison program with Environmental Resource Associates (ERA) located in Arvada, Colorado and Analytics, Inc. located in Atlanta, Georgia. Table C-2 compiles the results of the Exelon Industrial Services Ft. Smallwood Laboratory's participation in a split sample program with Teledyne Brown Engineering located in Knoxville, Tennessee. Table C-3 identifies a list of typical MDAs achieved by Teledyne Brown for Gamma Spectroscopy.

All the EIS – Ft. Smallwood Environmental Laboratory results contained in Table C-1 agree with the inter-comparison laboratory results within the range of $\pm 2\ \sigma$ between the analytical values or are in agreement with the ranges established in the NRC Resolution Test Criteria.

All the results contained in Table C-2 agree within the range of ±2 σ of each other with their respective Ft. Smallwood Environmental Laboratory original, replicate and/or Teledyne Brown Engineering's split laboratory samples.

3.4 Land Use Survey

In September 2018, Ginna staff conducted a Land Use Survey to identify the location of the nearest milk animal, the nearest residence, and the nearest garden greater than 500 square feet in each of the nine sectors within a five-mile radius of the power plant. The Land Use Survey is conducted in accordance with Ginna procedures (Ref. 4). If changes are noted in the annual Land Use Survey, alterations to Ginna's REMP program would be made to ensure sampling practices cover these new areas of potential public exposure. The position of the nearest residence and garden and animals producing milk for human consumption in each sector is provided in Appendix D, Table D-1.

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.
- Single-family home / senior housing subdivision / development construction was observed near the plant on LaFrank Drive (Ontario), and South of Route 104 near Tops Plaza (Ontario).
- Lake Front Estates and Summer Lake subdivisions continue to expand along with the southeast corner of Lake Road and Slocum Road.
- Other single-family home construction was observed sporadically within 5-miles of the plant.
- A new 120-acre commercial hydroponic farm continues construction on the east-end of Timothy Lane (North of Route 104). During 2018, this facility did not become operational.
- 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 5-miles of Ginna.
- No new agricultural land use was identified.
- No new food producing facilities were identified as the commercial hydroponic farm is not currently growing produce.
- No new milk producing animals were identified.

3.5 Program Exceptions

The reportable items in the Annual Environmental Radiological Operating Report under procedure CHA-RETS-VARIATION are as follows:

- On 4/6/18, Environmental Sample Station ES3 (Air Sample Station) was found to be out of service following a significant wind event. The volume collected during this time period was 86.5 m^3, which does not meet the minimum required sample volume for the sample period.

- On 4/19/18, TLD16 (SW Corner of orchard, approximately 3000' West of plant, approximately 200' North of Lake Road) was found on the ground during quarterly TLD changeout. TLD16 was changed out for the quarter. TLD64 (Westside of direct road, adjacent to orchard) which is near TLD16 did not experience any sampling anomalies. The cause of TLD16 being on the ground was the storm which brought high winds on 3/2/18.

- On 4/19/18, TLD32 (Woodard Road at County Line Road, pole at Northwest corner) was found remounted on an incorrect pole facing the incorrect direction (away from reactor center-line) during quarterly TLD changeout. This TLD is located between TLD31 (Lake Road, pole 20' North of road, 500' East of Salt Road) and TLD33 (County Line Road at RR tracks, pole approximately 100' East along tracks). The cause of TLD32 being remounted on the wrong pole in the wrong direction was the storm which brought high winds on 3/2/18.

- On 4/27/18, Environmental Sample Station ES3 (Air Sample Station) was relocated from GPS coordinates (43.27643, -77.30366) to GPS coordinates (43.27667, -77.30646) due to an ongoing power supply issue. Both locations remain in the same meteorological sector. For the sampling period from 4/23/18 – 4/27/18, the sample collection station collected 41.9 m^3 of sample. After relocation where the sample period was from 4/27/18 to 4/30/18, 133.6 m^3 of sample was collected. The same particulate filter was used for both sampling periods. This volume meets the minimum amount required, but the change in location has been noted as an exception.

- On 12/3/18, Environmental Sample Station ES6 (Air Sample Station) was found to be out of service. The volume collected during this time was 69.0 m^3, which does not meet the minimum required sample volume for the sample period.

3.6 Corrections to Previous Reports

There are no corrections necessary to any previously submitted Annual Radiological Environmental Operating Report (AREOR).

4. RESULTS AND DISCUSSIONS

All environmental samples collected during the year were analyzed in accordance with Exelon analytical procedures (Ref. 5). The analytical results for this reporting period are presented in Appendix B and the detectable activity results are also summarized in Table 2. For discussion purposes, the analytical results are divided into five categories: Aquatic Environment, the Atmospheric Environment, the Terrestrial Environment, Direct Radiation, and Groundwater.

4.1 Aquatic Environment

The aquatic environment surrounding the plant was monitored by analyzing samples of surface and drinking water, Lake Ontario fish, and shoreline sediment. These samples were obtained from various sampling locations near the plant.

4.1.a Surface and Drinking Water

Monthly composite samples are collected from Lake Ontario at an upstream control location (Monroe County Water Authority - Shoremont) and a downstream indicator location (Ontario Water District Plant - OWD) and analyzed for gross beta activity (Table B-1). A grab sample of Deer Creek is collected and analyzed monthly for gross beta activity (Table B-1). Lake Ontario is a primary indicator for sampling due to the close proximity to the station as well as the Lake providing recreational activities which could be a means of public exposure. Additionally, liquid releases from the station enter Lake Ontario waters, which leads to sampling of this environment, in all its forms, to be a priority.

In 2018, the gross beta averages for the upstream Lake Ontario monitoring locations (controls) and downstream Lake Ontario monitoring locations (indicators) were 2.89 pCi/Liter and 2.69 pCi/Liter, respectively. Gross beta analysis of the monthly composite samples showed no statistically significant difference in activity between the control and indicator locations that would indicate plant related activity higher than background.

The average gross beta concentration seen in the Mill Creek samples (control) and the Deer Creek (indicator) samples were 3.96 pCi/Liter and 4.27 pCi/Liter, respectively. Results from Deer Creek (indicator) and Mill Creek (control) are higher than other surface water samples within the REMP program due to naturally occurring radiological daughter products from radon within the soil being introduced into the samples. These naturally occurring radiological daughter products would exist in this environ at these same levels even if Ginna had never been built. Gross beta analysis of the samples showed no statistically significant difference in activity between the control and indicator locations that would indicate plant related activity higher than background.

Gamma isotopic analysis is performed on each monthly composite sample. These are listed in Table B-1 and are separated by source of sample. During 2018, no sample results indicated detection of gamma activity above MDA.

Tritium analysis was performed on all water samples on a monthly basis. Composites are made from the weekly samples and a portion filtered to remove interferences for analysis by beta scintillation. During 2018, no surface water or drinking water sample results indicated detectable tritium activity.

4.1.b Aquatic Organisms

Indicator fish are caught in the vicinity of the Discharge Canal and analyzed for radioactivity from liquid effluent releases from the plant. The fish are filleted to represent that portion which would normally be eaten and represents the likely pathway for human exposure. Additional fish are caught more than 15 miles away to be used as control samples and are prepared in the same manner.

At a minimum, four different edible species of fish are analyzed during each half-year from the indicator and background locations. Fish are caught by R.E. Ginna Nuclear Power Plant Chemistry personnel and are analyzed by gamma spectroscopy after being held for periods typically less than two weeks to keep the LLD value for the shorter half-life isotopes realistic. Detection limits could also be affected by small mass samples, (< 2000 grams), in some species. gamma isotopic concentrations (pCi/kilogram wet) are listed in Table B-2.

During 2018, none of the indicator samples indicated activity other than naturally occurring radionuclides.

4.1.c Shoreline Sediment

Samples of shoreline sediment are taken upstream (Town of Greece near Slater Creek) and downstream (Near the Ontario Water District) of R.E. Ginna Nuclear Power Plant. The control sample is typical of the lake bottom, rich in mollusk shells and rocky particulate. These samples are analyzed for radionuclides that a member of the public would be expected to encounter during swimming and wading activities. Similarly, indicator samples are collected at the Bear Creek boat dock as this is another recreational area accessible to the public.

Results of the gamma isotopic analysis for sediment are included in Table B-3. During 2018, all sediment samples indicated that gamma emitters were below detection limits.

4.2 Atmospheric Environment

Radioactive particles in air are collected by drawing approximately one standard cubic foot per minute (SCFM) through a two-inch diameter particulate filter. The volume of air sampled is measured by a dry gas meter and corrected for the pressure drop across the filter. The filters are changed weekly and allowed to decay for three days prior to counting to eliminate most of the natural radioactivity such as the short half-life decay products of radon. The decay period is used to give a more sensitive measurement of long-lived man-made radioactivity.

A ring of six sampling stations is located on the plant site from 180 to 440 meters from the reactor centerline near the point of the maximum annual average ground level concentration, one additional sampling location is located on-site at 770 meters, and two others offsite at approximately seven miles. In addition, there are three sampling stations located approximately seven to 16 miles from the site that serve as control stations. The arrangement of air sampling stations in concentric rings around the station would ensure the environment would be appropriately monitored if a radiological release were to occur. See Figure A-2 and Figure A-4.

4.2.a Air Iodine

Radioiodine cartridges are placed at six locations. These cartridges are changed and analyzed each week. No positive analytical results were found on any sample. A list of values for these cartridges is given in Table B-4.

4.2.b Air Particulate Filters

The major airborne species released as gaseous effluents are noble gases and tritium. Most of this activity is released in a gaseous form; however, some radioiodine is released as airborne particulate and some of the particulate activity is due to short lived noble gas decay products. Tables B-5 provides a list of gross beta analysis values for the on-site sample stations. Table B-6 is a list of gross beta analysis values for the off-site sample stations.

Based on the weekly comparisons, there was no statistical difference between the control and indicator radioactive particulate concentrations. The average for the control samples (i.e., offsite sampling locations) was 0.023 pCi/m^3 and the averages for the indicator samples (i.e., onsite sampling locations) was 0.022 pCi/m^3 for the period of January to December 2018. Maximum weekly concentrations for all control stations and all indicator stations were 0.047 pCi/m^3 and 0.048 pCi/m^3, respectively.

The particulate filters from each sampling location were saved and a 13-week composite was made. A gamma isotopic analysis was performed for each sampling location and corrected for decay. No positive analytical results were found on any sample. The results of these analyses are listed in Tables B-7.

4.3 Terrestrial Environment

Crops are grown on the plant property in a location with a highest off-site meteorological deposition parameter, and samples of the produce are collected at harvest time for analysis. Control samples are purchased from farms greater than 10 miles from the plant.

4.3.a Vegetation

There was no indication in the vegetation samples contained activity greater than naturally occurring background levels. Both onsite (indicator) and offsite (control) vegetation samples are rinsed prior to sampling as this is the expected behavior to be exhibited by a member of the public prior to consuming any produce. Analyses revealed that there was no difference in the

radiological activity observed in the indicator and control sampling locations. Gamma isotopic data is provided in Table B-8.

4.3.b Milk

Although there are no indicator dairy herds located within five miles from the plant, Ginna has elected to continue sampling the milk pathway as a supplemental sample to satisfy this potential exposure pathway to a member of the public. This pathway is specific to gaseous radiological releases from Ginna station that could deposit onto the grazing pastures of dairy farms. When these grazing cows are milked, any potential radiological exposure received by the cow could enter the human pathway.

In 2018, milk samples were collected monthly during November through May from the indicator farm and biweekly during June through October. Samples are collected twice as frequently in the summer as the likelihood of cows grazing and not consuming stored feed is higher during this time. A control farm sample is taken for each monthly sample and once during each biweekly period. The milk is analyzed for Iodine-131 and also analyzed by gamma spectroscopy.

During 2018, no samples indicated I-131 activity above detection levels. There was no difference in the radiological activity observed in the indicator and control sampling locations. Table B-9 provides a listing of all samples collected and analytical results.

4.4 Direct Radiation

Dosimeters are placed as part of the environmental monitoring program. 41 dosimeter badges are currently placed in four rings around the plant. These rings range from less than 1,000 feet to 15 miles and have been dispersed to give indications in each of the nine land-based sectors around the plant should an excessive release occur from the plant. Badges are changed and read after approximately three months exposure. Each direct radiation sampling location is described in Table A-1 and identified in Figure A-2.

Direct radiation readings at locations #7 and #13 are influenced by their close proximity to the site's Independent Spent Fuel Storage Installation (ISFSI) and will normally read slightly higher than other locations. Environmental Station 13, the closest sampling location to the ISFSI, received an average quarterly dose of 18.4 mRem during 2018. All onsite indicators averaged 12.2 mRem/qtr.

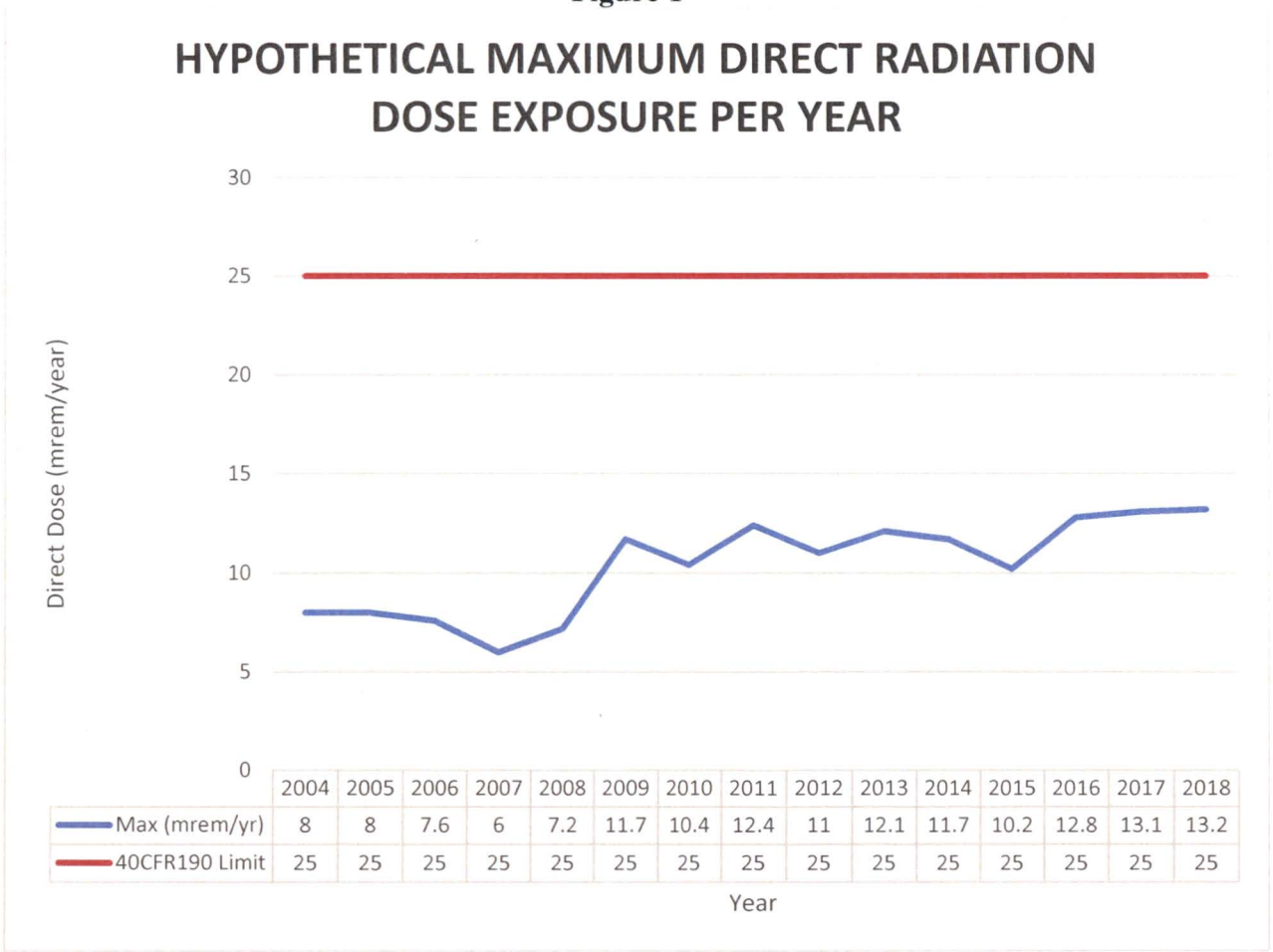
For the year of 2018, the average, minimum, and maximum exposure readings was as follows:

Monitoring Group	Average (mrem/qtr)	Min. (mrem/qtr)	Max (mrem/qtr)
Onsite Indicators	12.2	8.8	19.2
Site Boundary Indicators	12.1	9.2	15.1
Offsite Indicators	11.1	8.1	13.2
Control Locations	10.5	8.8	11.8

40 CFR 190 requires that the annual dose equivalent not exceed 25 millirem to the whole body of any member of the public. The average quarterly exposure observed at the control monitoring stations was used to determine the background level (equivalent to 10.5 millirems monthly or 42.0 millirem annually), while the highest total annual dosimeter reading at an individual site boundary environmental monitoring location (55.2 millirem) was observed at Environmental Monitoring Station #64. The difference in these values determines the maximum possible direct radiation dose exposure to an offsite member of the public. Accordingly, the hypothetical maximum direct radiation dose exposure to the public for 2018 was determined to be 13.2 millirem by subtraction of average background from the maximum annual indicator site.

Figure 1 represents the hypothetical maximum direct radiation dose exposure over the past fifteen years. As noted in the 2011 Annual Radiological Environmental Operating Report (AREOR), an apparent upward trend with the reported average annual direct radiation dose was identified. It was noted that the average annual direct dose to an offsite member of the public had increased 2 – 3 mRem since 2008 (Condition Report CR-2012-001275). Ginna staff evaluated this apparent trend and concluded the elevated dosimeter readings were likely the result of increased onsite hold times after the dosimeters had been collected.

Figure 1



	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Max (mrem/yr)	8	8	7.6	6	7.2	11.7	10.4	12.4	11	12.1	11.7	10.2	12.8	13.1	13.2
40CFR190 Limit	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25

4.5 Groundwater

Groundwater monitoring wells have been established in close proximity to the station and are routinely sampled by Ginna personnel. In 2018, Ginna staff collected and analyzed samples collected from a total of 14 groundwater monitoring wells:

- GW01: Warehouse Access Road (Control)
- GW03: Screenhouse West, South Well
- GW04: Screenhouse West, North Well
- GW05: Screenhouse East, South (15.5')
- GW06: Screenhouse East, Middle (20.0')
- GW07: Screenhouse East, North (24.0')
- GW08: All Volatiles Treatment Building
- GW10: Technical Support Center, South
- GW11: Contaminated Storage Building, SE (24.0')
- GW12: West of Orchard Access Road
- GW13: North of Independent Spent Fuel Storage Installation (ISFSI)
- GW14: South of Canister Preparation Building
- GW15: West of Manor House
- GW16: Southeast of Manor House

Tritium is sampled for at nuclear facilities due to it the migration capabilities of tritium. Essentially, tritium, when in an aqueous form, flows like water and can be found in surface water, groundwater, and atmospheric environs due to evaporative processes found in nature. Nuclear stations place a sensitivity on detecting tritium in the environment as it is an efficient marker to show if radioactivity has been introduced off-site. Groundwater samples are analyzed for tritium to a detection limit of 500 pCi/L, and for gamma emitting radionuclides to the environmental LLDs. The analytical results for groundwater monitoring well samples collected during 2018 are presented in table B-13.

No positive tritium results were identified in any of the groundwater monitoring wells during 2018.

4.6 Summary and Conclusion

Operation of the R.E. Ginna Nuclear Power Plant produced radioactivity and ambient radiation levels significantly below the limits of the ODCM and 40 CFR 190. The analytical results from the Radiological Environmental Monitoring Program indicate the operation of the R.E. Ginna Nuclear Power Plant had no measurable radiological impact on the environment or measurable build-up of plant-related radionuclides in the environment. The results also indicate operation of the plant did not result in a measurable radiation dose to the general population above natural background levels.

Additionally, the 2018 results are consistent with data for the past seven years and exhibited no detectable increases or adverse trends. Further explanation on REMP data can be found in Appendix E.

5. REFERENCES

1. Procedure CY-GI-170-300, Offsite Dose Calculation Manual (ODCM) R.E. Ginna Nuclear Power Plant, Revision 33 - 36 (Effective Date: 12/19/2017 – end of 2018)

2. R.E. Ginna Nuclear Power Plant, Technical Specification 5.6.2; Annual Radiological Environmental Operating Report.

3. Procedure CY-AA-170-100, Radiological Environmental Monitoring Program.

4. Procedure CH-ENV-LAND-USE, Land Use Census; Completed September 2018.

5. Exelon Industrial Services – Ft. Smallwood Environmental Laboratory Procedures Manual, General Services Department.

Table 1

Synopsis of R.E. Ginna Nuclear Power Plant Radiological Environmental Monitoring Program

Sample Type	Sampling Frequency[1]	Number of Locations	Number Collected	Analysis	Analysis Frequency[1]	Number Analyzed
Aquatic Environment						
Surface & Drinking Water	M/C	7	89	Gamma	MC/MG	89
			89	Gross Beta	MC/MG	89
			89	Tritium	M/Q	89
Fish[2]	A	4	16	Gamma	A	16
Shoreline Sediment	SA	2	6	Gamma	SA	6
Groundwater	M/Q	14	71	Tritium	M/Q	71
			71	Gamma	M/Q	71
Atmospheric Environment						
Air Iodine[3]	W	6	312	I-131	W	312
Air Particulates[4]	W	12	624	Gross Beta	W	624
			48	Gamma	QC	48
Direct Radiation Ambient Radiation	Q	41	164	TLD	Q	164
Terrestrial Environment						
Milk[5]	M/BW	2	38	Gamma	M/BW	38
Vegetation[6]	M	4	28	Gamma	M	28

[1] W=Weekly, BW=BiWeekly (15 days), M=Monthly (31 days), Q=Quarterly (92 days), SA=Semiannual, A=Annual, C=Composite
[2] Twice during fishing season including at least four species.
[3] The collection device contains activated charcoal.
[4] Beta counting is performed ≥ 24 hours following filter change. Gamma spectroscopy performed on quarterly composite of weekly samples.
[5] Bi-Weekly during growing season.
[6] Annual at time of harvest. Samples include broad leaf vegetation.

Table 2

Annual Summary of Radioactivity in the Environs of the R.E. Ginna Nuclear Power Plant

Medium or Pathway Sampled (Unit of Measurement)	Type and Total Number of Analyses Performed	Lower Limit of Detection (LLD)	Indicator Locations Mean (F)/Range[1]	Location with Highest Annual Mean Name/Distance & Direction[2]	Highest Annual Mean (F) / Range[1]	Control Locations Mean (F)/Range
Aquatic Environment						
Surface & Drinking Water (pCi/L)	Gamma (89) Tritium (89)	2.3 (Cs-137) 2000	-- (51/51) -- (51/51)	-- --	-- (13/13) -- (13/13)	-- (25/25) -- (25/25)
Surface & Drinking Water, (pCi/L)	Gross Beta (89)	0.5	2.69 (51/51) (1.28 - 11.00)	Deer Creek – ESE	4.27 (12/12) (1.41 – 11.00)	2.89 (25/25) (1.22 - 8.05)
Sediment (pCi/kg)	Gamma (6)	17 (Cs-137)	-- (4/4) --	--	-- (4/4) --	-- (2/2) --
Fish (pCi/kg)	Gamma (16)	15 (Cs-137)	-- (8/8) (--)	--	-- (8/8) (--)	-- (8/8) --
Groundwater (pCi/L)	Tritium (71) Gamma (71)	500 2.3 (Cs-137)	-- (71/71) -- (71/71)	-- --	-- (12/12) -- (12/12)	-- (4/4) -- (4/4)
Direct Radiation						
Ambient Radiation (mR/91 days)	Dosimeters (164)	--	11.8 (128/128) (8.1-19.2)	Env. Station 13 0.77km SSW	18.4 (4/4) (17.4-19.2)	10.5 (36/36) (8.8-11.8)

Table 2

Annual Summary of Radioactivity in the Environs of the R.E. Ginna Nuclear Power Plant

Medium or Pathway Sampled (Unit of Measurement)	Type and Total Number of Analyses Performed	Lower Limit of Detection (LLD)	Indicator Locations Mean (F)/Range[1]	Location with Highest Annual Mean Name/Distance & Direction[2]	Highest Annual Mean (F) / Range[1]	Control Locations Mean (F)/Range
Atmospheric Environment						
Air Iodine (10^{-2} pCi/m^3)	I-131 (312)	0.002	-- (260/260) (--)	--	-- (52/52) (--)	-- (52/52) (--)
Air Particulates (10^{-2} pCi/m^3)	Gross Beta (624)	0.5	2.2 (467/467) (0.9 – 4.8)	Env. Station 3 - 0.44 km ESE	2.4 (52/52) (1.1 – 4.8)	2.3 (156/156) (0.8 – 4.7)
Air Particulates (10^{-3} pCi/m^3)	Gamma (48)	1.8 (Cs-137)	-- (36/36) (--)	--	-- (4/4) (--)	-- (12/12) (--)
Terrestrial Environment						
Milk (pCi/L)	Gamma (38)	0.01 (I-131)	-- (19/19) (--)	--	-- (19/19) (--)	-- (19/19) (--)
Vegetation (pCi/L)	Gamma (28)	27 (Cs-137)	-- (20/20) --	--	-- (8/8) --	--(8/8) --

[1] Mean and range based upon detectable measurements only. Fraction (F) of detectable measurements at specified location is indicated in parentheses
[2] From the center point of the containment building.
-- No detectable activity at specified location.

APPENDIX A

REMP Sample Locations

Summary of Appendix A Content

Appendix A contains information concerning the environmental samples which were collected during this operating period.

Sample locations and specific information about individual locations for Ginna are provided in Table A-1.

Figure A-1 shows the location of the R.E. Ginna Nuclear Power Plant in relation to New York State and Lake Ontario. Figures A-2, A-3, and A-4 show the locations of the power plant sampling sites in relation to the plant site at different degrees of detail.

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TABLE A-1
Locations of Environmental Sampling Stations for the R.E. Ginna Nuclear Plant

Station	Description	Distance		Direction
		Meters	Miles	Sector
	Air Samplers			
2	Manor House Yard	360	0.22	E
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 side of plant parking lot	300	0.19	SW
7	Onsite-utility pole along West plant fence	240	0.15	WSW
8	Seabreeze	19840	12.33	WSW
9	Webster	11150	6.93	SW
10	Walworth	12730	7.91	S
11	Williamson	11540	7.17	ESE
12	Sodus Point	25170	15.64	E
13	Substation 13	770	0.48	SSW
	Direct Radiation			
2	Onsite-Manor House Yard	360	0.22	E
3	Onsite-In field approximately 200 ft SE of station #2	440	0.27	ESE
4	Onsite- East of Training Center Parking Lot	320	0.19	SE
5	Onsite-Between creek and plant entry road	180	0.11	SSE
6	Onsite-SW side of plant parking lot	300	0.19	SW
7	Onsite-utility pole along West plant fence	240	0.15	WSW
8	Topper Drive-Irondequoit, Seabreeze Substation #51	19840	12.33	WSW
9	Phillips Road-Webster, intersection with Highway #104, Substation #74	11150	6.93	SW
10	Atlantic Avenue-Walworth, Substation #230	12730	7.91	S
11	W. Main Street-Williamson, Substation #207	11540	7.17	ESE
12	12 Seaman Avenue-Sodus Point-Off Lake Road by Sewer district, Substation #209	25170	15.64	E
13	Onsite - South of Meteorological Tower	260	0.16	WNW
14	NW corner of field along lake shore	860	0.53	WNW
15	Field access road, west of orchard, approximately 3000' West of plant	920	0.57	W
16	SW Corner of orchard, approximately 3000' West of plant, approximately 200' North of Lake Road	1030	0.64	WSW
17	Utility pole in orchard, approximately 75" North of Lake Road	510	0.32	SSW
18	Substation 13A fence, North Side	730	0.45	SSW
19	On NW corner of house 100' East of plant access road	460	0.29	S
20	Approximately 150' West of Ontario Center Road and approximately 170' South of Lake Road	650	0.40	SSE

Station	Description	Distance		Direction
		Meters	Miles	Sector
21	North side of Lake Road, approximately 200' East of Ontario Center Road	660	0.41	SE
22	North side of Lake Road, SE, property corner	920	0.57	SE
23	East property line, midway between Lake Road and Lake shore	780	0.49	ESE
24	Lake shore near NE corner of property	730	0.45	E
25	Substation #73, Klem Road, adjacent to 897 Klem Road	14000	8.70	WSW
26	Service Center, Plank Road, West of 250	14600	9.07	SW
27	Atlantic Avenue at Knollwood Drive utility pole, North side of road	14120	8.77	SSW
28	Substation #193, Marion, behind Stanton Ag. Service, North Main Street	17450	10.84	SE
29	Substation #208, Town Line Road (CR-118), 1000 ' North of Route 104	14050	8.73	ESE
30	District Office, Sodus, on pole, West side of bldg	20760	12.90	ESE
31	Lake Road, pole 20' North of road, 500' East of Salt Road	7330	4.56	W
32	Woodard Road at County Line Road, pole @ Northwest corner.	6070	3.77	WSW
33	County Line Road at RR tracks, pole approximately 100' East along tracks	7950	4.94	SW
34	Pole at Route 104, Lincoln Road, SW Corner.	6520	4.05	SSW
35	Transmission Right of Way, North of Clevenger Road on pole.	7490	4.65	SSW
36	Substation #205, Route 104, East of Ontario Center Road, North side of fence.	5480	3.41	S
37	Rail Road Avenue, pole at 2048	5770	3.59	SSE
38	Fisher Road at RR Tracks, pole East of road	6910	4.29	SE
39	Seeley Road, Pole South side 100' West of intersection with Stony Lonesome Road	6930	4.31	ESE
40	Lake Road at Stoney Lonesome Road, pole at SE corner	6440	4.00	E
63	Westside of warehouse access road	740	0.46	SW
64	Westside of direct road, adjacent to orchard	1190	0.74	W
	Fish			
	Lake Ontario Discharge Plume	2200	1.37	ENE
	Russell Station	25600	15.9	W

Produce (Vegetation)				
Indicator and background samples of various produce are collected from gardens grown on company property and purchased from farms >10 miles from the plant.				
Station	**Description**	**Distance**		**Direction**
		Meters	**Miles**	**Sector**
	Onsite Supplemental Garden (E)	610	0.38	E
	Onsite Supplemental Garden (ESE)	430	0.27	ESE
	Onsite Supplemental Garden (SSE)	660	0.41	SSE
Water				
	Shoremont/MCWA	27150	16.87	W
	Ontario Water District	2220	1.38	ENE
	Circ Water Intake	1070	0.66	N
	Circ Water Discharge	110	0.07	NNE
	Deer Creek	Points downstream of Outfall 006	Points downstream of Outfall 006	ESE
Sediment				
	Lake Ontario Discharge Plume	2200	1.37	ENE
	Russell Station	25600	15.91	W
	Bethnic	1070	0.66	N
Milk				
	Field Craft Farm, Williamson (Indicator)	8240	5.12	ESE
	Schultz Farm, S. Sodus (Control)	19030	11.82	SE

Figure A-1

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

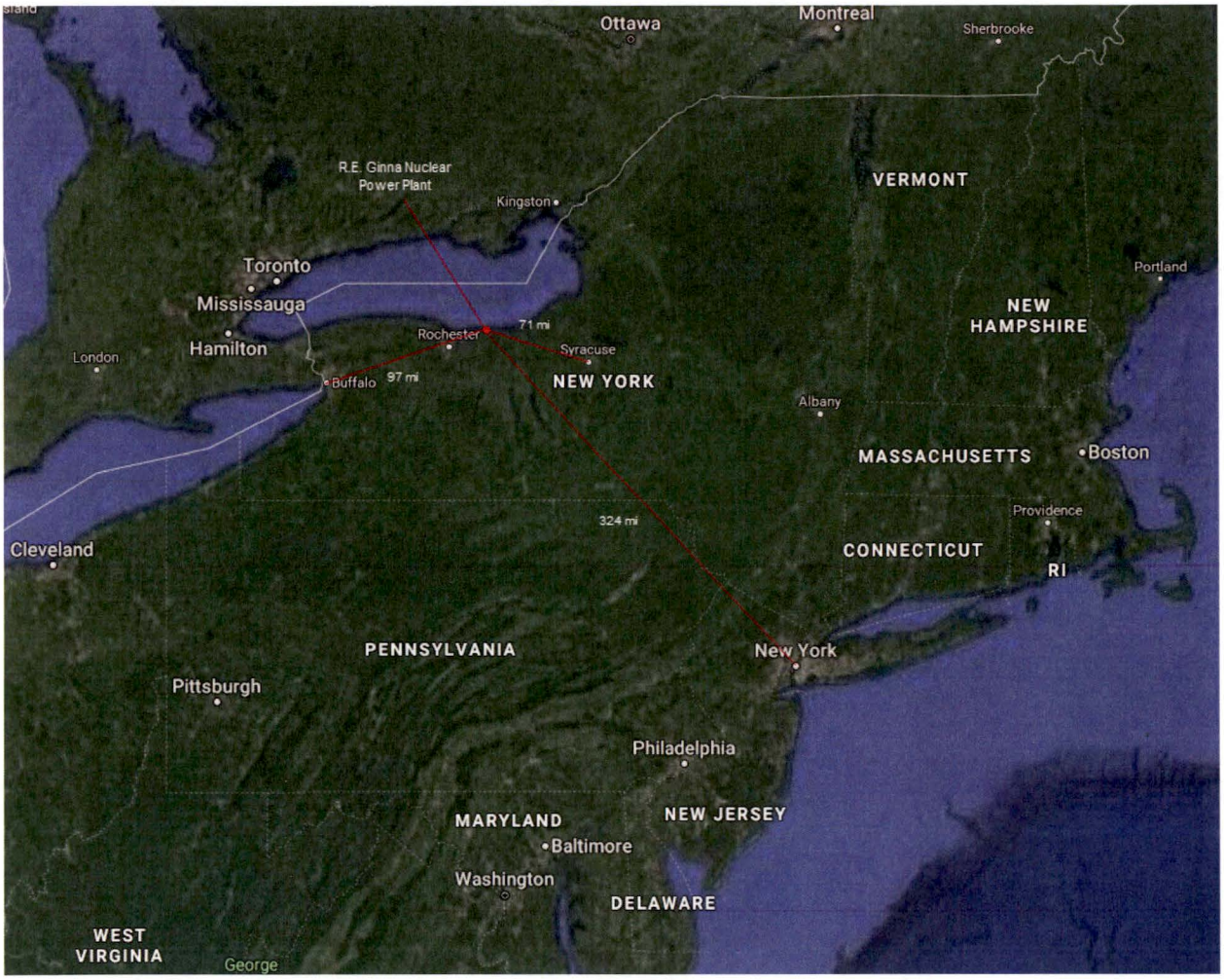


Figure A-2

Onsite Sample Locations

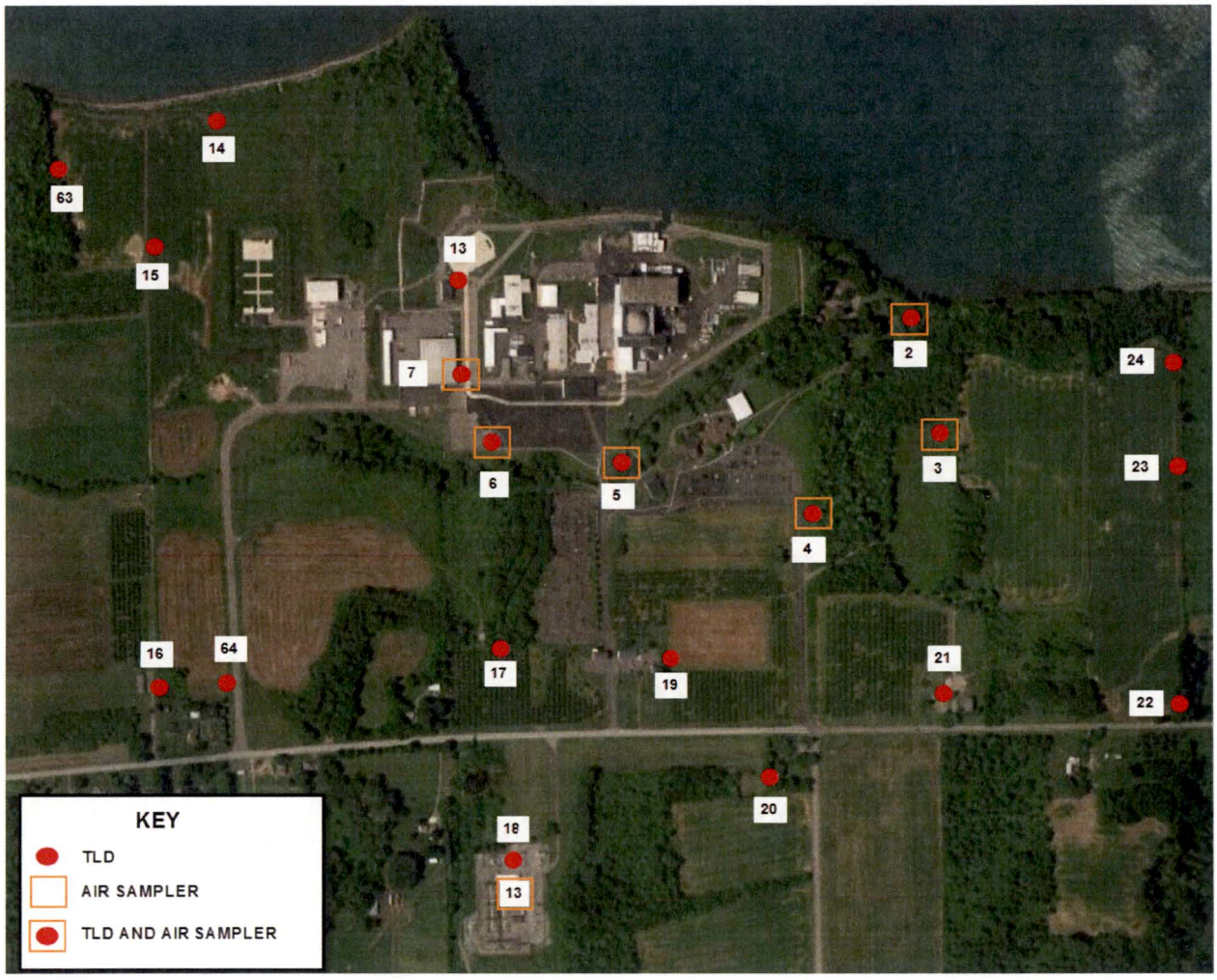
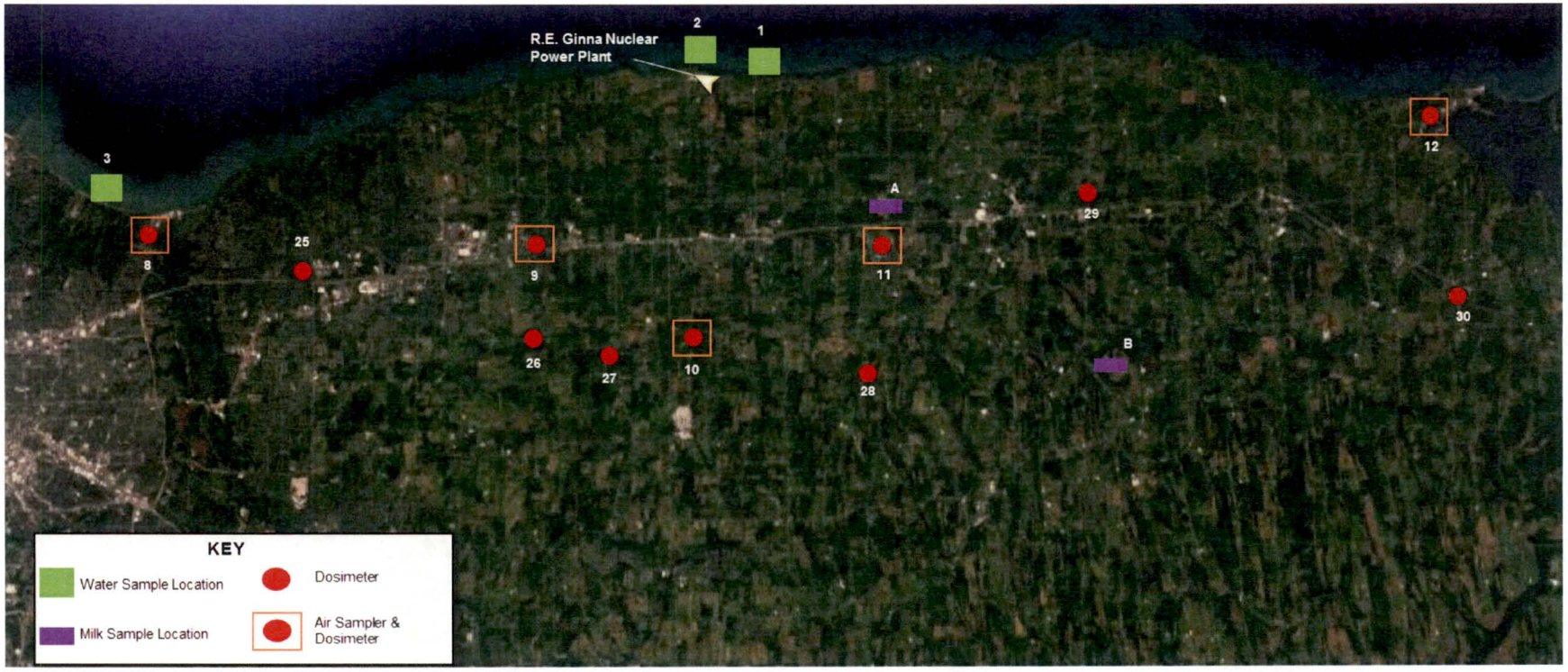


Figure A-3

Offsite Sample Locations (TLDs and Milk Farms within 5 Miles)

Figure A-4
Water Sample, Milk Farms and TLD Locations



APPENDIX B

REMP Analytical Results

Summary of Appendix B Content

Appendix B is a presentation of the analytical results for the R.E. Ginna Nuclear Power Plant radiological environmental monitoring programs.

TABLE OF CONTENTS - ANALYTICAL RESULTS

Table B-1

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	1/8/2018	< 2.3	< 939	*	2.79 +/- 0.71
	2/5/2018	< 2.3	< 398	*	2.67 +/- 0.71
	3/5/2018	< 2.3	< 948	*	2.51 +/- 0.70
	4/2/2018	< 2.3	< 951	*	2.68 +/- 0.69
	4/30/2018	< 2.3	< 930	*	2.48 +/- 0.68
	5/29/2018	< 2.3	< 934	*	2.38 +/- 0.69
	6/25/2018	< 2.3	< 940	*	1.73 +/- 0.64
	7/23/2018	< 2.3	< 949	*	2.30 +/- 0.70
	8/20/2018	< 2.3	< 951	*	2.08 +/- 0.65
	9/17/2018	< 2.3	< 961	*	1.90 +/- 0.64
	10/15/2018	< 2.3	< 943	*	1.37 +/- 0.65
	11/12/2018	< 2.3	< 952	*	1.84 +/- 0.63
	12/10/2018	< 2.3	< 960	*	2.65 +/- 0.70
CIRC-OUT Circulating Water Outlet - N	1/8/2018	< 2.3	< 945	*	2.32 +/- 0.68
	2/5/2018	< 2.3	< 401	*	3.06 +/- 0.73
	3/5/2018	< 2.3	< 954	*	3.34 +/- 0.75
	4/2/2018	< 2.3	< 950	*	3.25 +/- 0.73
	4/30/2018	< 2.3	< 931	*	2.04 +/- 0.65
	5/29/2018	< 2.3	< 938	*	1.83 +/- 0.66
	6/25/2018	< 2.3	< 934	*	1.71 +/- 0.64
	7/23/2018	< 2.3	< 946	*	1.74 +/- 0.66
	8/20/2018	< 2.3	< 951	*	1.90 +/- 0.64
	9/17/2018	< 2.3	< 957	*	2.25 +/- 0.66
	10/15/2018	< 2.3	< 941	*	1.57 +/- 0.66
	11/12/2018	< 2.3	< 949	*	2.72 +/- 0.69
	12/10/2018	< 2.3	< 955	*	2.65 +/- 0.71
DC Deer Creek - ESE	1/24/2018	< 2.3	< 956	*	2.88 +/- 0.73
	2/19/2018	< 2.3	< 951	*	2.57 +/- 0.72
	3/20/2018	< 2.3	< 963	*	2.71 +/- 0.75
	4/16/2018	< 2.3	< 945	*	5.63 +/- 0.87
	5/17/2018	< 2.3	< 939	*	3.32 +/- 0.79
	6/11/2018	< 2.3	< 938	*	4.07 +/- 0.98
	7/10/2018	< 2.3	< 955	*	5.45 +/- 1.00
	8/7/2018	< 2.3	< 950	*	11.07 +/- 4.00[3]
	9/5/2018	< 2.3	< 961	*	5.01 +/- 0.97
	10/3/2018	< 2.3	< 972	*	1.41 +/- 0.66
	11/26/2018	< 2.3	< 969	*	4.13 +/- 0.80
	12/5/2018	< 2.3	< 964	*	3.04 +/- 0.75

Table B-1

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]	1/8/2018	< 2.3	< 981	*	2.34 +/- 0.69
	2/5/2018	< 2.3	< 945	*	2.13 +/- 0.67
	3/5/2018	< 2.3	< 953	*	1.39 +/- 0.63
	4/2/2018	< 2.3	< 943	*	2.08 +/- 0.65
	4/30/2018	< 2.3	< 933	*	2.33 +/- 0.67
	5/29/2018	< 2.3	< 944	*	1.82 +/- 0.66
	6/25/2018	< 2.3	< 936	*	1.52 +/- 0.64
	7/23/2018	< 2.3	< 951	*	1.22 +/- 0.63
	8/20/2018	< 2.3	< 959	*	1.63 +/- 0.63
	9/17/2018	< 2.3	< 953	*	1.68 +/- 0.62
	10/15/2018	< 2.3	< 946	*	2.02 +/- 0.69
	11/12/2018	< 2.3	< 951	*	2.09 +/- 0.65
	12/10/2018	< 2.3	< 958	*	2.45 +/- 0.69
ML Mill Creek – SW[1]	1/24/2018	< 2.3	< 957	*	2.98 +/- 0.74
	2/19/2018	< 2.3	< 947	*	2.56 +/- 0.72
	3/20/2018	< 2.3	< 957	*	3.01 +/- 0.77
	4/16/2018	< 2.3	< 951	*	5.39 +/- 0.86
	5/17/2018	< 2.3	< 394	*	2.80 +/- 0.75
	6/11/2018	< 2.3	< 941	*	2.54 +/- 0.72
	7/10/2018	< 2.3	< 943	*	4.95 +/- 0.92
	8/7/2018	< 2.3	< 951	*	8.05 +/- 2.61
	9/5/2018	< 2.3	< 968	*	4.82 +/- 0.88
	10/3/2018	< 2.3	< 972	*	2.93 +/- 0.78
	11/26/2018	< 2.3	< 974	*	3.77 +/- 0.78
	12/5/2018	< 2.3	< 975	*	3.73 +/- 0.79
W Webster (Supplemental)	1/8/2018	< 2.3	< 941	*	1.85 +/- 0.66
	2/5/2018	< 2.3	< 952	*	1.95 +/- 0.65
	3/5/2018	< 2.3	< 944	*	1.92 +/- 0.66
	4/2/2018	< 2.3	< 950	*	1.67 +/- 0.62
	4/30/2018	< 2.3	< 934	*	2.35 +/- 0.67
	5/29/2018	< 2.3	< 936	*	1.93 +/- 0.67
	6/25/2018	< 2.3	< 931	*	1.85 +/- 0.65
	7/23/2018	< 2.3	< 954	*	1.53 +/- 0.65
	8/20/2018	< 2.3	< 952	*	1.93 +/- 0.64
	9/17/2018	< 2.3	< 961	*	1.46 +/- 0.61
	10/15/2018	< 2.3	< 943	*	1.72 +/- 0.67
	11/12/2018	< 2.3	< 957	*	1.33 +/- 0.59
	12/10/2018	< 2.3	< 958	*	2.22 +/- 0.68

Table B-1

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	1/8/2018	< 2.3	< 943	*	2.64 +/- 0.71
	2/5/2018	< 2.3	< 949	*	2.21 +/- 0.67
	3/5/2018	< 2.3	< 953	*	3.37 +/- 0.76
	4/2/2018	< 2.3	< 947	*	2.67 +/- 0.69
	4/30/2018	< 2.3	< 937	*	2.13 +/- 0.66
	5/29/2018	< 2.3	< 936	*	2.05 +/- 0.67
	6/25/2018	< 2.3	< 943	*	1.30 +/- 0.62
	7/23/2018	< 2.3	< 955	*	1.31 +/- 0.63
	8/20/2018	< 2.3	< 964	*	1.41 +/- 0.61
	9/17/2018	< 2.3	< 952	*	1.66 +/- 0.62
	10/15/2018	< 2.3	< 947	*	1.28 +/- 0.64
	11/12/2018	< 2.3	< 954	*	2.07 +/- 0.65
	12/10/2018	< 2.3	< 960	*	2.14 +/- 0.67

[1] Control Location
[2] All Non-Natural Gamma Emitters < MDA.
[3] The cause of the elevated Gross Beta analysis for Deer Creek on 8/7/18 is due to seasonal stagnation of the creek allowing for accumulation of natural beta emitters in the low water level.

Table B-2

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)
EAST	10/12/2018	Brown Trout	*
East Sector	11/9/2018	Chinook Salmon	*
Greece[1]	5/11/2018	Brown Trout	*
Control	5/11/2018	Chinook Salmon	*
HAMLIN[1]	5/18/2018	Largemouth Bass	*
Control	5/18/2018	Smallmouth Bass	*
	10/1/2018	Brown Trout	*
	10/1/2018	Chinook Salmon	*
	10/1/2018	Rainbow Trout	*
	10/1/2018	Salmon	*
NORTH	1/12/2018	Rainbow Trout	*
North Sector	1/12/2018	Carp	*
	1/23/2018	Brown Trout	*
	1/24/2018	Smallmouth Bass	*
	10/25/2018	Freshwater Drum	*
	11/8/2018	Lake Trout	*
EAST	10/12/2018	Brown Trout	*

[1] Control Locations include Greece, NY and Irondequoit, NY.

Table B-3

Concentration of Gamma Emitters in Sediment
(Results in units of pCi/kg (wet) +/- 2σ)

Sample Code	Sample Date	Gamma Emitters (Cs-137)
Shoreline		
EAST - Shoreline	5/7/2018	*
East Sector	5/9/2018	*
	8/6/2018	*
	11/9/2018	*
Greece[1] - Shoreline	5/7/2018	*
Control	8/6/2018	*

[1] Control Location

Table B-4

Concentration of Iodine-131 in Filtered Air (Charcoal Cartridges)
(Results in units of 10^{-2} pCi/m^3 +/- 2σ)

Start Date	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
1/1/2018	1/8/2018	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
1/8/2018	1/15/2018	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
1/15/2018	1/22/2018	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
1/22/2018	1/29/2018	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
1/29/2018	2/5/2018	< 0.002	< 0.002	< 0.002			
1/31/2018	2/6/2018				< 0.002	< 0.002	< 0.002
2/5/2018	2/12/2018	< 0.002	< 0.002	< 0.002			
2/6/2018	2/13/2018				< 0.002	< 0.002	< 0.002
2/12/2018	2/19/2018	< 0.002	< 0.002	< 0.002			
2/13/2018	2/20/2018				< 0.002	< 0.002	< 0.002
2/19/2018	2/26/2018	< 0.002	< 0.002	< 0.002			
2/20/2018	2/27/2018				< 0.002	< 0.002	< 0.002
2/26/2018	3/5/2018	< 0.002	< 0.002	< 0.002			
2/27/2018	3/6/2018				< 0.002	< 0.002	< 0.002
3/5/2018	3/13/2018	< 0.002	< 0.002	< 0.002			
3/6/2018	3/13/2018				< 0.002	< 0.002	< 0.002
3/13/2018	3/19/2018	< 0.002	< 0.002	< 0.002			
3/13/2018	3/20/2018				< 0.002	< 0.002	< 0.002
3/19/2018	3/26/2018	< 0.002	< 0.002	< 0.002			
3/20/2018	3/27/2018				< 0.002	< 0.002	< 0.002
3/26/2018	4/2/2018	< 0.002	< 0.002	< 0.002			
3/27/2018	4/3/2018				< 0.002	< 0.002	< 0.002
4/2/2018	4/9/2018	< 0.002	< 0.002	< 0.002			
4/3/2018	4/10/2018				< 0.002	< 0.002	< 0.002
4/9/2018	4/16/2018	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
4/16/2018	4/23/2018	< 0.002	< 0.002	< 0.002			
4/17/2018	4/24/2018				< 0.002	< 0.002	< 0.002
4/23/2018	4/30/2018	< 0.002	< 0.002	< 0.002			
4/24/2018	5/1/2018				< 0.002	< 0.002	< 0.002
4/30/2018	5/8/2018	< 0.002	< 0.002	< 0.002			
5/1/2018	5/8/2018				< 0.002	< 0.002	< 0.002
5/8/2018	5/15/2018	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
5/15/2018	5/21/2018	< 0.002	< 0.002	< 0.002			
5/15/2018	5/22/2018				< 0.002	< 0.002	< 0.002
5/21/2018	5/29/2018	< 0.002	< 0.002	< 0.002			
5/22/2018	5/30/2018				< 0.002	< 0.002	< 0.002
5/29/2018	6/4/2018	< 0.002	< 0.002	< 0.002			
5/30/2018	6/5/2018				< 0.002	< 0.002	< 0.002
6/4/2018	6/12/2018	< 0.002	< 0.002	< 0.002			
6/5/2018	6/12/2018				< 0.002	< 0.002	< 0.002
6/12/2018	6/19/2018	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
6/19/2018	6/25/2018	< 0.002	< 0.002	< 0.002			
6/19/2018	6/26/2018				< 0.002	< 0.002	< 0.002

Table B-4

Concentration of Iodine-131 in Filtered Air (Charcoal Cartridges)
(Results in units of 10^{-2} pCi/m^3 +/- 2σ)

Start Date	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
6/25/2018	7/2/2018	< 0.002	< 0.002	< 0.002			
6/26/2018	7/3/2018				< 0.002	< 0.002	< 0.002
7/2/2018	7/9/2018	< 0.002	< 0.002	< 0.002			
7/3/2018	7/10/2018				< 0.002	< 0.002	< 0.002
7/9/2018	7/16/2018	< 0.002	< 0.002	< 0.002			
7/10/2018	7/17/2018				< 0.002	< 0.002	< 0.002
7/16/2018	7/23/2018	< 0.002	< 0.002	< 0.002			
7/17/2018	7/24/2018				< 0.002	< 0.002	< 0.002
7/23/2018	7/30/2018	< 0.002	< 0.002	< 0.002			
7/24/2018	7/31/2018				< 0.002	< 0.002	< 0.002
7/30/2018	8/6/2018	< 0.002	< 0.002	< 0.002			
7/31/2018	8/7/2018				< 0.002	< 0.002	< 0.002
8/6/2018	8/13/2018	< 0.002	< 0.002	< 0.002			
8/7/2018	8/15/2018				< 0.002	< 0.002	< 0.002
8/13/2018	8/20/2018	< 0.002	< 0.002	< 0.002			
8/15/2018	8/21/2018				< 0.002	< 0.002	< 0.002
8/20/2018	8/27/2018	< 0.002	< 0.002	< 0.002			
8/21/2018	8/28/2018				< 0.002	< 0.002	< 0.002
8/27/2018	9/4/2018	< 0.002	< 0.002	< 0.002			
8/28/2018	9/5/2018				< 0.002	< 0.002	< 0.002
9/4/2018	9/11/2018	< 0.002	< 0.002	< 0.002			
9/5/2018	9/11/2018				< 0.002	< 0.002	< 0.002
9/11/2018	9/17/2018	< 0.002	< 0.002	< 0.002			
9/11/2018	9/18/2018				< 0.002	< 0.002	< 0.002
9/17/2018	9/25/2018	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
9/25/2018	10/2/2018	< 0.002	< 0.002	< 0.002			
9/25/2018	10/3/2018				< 0.002	< 0.002	< 0.002
10/2/2018	10/9/2018	< 0.002	< 0.002	< 0.002			
10/3/2018	10/9/2018				< 0.002	< 0.002	< 0.002
10/9/2018	10/16/2018	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
10/16/2018	10/22/2018	< 0.002	< 0.002	< 0.002			
10/16/2018	10/23/2018				< 0.002	< 0.002	< 0.002
10/22/2018	10/29/2018	< 0.002	< 0.002	< 0.002			
10/23/2018	10/30/2018				< 0.002	< 0.002	< 0.002
10/29/2018	11/6/2018	< 0.002	< 0.002	< 0.002			
10/30/2018	11/6/2018				< 0.002	< 0.002	< 0.002
11/6/2018	11/12/2018	< 0.002	< 0.002	< 0.002			
11/6/2018	11/13/2018				< 0.002	< 0.002	< 0.002
11/12/2018	11/19/2018	< 0.002	< 0.002	< 0.002			
11/13/2018	11/20/2018				< 0.002	< 0.002	< 0.002
11/19/2018	11/26/2018	< 0.002	< 0.002	< 0.002			
11/20/2018	11/27/2018				< 0.002	< 0.002	< 0.002

Table B-4

Concentration of Iodine-131 in Filtered Air (Charcoal Cartridges)
(Results in units of 10^{-2} pCi/m^3 +/- 2σ)

Start Date	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
11/26/2018	12/3/2018	< 0.002	< 0.002	< 0.002			
11/27/2018	12/4/2018						< 0.002
11/27/2018	12/4/2018				< 0.002	< 0.002	
12/3/2018	12/10/2018	< 0.002	< 0.002	< 0.002			
12/4/2018	12/11/2018				< 0.002	< 0.002	< 0.002
12/10/2018	12/18/2018	< 0.002	< 0.002	< 0.002			
12/11/2018	12/19/2018				< 0.002	< 0.002	< 0.002
12/18/2018	12/26/2018	< 0.002	< 0.002	< 0.002			
12/19/2018	12/27/2018				< 0.002	< 0.002	< 0.002
12/26/2018	1/2/2019	< 0.002	< 0.002	< 0.002			
12/27/2018	1/2/2019				< 0.002	< 0.002	< 0.002

[1]Control Location

Table B-5

Concentration of Beta Emitters in Air Particulates – Onsite Samples
(Results in units of 10^{-2} pCi/m^3 +/- 2σ Uncertainty)

Start Date	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
1/1/2018	1/8/2018	2.5 +/- 0.1	2.8 +/- 0.3	2.6 +/- 0.2	2.4 +/- 0.1	2.4 +/- 0.1	2.2 +/- 0.1	2.6 +/- 0.1
1/8/2018	1/15/2018	2.2 +/- 0.1	2.5 +/- 0.2	2.3 +/- 0.1	2.2 +/- 0.1	2.5 +/- 0.1	2.1 +/- 0.1	2.5 +/- 0.1
1/15/2018	1/22/2018	4.1 +/- 0.2	4.5 +/- 0.3	3.1 +/- 0.2	3.9 +/- 0.2	4.5 +/- 0.2	4.1 +/- 0.2	4.1 +/- 0.2
1/22/2018	1/29/2018	1.9 +/- 0.1	2.1 +/- 0.2	2.1 +/- 0.1	2.1 +/- 0.1	1.9 +/- 0.1	1.9 +/- 0.1	1.9 +/- 0.1
1/29/2018	2/5/2018	1.8 +/- 0.1	2.2 +/- 0.2	2.1 +/- 0.1	1.8 +/- 0.1			
1/31/2018	2/5/2018					1.9 +/- 0.1		
1/29/2018	2/5/2018						1.6 +/- 0.1	
1/31/2018	2/6/2018							1.8 +/- 0.1
2/5/2018	2/12/2018	2.5 +/- 0.1	3.0 +/- 0.2	2.4 +/- 0.1	2.6 +/- 0.1	2.7 +/- 0.1	2.4 +/- 0.1	
2/6/2018	2/13/2018							3.1 +/- 0.1
2/12/2018	2/19/2018	3.4 +/- 0.2	3.9 +/- 0.3	3.5 +/- 0.2	3.4 +/- 0.2	3.5 +/- 0.2	3.3 +/- 0.1	
2/13/2018	2/20/2018							3.4 +/- 0.2
2/19/2018	2/26/2018	1.7 +/- 0.1	1.9 +/- 0.2	1.9 +/- 0.1	1.7 +/- 0.1	1.8 +/- 0.1	1.7 +/- 0.1	
2/20/2018	2/27/2018							1.9 +/- 0.1
2/26/2018	3/5/2018	2.7 +/- 0.1	3.1 +/- 0.2	2.7 +/- 0.2	2.7 +/- 0.1	2.7 +/- 0.1	2.8 +/- 0.1	
2/27/2018	3/6/2018							2.6 +/- 0.1
3/5/2018	3/13/2018	1.0 +/- 0.1	1.1 +/- 0.2	1.1 +/- 0.1	1.1 +/- 0.1	1.0 +/- 0.1	0.9 +/- 0.1	
3/6/2018	3/13/2018							0.9 +/- 0.1
3/13/2018	3/19/2018	2.4 +/- 0.1	3.0 +/- 0.2	2.7 +/- 0.2	2.5 +/- 0.1	2.7 +/- 0.1	2.4 +/- 0.1	
3/13/2018	3/20/2018							2.3 +/- 0.1
3/19/2018	3/26/2018	1.7 +/- 0.1	2.1 +/- 0.2	2.1 +/- 0.1	1.6 +/- 0.1	1.8 +/- 0.1	1.6 +/- 0.1	
3/20/2018	3/27/2018							1.8 +/- 0.1
3/26/2018	4/2/2018	1.7 +/- 0.1	2.2 +/- 0.2	2.0 +/- 0.1	1.7 +/- 0.1	1.8 +/- 0.1	1.7 +/- 0.1	
3/27/2018	4/3/2018							1.9 +/- 0.1

Table B-5

Concentration of Beta Emitters in Air Particulates – Onsite Samples
(Results in units of 10^{-2} pCi/m^3 +/- 2σ Uncertainty)

Start Date	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
4/2/2018	4/9/2018	2.0 +/- 0.1	3.4 +/- 0.6	2.0 +/- 0.1	1.8 +/- 0.1	1.9 +/- 0.1	1.8 +/- 0.1	
4/3/2018	4/10/2018							1.8 +/- 0.1
4/9/2018	4/16/2018	2.0 +/- 0.1	2.3 +/- 0.2	2.0 +/- 0.1	1.9 +/- 0.1	2.1 +/- 0.1	1.9 +/- 0.1	1.8 +/- 0.1
4/16/2018	4/23/2018	1.6 +/- 0.1	2.0 +/- 0.3	1.8 +/- 0.1	1.6 +/- 0.1	1.7 +/- 0.1	1.5 +/- 0.1	
4/17/2018	4/24/2018							2.0 +/- 0.1
4/23/2018	4/30/2018	1.8 +/- 0.1	2.3 +/- 0.3	2.0 +/- 0.1	2.0 +/- 0.1	1.9 +/- 0.1	1.7 +/- 0.1	
4/24/2018	5/1/2018							1.9 +/- 0.1
4/30/2018	5/8/2018	2.1 +/- 0.1	2.6 +/- 0.2	2.4 +/- 0.1	2.2 +/- 0.1	2.1 +/- 0.1	1.8 +/- 0.1	
5/1/2018	5/8/2018							2.1 +/- 0.1
5/8/2018	5/15/2018	1.6 +/- 0.1	2.0 +/- 0.2	1.7 +/- 0.1	1.7 +/- 0.1	1.8 +/- 0.1	1.5 +/- 0.1	1.7 +/- 0.1
5/15/2018	5/21/2018	1.3 +/- 0.1	1.8 +/- 0.2	1.5 +/- 0.1	1.5 +/- 0.1	1.4 +/- 0.1	1.3 +/- 0.1	
5/15/2018	5/22/2018							1.6 +/- 0.1
5/21/2018	5/29/2018	2.4 +/- 0.1	3.0 +/- 0.2	2.6 +/- 0.1	2.7 +/- 0.1	2.6 +/- 0.1	2.2 +/- 0.1	
5/22/2018	5/30/2018							2.4 +/- 0.1
5/29/2018	6/4/2018	1.5 +/- 0.1	1.8 +/- 0.2	1.8 +/- 0.1	1.6 +/- 0.1	1.7 +/- 0.1	1.2 +/- 0.1	
5/30/2018	6/5/2018							1.2 +/- 0.1
6/4/2018	6/12/2018	1.1 +/- 0.1	1.6 +/- 0.2	1.3 +/- 0.1	1.2 +/- 0.1	1.2 +/- 0.1	1.0 +/- 0.1	
6/5/2018	6/12/2018							1.3 +/- 0.1
6/12/2018	6/19/2018	1.8 +/- 0.2	2.4 +/- 0.2	2.0 +/- 0.1	2.0 +/- 0.1	2.0 +/- 0.1	1.8 +/- 0.1	1.8 +/- 0.1
6/19/2018	6/25/2018	1.6 +/- 0.1	1.9 +/- 0.2	1.8 +/- 0.1	1.6 +/- 0.1	1.9 +/- 0.2	1.4 +/- 0.1	
6/19/2018	6/26/2018							1.6 +/- 0.1
6/25/2018	7/2/2018	2.6 +/- 0.1	2.9 +/- 0.2	2.9 +/- 0.1	2.9 +/- 0.2	3.1 +/- 0.2	2.6 +/- 0.1	
6/26/2018	7/3/2018							3.0 +/- 0.1

Table B-5

Concentration of Beta Emitters in Air Particulates – Onsite Samples
(Results in units of 10^{-2} pCi/m^3 +/- 2σ Uncertainty)

Start Date	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
7/2/2018	7/9/2018	2.0 +/- 0.1	2.5 +/- 0.2	2.1 +/- 0.1	2.0 +/- 0.1	2.0 +/- 0.2	2.1 +/- 0.1	
7/3/2018	7/10/2018							2.1 +/- 0.1
7/9/2018	7/16/2018	2.7 +/- 0.1	3.2 +/- 0.2	2.8 +/- 0.1	2.9 +/- 0.2	3.3 +/- 0.2	3.0 +/- 0.2	
7/10/2018	7/17/2018							2.7 +/- 0.1
7/16/2018	7/23/2018	2.0 +/- 0.1	2.0 +/- 0.1	1.8 +/- 0.1	1.9 +/- 0.1	2.0 +/- 0.2	2.1 +/- 0.1	
7/17/2018	7/24/2018							1.6 +/- 0.1
7/23/2018	7/30/2018	1.6 +/- 0.1	1.7 +/- 0.1	1.6 +/- 0.1	1.6 +/- 0.1	1.8 +/- 0.2	1.6 +/- 0.1	
7/24/2018	7/31/2018							1.7 +/- 0.1
7/30/2018	8/6/2018	4.1 +/- 0.2	4.8 +/- 0.2	4.1 +/- 0.2	4.0 +/- 0.2	4.3 +/- 0.2	4.2 +/- 0.2	
7/31/2018	8/7/2018							4.0 +/- 0.2
8/6/2018	8/13/2018	2.6 +/- 0.1	2.8 +/- 0.1	2.4 +/- 0.1	2.5 +/- 0.1	2.8 +/- 0.2	2.6 +/- 0.1	
8/7/2018	8/14/2018							2.2 +/- 0.1
8/13/2018	8/20/2018	3.1 +/- 0.2	3.5 +/- 0.2	3.2 +/- 0.1	3.1 +/- 0.2	3.2 +/- 0.2	3.4 +/- 0.2	
8/14/2018	8/21/2018							2.9 +/- 0.1
8/20/2018	8/27/2018	2.9 +/- 0.1	3.1 +/- 0.2	2.9 +/- 0.1	3.0 +/- 0.2	3.0 +/- 0.2	3.2 +/- 0.2	
8/21/2018	8/28/2018							3.2 +/- 0.1
8/27/2018	9/4/2018	2.4 +/- 0.1	2.7 +/- 0.1	2.4 +/- 0.1	2.3 +/- 0.1	2.3 +/- 0.2	2.6 +/- 0.1	
8/28/2018	9/5/2018							1.9 +/- 0.1
9/4/2018	9/11/2018	1.9 +/- 0.1	2.0 +/- 0.1	1.9 +/- 0.1	1.8 +/- 0.1	2.1 +/- 0.2	1.9 +/- 0.1	
9/5/2018	9/11/2018							1.6 +/- 0.1
9/11/2018	9/17/2018	1.6 +/- 0.1	1.7 +/- 0.1	1.7 +/- 0.1	1.5 +/- 0.1	1.8 +/- 0.2	1.8 +/- 0.1	1.7 +/- 0.1
9/17/2018	9/25/2018	2.1 +/- 0.1	2.2 +/- 0.1	1.9 +/- 0.1	2.0 +/- 0.1	2.2 +/- 0.2	2.2 +/- 0.1	1.8 +/- 0.1
9/25/2018	10/2/2018	2.0 +/- 0.1	2.0 +/- 0.1	1.9 +/- 0.1	1.7 +/- 0.1	1.8 +/- 0.2	2.0 +/- 0.1	1.8 +/- 0.1

Table B-5

Concentration of Beta Emitters in Air Particulates – Onsite Samples
(Results in units of 10^{-2} pCi/m^3 +/- 2σ Uncertainty)

Start Date	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
10/2/2018	10/9/2018	1.9 +/- 0.1	2.1 +/- 0.1	1.8 +/- 0.1	1.9 +/- 0.1	2.1 +/- 0.2	2.0 +/- 0.1	1.9 +/- 0.1
10/9/2018	10/16/2018	1.9 +/- 0.1	2.1 +/- 0.1	1.8 +/- 0.1	1.9 +/- 0.1	2.1 +/- 0.2	2.1 +/- 0.1	1.8 +/- 0.1
10/16/2018	10/22/2018	1.8 +/- 0.1	2.0 +/- 0.1	1.8 +/- 0.1	1.8 +/- 0.1	1.8 +/- 0.2	1.8 +/- 0.1	
10/16/2018	10/23/2018							1.6 +/- 0.1
10/22/2018	10/29/2018	1.4 +/- 0.1	1.5 +/- 0.1	1.3 +/- 0.1	1.4 +/- 0.1	1.4 +/- 0.1	1.5 +/- 0.1	
10/23/2018	10/30/2018							1.3 +/- 0.1
10/29/2018	11/6/2018	1.6 +/- 0.1	1.8 +/- 0.1	1.6 +/- 0.1	1.6 +/- 0.1	1.6 +/- 0.1	1.8 +/- 0.1	
10/30/2018	11/6/2018							1.5 +/- 0.1
11/6/2018	11/12/2018	1.7 +/- 0.1	1.8 +/- 0.1	1.7 +/- 0.1	1.6 +/- 0.1	1.7 +/- 0.2	1.8 +/- 0.1	
11/6/2018	11/13/2018							1.6 +/- 0.1
11/12/2018	11/19/2018	1.7 +/- 0.1	1.8 +/- 0.1	1.8 +/- 0.1	1.8 +/- 0.1	1.9 +/- 0.2	1.8 +/- 0.1	
11/13/2018	11/20/2018							1.8 +/- 0.1
11/19/2018	11/26/2018	2.5 +/- 0.1	2.7 +/- 0.1	2.5 +/- 0.1	2.4 +/- 0.1	2.5 +/- 0.2	2.7 +/- 0.1	
11/20/2018	11/27/2018							2.4 +/- 0.1
11/26/2018	12/3/2018	1.4 +/- 0.1	1.5 +/- 0.1	1.4 +/- 0.1	1.5 +/- 0.1	[1]	1.6 +/- 0.1	
11/27/2018	12/4/2018							1.3 +/- 0.1
12/3/2018	12/10/2018	2.0 +/- 0.1	2.2 +/- 0.1	2.0 +/- 0.1	2.0 +/- 0.1	2.2 +/- 0.2	2.1 +/- 0.1	
12/4/2018	12/11/2018							2.1 +/- 0.1
12/10/2018	12/18/2018	4.0 +/- 0.2	4.2 +/- 0.2	3.8 +/- 0.1	3.8 +/- 0.2	4.1 +/- 0.2	4.3 +/- 0.2	
12/11/2018	12/19/2018							3.8 +/- 0.1
12/18/2018	12/26/2018	2.2 +/- 0.1	2.4 +/- 0.1	2.1 +/- 0.1	2.1 +/- 0.1	2.3 +/- 0.2	2.3 +/- 0.1	
12/19/2018	12/27/2018							2.0 +/- 0.1
12/26/2018	1/2/2019	2.0 +/- 0.1	2.3 +/- 0.1	2.1 +/- 0.1	2.2 +/- 0.1	2.2 +/- 0.2	2.4 +/- 0.1	
12/27/2018	1/2/2019							1.9 +/- 0.1

[1]Sampler Malfunction/Low Flow. See Section 3.5 for additional information.

Table B-6

Concentration of Beta Emitters in Air Particulates - Offsite Samples
(Results in units of 10^{-2} pCi/m^3 +/- 2σ Uncertainty)

Start Date	Stop Date	STATION-08[1] Seabreeze	STATION-09 Webster	STATION-10[1] Walworth	STATION-11 Williamson	STATION-12[1] Sodus Point
1/1/2018	1/8/2018	2.8 +/- 0.1	2.6 +/- 0.1	2.7 +/- 0.2	2.7 +/- 0.2	2.8 +/- 0.2
1/8/2018	1/15/2018	2.4 +/- 0.1	2.4 +/- 0.1	2.7 +/- 0.1	2.6 +/- 0.1	2.6 +/- 0.1
1/15/2018	1/22/2018	4.0 +/- 0.2	3.5 +/- 0.2	4.2 +/- 0.2	3.9 +/- 0.2	4.1 +/- 0.2
1/22/2018	1/29/2018	1.6 +/- 0.1	1.8 +/- 0.1	2.0 +/- 0.1	1.8 +/- 0.1	1.9 +/- 0.1
1/31/2018	2/6/2018	1.9 +/- 0.1	2.0 +/- 0.1	2.0 +/- 0.1	1.9 +/- 0.1	1.8 +/- 0.1
2/6/2018	2/13/2018	3.0 +/- 0.1	2.5 +/- 0.1	3.3 +/- 0.2	3.1 +/- 0.1	3.0 +/- 0.1
2/13/2018	2/20/2018	3.1 +/- 0.1	2.7 +/- 0.1	3.4 +/- 0.2	2.9 +/- 0.1	3.1 +/- 0.1
2/20/2018	2/27/2018	1.8 +/- 0.1	1.8 +/- 0.1	2.1 +/- 0.1	1.8 +/- 0.1	1.8 +/- 0.1
2/27/2018	3/6/2018	2.8 +/- 0.1	2.7 +/- 0.1	2.9 +/- 0.2	2.7 +/- 0.1	2.6 +/- 0.1
3/6/2018	3/13/2018	1.0 +/- 0.1	1.0 +/- 0.1	0.9 +/- 0.1	0.9 +/- 0.1	0.8 +/- 0.1
3/13/2018	3/20/2018	2.4 +/- 0.1	2.3 +/- 0.1	2.6 +/- 0.1	2.3 +/- 0.1	2.3 +/- 0.1
3/20/2018	3/27/2018	1.4 +/- 0.1	1.9 +/- 0.1	2.0 +/- 0.1	1.9 +/- 0.1	1.9 +/- 0.1
3/27/2018	4/3/2018	2.1 +/- 0.1	2.1 +/- 0.1	2.1 +/- 0.1	2.0 +/- 0.1	2.0 +/- 0.1
4/3/2018	4/10/2018	1.8 +/- 0.1	1.8 +/- 0.1	1.9 +/- 0.1	1.8 +/- 0.1	1.8 +/- 0.1
4/9/2018	4/16/2018	1.8 +/- 0.1	1.8 +/- 0.1	1.9 +/- 0.1	1.8 +/- 0.1	1.8 +/- 0.1
4/17/2018	4/24/2018	2.0 +/- 0.1	1.8 +/- 0.1	2.1 +/- 0.1	1.9 +/- 0.1	2.0 +/- 0.1
4/24/2018	5/1/2018	2.0 +/- 0.1	2.0 +/- 0.1	2.2 +/- 0.1	2.1 +/- 0.1	2.0 +/- 0.1
5/1/2018	5/8/2018	2.1 +/- 0.1	2.0 +/- 0.1	2.3 +/- 0.1	2.4 +/- 0.1	2.1 +/- 0.1
5/8/2018	5/15/2018	1.7 +/- 0.1	1.8 +/- 0.1	2.0 +/- 0.1	1.9 +/- 0.1	1.6 +/- 0.1
5/15/2018	5/22/2018	1.5 +/- 0.1	1.6 +/- 0.1	1.6 +/- 0.1	1.5 +/- 0.1	1.5 +/- 0.1
5/22/2018	5/30/2018	2.7 +/- 0.1	2.1 +/- 0.1	2.7 +/- 0.1	3.1 +/- 0.2	2.4 +/- 0.1
5/30/2018	6/5/2018	1.4 +/- 0.1	2.2 +/- 0.2	1.6 +/- 0.1	1.5 +/- 0.1	1.6 +/- 0.1
6/5/2018	6/12/2018	1.4 +/- 0.1	1.3 +/- 0.1	1.3 +/- 0.1	1.3 +/- 0.1	1.2 +/- 0.1
6/12/2018	6/19/2018	2.0 +/- 0.1	2.0 +/- 0.1	2.0 +/- 0.1	2.1 +/- 0.1	1.9 +/- 0.1
6/19/2018	6/26/2018	2.0 +/- 0.1	1.8 +/- 0.1	1.7 +/- 0.1	1.8 +/- 0.1	1.6 +/- 0.1
6/26/2018	7/3/2018	3.5 +/- 0.2	3.1 +/- 0.2	3.1 +/- 0.2	3.1 +/- 0.2	2.9 +/- 0.1
7/3/2018	7/10/2018	2.4 +/- 0.2	2.2 +/- 0.1	2.3 +/- 0.1	2.1 +/- 0.1	2.1 +/- 0.1
7/10/2018	7/17/2018	4.5 +/- 0.3	2.9 +/- 0.1	3.2 +/- 0.2	3.0 +/- 0.2	2.8 +/- 0.1
7/17/2018	7/24/2018	1.8 +/- 0.1	1.6 +/- 0.1	1.7 +/- 0.1	1.6 +/- 0.1	1.6 +/- 0.1
7/24/2018	7/31/2018	2.2 +/- 0.1	2.0 +/- 0.1	2.0 +/- 0.1	1.9 +/- 0.1	1.8 +/- 0.1
7/31/2018	8/7/2018	4.7 +/- 0.2	4.2 +/- 0.2	4.6 +/- 0.2	4.1 +/- 0.2	4.0 +/- 0.2
8/7/2018	8/15/2018	2.7 +/- 0.1	2.4 +/- 0.1	2.6 +/- 0.1	2.3 +/- 0.1	2.2 +/- 0.1
8/15/2018	8/21/2018	3.7 +/- 0.2	3.2 +/- 0.2	3.5 +/- 0.2	3.0 +/- 0.2	3.1 +/- 0.2
8/21/2018	8/28/2018	4.0 +/- 0.2	3.4 +/- 0.2	3.8 +/- 0.2	3.6 +/- 0.2	3.4 +/- 0.1
8/28/2018	9/5/2018	2.3 +/- 0.1	2.0 +/- 0.1	2.3 +/- 0.1	2.0 +/- 0.1	2.1 +/- 0.1
9/5/2018	9/11/2018	2.0 +/- 0.2	1.6 +/- 0.1	1.8 +/- 0.1	1.8 +/- 0.1	1.7 +/- 0.1
9/11/2018	9/17/2018			1.7 +/- 0.1		1.7 +/- 0.1
9/11/2018	9/18/2018	1.9 +/- 0.1	1.7 +/- 0.1		1.6 +/- 0.1	
9/17/2018	9/25/2018	2.3 +/- 0.1	1.9 +/- 0.1	2.1 +/- 0.1	2.1 +/- 0.1	1.9 +/- 0.1
9/25/2018	10/3/2018	1.9 +/- 0.1	1.8 +/- 0.1	1.9 +/- 0.1	1.7 +/- 0.1	1.7 +/- 0.1

Table B-6

Concentration of Beta Emitters in Air Particulates - Offsite Samples (Results in units of 10^{-2} pCi/m^3 +/- 2σ Uncertainty)

Start Date	Stop Date	STATION-08[1] Seabreeze	STATION-09 Webster	STATION-10[1] Walworth	STATION-11 Williamson	STATION-12[1] Sodus Point
10/3/2018	10/9/2018	2.2 +/- 0.2	2.1 +/- 0.1	2.2 +/- 0.2	2.3 +/- 0.2	2.1 +/- 0.1
10/9/2018	10/16/2018	2.1 +/- 0.1	1.8 +/- 0.1	2.1 +/- 0.1	2.0 +/- 0.1	1.9 +/- 0.1
10/16/2018	10/23/2018	2.0 +/- 0.1	1.7 +/- 0.1	1.9 +/- 0.1	1.8 +/- 0.1	1.8 +/- 0.1
10/23/2018	10/30/2018	1.4 +/- 0.1	1.3 +/- 0.1	1.3 +/- 0.1	1.4 +/- 0.1	1.4 +/- 0.1
10/30/2018	11/6/2018	1.9 +/- 0.1	1.6 +/- 0.1	1.7 +/- 0.1	1.6 +/- 0.1	1.6 +/- 0.1
11/6/2018	11/13/2018	2.1 +/- 0.1	1.7 +/- 0.1	1.9 +/- 0.1	1.8 +/- 0.1	1.8 +/- 0.1
11/13/2018	11/20/2018	1.8 +/- 0.1	1.5 +/- 0.1	1.8 +/- 0.1	1.7 +/- 0.1	1.8 +/- 0.1
11/20/2018	11/27/2018	2.3 +/- 0.1	2.1 +/- 0.1	2.1 +/- 0.1	2.2 +/- 0.1	2.3 +/- 0.1
11/27/2018	12/4/2018			1.6 +/- 0.1	1.3 +/- 0.1	1.3 +/- 0.1
11/27/2018	12/4/2018	1.5 +/- 0.1	1.4 +/- 0.1			
12/4/2018	12/11/2018	2.5 +/- 0.1	2.4 +/- 0.1	2.6 +/- 0.1	2.4 +/- 0.1	2.3 +/- 0.1
12/11/2018	12/19/2018	4.2 +/- 0.2	3.5 +/- 0.1	3.6 +/- 0.2	3.7 +/- 0.2	3.9 +/- 0.1
12/19/2018	12/27/2018	2.3 +/- 0.1	2.0 +/- 0.1	2.2 +/- 0.1	2.0 +/- 0.1	2.2 +/- 0.1
12/27/2018	1/2/2019	2.3 +/- 0.2	2.0 +/- 0.1	2.2 +/- 0.1	2.0 +/- 0.1	2.0 +/- 0.1

[1] Control Location

Table B-7

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-02	Manor House Yard	4/2/2018	< 1.8	< 0.002
		7/2/2018	< 1.8	< 0.002
		10/2/2018	< 1.8	< 0.002
		1/2/2019	< 1.8	< 0.002
STATION-03	North of Training Center Parkling Lot	4/2/2018	< 1.8	< 0.002
		7/2/2018	< 1.8	< 0.002
		10/2/2018	< 1.8	< 0.002
		1/2/2019	< 1.8	< 0.002
STATION-04	Training Center Parking Lot	4/2/2018	< 1.8	< 0.002
		7/2/2018	< 1.8	< 0.002
		10/2/2018	< 1.8	< 0.002
		1/2/2019	< 1.8	< 0.002
STATION-05	Creek Bridge	4/2/2018	< 1.8	< 0.002
		7/2/2018	< 1.8	< 0.002
		10/2/2018	< 1.8	< 0.002
		1/2/2019	< 1.8	< 0.002
STATION-06	Main Parking Lot	4/2/2018	< 1.8	< 0.002
		7/2/2018	< 1.8	< 0.002
		10/2/2018	< 1.8	< 0.002
		1/2/2019	< 1.8	< 0.002
STATION-07	West Fence Line	4/2/2018	< 1.8	< 0.002
		7/2/2018	< 1.8	< 0.002
		10/2/2018	< 1.8	< 0.002
		1/2/2019	< 1.8	< 0.002
STATION-08[1]	Seabreeze	4/3/2018	< 1.8	< 0.002
		7/3/2018	< 1.8	< 0.002
		10/2/2018	< 1.8	< 0.002
		1/2/2019	< 1.8	< 0.002
STATION-09	Webster	4/3/2018	< 1.8	< 0.002
		7/3/2018	< 1.8	< 0.002
		10/2/2018	< 1.8	< 0.002
		1/2/2019	< 1.8	< 0.002
STATION-10[1]	Walworth	4/3/2018	< 1.8	< 0.002
		7/3/2018	< 1.8	< 0.002
		10/2/2018	< 1.8	< 0.002
		1/2/2019	< 1.8	< 0.002

Table B-7 (Continued)

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	4/3/2018	< 1.8	< 0.002
		7/3/2018	< 1.8	< 0.002
		10/2/2018	< 1.8	< 0.002
		1/2/2019	< 1.8	< 0.002
STATION-12[1]	Sodus Point	4/3/2018	< 1.8	< 0.002
		7/3/2018	< 1.8	< 0.002
		10/2/2018	< 1.8	< 0.002
		1/2/2019	< 1.8	< 0.002
STATION-13	Substation 13	4/3/2018	< 1.8	< 0.002
		7/3/2018	< 1.8	< 0.002
		10/2/2018	< 1.8	< 0.002
		1/2/2019	< 1.8	< 0.002

[1] Control Location

Table B-8

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]				
Local Sites in				
Control Sectors	7/19/2018	Greens	< 27	< 20
	7/19/2018	Squash	< 27	< 20
	9/27/2018	Apples	< 27	< 20
	9/27/2018	Cabbage	< 27	< 20
	9/27/2018	Grapes	< 27	< 20
	9/27/2018	Onion (root)	< 27	< 20
	9/27/2018	Pears	< 27	< 20
	9/27/2018	Tomato	< 27	< 20
EAST				
East Sector	7/3/2018	Greens	< 27	< 20
	7/19/2018	Squash	< 27	< 20
	7/31/2018	Onion (root)	< 27	< 20
	8/20/2018	Tomato	< 27	< 20
	9/5/2018	Cabbage	< 27	< 20
	9/5/2018	Pears	< 27	< 20
	9/21/2018	Apples	< 27	< 20
ESE				
East South East				
Sector	7/19/2018	Greens	< 27	< 20
	7/31/2018	Onion (root)	< 27	< 20
	7/31/2018	Squash	< 27	< 20
	8/20/2018	Tomato	< 27	< 20
	9/5/2018	Cabbage	< 27	< 20
	9/5/2018	Grapes	< 27	< 20
SSE				
South South East				
Garden	7/3/2018	Greens	< 27	< 20
	7/3/2018	Squash	< 27	< 20
	7/31/2018	Onion (root)	< 27	< 20
	8/20/2018	Tomato	< 27	< 20
	9/5/2018	Pears	< 27	< 20
	9/5/2018	Cabbage	< 27	< 20
	9/21/2018	Apples	< 27	< 20

[1] Control Location

Table B-9

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	1/16/2018	< 0.4	< 0.01
	2/12/2018	< 0.4	< 0.01
	3/12/2018	< 0.4	< 0.01
	4/9/2018	< 0.4	< 0.01
	5/7/2018	< 0.4	< 0.01
	6/4/2018	< 0.4	< 0.01
	6/18/2018	< 0.4	< 0.01
	7/2/2018	< 0.4	< 0.01
	7/16/2018	< 0.4	< 0.01
	7/30/2018	< 0.4	< 0.01
	8/13/2018	< 0.4	< 0.01
	8/27/2018	< 0.4	< 0.01
	9/10/2018	< 0.4	< 0.01
	9/24/2018	< 0.4	< 0.01
	10/8/2018	< 0.4	< 0.01
	10/22/2018	< 0.4	< 0.01
	11/5/2018	< 0.4	< 0.01
	12/3/2018	< 0.4	< 0.01
	12/17/2018	< 0.4	< 0.01
FARM_B			
(SCHULTZ[1])			
South Sodus Control	1/16/2018	< 0.4	< 0.01
	2/12/2018	< 0.4	< 0.01
	3/12/2018	< 0.4	< 0.01
	4/9/2018	< 0.4	< 0.01
	5/7/2018	< 0.4	< 0.01
	6/4/2018	< 0.4	< 0.01
	6/18/2018	< 0.4	< 0.01
	7/2/2018	< 0.4	< 0.01
	7/16/2018	< 0.4	< 0.01
	7/30/2018	< 0.4	< 0.01
	8/13/2018	< 0.4	< 0.01
	8/27/2018	< 0.4	< 0.01
	9/10/2018	< 0.4	< 0.01
	9/24/2018	< 0.4	< 0.01
	10/8/2018	< 0.4	< 0.01
	10/22/2018	< 0.4	< 0.01
	11/5/2018	< 0.4	< 0.01
	12/3/2018	< 0.4	< 0.01
	12/17/2018	< 0.4	< 0.01

[1] Control Location

Table B-10

Typical MDA Ranges for Gamma Spectrometry

Selected Nuclides	Air Particulates (10^{-2} pCi/m^3)	Surface Water, Drinking Water (pCi/L)	Fish (pCi/kg) Wet	Ground-water (pCi/L)	Milk (pCi/L)	Oysters (pCi/kg)	Shoreline Sediment (pCi/kg) Dry	Soil (pCi/kg) Dry	Vegetation (pCi/kg) Wet
Na-22	0.03 - 0.47	3.1 - 5.1	9.6 - 25.7	3.6 - 5.2	5 - 7.3	5.9 - 23.6	27.1 - 74.8	33.9 - 90.3	11.1 - 32.3
K-40	0.16 – 8.09	32.2 - 58.8	69.2 - 212	41.4 - 63	40.4 - 61.7	70.8 - 204	300 - 749	308 - 744	91.8 - 270
Cr-51	1.31 – 11.0	27.6 - 43.3	74 - 267	29.4 - 39.8	36.9 - 52.5	25.8 - 285	477 - 1303	507 - 1486	29.2 - 327
Mn-54	0.03 – 0.52	3 - 4.6	6.9 - 36.2	3.2 - 4.8	3.9 - 5.6	9.4 - 21.7	27.0 - 69.9	32.7 - 82.6	8.9 - 28.2
Co-58	0.05 – 0.73	3.1 - 4.7	8.6 - 38.6	3.2 - 4.8	4.1 - 5.7	7.4 - 30	38.6 - 96.8	38.1 - 109	8.2 - 30.5
Fe-59	0.21 – 2.35	6.8 - 10.4	26.8 - 97.6	7.1 - 10.8	10.1 - 14.3	14.3 - 87.1	96.7 - 271	100 - 283	18.5 - 73.9
Co-60	0.03 – 0.48	3.1 - 4.7	10.2 - 33.3	3.3 - 4.9	4.5 - 6.5	10 - 21.9	26.2 - 72	31.1 - 82.5	10.1 - 29.8
Zn-65	0.08 – 1.33	6.5 - 10.3	22.5 - 82.3	7.2 - 12	10.1 - 15.2	23.1 - 54	81 - 196	86.9 - 240	22.2 - 68.2
Nb-95	0.14 – 1.07	3.4 - 5.3	9 - 33.5	3.6 - 5.2	4.5 - 6.2	5.3 - 31.1	64.7 - 155	62.1 - 183	6.9 - 38.9
Zr-95	0.10 – 1.01	5.3 - 8.2	15.1 - 42.8	5.8 - 8	7.1 - 9.6	10.2 - 38.9	66.7 - 166	77.4 - 192	14.2 - 53.7
Ru-106	0.30 – 396	25.8 - 40.9	65.3 - 170	28.6 - 40.8	33.6 - 47.6	42.7 - 159	226 - 560	292 - 699	77.4 - 236
Ag-110m	0.03 – 0.43	2.9 - 4.5	7.8 - 20.2	3.2 - 4.5	3.7 - 5.2	5.1 - 18.3	26.7 - 65.1	35.2 - 90	8.3 - 26.4
I-131[1]	1.85 – 137	1.7 - 10.5	0 - 466	5.1 - 8.8	0.4 - 11.1	0 - 1046	294 - 4372	0 - 3833	0 - 583
Cs-134	0.03 – 0.40	2.9 - 4.4	7.7 - 30.1	3.2 - 4.6	3.6 - 5.3	8.5 - 21.4	41.6 - 66.6	44.5 - 84.4	10.2 - 27.5
Cs-137	0.03 – 0.43	3.2 - 4.9	7.7 - 36.6	3.5 - 5	4 - 5.7	9.7 - 21.4	42 - 59.7	40.6 - 87.2	11.2 - 29.3
Ba-140	1.01 - 17.2	5.1 - 14.2	0 - 145	5.8 - 9.7	7.8 - 28	0 - 199	274 - 1006	44.9 - 1198	0 - 175
La-140	1.01 - 17.2	6.1 - 10.6	0 - 142.5	5.8 - 9.7	6.3 - 10.9	0 - 199	274 - 1006	45.0 - 1198	0 - 174
Ce-144	0.12 – 2.05	16.2 - 30.9	39.4 - 110	19.8 - 26.6	22.7 - 37.2	27.3 - 112	128 - 314	187 - 435	42 - 127

[1] This MDA range for I-131 on a charcoal cartridge is typically 3.94 x 10-3 to 6.10 x 10-2 pCi/m^3

Table B-11

Typical LLDs for Gamma Spectrometry

Selected Nuclides	Air Particulates 10^{-3} pCi/m3	Surface Water, Drinking Water pCi/L	Fish pCi/kg (wet)	Groundwater pCi/L	Oysters pCi/kg (wet)	Precipitation pCi/L	Soil pCi/kg (dry)	Vegetation pCi/kg (wet)
Na-22	2.9	2.9	22	2.9	6	22	24	35
Cr-51	12	17	88	17	30	88	110	162
Mn-54	2.1	2.4	17	2.4	5	17	18	27
Co-58	2	2.4	16	2.4	5	16	17	25
Fe-59	4.6	5.2	37	5.2	11	37	38	60
Co-60	2.7	2.8	22	2.8	6	22	21	33
Zn-65	2.8	5.6	23	5.6	12	23	54	66
Nb-95	1.9	2.2	15	2.2	4	15	18	25
Zr-95	3.3	3.8	27	3.8	8	27	29	44
Ru-106	17	20	135	20	39	135	146	223
Ag-110m	1.8	2.1	14	2.1	4	14	16	25
Te-129m	20	26	149	26	50	149	180	265
I-131	1.5*	2**	11	2	4**	11	14	20
Cs-134	1.9	2.2	15	2.2	4	15	20	24
Cs-137	1.8	2.3	15	2.3	5	15	17	27
Ba-140	6.1	7.3	48	7.3	5	48	54	80
La-140	3.4	4.1	26	4.1	5	26	25	41
Ce-144	5.5	12	43	12	20	43	75	101

* The LLD for I-131 measured on a charcoal cartridge is 2.0 x10^{-3} pCi/m^3

** The LLD for Low Level I-131 measured in drinking water and milk is 0.3 pCi/L

Table B-12
Direct Radiation
(Results in Units of mR/90 days +/- 1σ)

Station	Location	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
2	Onsite-Manor House Yard	12.8 ± 0.5	12.0 ± 0.7	13.6 ± 0.7	13.1 ± 0.9
3	Onsite-In field approximately 200 ft SE of station #2	13.8 ± 0.7	12.1 ± 0.4	14.3 ± 0.5	13.0 ± 0.8
4	Onsite-Training Center yard driveway circle	12.6 ± 0.9	10.8 ± 0.4	12.4 ± 0.6	12.0 ± 0.6
5	Onsite-Between creek and plant entry road	12.7 ± 0.8	12.1 ± 0.5	13.0 ± 0.8	12.1 ± 1.0
6	Onsite-SW side of plant parking lot	11.2 ± 0.6	9.3 ± 0.6	10.0 ± 0.3	9.5 ± 0.6
7	Onsite-utility pole along West plant fence	12.3 ± 0.9	10.8 ± 0.4	11.5 ± 0.9	11.9 ± 0.5
8 [1]	Topper Drive-Irondequoit, Seabreeze Substation #51	12.4 ± 0.8	10.5 ± 0.5	11.4 ± 0.8	11.4 ± 0.7
9	Phillips Road-Webster, intersection with Highway #104, Substation #74	11.6 ± 0.6	9.9 ± 0.7	10.9 ± 0.4	11.0 ± 0.6
10 [1]	Atlantic Avenue-Walworth, Substation #230	11.3 ± 1.1	9.7 ± 0.6	10.5 ± 0.3	10.6 ± 0.4
11	W. Main Street-Williamson, Substation #207	11.4 ± 0.5	10.7 ± 0.4	10.6 ± 0.6	10.5 ± 0.5
12 [1]	12 Seaman Avenue-Sodus Point-Off Lake Road by Sewer district, Substation #209	12.2 ± 0.8	11.3 ± 0.4	12.2 ± 0.9	11.8 ± 0.5
13	Onsite- South of Meteorological Tower	20.3 ± 0.9	17.4 ± 1.0	19.9 ± 0.8	19.2 ± 0.7
14	NW corner of field along lake shore	12.6 ± 0.6	11.9 ± 0.5	12.9 ± 0.8	11.3 ± 0.6
15	Field access road, west of orchard, approximately 3000' West of plant	13.3 ± 0.6	12.4 ± 0.5	13.9 ± 0.4	13.6 ± 0.7

TABLE B-12 (Continued)
Direct Radiation
(Results in Units of mR/90 days +/- 1σ)

Station	Location	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
16	SW Corner of orchard, approximately 3000' West of plant, approximately 200' North of Lake Road	12.7 ± 0.7	12.0 ± 0.5	13.6 ± 0.4	13.2 ± 0.5
17	Utility pole in orchard, approximately 75" North of Lake Road	12.6 ± 0.6	11.2 ± 0.5	12.7 ± 0.7	12.6 ± 0.5
18	Approximately 30' North of NE corner of Substation 13A fence	11.4 ± 0.7	9.6 ± 0.6	10.7 ± 0.4	10.6 ± 0.6
19	On NW corner of house 100' East of plant access road	11.1 ± 0.6	9.2 ± 0.5	10.2 ± 0.5	10.3 ± 0.4
20	Approximately 150' West of Ontario Center Road and approximately 170' South of Lake Road	12.0 ± 0.7	11.6 ± 0.5	13.2 ± 0.4	12.2 ± 1.1
21	North side of Lake Road, approximately 200' East of Ontario Center Road	13.0 ± 0.7	11.4 ± 0.6	13.2 ± 0.7	12.0 ± 0.5
22	North side of Lake Road, SE, property owner	11.7 ± 0.5	10.1 ± 0.7	11.9 ± 0.4	10.9 ± 0.8
23	East property line, midway between Lake Road and Lake shore	13.0 ± 0.6	11.5 ± 0.6	13.6 ± 0.5	12.9 ± 0.6
24	Lake shore near NE corner of property	13.3 ± 1.1	10.9 ± 0.6	13.1 ± 0.6	12.8 ± 0.6
25 [1]	Substation #73, Klem Road, adjacent to 897 Klem Road	11.6 ± 0.5	9.6 ± 0.4	11.0 ± 0.4	11.0 ± 0.6
26 [1]	Service Center, Plank Road, West of 250	10.6 ± 0.4	10.0 ± 0.6	9.9 ± 0.4	10.0 ± 0.4
27 [1]	Atlantic Avenue at Knollwood Drive utility pole, North side of road	11.3 ± 0.6	9.7 ± 0.5	11.5 ± 0.5	10.7 ± 0.5
28 [1]	Substation #193, Marion, behind Stanton Ag. Service, North Main Street	11.4 ± 0.5	10.4 ± 0.8	10.1 ± 0.6	11.2 ± 0.5

TABLE B-12 (Continued)
Direct Radiation
(Results in Units of mR/90 days +/- 1σ)

Station	Location	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
29 [1]	Substation #208, Town Line Road (CR-118), 1000 ' North of Route 104	10.9 ± 0.6	10.0 ± 0.5	10.8 ± 0.4	11.3 ± 0.7
30 [1]	District Office, Sodus, on pole, West side of bldg	10.1 ± 0.5	8.8 ± 0.4	9.7 ± 0.4	10.0 ± 0.8
31	Lake Road, pole 20' North of road, 500' East of Salt Road	13.5 ± 0.6	11.7 ± 0.5	13.5 ± 0.6	13.2 ± 0.8
32	Woodard Road at County Line Road, pole @ BW corner	11.5 ± 0.6	10.3 ± 0.6	11.1 ± 0.5	11.1 ± 0.4
33	County Line Road at RR tracks, pole approximately 100' East along tracks	10.9 ± 0.4	9.8 ± 0.6	10.7 ± 0.5	10.9 ± 0.7
34	Lincoln Road, pole midway between Ridge Road and Route 104	13.3 ± 0.7	12.0 ± 0.6	13.3 ± 0.7	13.0 ± 0.7
35	Transmission Right of Way, North of Clevenger Road on pole	12.9 ± 0.5	11.9 ± 0.4	13.2 ± 0.4	12.5 ± 0.8
36	Substation #205, Route 104, East of Ontario Center Road, North side of fence	11.3 ± 0.8	10.0 ± 0.4	10.6 ± 0.7	11.4 ± 0.7
37	Rail Road Avenue, pole at 2048	10.4 ± 0.6	9.8 ± 0.6	10.0 ± 0.7	10.4 ± 0.5
38	Fisher Road at RR Tracks, pole East of road	12.9 ± 0.6	11.1 ± 0.7	12.6 ± 0.6	12.7 ± 0.7
39	Seeley Road, Pole South side 100' West of intersection with Stony Lonesome Road	12.9 ± 0.7	11.6 ± 0.5	12.2 ± 1.0	12.3 ± 0.5
40	Lake Road at Stoney Lonesome Road, pole at SE corner	11.3 ± 1.1	10.0 ± 0.4	10.6 ± 0.4	10.3 ± 0.6
63	Westside of warehouse access road	13.8 ± 0.6	13.4 ± 0.4	12.6 ± 0.5	12.6 ± 0.7
64	Westside of direct road, adjacent to orchard	14.9 ± 0.6	11.9 ± 0.4	15.1 ± 0.7	14.1 ± 0.7

1 - Control Location

TABLE B-13

Groundwater Monitoring Wells

Location	Sample Date	Tritium (pCi/l)	Gamma[1] (uCi/ml)
GW01: Warehouse Access Road (Control)	3/23/2018	< 426	< 8.93E-09
	6/14/2018	< 415	< 9.02E-09
	9/7/2018	< 447	< 8.92E-09
	12/21/2018	< 399	< 1.30E-08
GW03: Screenhouse West, South Well	1/12/2018	< 454	
	2/16/2018	< 455	
	3/23/2018	< 438	< 9.12E-09
	4/25/2018	< 437	
	5/25/2018	< 416	
	6/15/2018	< 413	< 8.75E-09
	7/29/2018	< 421	
	8/21/2018	< 414	
	9/7/2018	< 449	< 7.80E-09
	10/18/2018	< 438	
	11/28/2018	< 396	
	12/23/2018	< 403	< 7.53E-09
GW04: Screenhouse West, North Well	3/23/2018	< 445	< 8.35E-09
	6/15/2018	< 416	< 7.65E-09
	9/7/2018	< 447	< 7.08E-09
	12/23/2018	< 401	< 6.87E-09
GW05: Screenhouse East, South (15.5')	3/23/2018	< 445	< 9.01E-09
	6/17/2018	< 414	< 8.75E-09
	9/7/2018	< 453	< 1.06E-08
	12/23/2018	< 403	< 7.22E-09
GW06: Screenhouse East, Middle (20.0')	3/23/2018	< 441	< 7.73E-09
	6/15/2018	< 413	< 9.86E-09
	9/7/2018	< 444	< 9.69E-09
	12/23/2018	< 402	< 7.74E-09
GW07: Screenhouse East, North (24.0')	3/23/2018	< 440	< 6.78E-09
	6/15/2018	< 416	< 8.60E-09
	9/7/2018	< 447	< 6.53E-09
	12/23/2018	< 402	< 6.14E-09

TABLE B-13 (Continued)

Groundwater Monitoring Wells

Location	Sample Date	Tritium (pCi/l)	Gamma (uCi/ml)
GW08: All Volatiles Treatment Building	1/12/2018	< 457	
	2/16/2018	< 461	
	3/23/2018	< 444	< 7.81E-09
	4/25/2018	< 431	
	5/25/2018	< 418	
	6/19/2018	< 416	< 5.88E-09
	7/29/2018	< 417	
	8/21/2018	< 415	
	9/7/2018	< 445	< 7.48E-09
	10/18/2018	< 436	
	11/28/2018	< 401	
	12/23/2018	< 399	< 6.28E-09
GW10: Technical Support Center, South	3/23/2018	< 427	< 1.46E-08
	6/15/2018	< 413	< 1.03E-08
	9/7/2018	< 446	< 8.61E-09
	12/23/2018	< 400	< 7.46E-09
GW11: Southeast of Contaminated Service Building (CSB)	3/23/2018	< 447	< 7.25E-09
	6/15/2018	< 412	< 6.95E-09
	9/7/2018	< 444	< 7.29E-08
	12/23/2018	< 398	< 7.82E-09
GW12: West of Orchard Access Road	3/23/2018	< 439	< 7.25E-09
	6/14/2018	< 415	< 8.21E-08
	9/7/2018*	EMPTY	EMPTY
	12/21/2018	< 396	< 9.41E-09
GW13: North of Independent Spent Fuel Storage Installation (ISFSI)	3/23/2018	< 443	< 9.31E-09
	6/14/2018	< 415	< 7.82E-09
	9/7/2018	< 446	< 1.07E-08
	12/21/2018	< 397	< 1.26E-08
GW14: South of Canister Preparation Building	3/23/2018	< 441	< 8.55E-09
	6/14/2018	< 420	< 9.11E-09
	9/7/2018	< 447	< 8.27E-09
	12/21/2018	< 396	< 9.60E-09

TABLE B-13 (Continued)

Groundwater Monitoring Wells

Location	Sample Date	Tritium (pCi/l)	Gamma (uCi/ml)
GW15: West of Manor House	3/23/2018	< 438	< 9.86E-09
	6/14/2018	< 414	< 9.50E-09
	9/7/2018	< 447	< 8.72E-09
	12/21/2018	< 399	< 9.94E-09
GW16: Southeast of Manor House	3/23/2018	< 445	< 8.09E-09
	6/14/2018	< 417	< 8.95E-09
	9/7/2018	< 444	< 1.24E-08
	12/21/2018	< 397	< 7.10E-09

[1] Gamma analysis is performed on a quarterly basis for groundwater monitoring well results. Groundwater monitoring wells GW03 and GW08 are sampled monthly due to their location being important for early detection of any tritium within the environment.
* Groundwater Monitoring Well GW12 did not return a sample on 9/7/2018 as there was no groundwater in the monitoring well.

APPENDIX C

Quality Assurance Program

Summary of Appendix C Content:

Appendix C is a summary of Exelon Industrial Services (EIS) Laboratory's quality assurance program. Table C-1 is a compilation of results from the interlaboratory comparison program between EIS Laboratory, Environmental Resource Associates (ERA) located in Arvada, Colorado and Eckert and Ziegler Analytics Inc. located in Atlanta, Georgia. Table C-2, is a compilation of the results of the EIS laboratory's quality assurance analysis of laboratory duplicates and split samples with Teledyne Brown Engineering located in Knoxville, Tennessee. Table C-3, is a list of typical MDAs achieved by Teledyne Brown for Gamma Spectroscopy.

All the EIS Laboratory's results contained in Table C-1 generally agree with the intercomparison laboratory's results within the range of ±2 σ of each other. In addition, all the sets of intercomparison results in the table are in full agreement when they were further evaluated using the NRC Resolution Test Criteria[1]. The uncertainties for the EIS laboratory's results and Analytics' results are ±2σ while the ERA laboratory's uncertainty is based on USEPA guidelines[2].

All the results contained in Table C-2 agree within the range of ±2σ of each other with their respective EIS Laboratory original, replicate and/or Teledyne Brown Engineering's split laboratory samples.

The comparison of a soil sample SFS3 collected on 5/29/18 was in full agreement with the split laboratory sample positive for Cs-137 at 77.8±35.3 pCi/kg and 106±53.6 pCi/kg respectively. The replicate analysis showed no Cs 137 observed however the MDA value of 110pCi/kg was within the acceptable range of the positive results of the original and split sample in accordance with the NRC Radiochemical Acceptance Criteria for Split Samples [1].

Other samples whose nature generally preclude sample splitting are marked "**" in the Split Analysis column.

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[1] NRC Inspection Manual, Inspection Procedure 84750, March 15, 1994
[2] National Standards for Water Proficiency Testing Studies Criteria Document, December 1998

TABLE OF CONTENTS - ANALYTICAL RESULTS

TABLE C-1

Results of Participation in Cross Check Program

Sample Date	Sample Type and Units	Isotope Observed	Reported Laboratory's Results	Cross Check Lab Results
3/15/2018	Air Iodine - pCi/m^3	I-131	85.2	94.3
3/15/2018	Milk - pCi/L	Co-60	192	187
		Mn-54	140	131
		Fe-59	148	139
		Co-58	118	114
		Cr-51	317	326
		Zn-65	264	244
		I-131	106	108
		Cs-134	178	180
		Cs-137	176	172
		Ce-141	80	77
3/15/2018	Water - pCi/L	Gross Beta	272	275
4/9/2018	Water - pCi/L	Co-60	70	64.3
		Zn-65	95.9	86.7
		I-131	24.1	24.6
		Ba-133	88	91.5
		Cs-137	131	123
4/9/2018	Water - pCi/L	Gross Beta	64.6	73.7
6/7/2018	Air Filter - pCi/m^3	Fe-59	173	155
		Co-58	158	160
		Cr-51	437	160
		Ce-141	153	148
		Cs-137	179	178
		Cs-134	193	204
		Zn-65	268	283
		Mn-54	236	233
		Co-60	200	204
6/7/2018	Water - pCi/L	Mn-54	132	135
		Fe-59	97.4	89.7
		Co-58	87.9	92.9
		Co-60	112	118
		Zn-65	171	164
		I-131	77	74.1
		Cs-134	101	119
		Cs-137	106	103
		Ce-141	90.4	85.8
6/7/2018	Water - pCi/L	Gross Beta	216	251
7/9/2018	Water - pCi/L	H-3	216	204
9/13/2018	Air Filter - pCi/m^3	Gross Beta	220	211

TABLE C-1 – Continued

Results of Participation in Cross Check Program

Sample Date	Sample Type and Units	Isotope Observed	Reported Laboratory's Results	Cross Check Lab Results
9/18/2018	Air Filter - pCi/m^3	Cs-134	870	921
		Zn-65	696	660
		Co-60	1178	1130
		Cs-137	403	373
		Am-241	52.3	64.1
10/5/2018	Water - pCi/L	Co-60	80.2	80.7
		Zn-65	318	336
		Cs-134	87.9	93
		Cs-137	223	235
		Ba-133	13.4	16.3
		I-131	28.1	27.2
12/6/2018	Air Filter - pCi/m^3	Fe-59	97.9	83.4
		Cr-51	226	217
		Ce-141	97.9	97
		Cs-137	98.8	88.2
		Cs-134	112	125
		Zn-65	201	193
		Co-60	158	155
		Co-58	85.7	86.5
		Mn-54	123	112
12/6/2018	Air Iodine - pCi/m^3	I-131	86.2	89.7
12/6/2018	Milk	Ce-141	145	133
		Mn-54	178	154
		Cs-134	193	171
		I-131	95.8	93.3
		Co-60	215	212
		Co-58	123	119
		Cr-51	372	298
		Fe-59	127	114
		Cs-137	141	121
		Zn-65	242	264
12/6/2018	Water - pCi/L	Gross Beta	257	295

[1] See discussion at the beginning of the Appendix

TABLE C-2
Results of Quality Assurance Program

Sample Type and Location [2]	Sample Date	Type of Analysis	Result[2] Units	Original Analysis	Replicate Analysis	Split Analysis
Air Iodine - A1	1/1/2018	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A2	1/1/2018	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A3	1/1/2018	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A4	1/1/2018	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A5	1/1/2018	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - SFA1	1/1/2018	I-131	pCi/m^3	<MDA	<MDA	**
Air Filter - A1	1/16/2018	Gross Beta	pCi/m^3	2.2 +/- 0.1	1.8 +/- 0.1	**
Air Filter - A2	1/16/2018	Gross Beta	pCi/m^3	2.5 +/- 0.2	1.2 +/- 0.1	**
Air Filter - A3	1/16/2018	Gross Beta	pCi/m^3	2.1 +/- 0.1	1.8 +/- 0.1	**
Air Filter - A4	1/16/2018	Gross Beta	pCi/m^3	1.9 +/- 0.1	1.8 +/- 0.1	**
Air Filter - A5	1/16/2018	Gross Beta	pCi/m^3	2.2 +/- 0.1	1.8 +/- 0.1	**
Air Filter - SFA1	1/16/2018	Gross Beta	pCi/m^3	2.1 +/- 0.1	1.6 +/- 0.1	**
Air Filter - SFA2	1/16/2018	Gross Beta	pCi/m^3	2.3 +/- 0.1	1.8 +/- 0.1	**
Air Filter - SFA3	1/16/2018	Gross Beta	pCi/m^3	2.2 +/- 0.1	1.7 +/- 0.1	**
Air Filter - SFA4	1/16/2018	Gross Beta	pCi/m^3	2.1 +/- 0.1	1.8 +/- 0.1	**
Air Iodine - A1	1/16/2018	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A2	1/16/2018	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A3	1/16/2018	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A4	1/16/2018	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A5	1/16/2018	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - SFA1	1/16/2018	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A1	2/6/2018	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A2	2/6/2018	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A3	2/6/2018	I-131	pCi/m^3	<MDA	<MDA	**
Air Filter - A1	2/20/2018	Gross Beta	pCi/m^3	2.1 +/- 0.1	2.1 +/- 0.1	**
Air Filter - A2	2/20/2018	Gross Beta	pCi/m^3	1.8 +/- 0.1	2.0 +/- 0.1	**
Air Filter - A3	2/20/2018	Gross Beta	pCi/m^3	2.1 +/- 0.1	2.2 +/- 0.1	**
Air Filter - A4	2/20/2018	Gross Beta	pCi/m^3	2.0 +/- 0.1	2.2 +/- 0.1	**
Air Filter - A5	2/20/2018	Gross Beta	pCi/m^3	2.1 +/- 0.1	2.2 +/- 0.1	**
Air Filter - SFA1	2/20/2018	Gross Beta	pCi/m^3	1.9 +/- 0.1	2.0 +/- 0.1	**
Air Filter - SFA2	2/20/2018	Gross Beta	pCi/m^3	1.7 +/- 0.1	1.8 +/- 0.1	**
Air Filter - SFA3	2/20/2018	Gross Beta	pCi/m^3	1.9 +/- 0.1	2.0 +/- 0.1	**
Air Filter - SFA4	2/20/2018	Gross Beta	pCi/m^3	1.9 +/- 0.1	1.9 +/- 0.1	**

TABLE C-2 - Continued

Results of Quality Assurance Program

Sample Type and Location [2]	Sample Date	Type of Analysis	Result[2] Units	Original Analysis	Replicate Analysis	Split Analysis
Air Filter - A1	3/5/2018	Gross Beta	pCi/m^3	2.5 +/- 0.1	2.5 +/- 0.2	**
Air Filter - A2	3/5/2018	Gross Beta	pCi/m^3	2.6 +/- 0.2	2.7 +/- 0.2	**
Air Filter - A3	3/5/2018	Gross Beta	pCi/m^3	2.9 +/- 0.2	2.9 +/- 0.2	**
Air Filter - A4	3/5/2018	Gross Beta	pCi/m^3	2.6 +/- 0.2	2.7 +/- 0.2	**
Air Filter - A5	3/5/2018	Gross Beta	pCi/m^3	2.6 +/- 0.1	2.6 +/- 0.2	**
Air Filter - SFA1	3/5/2018	Gross Beta	pCi/m^3	2.4 +/- 0.1	2.4 +/- 0.1	**
Air Filter - SFA2	3/5/2018	Gross Beta	pCi/m^3	2.5 +/- 0.1	2.6 +/- 0.1	**
Air Filter - SFA3	3/5/2018	Gross Beta	pCi/m^3	2.5 +/- 0.1	2.5 +/- 0.1	**
Air Filter - SFA4	3/5/2018	Gross Beta	pCi/m^3	2.3 +/- 0.1	2.4 +/- 0.1	**
Air Iodine - A1	3/13/2018	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A2	3/13/2018	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A3	3/13/2018	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A4	3/13/2018	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A5	3/13/2018	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - SFA1	3/13/2018	I-131	pCi/m^3	<MDA	<MDA	**
Air Filter - A1	4/3/2018	Gamma	pCi/m^3	<MDA	<MDA	<MDA
Air Filter - A2	4/3/2018	Gamma	pCi/m^3	<MDA	<MDA	<MDA
Air Filter - A3	4/3/2018	Gamma	pCi/m^3	<MDA	<MDA	<MDA
Air Filter - A4	4/3/2018	Gamma	pCi/m^3	<MDA	<MDA	<MDA
Air Filter - A5	4/3/2018	Gamma	pCi/m^3	<MDA	<MDA	<MDA
Air Filter - SFA1	4/3/2018	Gamma	pCi/m^3	<MDA	<MDA	<MDA
Air Filter - SFA2	4/3/2018	Gamma	pCi/m^3	<MDA	<MDA	<MDA
Air Filter - SFA3	4/3/2018	Gamma	pCi/m^3	<MDA	<MDA	<MDA
Air Filter - SFA4	4/3/2018	Gamma	pCi/m^3	<MDA	<MDA	<MDA
Air Filter - A1	4/9/2018	Gross Beta	pCi/m^3	2.0 +/- 0.1	2.0 +/- 0.1	**
Air Filter - A2	4/9/2018	Gross Beta	pCi/m^3	2.1 +/- 0.1	1.9 +/- 0.1	**
Air Filter - A3	4/9/2018	Gross Beta	pCi/m^3	1.9 +/- 0.1	2.0 +/- 0.1	**
Air Filter - A4	4/9/2018	Gross Beta	pCi/m^3	2.0 +/- 0.1	2.0 +/- 0.1	**
Air Filter - A5	4/9/2018	Gross Beta	pCi/m^3	2.1 +/- 0.1	2.1 +/- 0.1	**
Air Filter - SFA1	4/9/2018	Gross Beta	pCi/m^3	2.2 +/- 0.2	2.1 +/- 0.2	**
Air Filter - SFA2	4/9/2018	Gross Beta	pCi/m^3	2.2 +/- 0.1	2.0 +/- 0.1	**
Air Filter - SFA3	4/9/2018	Gross Beta	pCi/m^3	2.1 +/- 0.1	2.0 +/- 0.1	**
Air Filter - SFA4	4/9/2018	Gross Beta	pCi/m^3	1.9 +/- 0.1	1.9 +/- 0.1	**

TABLE C-2 - Continued

Results of Quality Assurance Program

Sample Type and Location [2]	Sample Date	Type of Analysis	Result[2] Units	Original Analysis	Replicate Analysis	Split Analysis
Air Iodine - A1	4/17/2018	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A2	4/17/2018	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A3	4/17/2018	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A4	4/17/2018	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A5	4/17/2018	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - SFA1	4/17/2018	I-131	pCi/m^3	<MDA	<MDA	**
Air Filter - A1	5/8/2018	Gross Beta	pCi/m^3	2.3 +/- 0.1	2.3 +/- 0.1	**
Air Filter - A2	5/8/2018	Gross Beta	pCi/m^3	2.1 +/- 0.1	2.1 +/- 0.1	**
Air Filter - A3	5/8/2018	Gross Beta	pCi/m^3	2.3 +/- 0.1	2.2 +/- 0.1	**
Air Filter - A4	5/8/2018	Gross Beta	pCi/m^3	2.2 +/- 0.1	2.1 +/- 0.1	**
Air Filter - A5	5/8/2018	Gross Beta	pCi/m^3	2.3 +/- 0.1	2.3 +/- 0.1	**
Air Filter - SFA1	5/8/2018	Gross Beta	pCi/m^3	2.5 +/- 0.1	2.5 +/- 0.1	**
Air Filter - SFA2	5/8/2018	Gross Beta	pCi/m^3	2.4 +/- 0.1	2.4 +/- 0.1	**
Air Filter - SFA3	5/8/2018	Gross Beta	pCi/m^3	2.3 +/- 0.1	2.3 +/- 0.1	**
Air Filter - SFA4	5/8/2018	Gross Beta	pCi/m^3	2.2 +/- 0.1	2.3 +/- 0.1	**
Air Iodine - A1	5/14/2018	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A2	5/14/2018	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A3	5/14/2018	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A4	5/14/2018	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A5	5/14/2018	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - SFA1	5/14/2018	I-131	pCi/m^3	<MDA	<MDA	**
Misc ground coverage - SFB1	5/29/2018	Gamma	pCi/kg	<MDA	<MDA	<MDA
Misc ground coverage - SFB3	5/29/2018	Gamma	pCi/kg	<MDA	<MDA	<MDA
Soil - SFS1	5/29/2018	Gamma	pCi/kg	<MDA	<MDA	<MDA
Soil - SFS3 [1]	5/29/2018	Cs-137	pCi/kg	77.8 +/- 35.3	**	106.0 +/- 53.6
Air Filter - A1	6/11/2018	Gross Beta	pCi/m^3	1.5 +/- 0.1	1.6 +/- 0.1	**
Air Filter - A2	6/11/2018	Gross Beta	pCi/m^3	1.4 +/- 0.1	1.4 +/- 0.1	**
Air Filter - A3	6/11/2018	Gross Beta	pCi/m^3	1.5 +/- 0.1	1.6 +/- 0.1	**
Air Filter - A4	6/11/2018	Gross Beta	pCi/m^3	1.4 +/- 0.1	1.4 +/- 0.1	**
Air Filter - A5	6/11/2018	Gross Beta	pCi/m^3	1.6 +/- 0.1	1.5 +/- 0.1	**

TABLE C-2 - Continued

Results of Quality Assurance Program

Sample Type and Location (2)	Sample Date	Type of Analysis	Result Units	Original Analysis	Replicate Analysis	Split Analysis
Air Filter - SFA1	6/11/2018	Gross Beta	pCi/m^3	1.4 +/- 0.1	1.5 +/- 0.1	**
Air Filter - SFA2	6/11/2018	Gross Beta	pCi/m^3	1.5 +/- 0.1	1.4 +/- 0.1	**
Air Filter - SFA3	6/11/2018	Gross Beta	pCi/m^3	1.4 +/- 0.1	0.5 +/- 0.1	**
Air Filter - SFA4	6/11/2018	Gross Beta	pCi/m^3	1.5 +/- 0.1	1.5 +/- 0.1	**
Bottom sediment - WBS2	6/13/2018	Gamma	pCi/kg	<MDA	<MDA	<MDA
Bottom sediment - WBS4	6/13/2018	Gamma	pCi/kg	<MDA	<MDA	<MDA
Cabbage - IB11	6/19/2018	Gamma	pCi/kg	<MDA	<MDA	<MDA
Cabbage - IB5	6/19/2018	Gamma	pCi/kg	<MDA	<MDA	<MDA
Cabbage - IB8	6/19/2018	Gamma	pCi/kg	<MDA	<MDA	<MDA
Bay Water - WA1	6/29/2018	Gamma	pCi/L	<MDA	<MDA	<MDA
Bay Water - WA2	6/29/2018	Gamma	pCi/L	<MDA	<MDA	<MDA
Air Filter - A1	7/3/2018	Gamma	pCi/m^3	<MDA	<MDA	<MDA
Air Filter - A2	7/3/2018	Gamma	pCi/m^3	<MDA	<MDA	<MDA
Air Filter - A3	7/3/2018	Gamma	pCi/m^3	<MDA	<MDA	<MDA
Air Filter - A4	7/3/2018	Gamma	pCi/m^3	<MDA	<MDA	<MDA
Air Filter - A5	7/3/2018	Gamma	pCi/m^3	<MDA	<MDA	<MDA
Air Filter - SFA1	7/3/2018	Gamma	pCi/m^3	<MDA	<MDA	<MDA
Air Filter - SFA2	7/3/2018	Gamma	pCi/m^3	<MDA	<MDA	<MDA
Air Filter - SFA3	7/3/2018	Gamma	pCi/m^3	<MDA	<MDA	<MDA
Air Filter - SFA4	7/3/2018	Gamma	pCi/m^3	<MDA	<MDA	<MDA
Air Iodine - A1	7/3/2018	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A2	7/3/2018	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A3	7/3/2018	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A4	7/3/2018	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A5	7/3/2018	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - SFA1	7/3/2018	I-131	pCi/m^3	<MDA	<MDA	**
Air Filter - A1	7/9/2018	Gross Beta	pCi/m^3	1.5 +/- 0.1	1.5 +/- 0.1	**
Air Filter - A2	7/9/2018	Gross Beta	pCi/m^3	1.5 +/- 0.1	1.4 +/- 0.1	**
Air Filter - A3	7/9/2018	Gross Beta	pCi/m^3	1.5 +/- 0.1	1.5 +/- 0.1	**
Air Filter - A4	7/9/2018	Gross Beta	pCi/m^3	1.3 +/- 0.1	1.3 +/- 0.1	**
Air Filter - A5	7/9/2018	Gross Beta	pCi/m^3	1.5 +/- 0.1	1.5 +/- 0.1	**

TABLE C-2 - Continued

Results of Quality Assurance Program

Sample Type and Location (2)	Sample Date	Type of Analysis	Result Units	Original Analysis	Replicate Analysis	Split Analysis
Air Filter - SFA1	7/9/2018	Gross Beta	pCi/m^3	1.3 +/- 0.1	1.3 +/- 0.1	**
Air Filter - SFA2	7/9/2018	Gross Beta	pCi/m^3	1.6 +/- 0.1	1.6 +/- 0.1	**
Air Filter - SFA3	7/9/2018	Gross Beta	pCi/m^3	1.3 +/- 0.1	1.4 +/- 0.1	**
Air Filter - SFA4	7/9/2018	Gross Beta	pCi/m^3	1.2 +/- 0.1	1.4 +/- 0.1	**
Cabbage - IB12	7/17/2018	Gamma	pCi/kg	<MDA	<MDA	<MDA
Cabbage - IB4	7/17/2018	Gamma	pCi/kg	<MDA	<MDA	<MDA
Kale - IB10	7/17/2018	Gamma	pCi/kg	<MDA	<MDA	<MDA
Air Iodine - A1	7/30/2018	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A2	7/30/2018	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A3	7/30/2018	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A4	7/30/2018	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A5	7/30/2018	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - SFA1	7/30/2018	I-131	pCi/m^3	<MDA	<MDA	**
Air Filter - A1	8/6/2018	Gross Beta	pCi/m^3	1.4 +/- 0.1	1.3 +/- 0.1	**
Air Filter - A2	8/6/2018	Gross Beta	pCi/m^3	1.3 +/- 0.1	1.3 +/- 0.1	**
Air Filter - A3	8/6/2018	Gross Beta	pCi/m^3	1.2 +/- 0.1	1.3 +/- 0.1	**
Air Filter - A4	8/6/2018	Gross Beta	pCi/m^3	1.2 +/- 0.1	1.1 +/- 0.1	**
Air Filter - A5	8/6/2018	Gross Beta	pCi/m^3	1.4 +/- 0.1	1.2 +/- 0.1	**
Air Filter - SFA1	8/6/2018	Gross Beta	pCi/m^3	1.3 +/- 0.1	1.2 +/- 0.1	**
Air Filter - SFA2	8/6/2018	Gross Beta	pCi/m^3	1.3 +/- 0.1	1.3 +/- 0.1	**
Air Filter - SFA3	8/6/2018	Gross Beta	pCi/m^3	1.3 +/- 0.1	1.3 +/- 0.1	**
Air Filter - SFA4	8/6/2018	Gross Beta	pCi/m^3	1.3 +/- 0.1	1.2 +/- 0.1	**
Oysters - IA3	8/15/2018	Gamma	pCi/kg	<MDA	<MDA	<MDA
Oysters - IA6	8/15/2018	Gamma	pCi/kg	<MDA	<MDA	<MDA
Perch - IA4	8/15/2018	Gamma	pCi/kg	<MDA	<MDA	<MDA
Striped bass - IA5	8/15/2018	Gamma	pCi/kg	<MDA	<MDA	<MDA
Air Iodine - A1	8/27/2018	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A2	8/27/2018	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A3	8/27/2018	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A4	8/27/2018	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A5	8/27/2018	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - SFA1	8/27/2018	I-131	pCi/m^3	<MDA	<MDA	**

TABLE C-2 - Continued

Results of Quality Assurance Program

Sample Type and Location [2]	Sample Date	Type of Analysis	Result Units	Original Analysis	Replicate Analysis	Split Analysis
Air Filter - A1	9/11/2018	Gross Beta	pCi/m^3	2.5 +/- 0.2	2.4 +/- 0.2	**
Air Filter - A2	9/11/2018	Gross Beta	pCi/m^3	1.6 +/- 0.1	1.5 +/- 0.1	**
Air Filter - A3	9/11/2018	Gross Beta	pCi/m^3	1.7 +/- 0.1	1.6 +/- 0.1	**
Air Filter - A4	9/11/2018	Gross Beta	pCi/m^3	1.4 +/- 0.1	1.4 +/- 0.1	**
Air Filter - A5	9/11/2018	Gross Beta	pCi/m^3	1.4 +/- 0.1	1.4 +/- 0.1	**
Air Filter - SFA1	9/11/2018	Gross Beta	pCi/m^3	1.5 +/- 0.1	1.4 +/- 0.1	**
Air Filter - SFA2	9/11/2018	Gross Beta	pCi/m^3	1.7 +/- 0.1	1.6 +/- 0.1	**
Air Filter - SFA3	9/11/2018	Gross Beta	pCi/m^3	1.4 +/- 0.1	1.4 +/- 0.1	**
Air Filter - SFA4	9/11/2018	Gross Beta	pCi/m^3	1.4 +/- 0.1	1.4 +/- 0.1	**
Oysters - IA3	10/3/2018	Gamma	pCi/kg	<MDA	<MDA	<MDA
Oysters - IA6	10/3/2018	Gamma	pCi/kg	<MDA	<MDA	<MDA
Air Filter - A1	10/8/2018	Gross Beta	pCi/m^3	2.9 +/- 0.1	2.8 +/- 0.1	**
Air Filter - A2	10/8/2018	Gross Beta	pCi/m^3	2.8 +/- 0.1	2.6 +/- 0.1	**
Air Filter - A3	10/8/2018	Gross Beta	pCi/m^3	3.0 +/- 0.1	2.9 +/- 0.1	**
Air Filter - A4	10/8/2018	Gross Beta	pCi/m^3	2.6 +/- 0.1	2.6 +/- 0.1	**
Air Filter - A5	10/8/2018	Gross Beta	pCi/m^3	2.9 +/- 0.1	2.9 +/- 0.1	**
Air Filter - SFA1	10/8/2018	Gross Beta	pCi/m^3	2.6 +/- 0.1	2.4 +/- 0.1	**
Air Filter - SFA2	10/8/2018	Gross Beta	pCi/m^3	2.7 +/- 0.1	2.6 +/- 0.1	**
Air Filter - SFA3	10/8/2018	Gross Beta	pCi/m^3	2.6 +/- 0.1	2.5 +/- 0.1	**
Air Filter - SFA4	10/8/2018	Gross Beta	pCi/m^3	2.6 +/- 0.1	2.5 +/- 0.1	**
Shoreline sediment - WB1	10/11/2018	Gamma	pCi/kg	<MDA	<MDA	<MDA
Air Filter - A1	11/5/2018	Gross Beta	pCi/m^3	1.7 +/- 0.1	1.5 +/- 0.1	**
Air Filter - A2	11/5/2018	Gross Beta	pCi/m^3	1.6 +/- 0.1	1.5 +/- 0.1	**
Air Filter - A3	11/5/2018	Gross Beta	pCi/m^3	1.7 +/- 0.1	1.6 +/- 0.1	**
Air Filter - A4	11/5/2018	Gross Beta	pCi/m^3	1.5 +/- 0.1	1.5 +/- 0.1	**
Air Filter - A5	11/5/2018	Gross Beta	pCi/m^3	1.6 +/- 0.1	1.5 +/- 0.1	**
Air Filter - SFA1	11/5/2018	Gross Beta	pCi/m^3	1.5 +/- 0.1	1.5 +/- 0.1	**
Air Filter - SFA2	11/5/2018	Gross Beta	pCi/m^3	1.7 +/- 0.1	1.6 +/- 0.1	**
Air Filter - SFA3	11/5/2018	Gross Beta	pCi/m^3	1.5 +/- 0.1	1.6 +/- 0.1	**
Air Filter - SFA4	11/5/2018	Gross Beta	pCi/m^3	1.7 +/- 0.1	1.7 +/- 0.1	**

TABLE C-2 - Continued

Results of Quality Assurance Program

Sample Type and Location [2]	Sample Date	Type of Analysis	Result Units	Original Analysis	Replicate Analysis	Split Analysis
Air Iodine - A1	11/12/2018	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A1	11/12/2018	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A2	11/12/2018	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A2	11/12/2018	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A3	11/12/2018	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A3	11/12/2018	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A4	11/12/2018	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A4	11/12/2018	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A5	11/12/2018	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A5	11/12/2018	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - SFA1	11/12/2018	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - SFA1	11/12/2018	I-131	pCi/m^3	<MDA	<MDA	**
Bay Water - WA1	11/29/2018	Gamma	pCi/L	<MDA	<MDA	**
Bay Water - WA2	11/29/2018	Gamma	pCi/L	<MDA	<MDA	<MDA
Air Filter - A1	12/10/2018	Gross Beta	pCi/m^3	1.7 +/- 0.1	1.8 +/- 0.1	**
Air Filter - A2	12/10/2018	Gross Beta	pCi/m^3	1.7 +/- 0.1	1.6 +/- 0.1	**
Air Filter - A3	12/10/2018	Gross Beta	pCi/m^3	1.8 +/- 0.1	1.6 +/- 0.1	**
Air Filter - A4	12/10/2018	Gross Beta	pCi/m^3	1.7 +/- 0.1	1.7 +/- 0.1	**
Air Filter - A5	12/10/2018	Gross Beta	pCi/m^3	1.7 +/- 0.1	1.7 +/- 0.1	**
Air Filter - SFA1	12/10/2018	Gross Beta	pCi/m^3	1.6 +/- 0.1	1.6 +/- 0.1	**
Air Filter - SFA2	12/10/2018	Gross Beta	pCi/m^3	1.8 +/- 0.1	1.7 +/- 0.1	**
Air Filter - SFA3	12/10/2018	Gross Beta	pCi/m^3	1.7 +/- 0.1	1.7 +/- 0.1	**
Air Filter - SFA4	12/10/2018	Gross Beta	pCi/m^3	1.6 +/- 0.1	1.5 +/- 0.1	**

[1] See discussion at the beginning of the Appendix.

[2] Results reported for Air samples I-131 and Beta are in 10^{-2} pCi/m3. All Vegetation and Soil, Oysters and Fish are in pCi/Kg. All water and milk are in pCi/L, TLD are in mR/90 Day

** The nature of these samples precluded splitting them with an independent laboratory.

Table C-3

Teledyne Brown Engineering's Typical MDAs for Gamma Spectrometry

Selected Nuclides	Bay Water pCi/l	Fish pCi/kg	Shellfish pCi/kg	Sediment pCi/kg	Vegetation pCi/kg	Particulates 10^{-3}pCi/m^3
H-3	175	--	--	--	--	--
Na-22	1	8	3	12	6	5
Cr-51	12	105	4	104	50	63
Mn-54	1	9	3	12	5	4
Co-58	1	9	4	9	4	5
Fe-59	3	28	9	24	10	12
Co-60	1	9	4	12	5	6
Zn-65	2	20	8	25	10	9
Nb-95	1	12	7	14	6	9
Zr-95	2	18	8	20	9	9
Ru-106	9	75	30	90	41	40
Ag-110m	1	10	10	10	5	4
Te-129m	16	131	60	162	79	95
I-131	4	65	30	35	22	74
Cs-134	1	8	4	10	5	4
Cs-137	1	9	4	10	5	4
BaLa-140	3	32	15	25	14	36
Ce-144	7	40	16	54	26	18

APPENDIX D

Land Use Survey

Summary of Appendix D Content:

Appendix D contains the results of a Land Use Survey conducted around R.E. Ginna Nuclear Power Plant during this operating period. A discussion of the results is included in Section 3.4 of this report.

TABLE OF CONTENTS - LAND USE SURVEY

TABLE D-1

Land Use Survey Distances

Sector (Direction in Degrees)	Distance to Nearest Residence	Distance to Nearest Garden (Latitude N, Longitude W)	Distance to Milk Producing Animals (Latitude N, Longitude W)
E (94)	1170 m	610 m Onsite Supplemental Garden (43.27727, 77.30140)	N/A
ESE (111)	1660 m	430 m Onsite Garden (43.27627, 77.30389)	N/A
ESE (119)	840 m	N/A	8240 m (43.24196, 77.21978)
SSE (145)	610 m	660 m Onsite Supplemental Garden (43.27278, 77.30413)	N/A
S	1500 m	N/A	N/A
SSW	620 m	N/A	N/A
SW	740 m	N/A	N/A
WSW	1470 m	N/A	N/A
W	2420 m	N/A	N/A

Discussion

A Land Use Survey was conducted to identify, within five miles, the location of the nearest milk animal, the nearest residence, and the nearest garden greater than 500 square feet in each of the nine sectors over land. A detailed description of the Land Use Survey is given in a separate attachment. The position of the nearest residence and garden and animals producing milk for human consumption in each sector out to five miles is given in the above Table D-1.

Changes from Previous Years:

- The nearest residence remains in the SSE sector, approximately 610 meters from the reactor.
- Single-family home / senior housing subdivision / development construction was observed near the plant on LaFrank Drive (Ontario), and South of Route 104 near Tops Plaza (Ontario).
- Lake Front Estates and Summer Lake subdivisions continue to expand along with the southeast corner of Lake Road and Slocum Road.
- Other single-family home construction was observed sporadically within 5-miles of the plant.
- A new 120-acre commercial hydroponic farm continues construction on the east-end of Timothy Lane (North of Route 104). During 2018, the facility did not become operational.
- 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 5-miles of Ginna.
- No new agricultural land use was identified.
- No new food producing facilities were identified as the commercial hydroponic farm is not currently growing produce.
- No new milk producing animals were identified.

Milk Animal Locations

- Schultz Farm – 450 Boston Road, Ontario NY
- Field Craft Farm (supplemental sample) – 6747 Salmon Creek Road, Williamson NY
- No new milk producing animals were identified in the 2018 survey.

APPENDIX E

Interpretations and Graphical Representations

Summary of Appendix E Content:

To better illustrate that the continued operation of the R.E. Ginna Nuclear Power Plant (Ginna) has no statistically significant impact on the surrounding environment, Appendix E contains the results of the last seven years of Radiological Environment Monitoring Program (REMP) data. Where applicable (when analytical results produced a measured numerical value), trends have been produced to show values that have been observed in the various environs surrounding Ginna. A discussion of these results will accompany each series of trends to enhance understanding of the REMP program.

TABLE OF CONTENTS – INTERPRETATIONS AND GRAPHICAL REPRESENTATIONS

E-Series 1

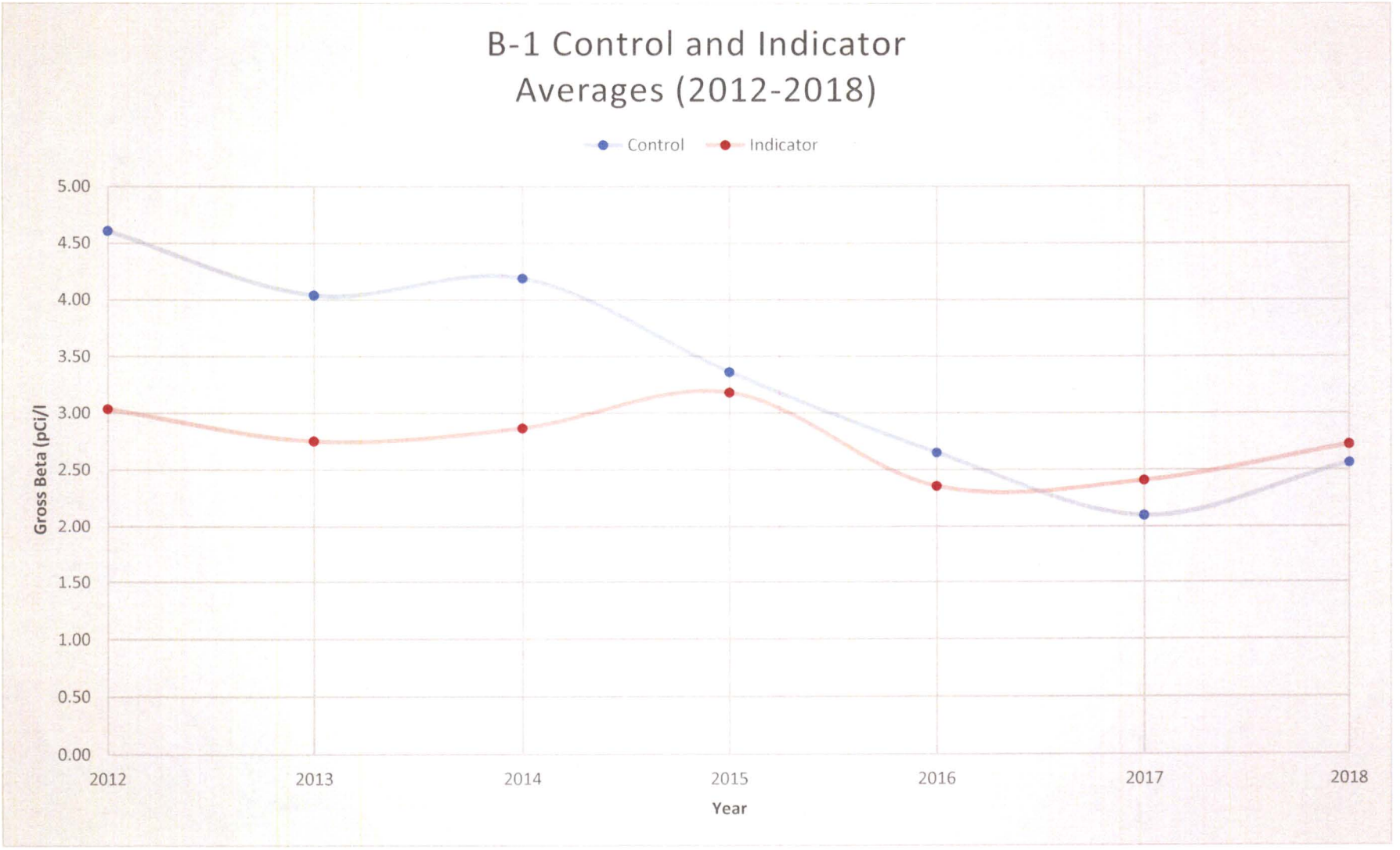
Table B-1 (Gross Beta Values for Surface and Drinking Water)

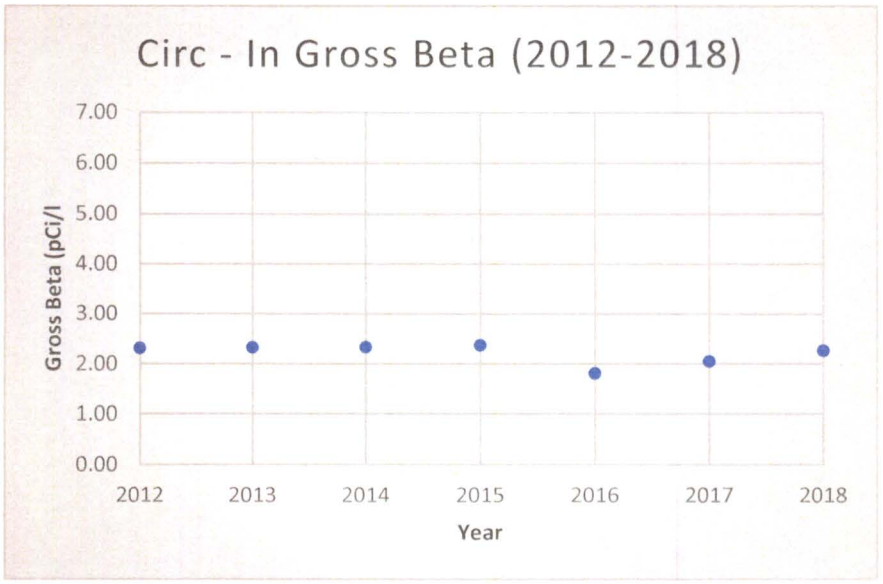
Ginna's Offsite Dose Calculation Manual (ODCM) is written in accordance with specifications contained within 10 CFR 20 and the Branch Technical Position document published by the NRC in 1979. This document specifies Gross Beta in Surface Water samples to be detected to a Lower Limit of Detection (LLD) of 4 pCi/l. Since that time, detection capabilities have improved which allow values to be measured lower than the required 4 pCi/l.

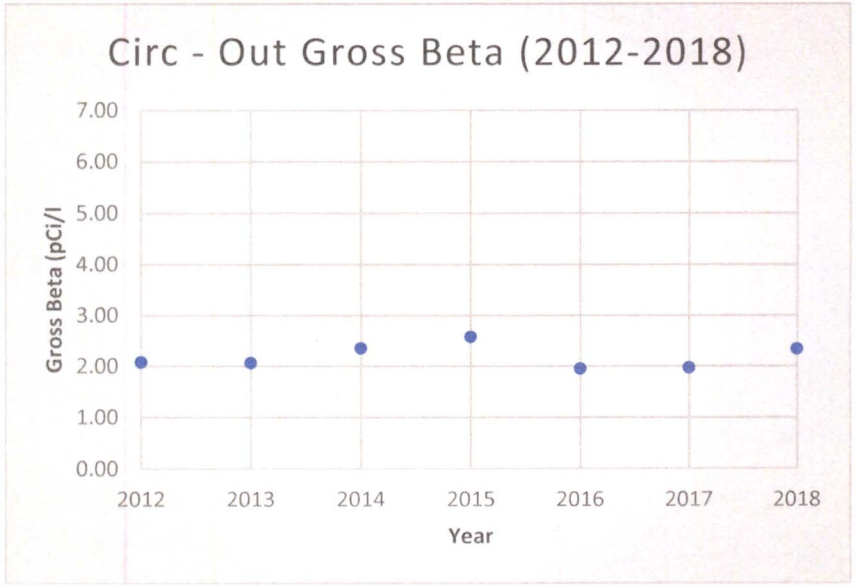
The trends below include the Gross Beta averages (from 2012-2018) for Ginna's surface water samples (Circ – In, Circ – Out, MCWA, Deer Creek, Mill Creek, OWD, and Webster). An elevated Gross Beta result inconsistent with the trend would indicate radionuclides in the sample which would require further analysis. From 2012 through 2018, no such results have been received from Ginna's REMP program.

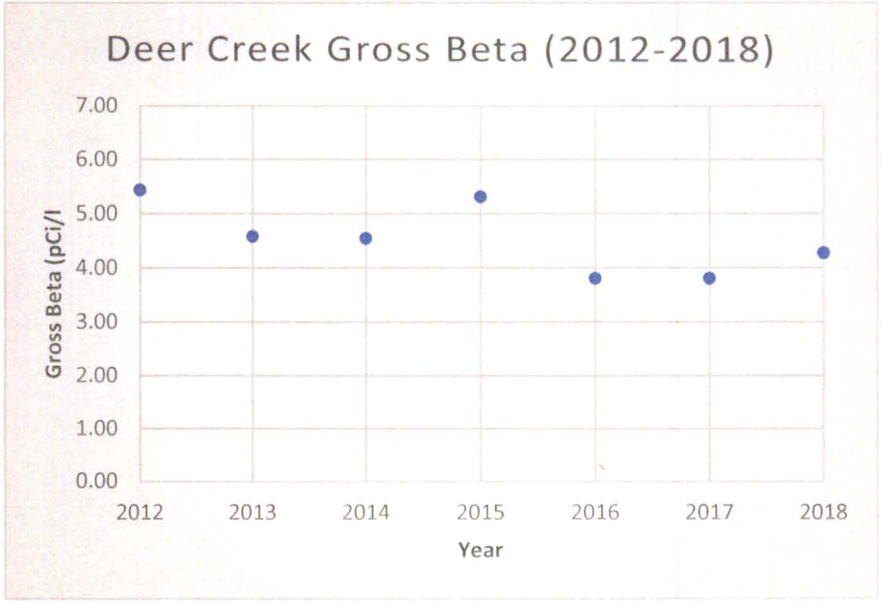
Results from Deer Creek (indicator) and Mill Creek (control) are higher than other surface water samples within the REMP program due to naturally occurring radiological daughter products within the soil being introduced into the samples. It is worth noting that these naturally occurring radiological daughter products would exist in this environ at these same levels even if Ginna had never been built. These samples are obtained to evaluate the potential for public exposure due to the surface water (Mill Creek, Circ-In, Circ-Out, and Deer Creek) and drinking water pathway (Monroe County Water Authority, Webster Water, and Ontario Water District). These locations are chosen as a member of the public is most likely to encounter water which has left Ginna property via these sample streams.

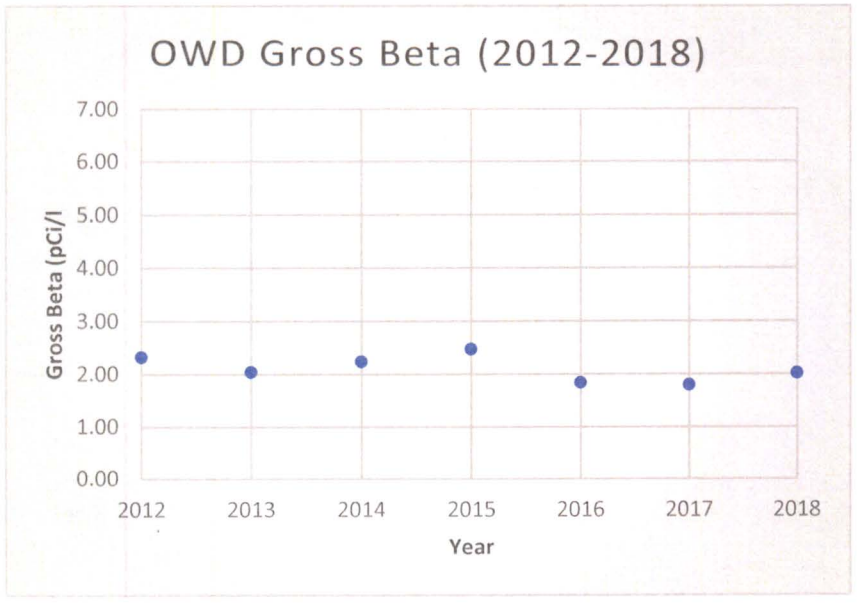
Trend "B-1 Control and Indicator Averages (2012-2018) shows the relationship between the control samples (Mill Creek, MCWA, and Webster Water) and the indicator samples (Circ-In, Circ-Out, Deer Creek, and OWD). This trend illustrates that there is no statistically significant difference between control and indicator samples for Gross Beta in Surface water from 2012-2018.

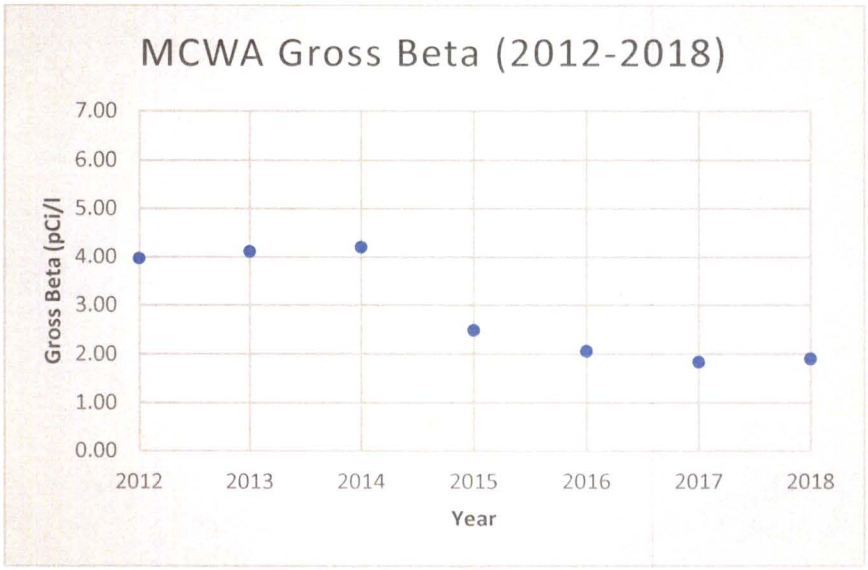

B-1 Control and Indicator Averages (2012-2018)
Control
Indicator
5.00
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
Gross Beta (pCi/l
2012
2013
2014
2015
2016
2017
2018
Year

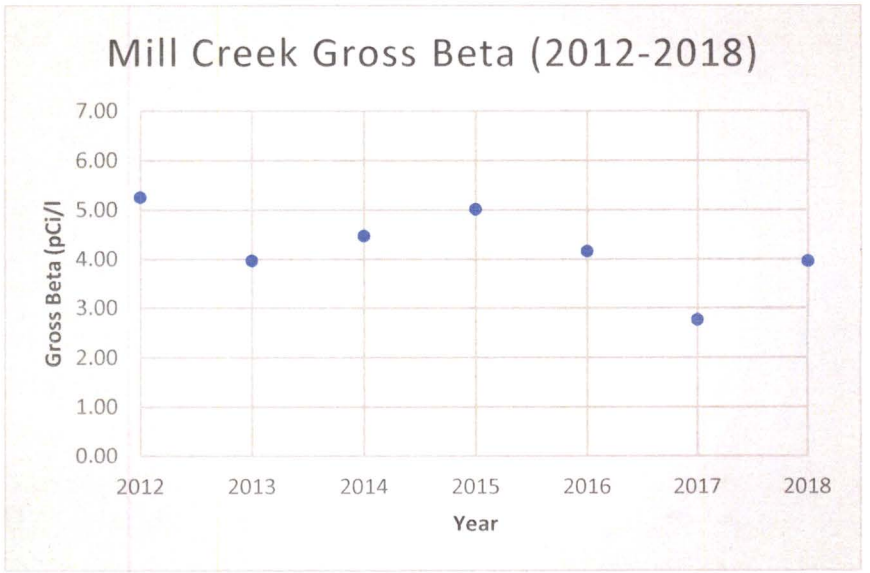

Circ - In Gross Beta (2012-2018)
Gross Beta (pCi/l
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
2012
2013
2014
2015
2016
2017
2018
Year

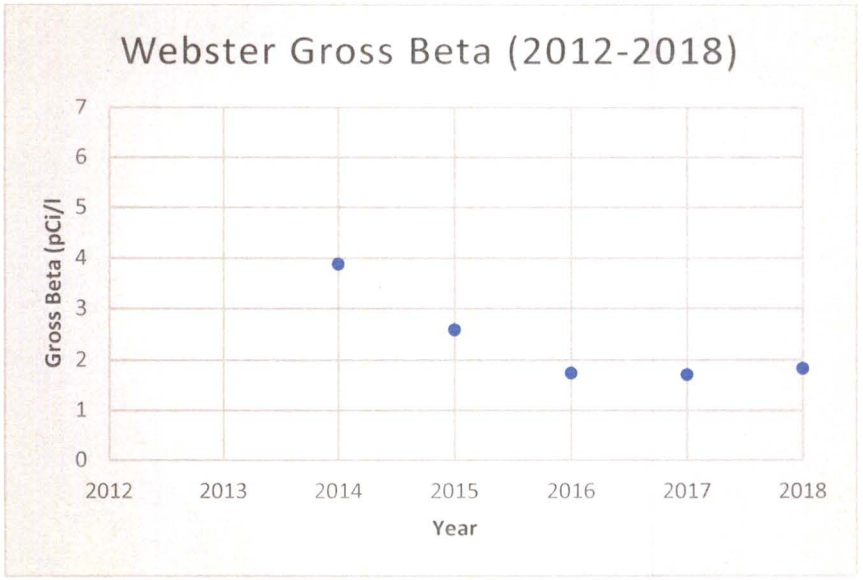

Circ - Out Gross Beta (2012-2018)
Gross Beta (pCi/l
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
2012
2013
2014
2015
2016
2017
2018
Year


Deer Creek Gross Beta (2012-2018)
Gross Beta (pCi/l
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
2012
2013
2014
2015
2016
2017
2018
Year


OWD Gross Beta (2012-2018)
Gross Beta (pCi/l
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
2012
2013
2014
2015
2016
2017
2018
Year


MCWA Gross Beta (2012-2018)
Gross Beta (pCi/l
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
2012
2013
2014
2015
2016
2017
2018
Year


Mill Creek Gross Beta (2012-2018)
Gross Beta (pCi/l
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
2012
2013
2014
2015
2016
2017
2018
Year


Webster Gross Beta (2012-2018)
Gross Beta (pCi/l
7
6
5
4
3
2
1
0
2012
2013
2014
2015
2016
2017
2018
Year

E-Series 2

Table B-5 / Table B-6 (Beta in Air Particulates)

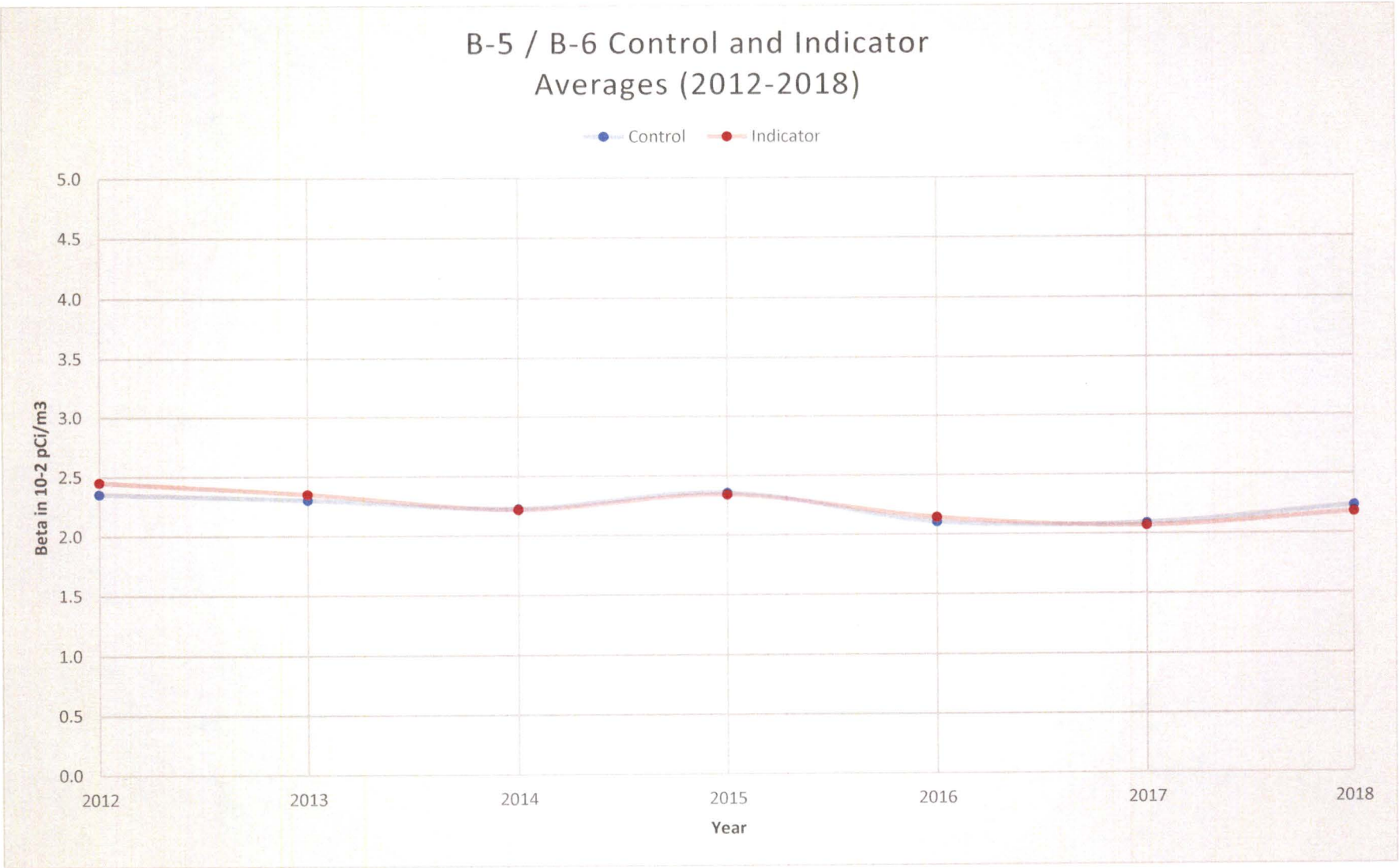
Ginna's Offsite Dose Calculation Manual (ODCM) is written in accordance with specifications contained within 10 CFR 20 and the Branch Technical Position document published by the NRC in 1979. This document specifies Gross Beta in Air Particulate samples to be detected to a Lower Limit of Detection (LLD) of 1.0 X 10^{-2} pCi/m^3. Accordingly, analyses performed as part of the REMP at Ginna satisfy this requirement.

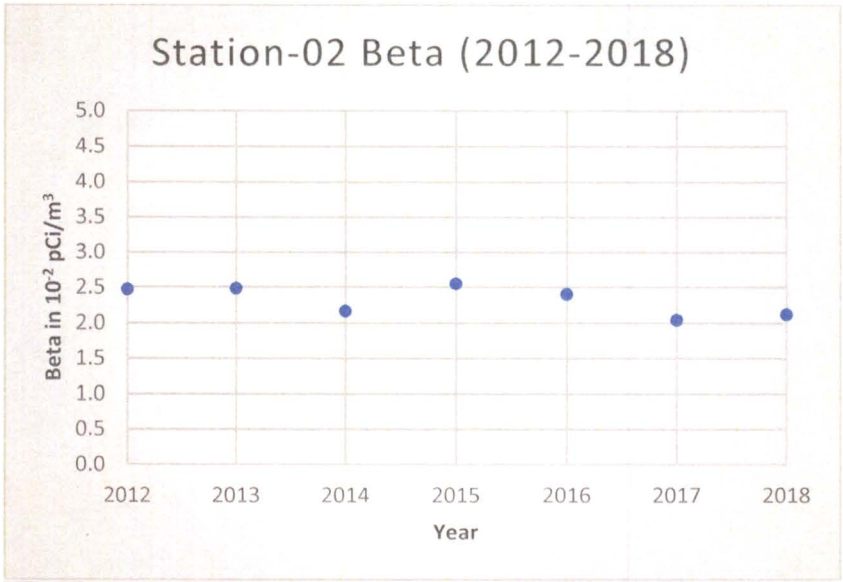
The trends below include the Gross Beta averages (from 2012-2018) for Ginna's air particulate samples (Station-02 through Station-13). An elevated Gross Beta result inconsistent with the trend would indicate radionuclides in the sample which would require further analysis. From 2012 through 2018, no such results have been received from Ginna's REMP program.

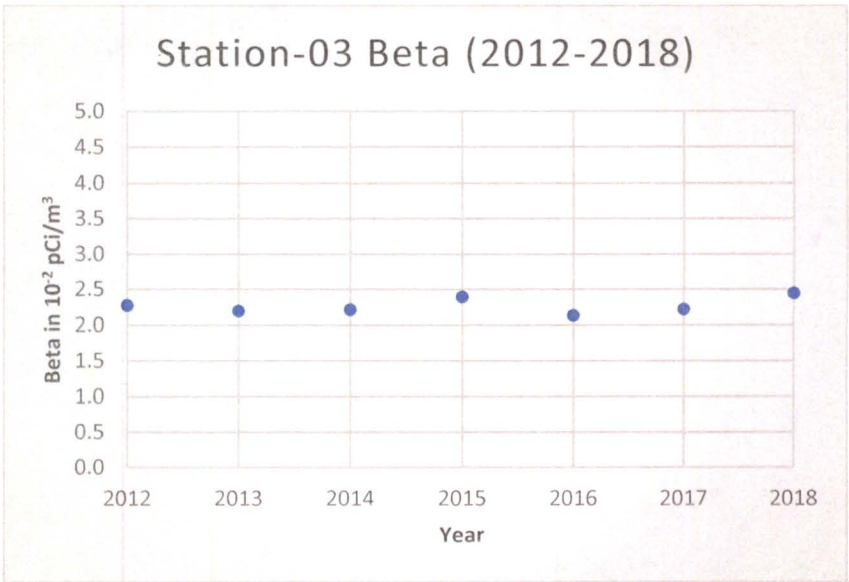
Sampling locations (Station-02 through Station-13) are noted below, and their classification as either a control or an indicator. These locations were selected to show areas where breathable air, which has the potential to be in communication with air released from Ginna, could lead to public exposure. Some locations (such as Station-08, Seabreeze and Station-12, Sodus Point) are sampled due to recreational activities in the area and their associated sensitivity.

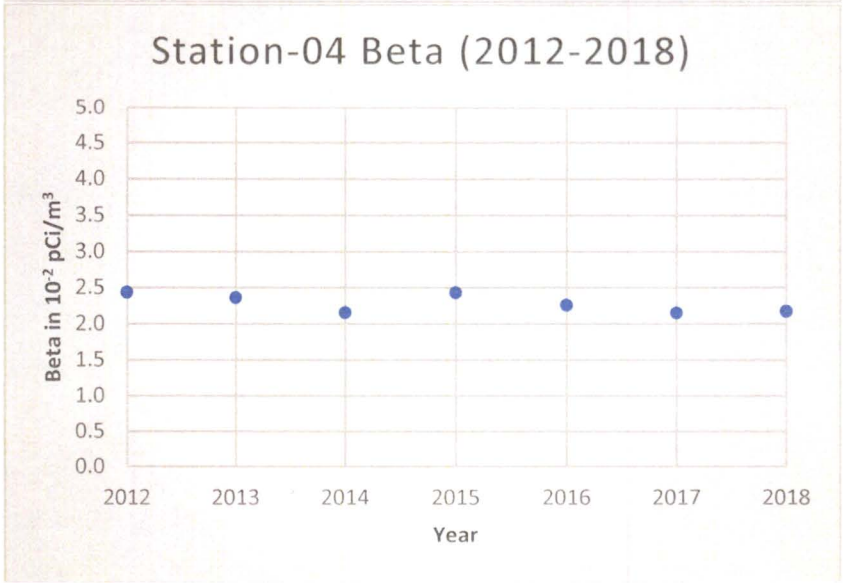
Station-02 – Manor House Yard, Ginna Property (Indicator)
Station-03 – North of Training Center Parking Lot, Ginna Property (Indicator)
Station-04 – East of Training Center Parking Lot, Ginna Property (Indicator)
Station-05 – Bridge Near Deer Creek, Ginna Property (Indicator)
Station-06 – Southwest of Plant Parking Lot, Ginna Property (Indicator)
Station-07 – Utility Pole West of Parking Lot, Ginna Property (Indicator)
Station-08 – Seabreeze (Control)
Station-09 – Webster (Indicator)
Station-10 – Walworth (Control)
Station-11 – Williamson (Indicator)
Station-12 – Sodus Point (Control)
Station-13 – Substation 13 (Indicator)

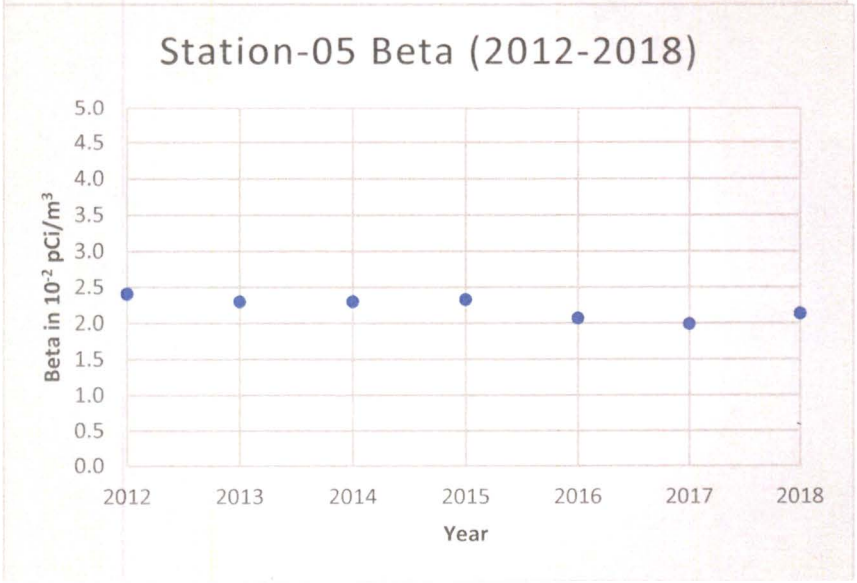
Trend "B-5 / B-6 Control and Indicator Averages (2012 – 2018) shows the relationship between the control samples (Station-08, Station-10, and Station-12) and the indicator samples (Station-02, Station-03, Station-04, Station-05, Station-06, Station-07, Station-09, and Station-11). This trend illustrates that there is no statistically significant difference between control and indicator samples for Gross Beta in Air Particulates from 2012-2018.

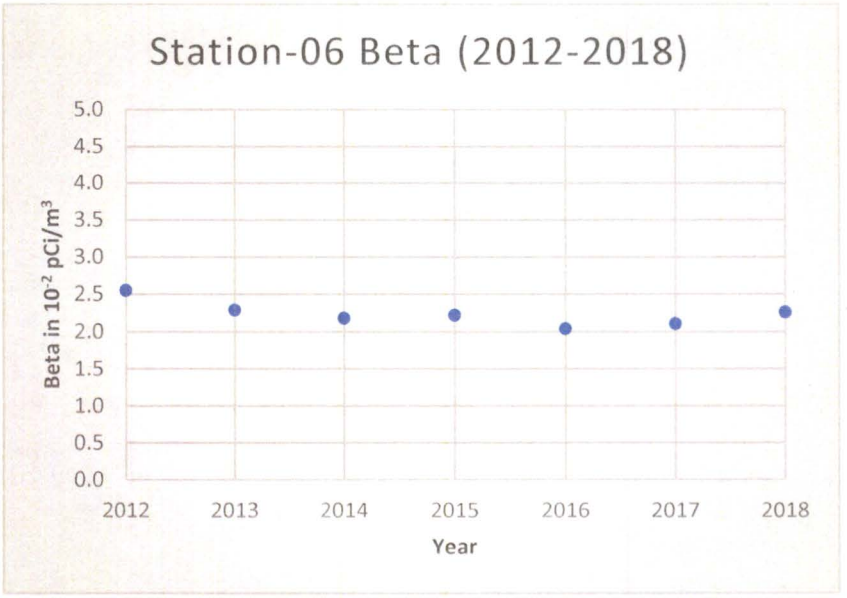

B-5 / B-6 Control and Indicator Averages (2012-2018)
Control
Indicator
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Beta in 10-2 pCi/m3
2012
2013
2014
2015
2016
2017
2018
Year

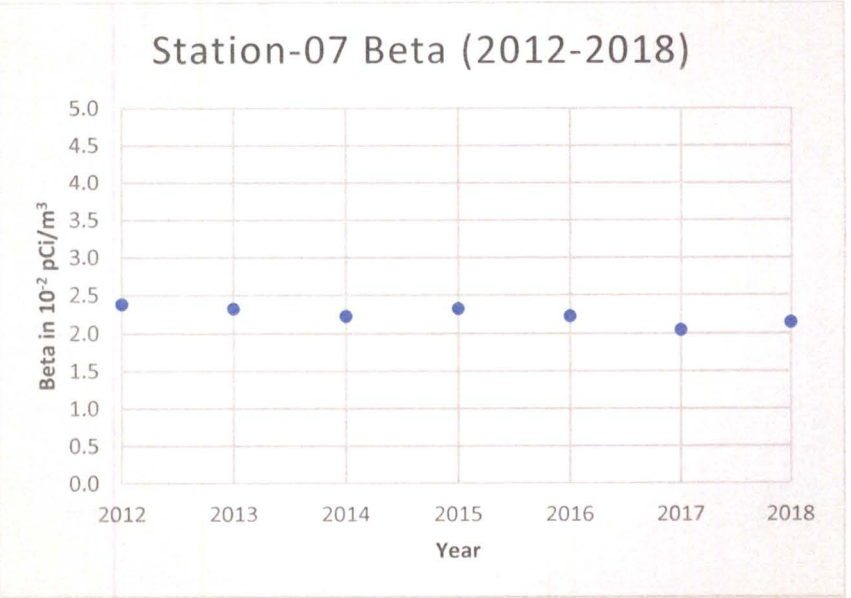

Station-02 Beta (2012-2018)
Beta in 10-2 pCi/m3
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
2012
2013
2014
2015
2016
2017
2018
Year

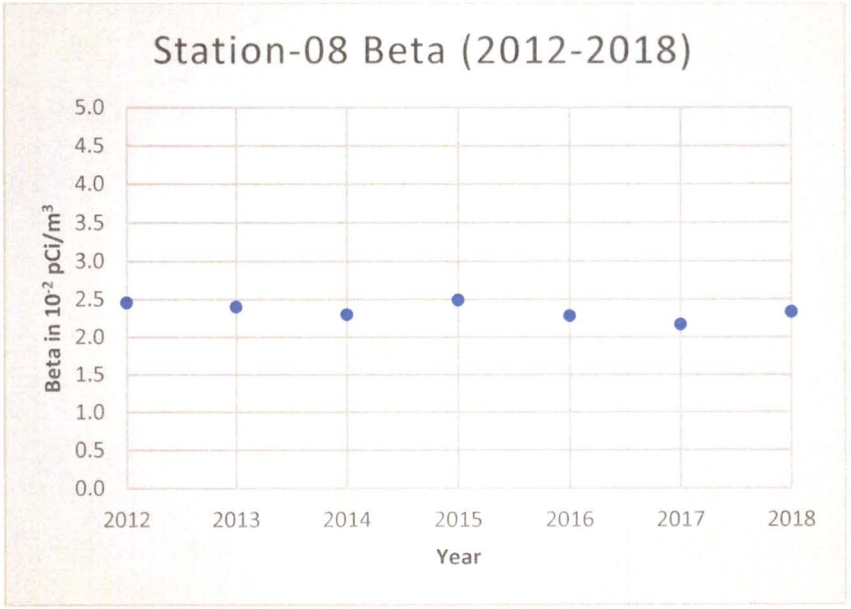

Station-03 Beta (2012-2018)
Beta in 10-2 pCi/m3
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
2012
2013
2014
2015
2016
2017
2018
Year

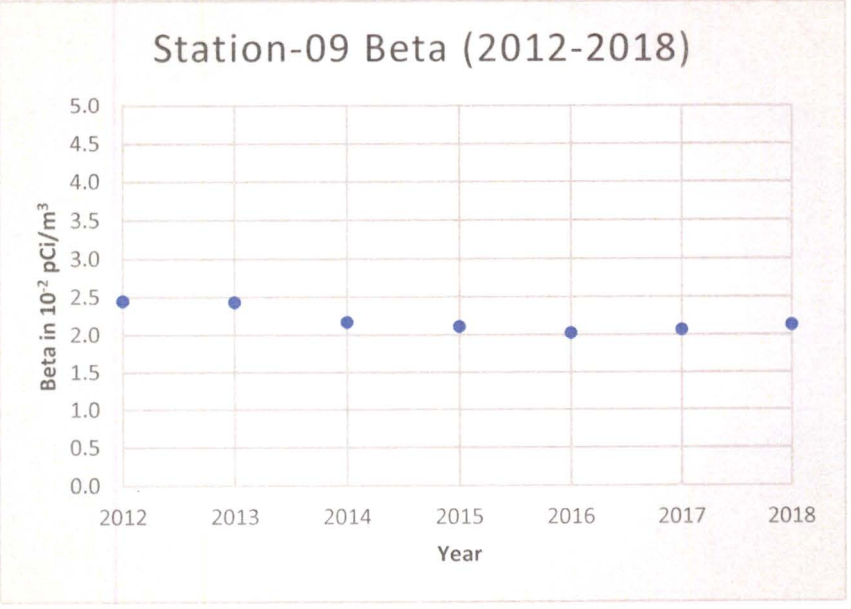

Station-04 Beta (2012-2018)
Beta in 10-2 pCi/m3
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
2012
2013
2014
2015
2016
2017
2018
Year

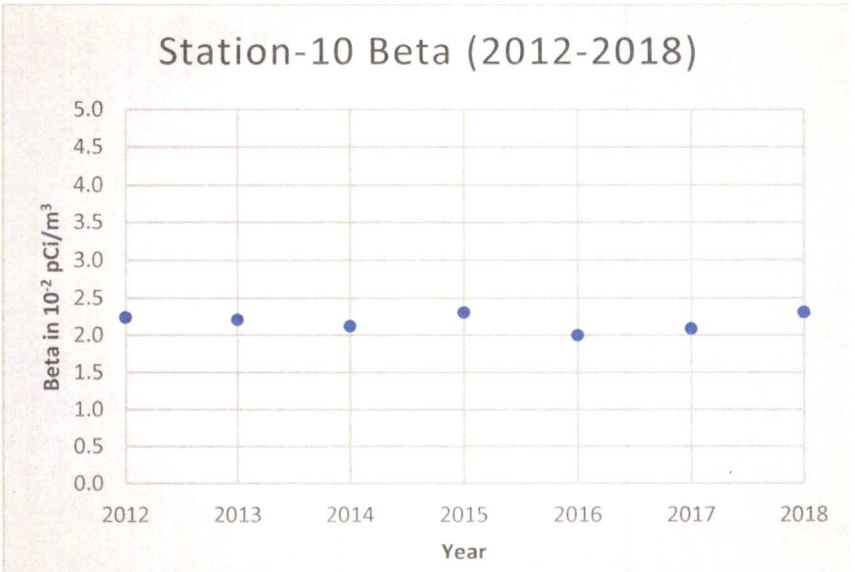

Station-05 Beta (2012-2018)
Beta in 10-2 pCi/m3
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
2012
2013
2014
2015
2016
2017
2018
Year

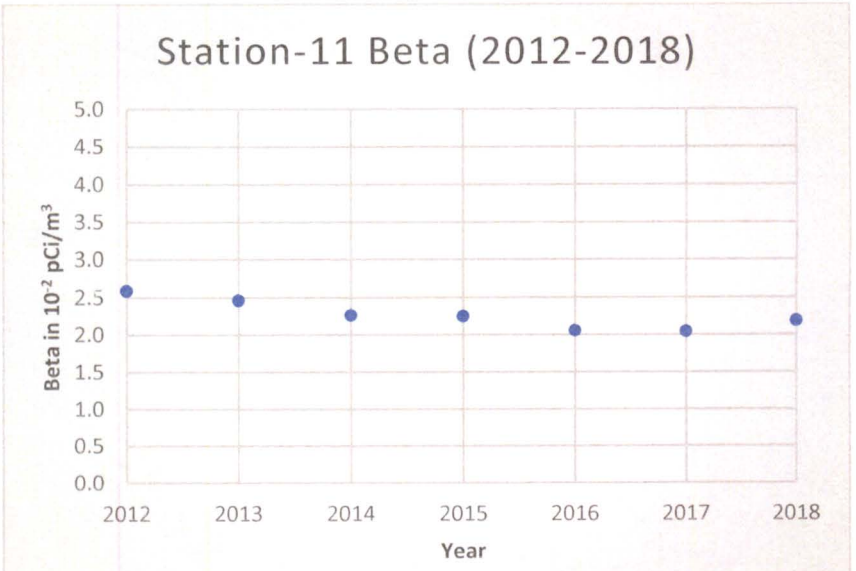

Station-06 Beta (2012-2018)
Beta in 10^{-2} pCi/m^3
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
2012
2013
2014
2015
2016
2017
2018
Year

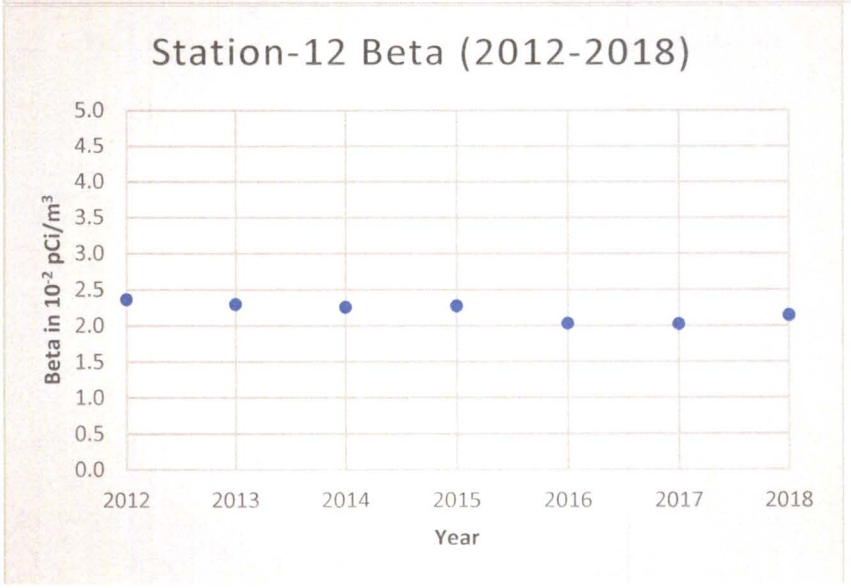

Station-07 Beta (2012-2018)
Beta in 10^{-2} pCi/m^3
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
2012
2013
2014
2015
2016
2017
2018
Year

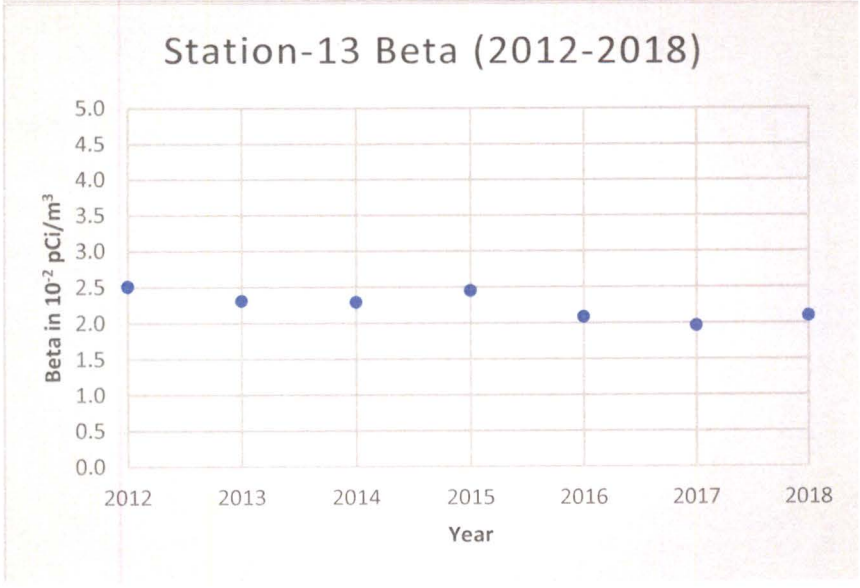

Station-08 Beta (2012-2018)
Beta in 10^{-2} pCi/m^3
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
2012
2013
2014
2015
2016
2017
2018
Year


Station-09 Beta (2012-2018)
Beta in 10^{-2} pCi/m^3
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
2012
2013
2014
2015
2016
2017
2018
Year


Station-10 Beta (2012-2018)
Beta in 10-2 pCi/m3
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
2012
2013
2014
2015
2016
2017
2018
Year


Station-11 Beta (2012-2018)
Beta in 10-2 pCi/m3
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
2012
2013
2014
2015
2016
2017
2018
Year


Station-12 Beta (2012-2018)
Beta in 10-2 pCi/m3
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
2012
2013
2014
2015
2016
2017
2018
Year


Station-13 Beta (2012-2018)
Beta in 10-2 pCi/m3
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
2012
2013
2014
2015
2016
2017
2018
Year

E-Series 3

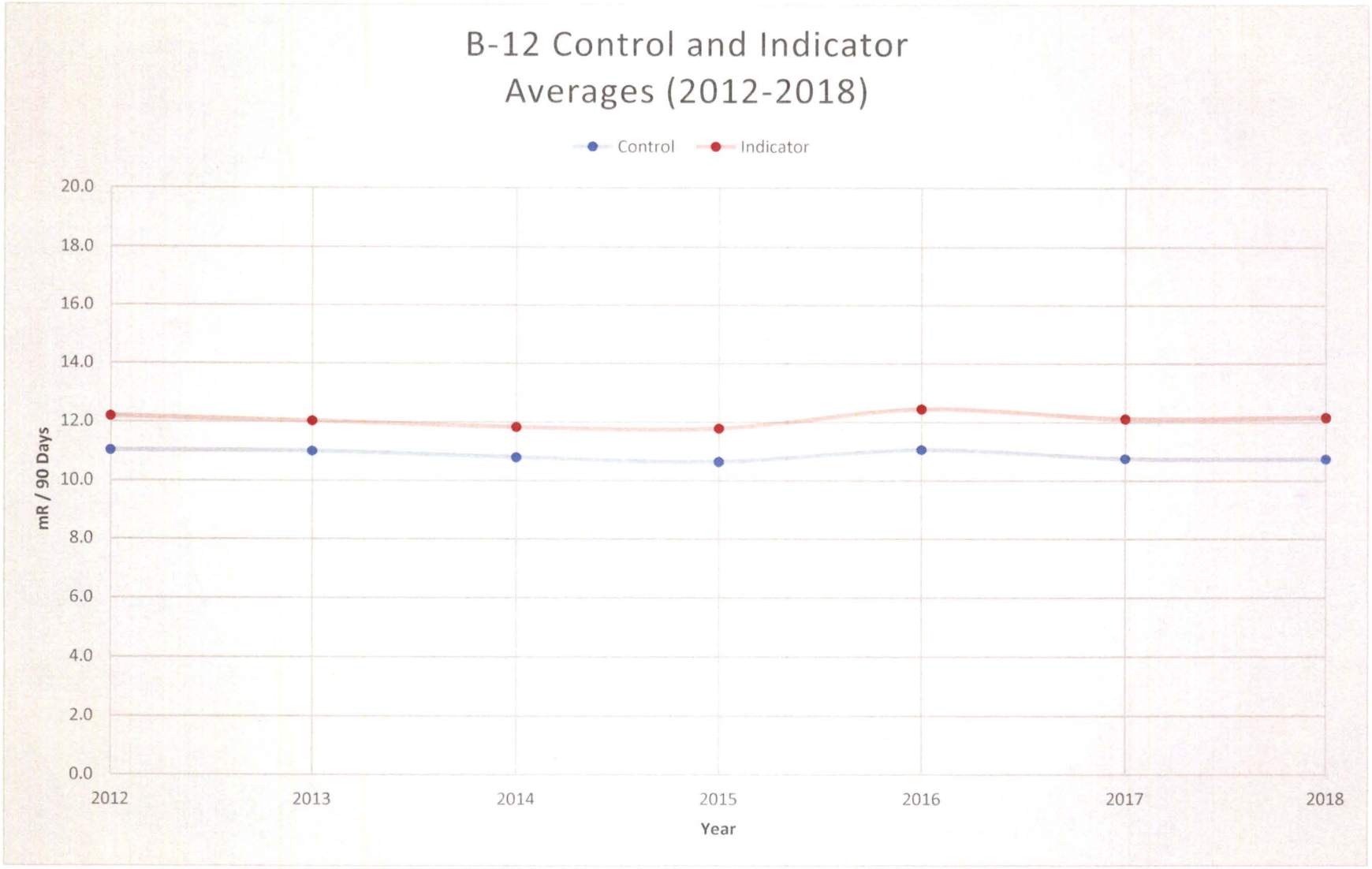
Table B-12 (Direct Radiation)

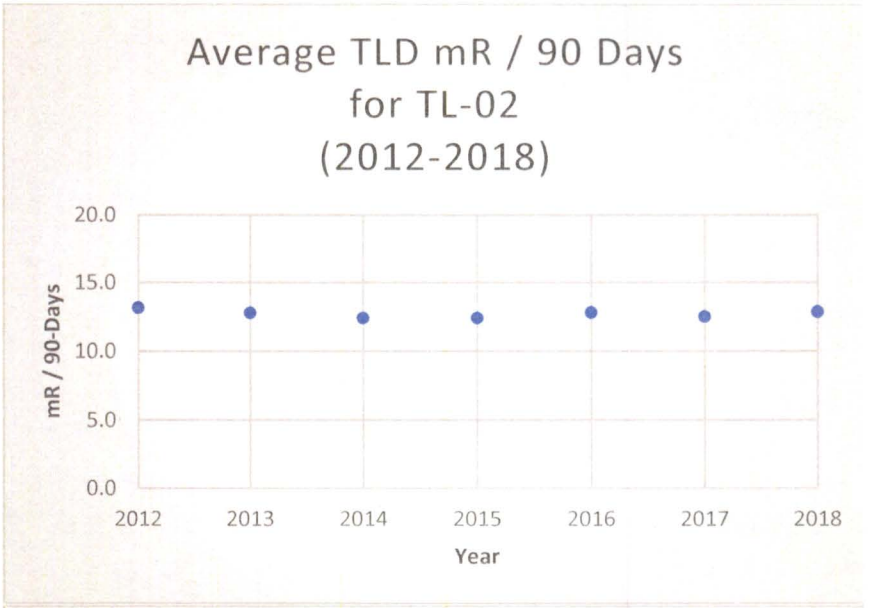
40 CFR 190 requires that the annual dose equivalent not exceed 25 millirem to the whole body of any member of the public. The average quarterly exposure observed at the control monitoring stations was used to determine the background level (equivalent to 10.5 millirems monthly or 42.0 millirem annually), while the highest total annual dosimeter reading at an individual site boundary environmental monitoring location (55.2 millirem) was observed at Environmental Monitoring Station #64. The difference in these values determines the maximum possible direct radiation dose exposure to an offsite member of the public. Accordingly, the hypothetical maximum direct radiation dose exposure to the public for 2018 was determined to be 13.2 millirem by subtraction of average background from the maximum annual indicator site.

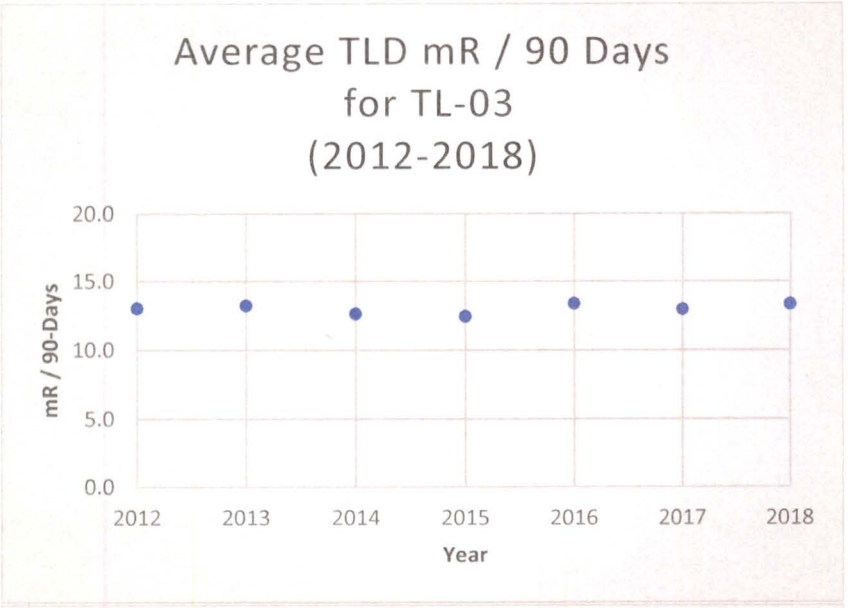
The trends below include the average quarterly exposure (in millirem, mR) for Ginna's direct radiation monitoring locations. This quarterly average is averaged for the year to facilitate trending.

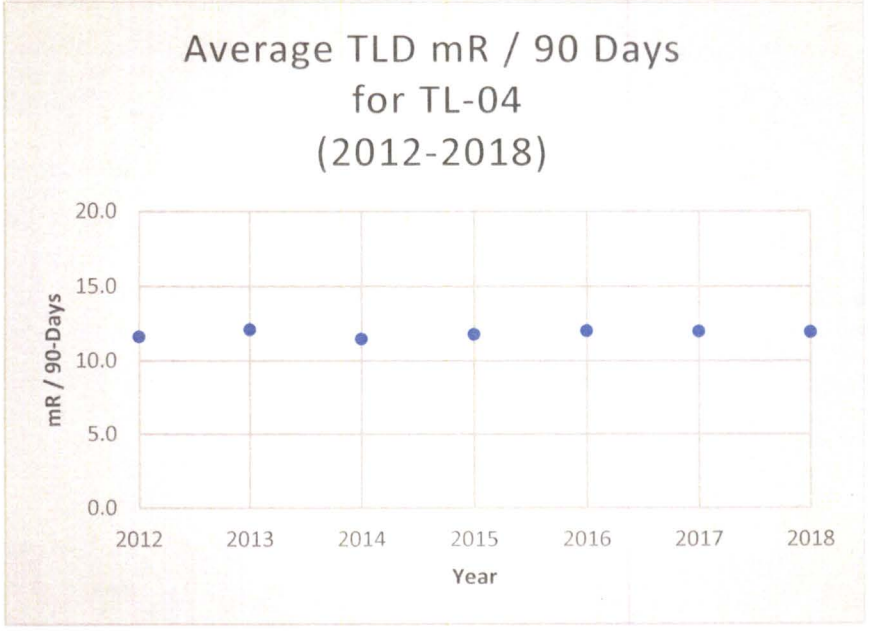
Direct radiation is the measurement that a member of the public would experience due to being near a source of radioactivity, such as a nuclear power plant in addition to natural sources. These natural sources are present throughout the environment (examples include being near bedrock rich in granite, being in the presence of the sun, radon gas emerging from layers of earth, etc.) and the direct radiation measurement Ginna collects is to determine if there is any statistically significant additional exposure from the operations of the nuclear facility.

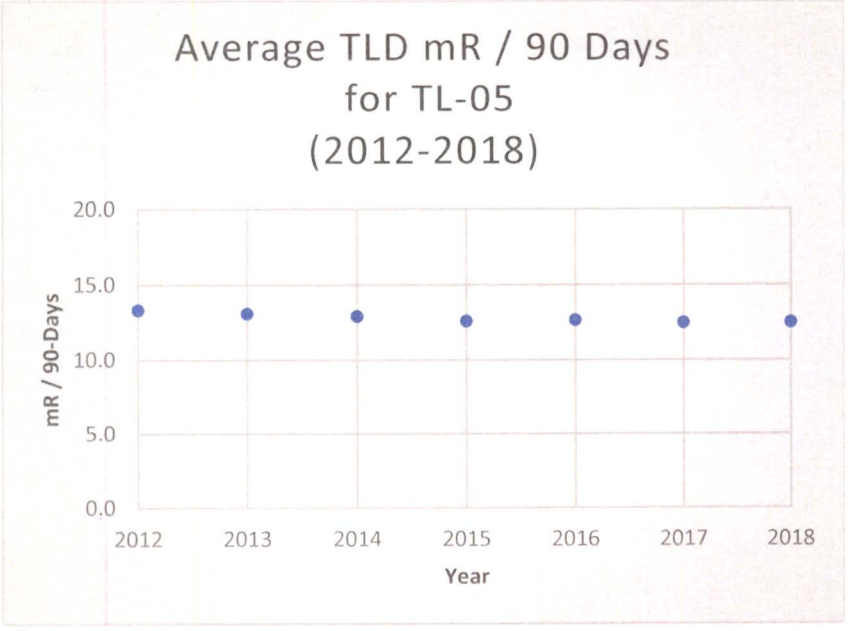
Trend "B-12 Control and Indicator Averages (2012-2018) shows the relationship between the control samples (TL-08, TL-10, TL-12, TL-25 – TL-30) and the indicator samples (TL-02 – TL 07, TL-11, TL-13 – TL-24, TL-31 – TL-40, TL-63, and TL-64). This trend illustrates that there is no statistically significant difference between control and indicator samples for direct radiation exposure in millirem from 2012-2018.

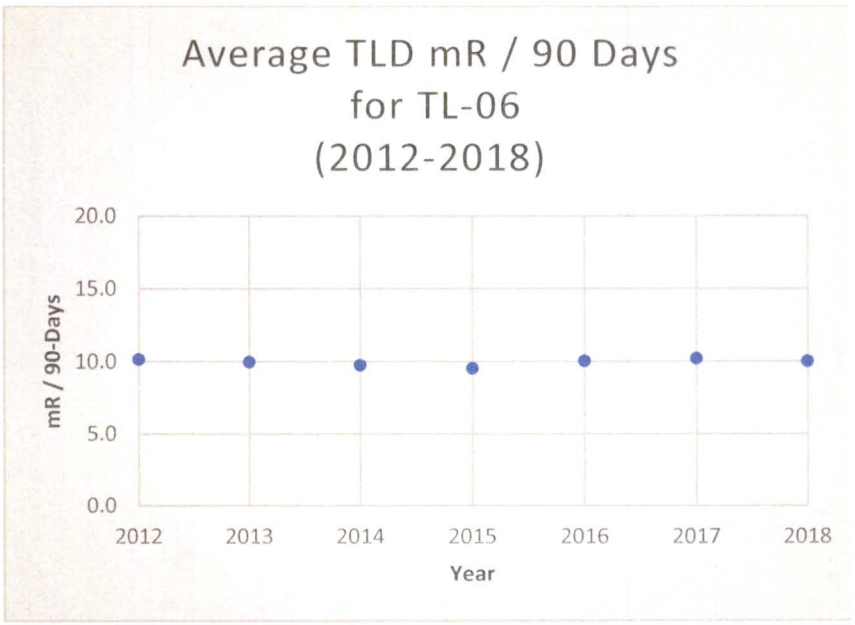

B-12 Control and Indicator Averages (2012-2018)
Control
Indicator
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
mR / 90 Days
2012
2013
2014
2015
2016
2017
2018
Year

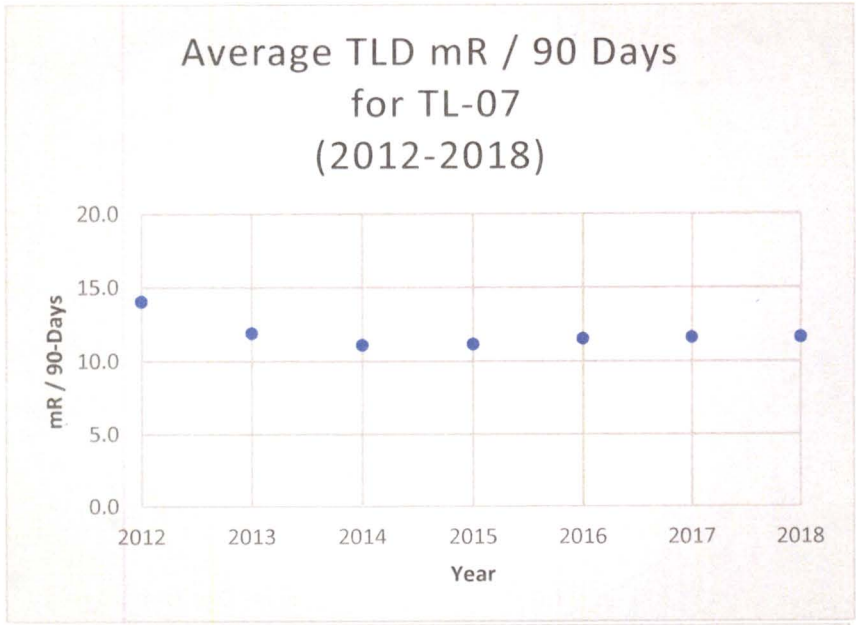

Average TLD mR / 90 Days
for TL-02
(2012-2018)
mR / 90-Days
20.0
15.0
10.0
5.0
0.0
2012
2013
2014
2015
2016
2017
2018
Year

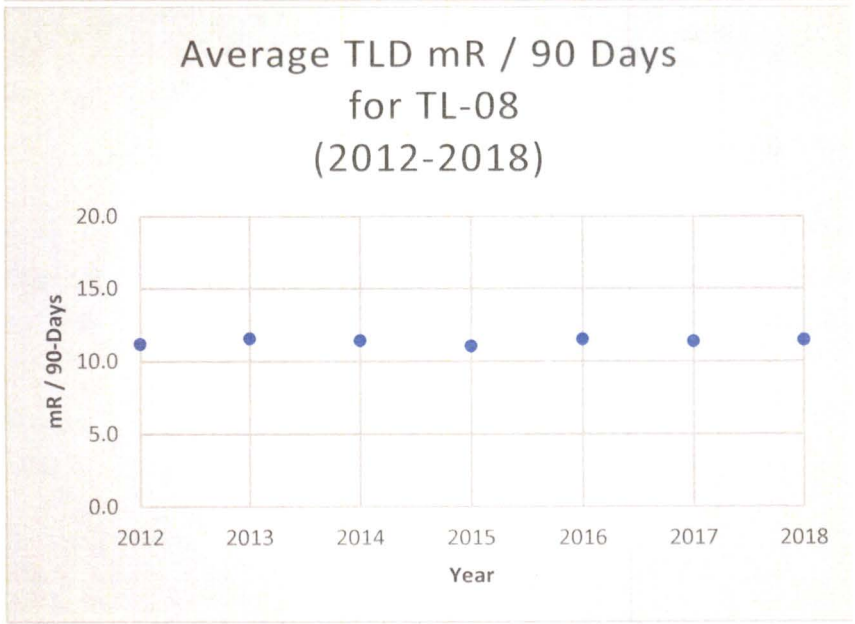

Average TLD mR / 90 Days
for TL-03
(2012-2018)
mR / 90-Days
20.0
15.0
10.0
5.0
0.0
2012
2013
2014
2015
2016
2017
2018
Year

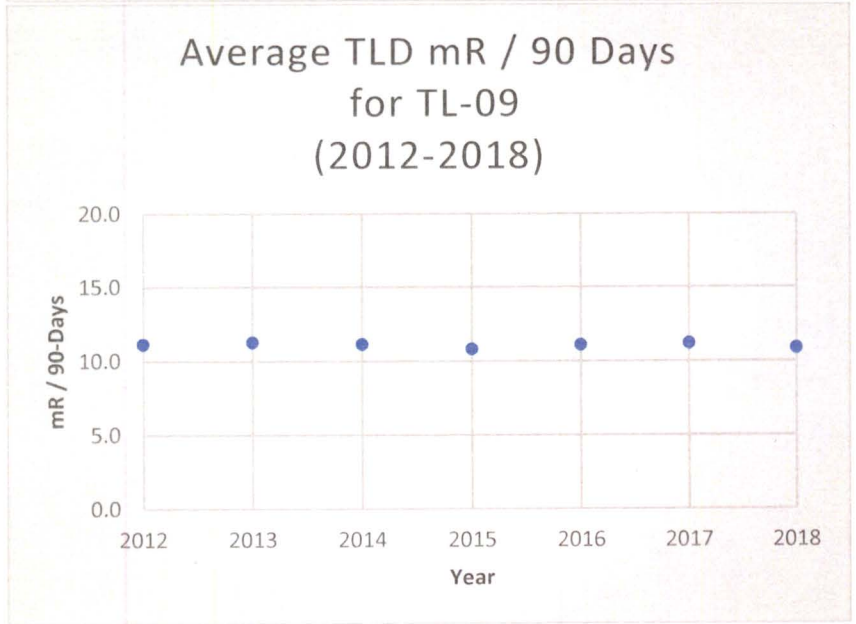

Average TLD mR / 90 Days
for TL-04
(2012-2018)
mR / 90-Days
20.0
15.0
10.0
5.0
0.0
2012
2013
2014
2015
2016
2017
2018
Year

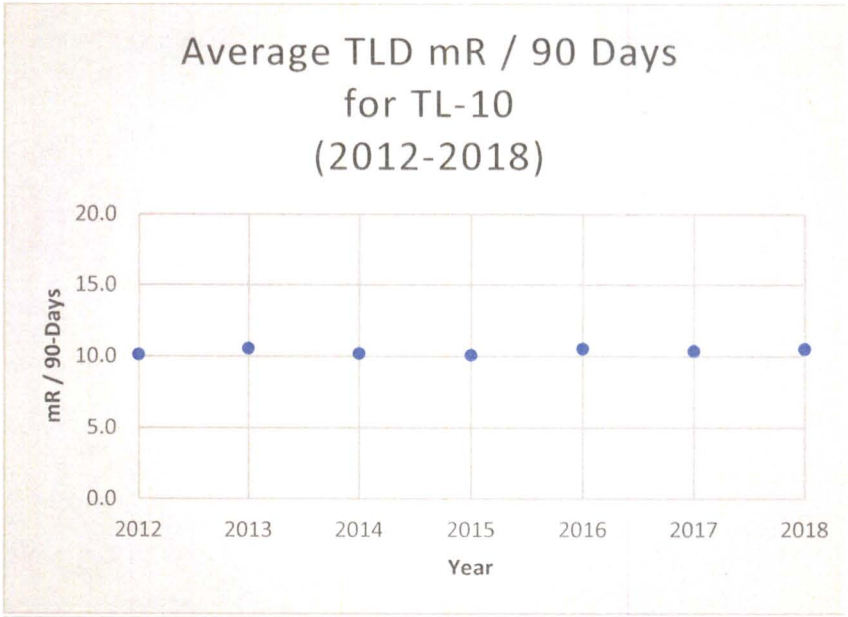

Average TLD mR / 90 Days
for TL-05
(2012-2018)
mR / 90-Days
20.0
15.0
10.0
5.0
0.0
2012
2013
2014
2015
2016
2017
2018
Year

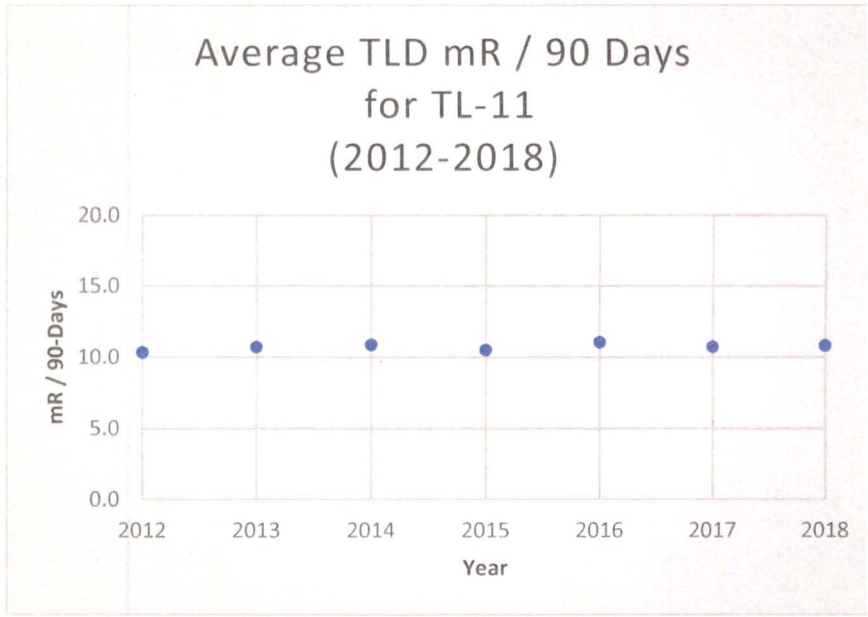

Average TLD mR / 90 Days
for TL-06
(2012-2018)
mR / 90-Days
20.0
15.0
10.0
5.0
0.0
2012
2013
2014
2015
2016
2017
2018
Year

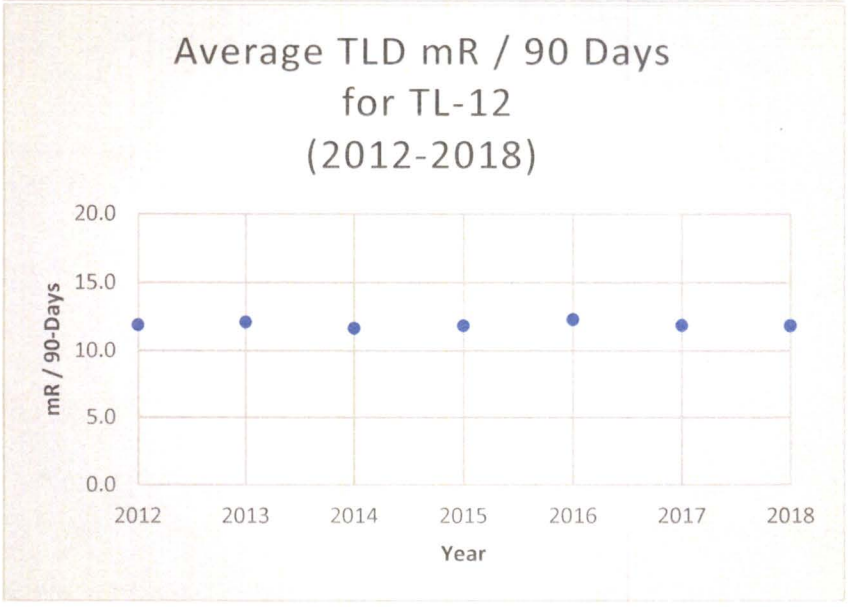

Average TLD mR / 90 Days
for TL-07
(2012-2018)
mR / 90-Days
20.0
15.0
10.0
5.0
0.0
2012
2013
2014
2015
2016
2017
2018
Year

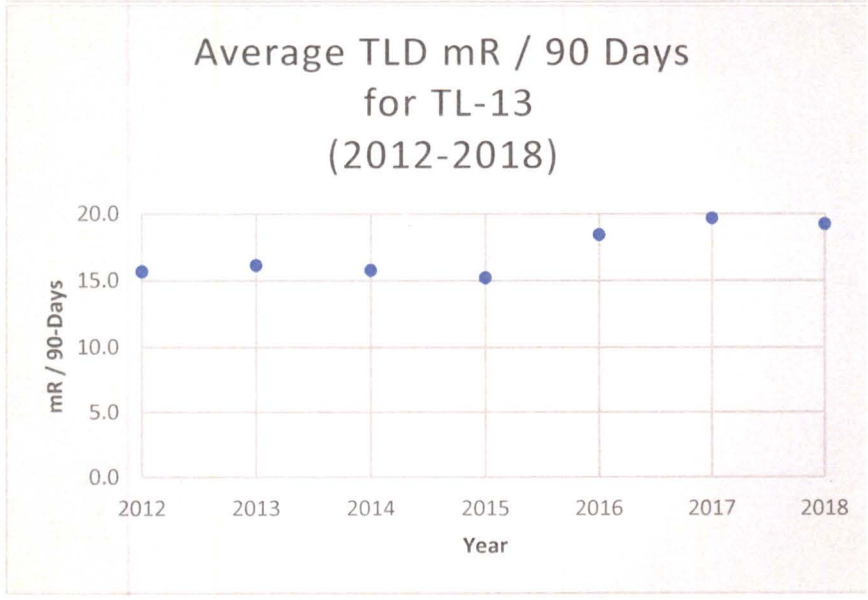

Average TLD mR / 90 Days
for TL-08
(2012-2018)
mR / 90-Days
20.0
15.0
10.0
5.0
0.0
2012
2013
2014
2015
2016
2017
2018
Year

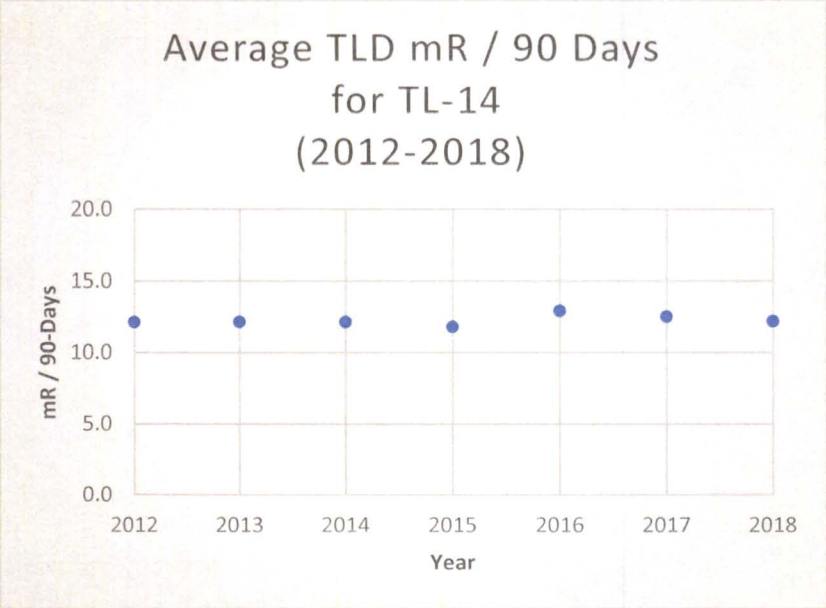

Average TLD mR / 90 Days
for TL-09
(2012-2018)
mR / 90-Days
20.0
15.0
10.0
5.0
0.0
2012
2013
2014
2015
2016
2017
2018
Year

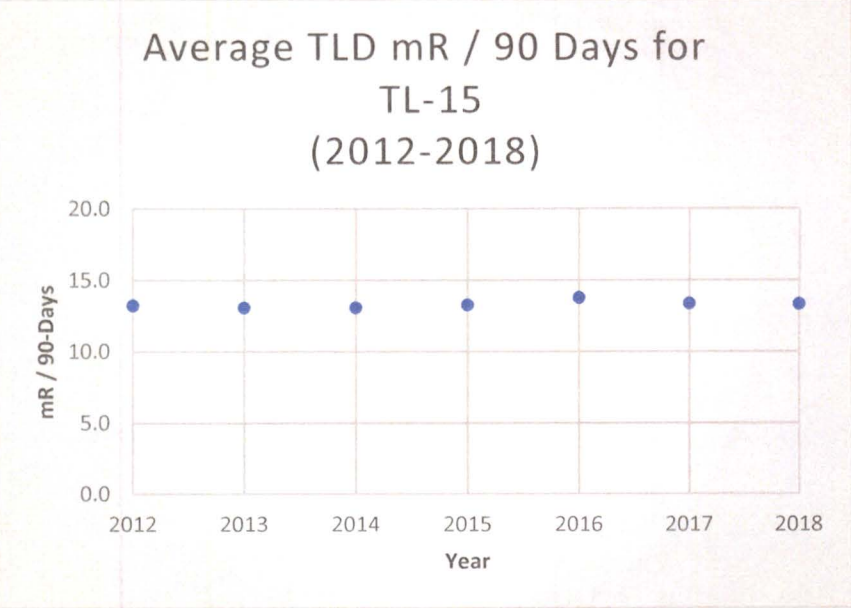

Average TLD mR / 90 Days
for TL-10
(2012-2018)
mR / 90-Days
20.0
15.0
10.0
5.0
0.0
2012
2013
2014
2015
2016
2017
2018
Year

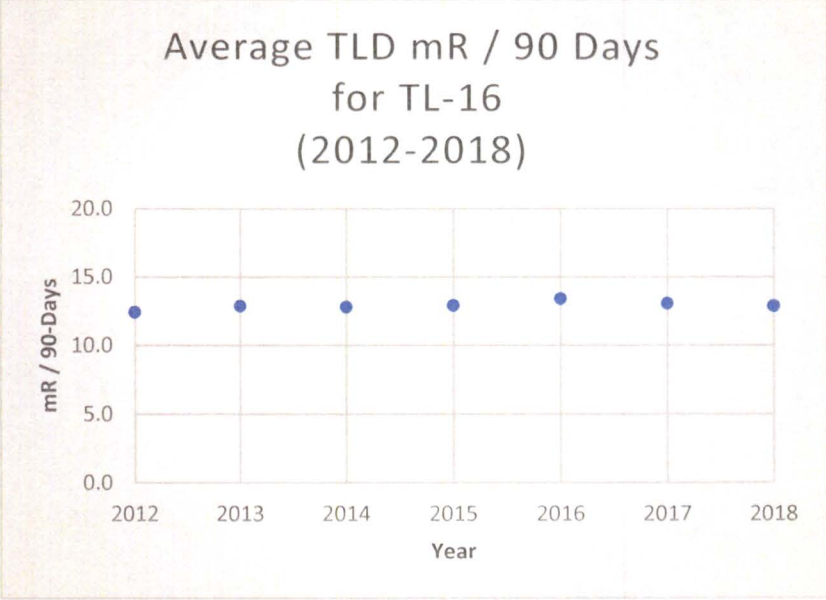

Average TLD mR / 90 Days
for TL-11
(2012-2018)
mR / 90-Days
20.0
15.0
10.0
5.0
0.0
2012
2013
2014
2015
2016
2017
2018
Year

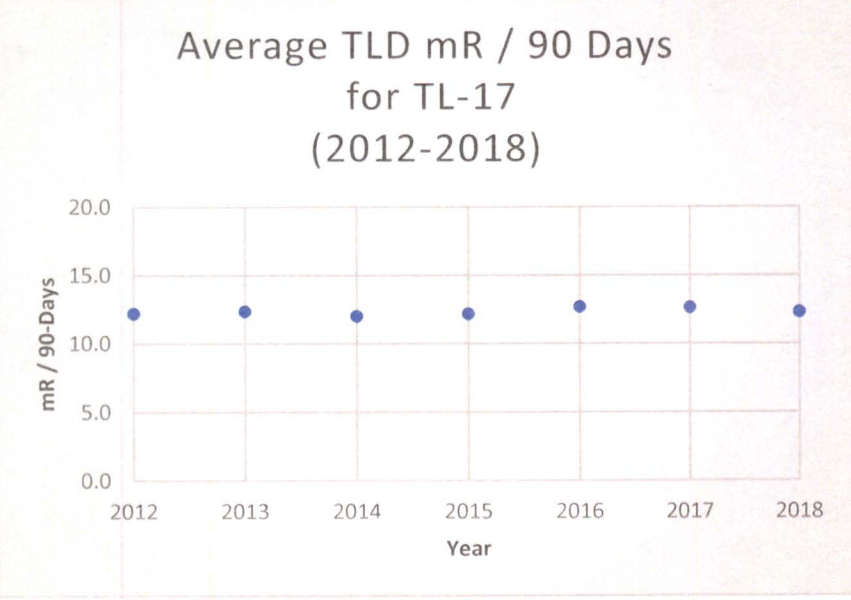

Average TLD mR / 90 Days
for TL-12
(2012-2018)
mR / 90-Days
20.0
15.0
10.0
5.0
0.0
2012
2013
2014
2015
2016
2017
2018
Year

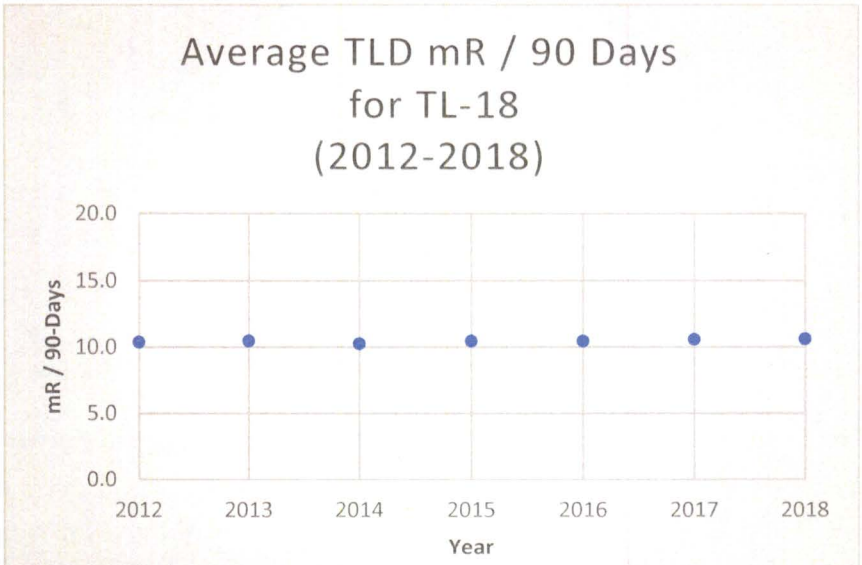

Average TLD mR / 90 Days
for TL-13
(2012-2018)
mR / 90-Days
20.0
15.0
10.0
5.0
0.0
2012
2013
2014
2015
2016
2017
2018
Year

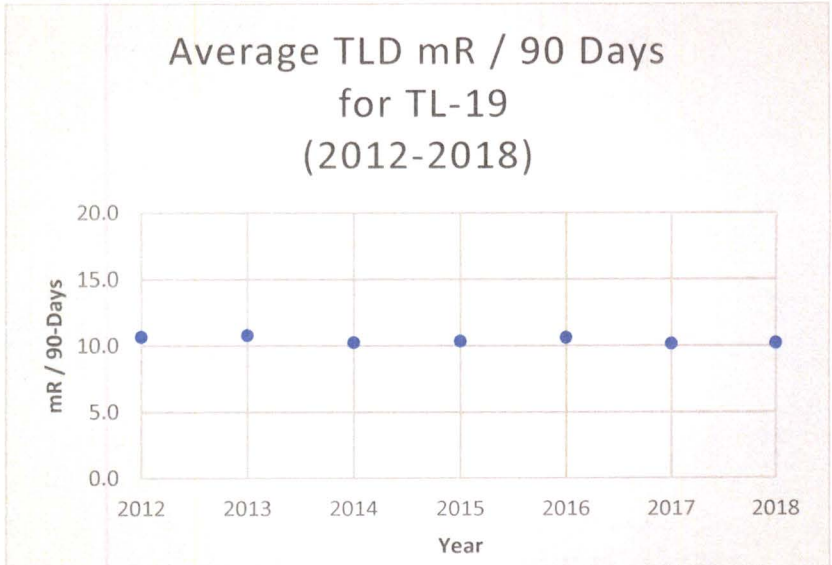

Average TLD mR / 90 Days
for TL-14
(2012-2018)
mR / 90-Days
20.0
15.0
10.0
5.0
0.0
2012
2013
2014
2015
2016
2017
2018
Year

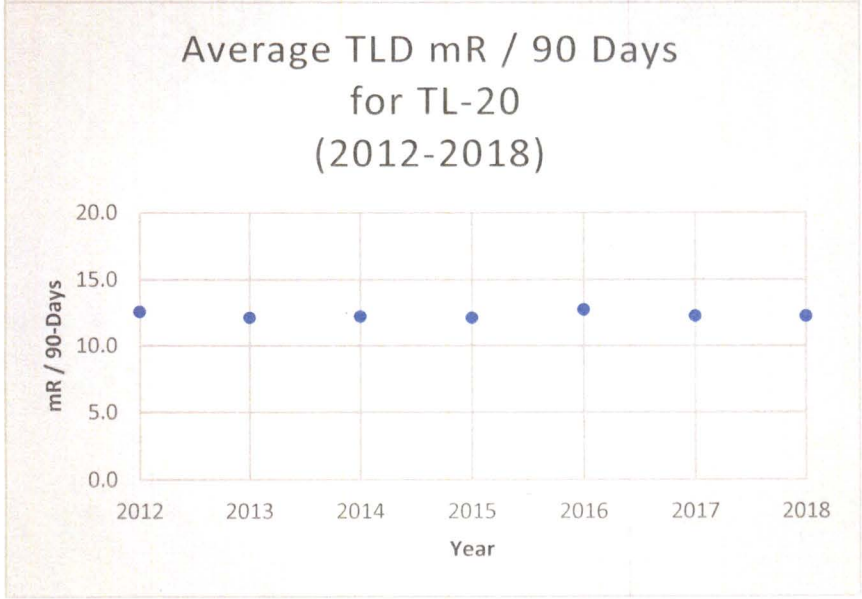

Average TLD mR / 90 Days for
TL-15
(2012-2018)
mR / 90-Days
20.0
15.0
10.0
5.0
0.0
2012
2013
2014
2015
2016
2017
2018
Year

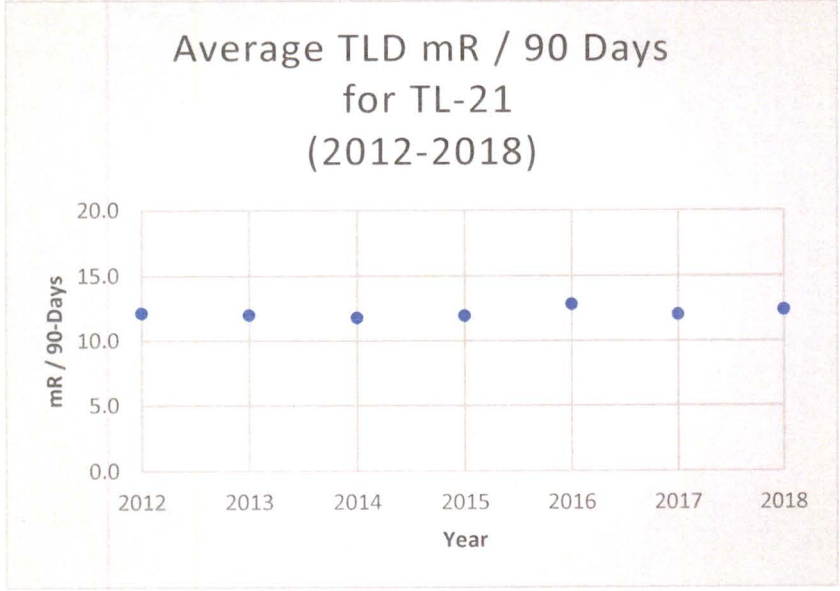

Average TLD mR / 90 Days
for TL-16
(2012-2018)
mR / 90-Days
20.0
15.0
10.0
5.0
0.0
2012
2013
2014
2015
2016
2017
2018
Year

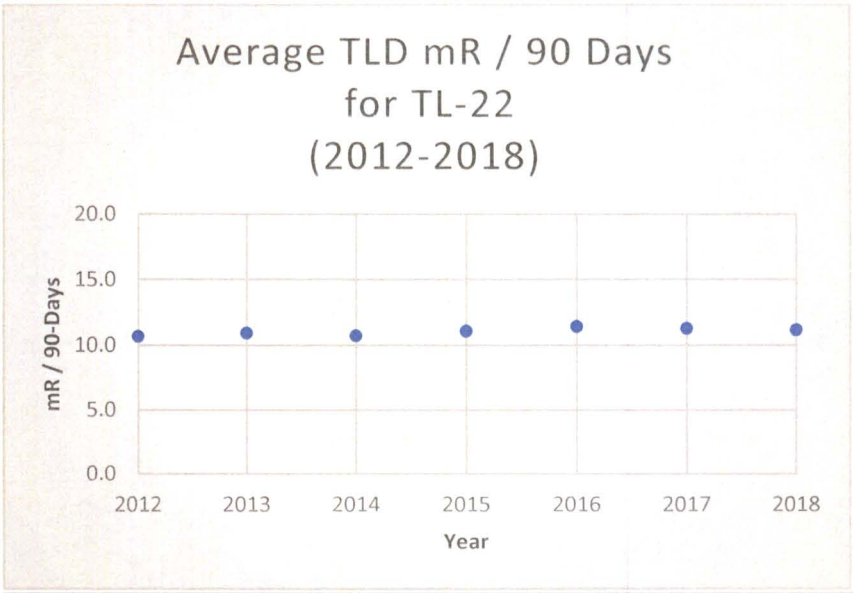

Average TLD mR / 90 Days
for TL-17
(2012-2018)
mR / 90-Days
20.0
15.0
10.0
5.0
0.0
2012
2013
2014
2015
2016
2017
2018
Year

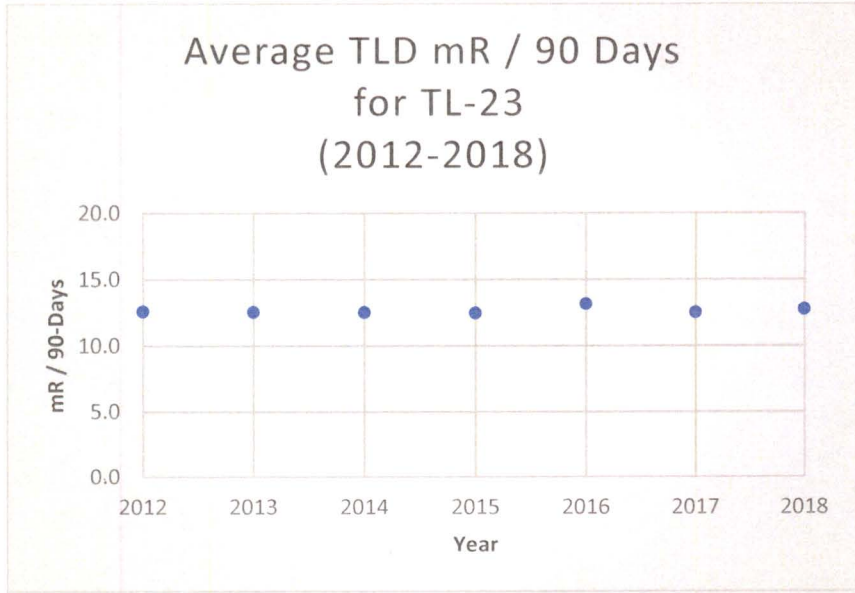

Average TLD mR / 90 Days
for TL-18
(2012-2018)
mR / 90-Days
20.0
15.0
10.0
5.0
0.0
2012
2013
2014
2015
2016
2017
2018
Year

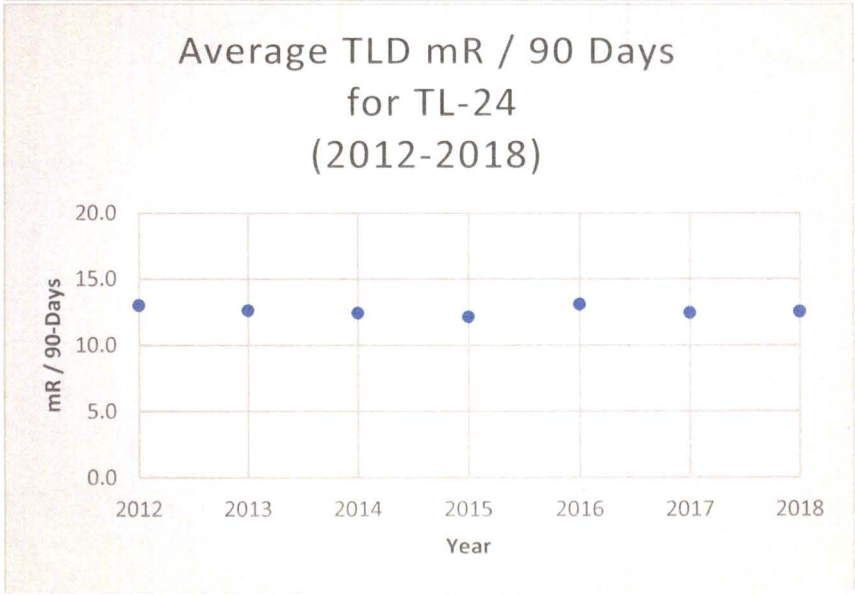

Average TLD mR / 90 Days
for TL-19
(2012-2018)
mR / 90-Days
20.0
15.0
10.0
5.0
0.0
2012
2013
2014
2015
2016
2017
2018
Year

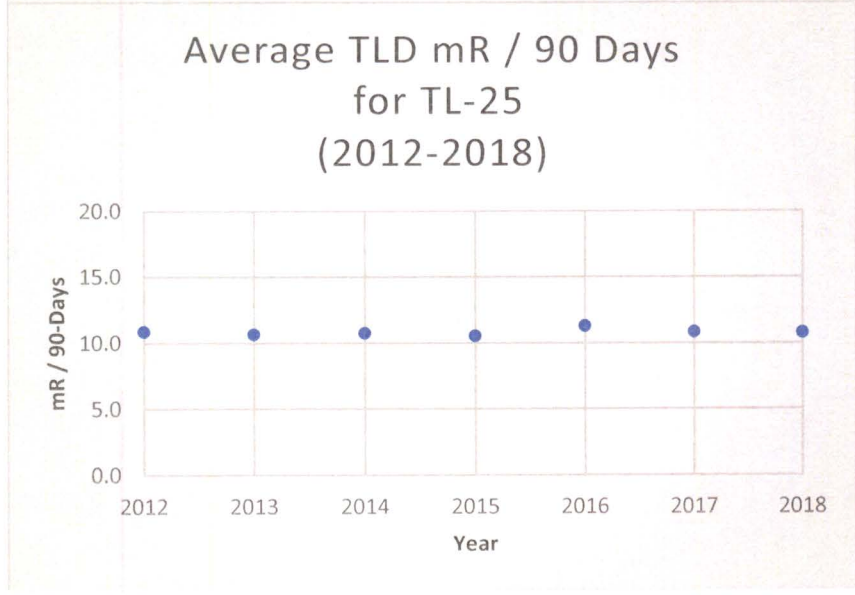

Average TLD mR / 90 Days
for TL-20
(2012-2018)
mR / 90-Days
20.0
15.0
10.0
5.0
0.0
2012
2013
2014
2015
2016
2017
2018
Year

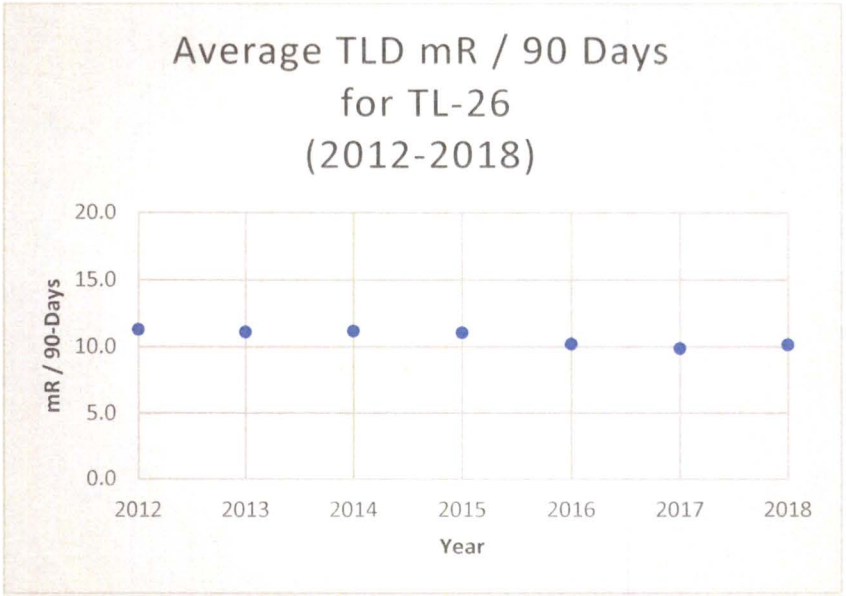

Average TLD mR / 90 Days
for TL-21
(2012-2018)
mR / 90-Days
20.0
15.0
10.0
5.0
0.0
2012
2013
2014
2015
2016
2017
2018
Year

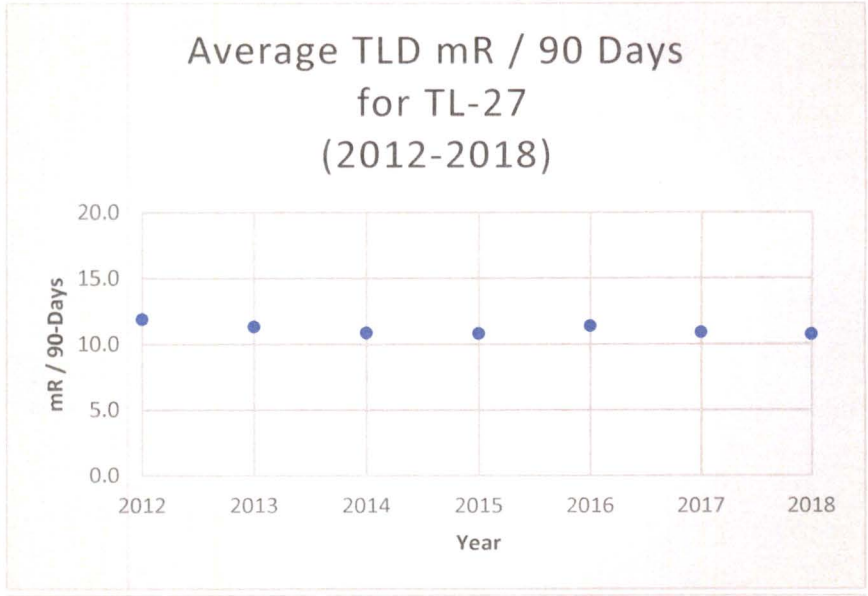

Average TLD mR / 90 Days
for TL-22
(2012-2018)
mR / 90-Days
20.0
15.0
10.0
5.0
0.0
2012
2013
2014
2015
2016
2017
2018
Year

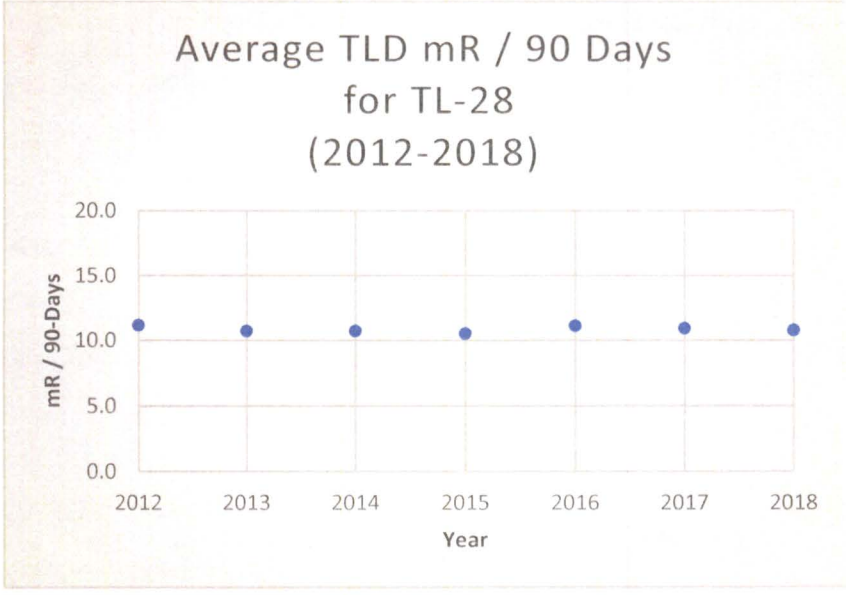

Average TLD mR / 90 Days
for TL-23
(2012-2018)
mR / 90-Days
20.0
15.0
10.0
5.0
0.0
2012
2013
2014
2015
2016
2017
2018
Year

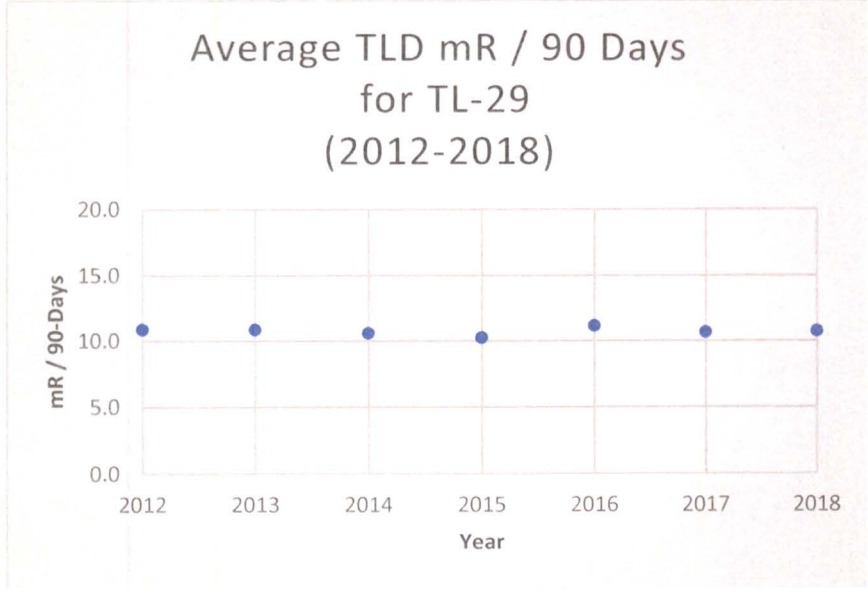

Average TLD mR / 90 Days
for TL-24
(2012-2018)
mR / 90-Days
20.0
15.0
10.0
5.0
0.0
2012
2013
2014
2015
2016
2017
2018
Year

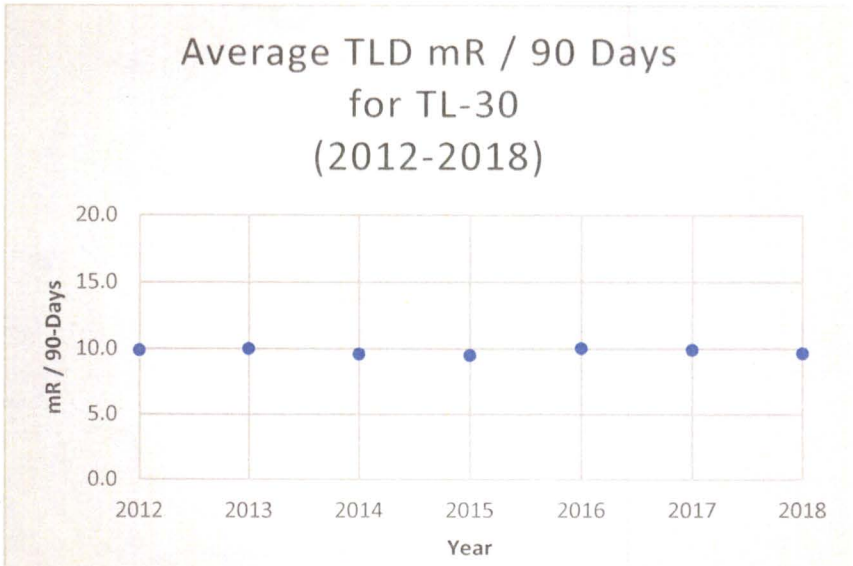

Average TLD mR / 90 Days
for TL-25
(2012-2018)
mR / 90-Days
20.0
15.0
10.0
5.0
0.0
2012
2013
2014
2015
2016
2017
2018
Year

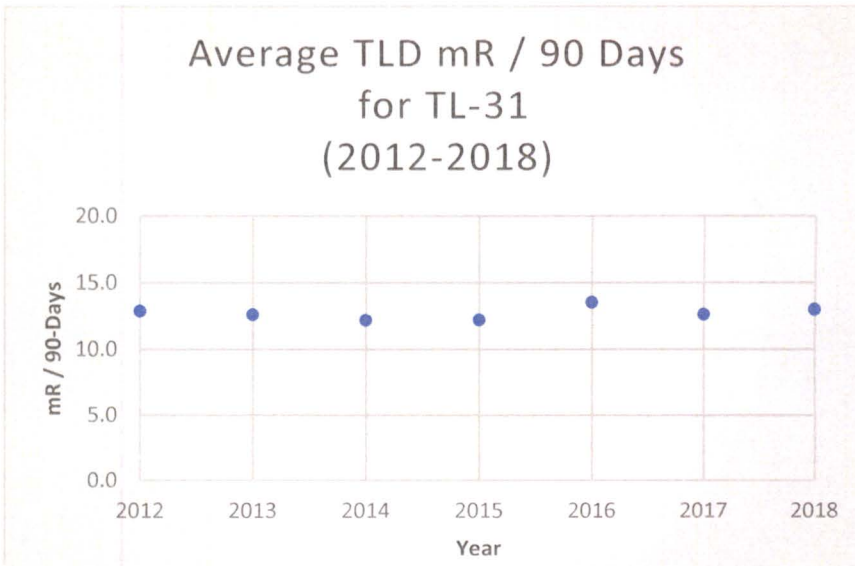

Average TLD mR / 90 Days
for TL-26
(2012-2018)
mR / 90-Days
20.0
15.0
10.0
5.0
0.0
2012
2013
2014
2015
2016
2017
2018
Year

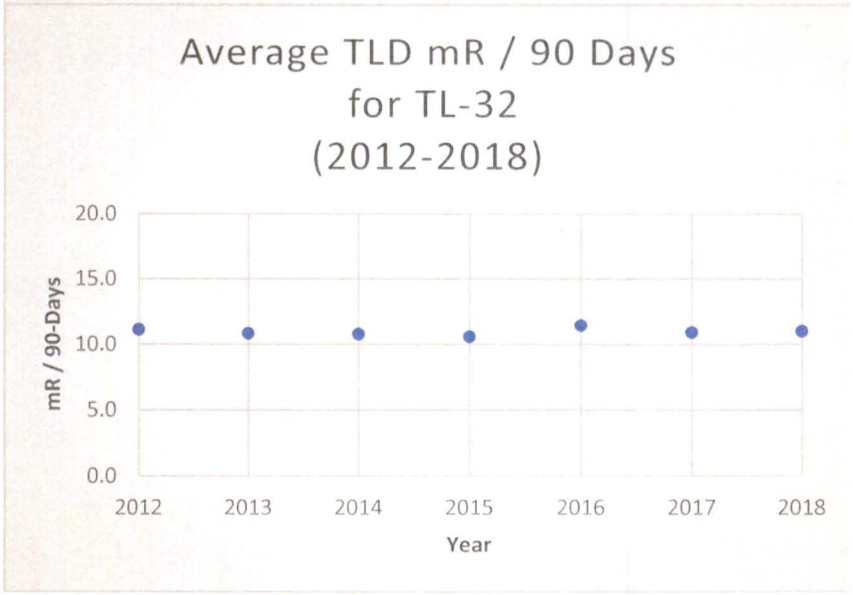

Average TLD mR / 90 Days
for TL-27
(2012-2018)
mR / 90-Days
20.0
15.0
10.0
5.0
0.0
2012
2013
2014
2015
2016
2017
2018
Year

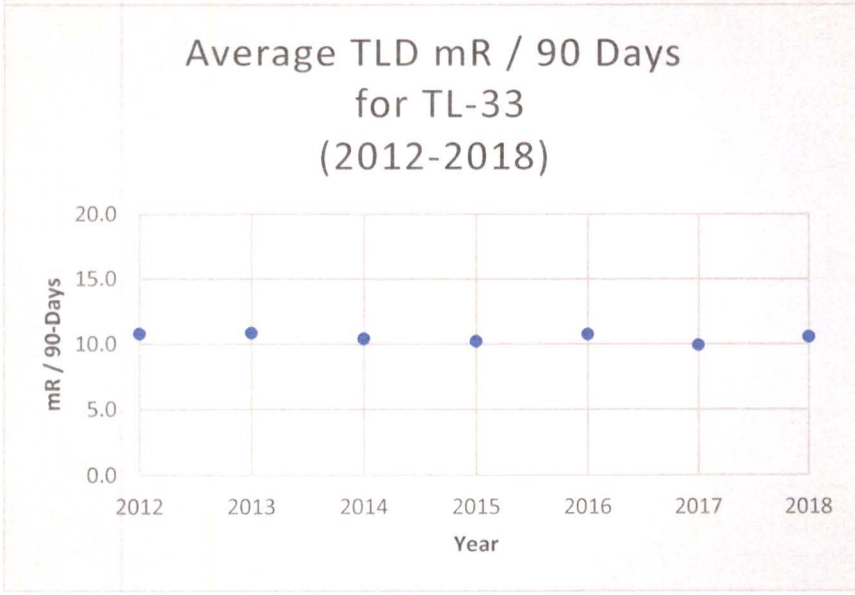

Average TLD mR / 90 Days
for TL-28
(2012-2018)
mR / 90-Days
20.0
15.0
10.0
5.0
0.0
2012
2013
2014
2015
2016
2017
2018
Year

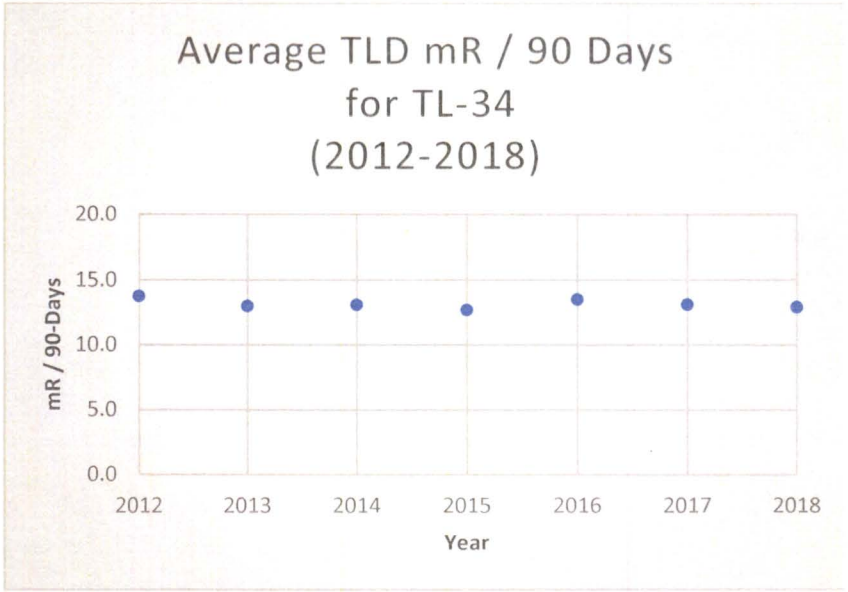

Average TLD mR / 90 Days
for TL-29
(2012-2018)
mR / 90-Days
20.0
15.0
10.0
5.0
0.0
2012
2013
2014
2015
2016
2017
2018
Year

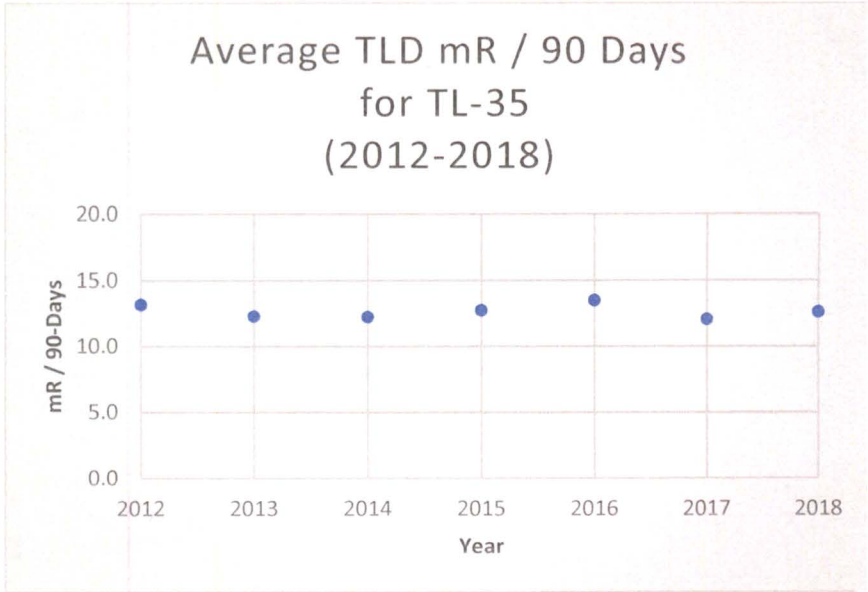

Average TLD mR / 90 Days
for TL-30
(2012-2018)
mR / 90-Days
20.0
15.0
10.0
5.0
0.0
2012
2013
2014
2015
2016
2017
2018
Year

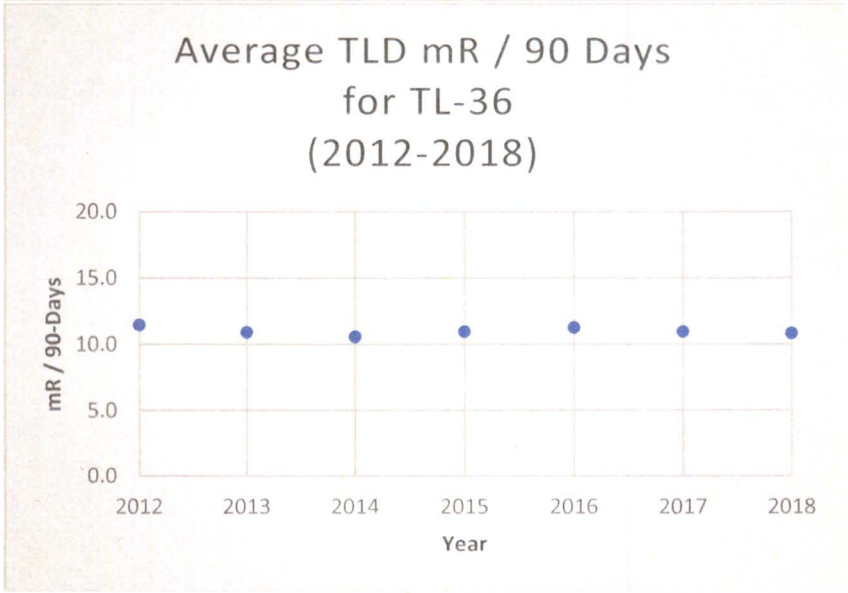

Average TLD mR / 90 Days
for TL-31
(2012-2018)
mR / 90-Days
20.0
15.0
10.0
5.0
0.0
2012
2013
2014
2015
2016
2017
2018
Year

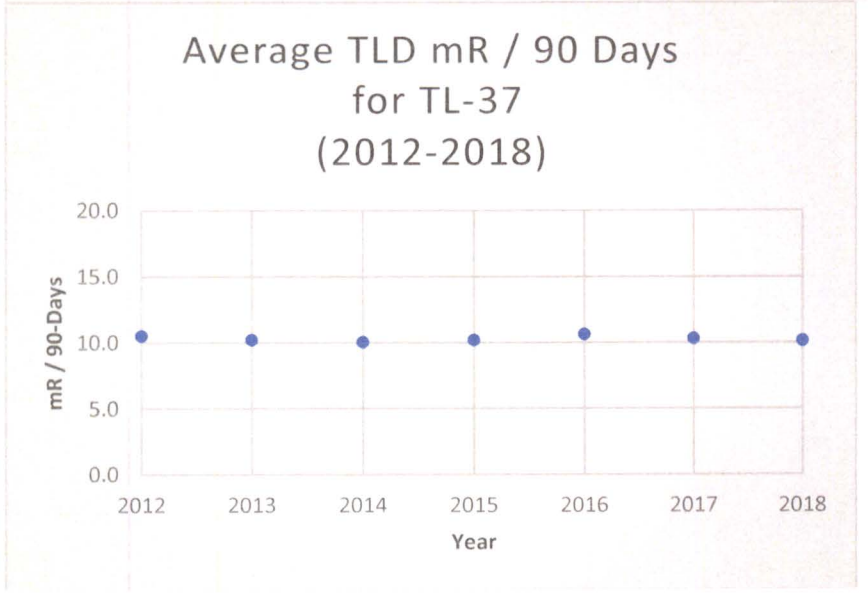

Average TLD mR / 90 Days
for TL-32
(2012-2018)
mR / 90-Days
20.0
15.0
10.0
5.0
0.0
2012
2013
2014
2015
2016
2017
2018
Year

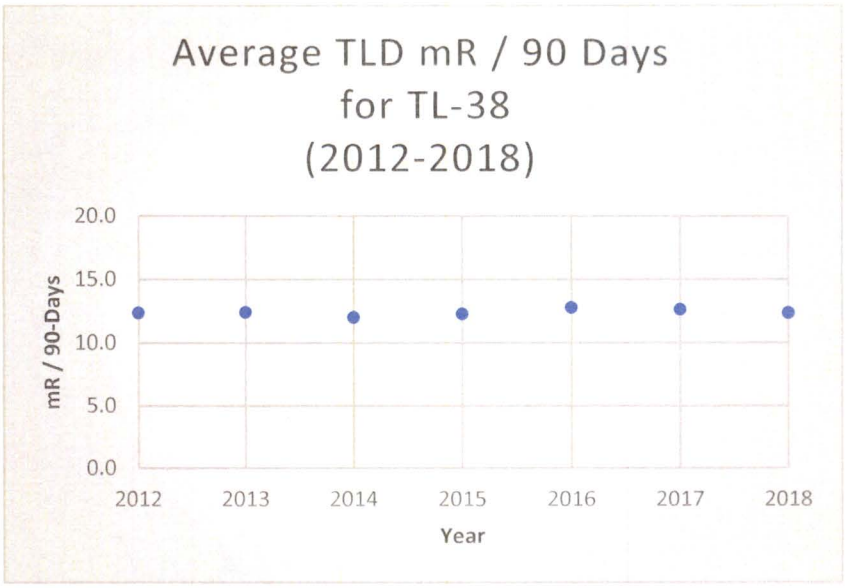

Average TLD mR / 90 Days
for TL-33
(2012-2018)
mR / 90-Days
20.0
15.0
10.0
5.0
0.0
2012
2013
2014
2015
2016
2017
2018
Year

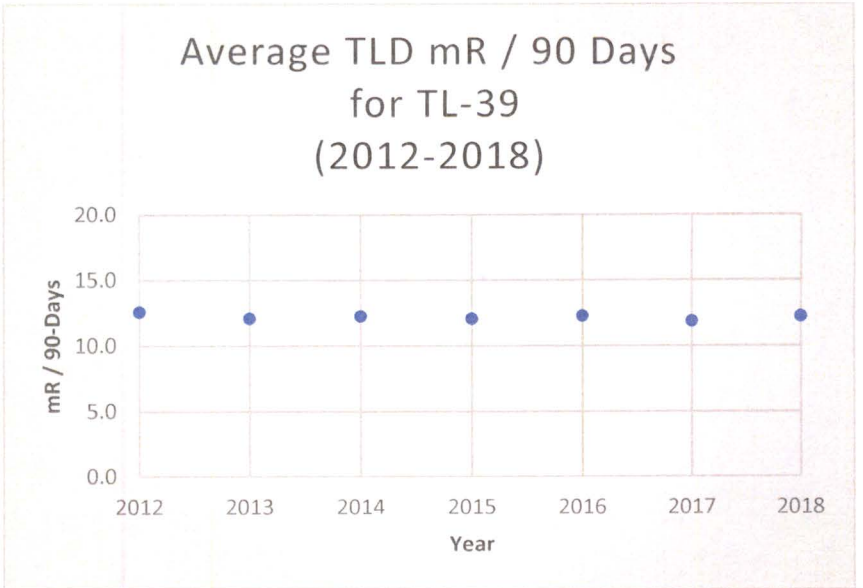

Average TLD mR / 90 Days
for TL-34
(2012-2018)
mR / 90-Days
20.0
15.0
10.0
5.0
0.0
2012
2013
2014
2015
2016
2017
2018
Year

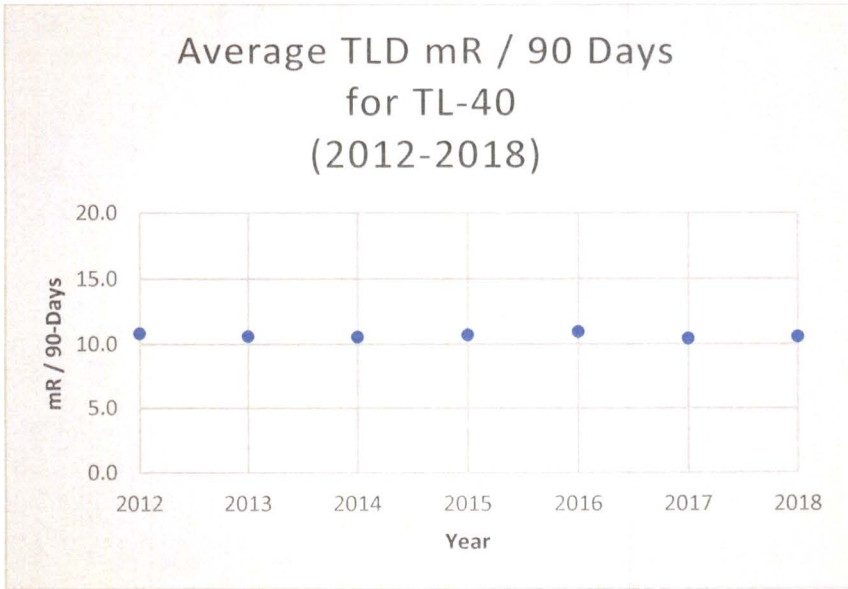

Average TLD mR / 90 Days
for TL-35
(2012-2018)
mR / 90-Days
20.0
15.0
10.0
5.0
0.0
2012
2013
2014
2015
2016
2017
2018
Year

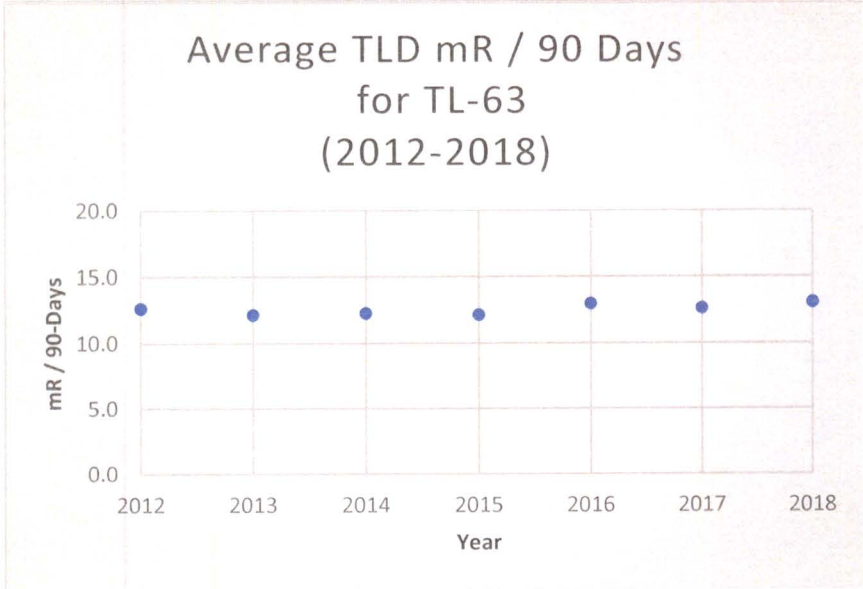

Average TLD mR / 90 Days
for TL-36
(2012-2018)
mR / 90-Days
20.0
15.0
10.0
5.0
0.0
2012
2013
2014
2015
2016
2017
2018
Year

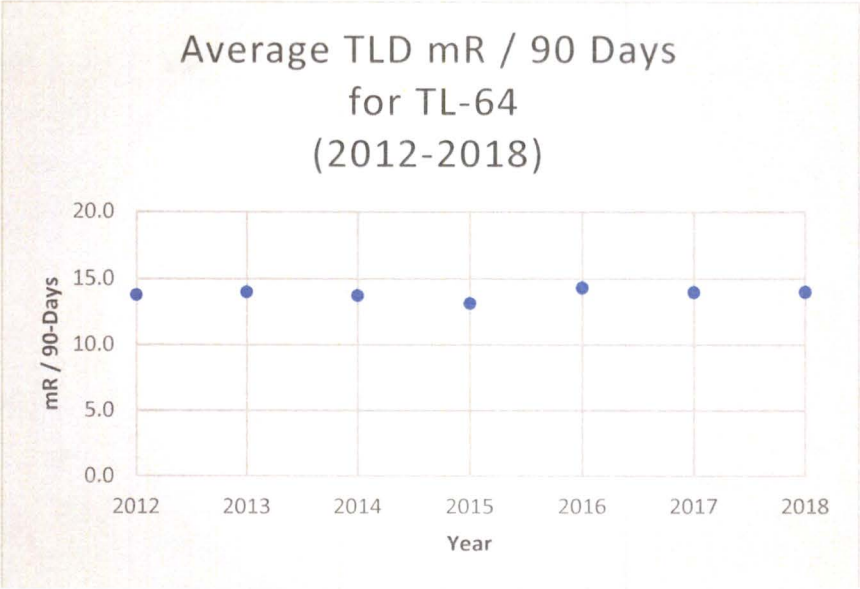

Average TLD mR / 90 Days
for TL-37
(2012-2018)
mR / 90-Days
20.0
15.0
10.0
5.0
0.0
2012
2013
2014
2015
2016
2017
2018
Year


Average TLD mR / 90 Days
for TL-38
(2012-2018)
mR / 90-Days
20.0
15.0
10.0
5.0
0.0
2012
2013
2014
2015
2016
2017
2018
Year


Average TLD mR / 90 Days
for TL-39
(2012-2018)
mR / 90-Days
20.0
15.0
10.0
5.0
0.0
2012
2013
2014
2015
2016
2017
2018
Year


Average TLD mR / 90 Days
for TL-40
(2012-2018)
mR / 90-Days
20.0
15.0
10.0
5.0
0.0
2012
2013
2014
2015
2016
2017
2018
Year


Average TLD mR / 90 Days
for TL-63
(2012-2018)
mR / 90-Days
20.0
15.0
10.0
5.0
0.0
2012
2013
2014
2015
2016
2017
2018
Year


Average TLD mR / 90 Days
for TL-64
(2012-2018)
20.0
15.0
10.0
5.0
0.0
mR / 90-Days
2012
2013
2014
2015
2016
2017
2018
Year

E-Series 4

Table B-13 (Tritium in Groundwater)

Ginna's Offsite Dose Calculation Manual (ODCM) is written in accordance with specifications contained within 10 CFR 20 and the Branch Technical Position document published by the NRC in 1979. This document specifies Tritium and Gamma in Groundwater samples to be detected to a Lower Limit of Detection (LLD) of 2,000 pCi/l. Since that time, detection capabilities have improved which allow values to be measured lower than the required 2,000 pCi/l and Ginna measures tritium concentration down to a LLD of 500 pCi/l.

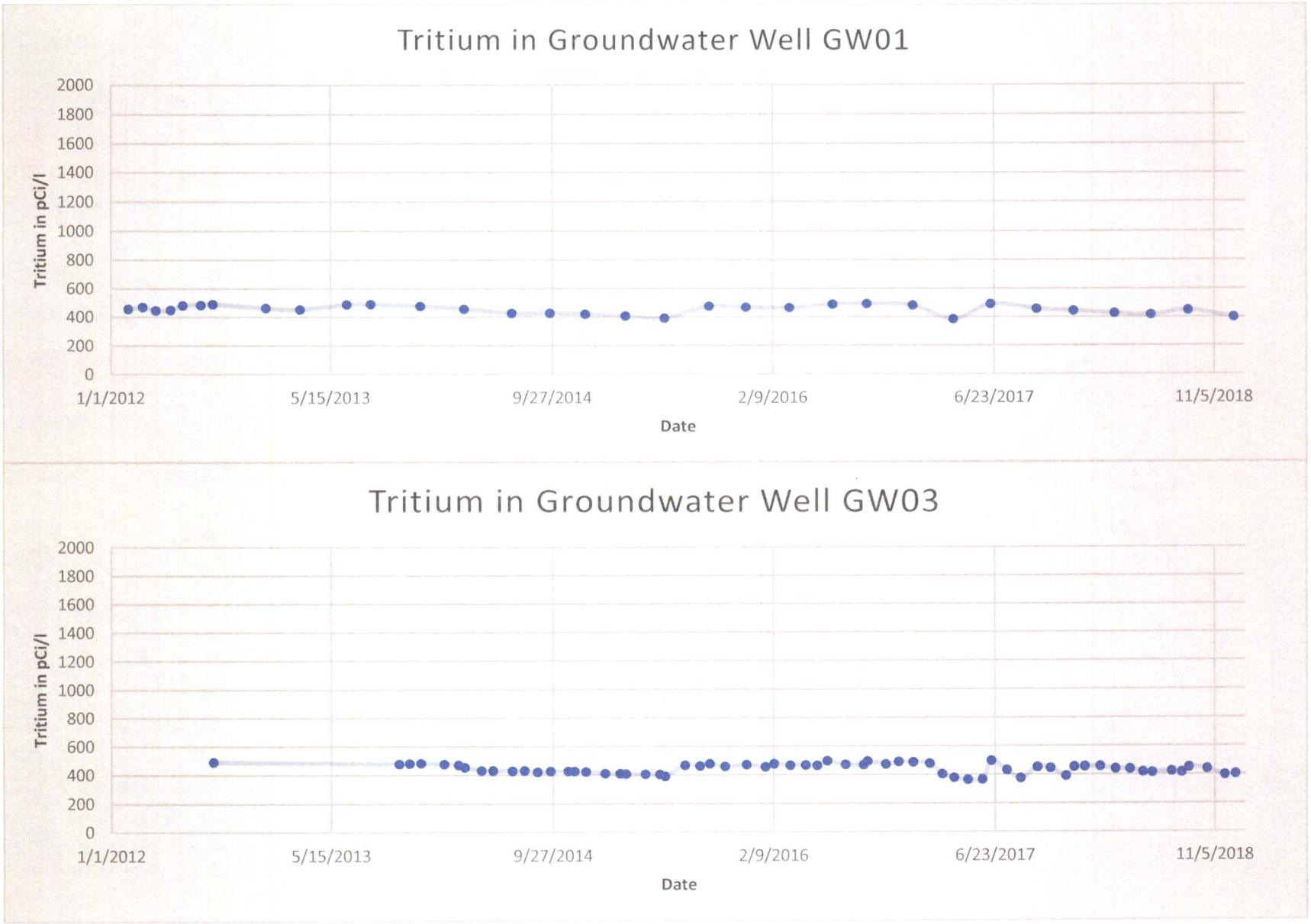
The trends below include the tritium averages (from 2012-2018) for Ginna's groundwater samples (GW01, GW03 – GW08, GW-10 – GW16). A tritium value of greater than 20,000 pCi/l would indicate radionuclides in the sample which would require further analysis and offsite reporting. From 2012 through 2018, no such results have been received from Ginna's REMP program.

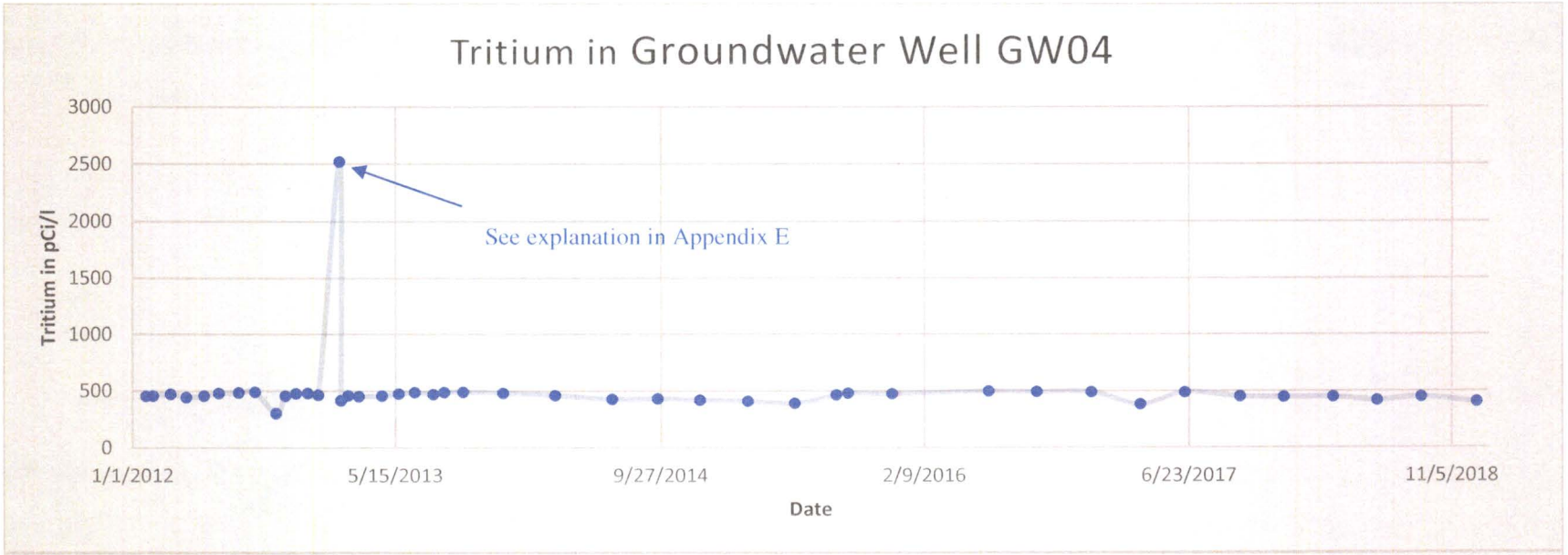
Tritium (H-3) is a radioactive form of Hydrogen and, when detected in the environment at high-levels (greater than 2,000 pCi/l, can be an indication that plant effluents may have been introduced into the environment. Tritium is sampled for at nuclear facilities due to its exposure capabilities for members of the public. Essentially, Tritium, when in an aqueous form, flows like water and can be found in surface water, groundwater, and atmospheric environs due to evaporative processes found in nature. Nuclear stations place a sensitivity on detecting Tritium in the environment as it is an efficient marker to show if radioactivity has been introduced off-site.

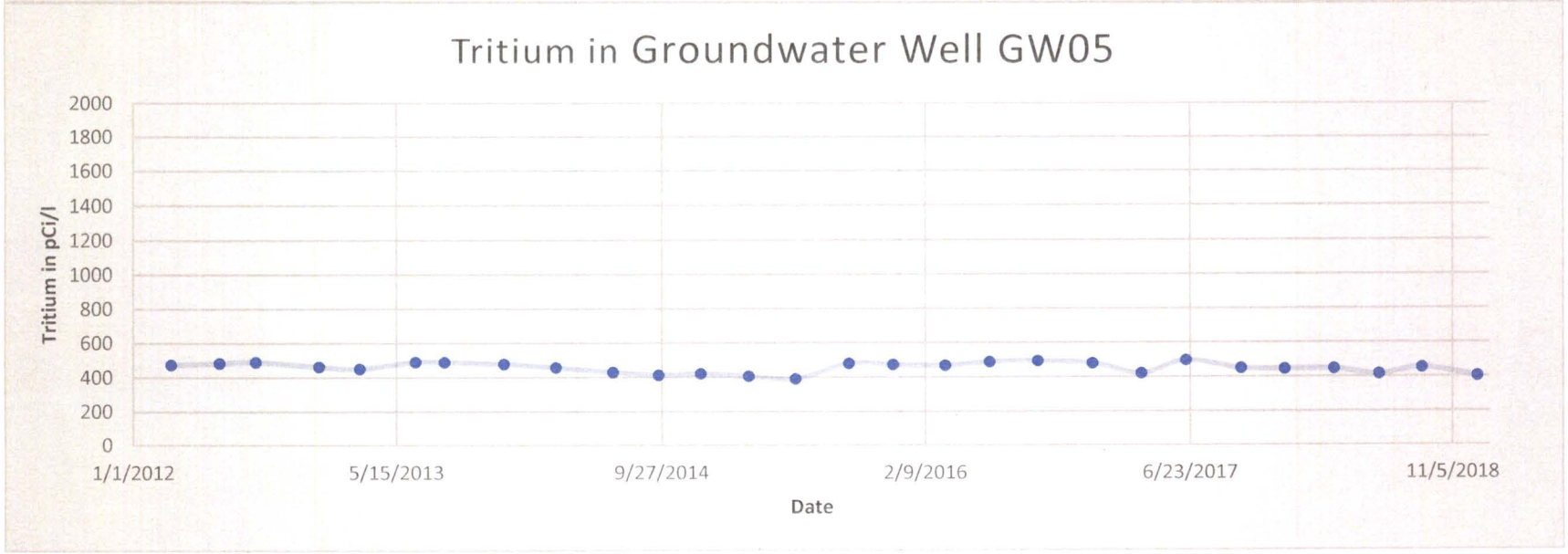
All results shown below are less-than values (< LLD) excluding the sample result for groundwater monitoring well GW04 from 1/30/2013, which the result was 2,520 pCi/l. This higher than normal value was the result of atmospheric recapture of gaseous tritium which accumulated in snow located around the facility. As this snow melted during this sampling period, this recaptured tritium was introduced into the groundwater and captured via our groundwater sampling program. It is worth noting that this value of 2,520 pCi/l is roughly 8-times lower than the reportable limit of 20,000 pCi/l.

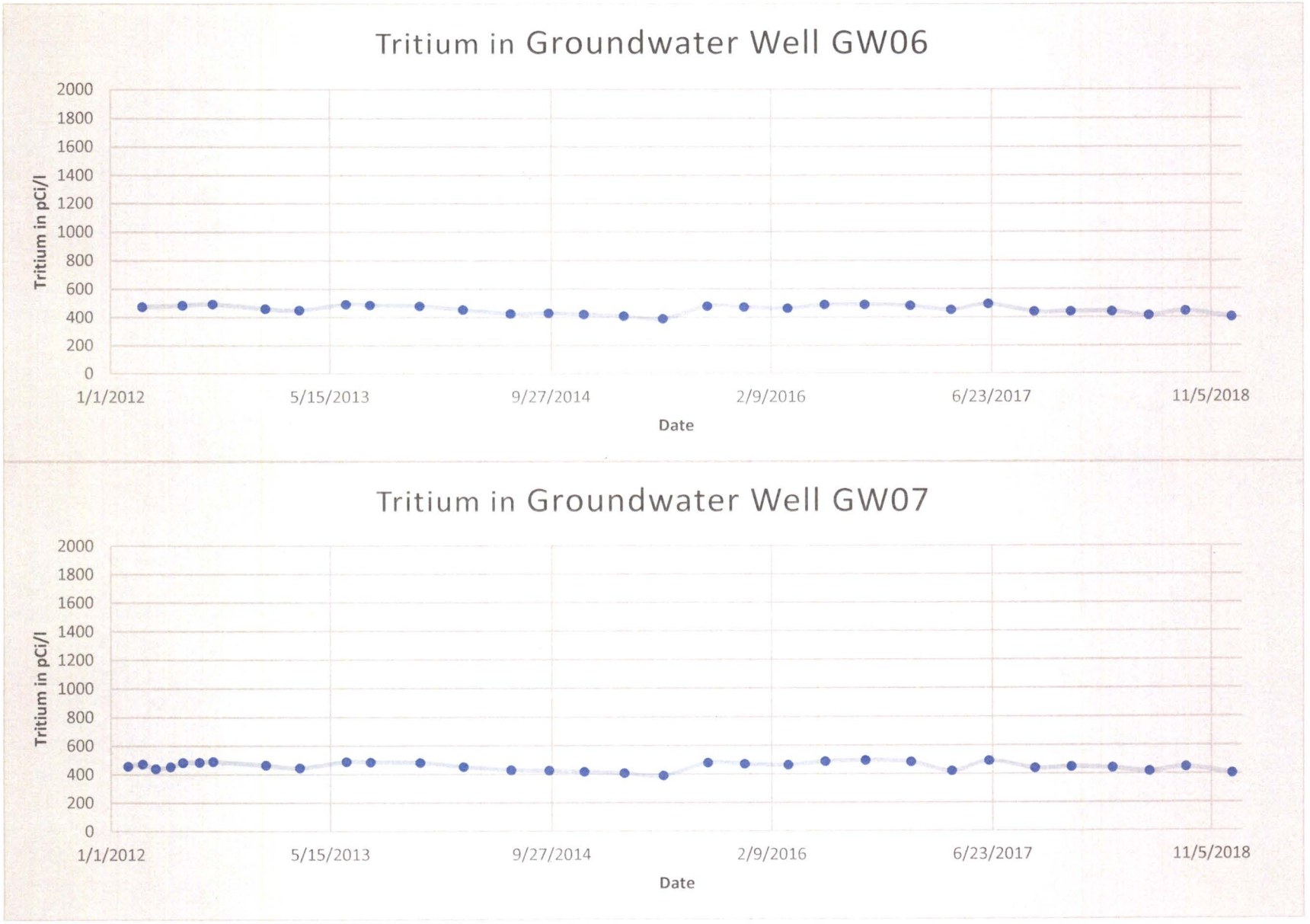
Additionally, groundwater monitoring well GW14 on 3/11/2014 was counted to an LLD of 2,000 pCi/l rather than the LLD of 500 pCi/l. Actual result was a less than value of < 1,950 pCi/l. Subsequent samples were collected to ensure there was no detectable tritium in the environment and these samples returned values of less than 500 pCi/l.

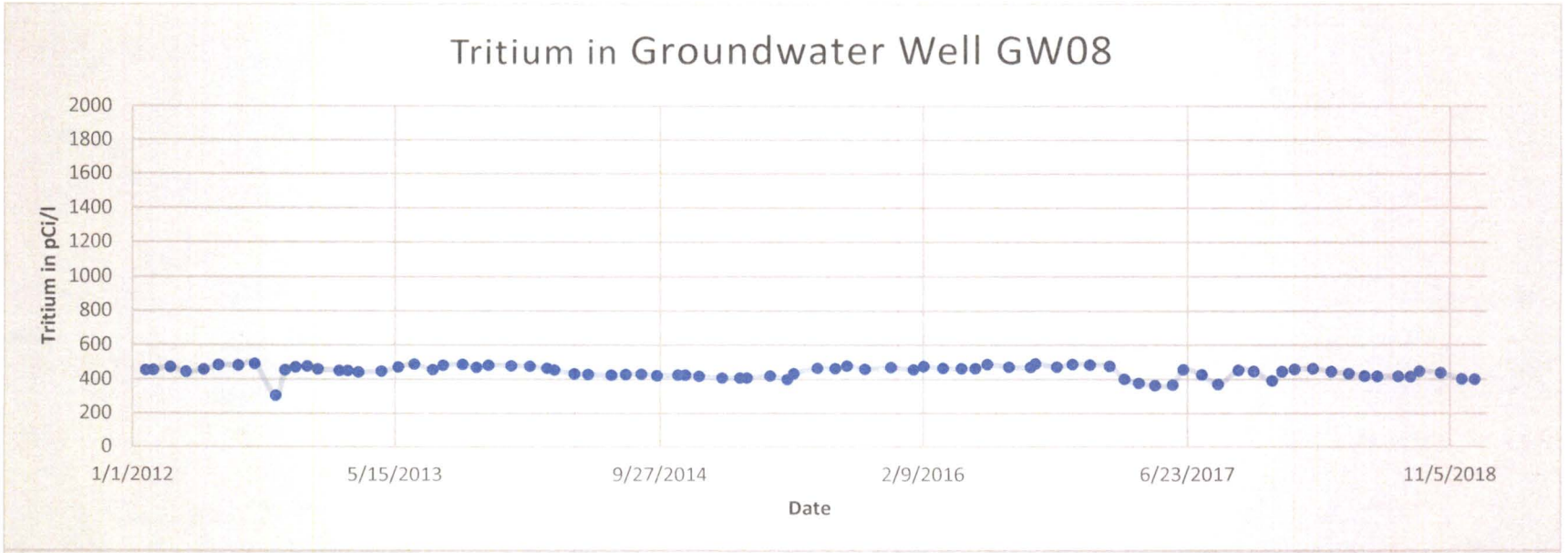
Ginna classifies groundwater monitoring well GW01 (West of the station, "upstream" as the "control" location for sampling. Due to the sampling frequencies of this program, it is difficult to graphically compare the control samples against the indicator samples. Since 2012, the average tritium concentration in control samples (Groundwater Monitoring Well GW01) was < 452 pCi/l whereas the average tritium concentration in indicator samples (Groundwater Monitoring Well GW-03 – GW08, GW10-GW16) was < 454 pCi/l. This result demonstrates that there is no statistically significant difference between control and indicator samples for Ginna's groundwater samples for the REMP.

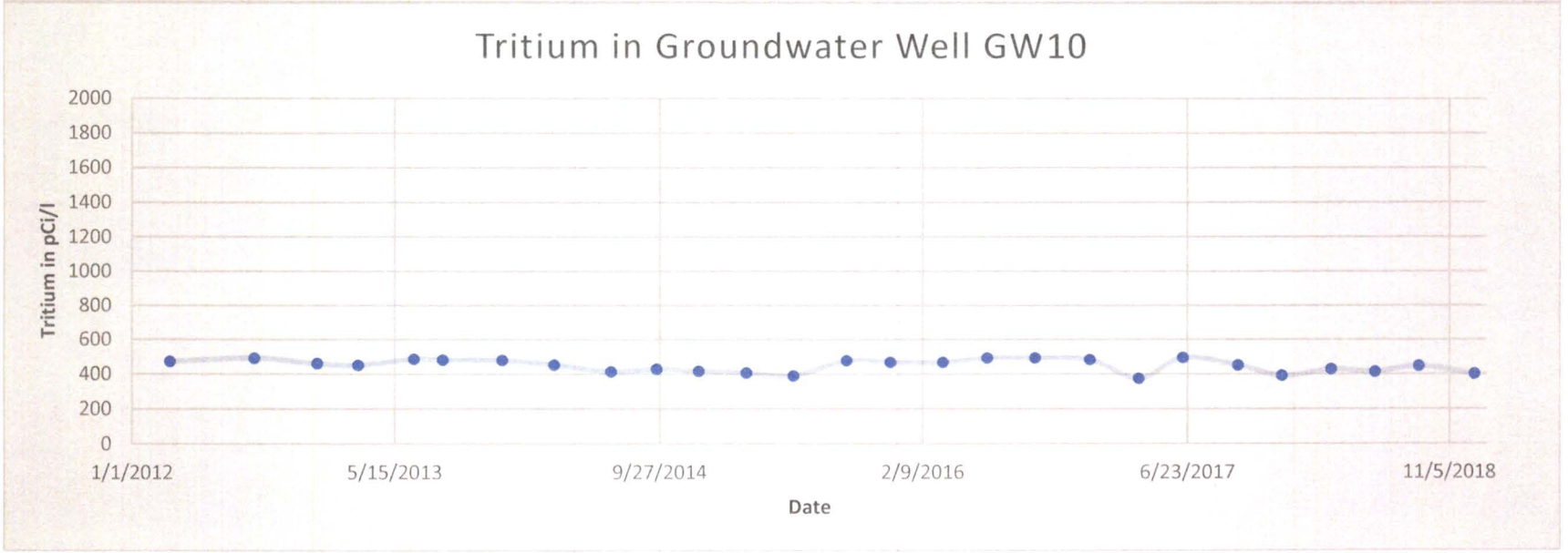

Tritium in Groundwater Well GW01
Tritium in pCi/l
2000
1800
1600
1400
1200
1000
800
600
400
200
0
1/1/2012
5/15/2013
9/27/2014
2/9/2016
6/23/2017
11/5/2018
Date
Tritium in Groundwater Well GW03
Tritium in pCi/l
2000
1800
1600
1400
1200
1000
800
600
400
200
0
1/1/2012
5/15/2013
9/27/2014
2/9/2016
6/23/2017
11/5/2018
Date

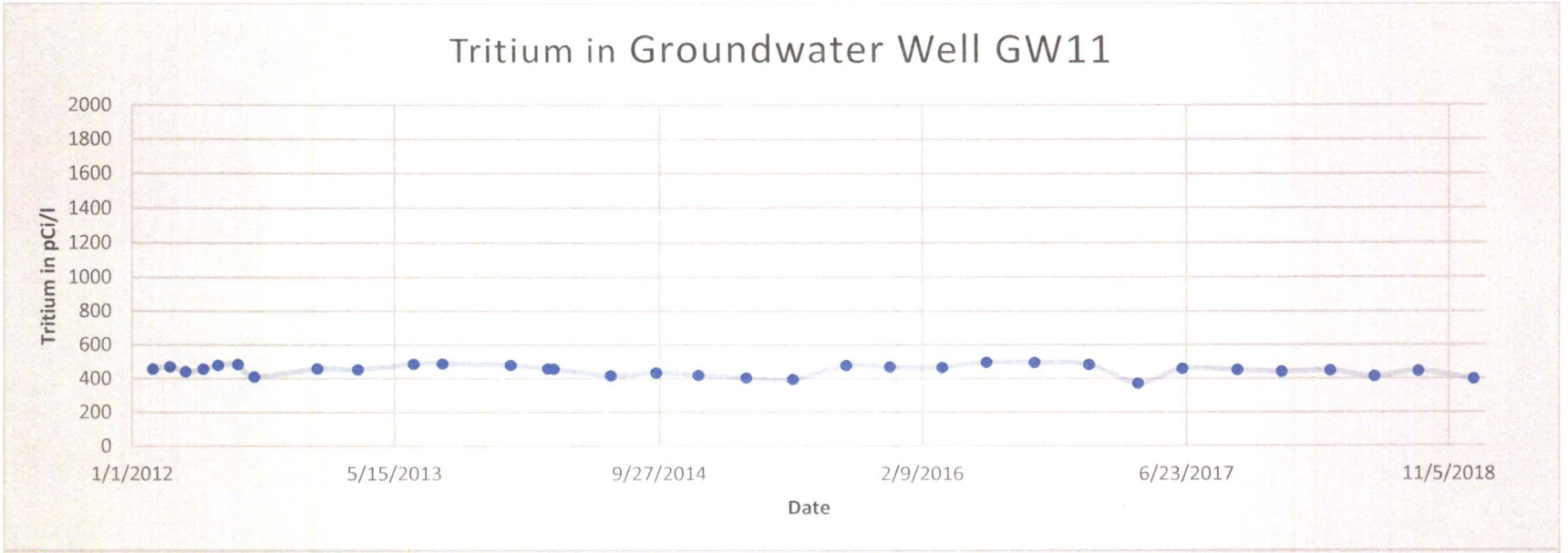

Tritium in Groundwater Well GW04
3000
2500
2000
1500
1000
500
0
Tritium in pCi/l
See explanation in Appendix E
1/1/2012
5/15/2013
9/27/2014
2/9/2016
6/23/2017
11/5/2018
Date

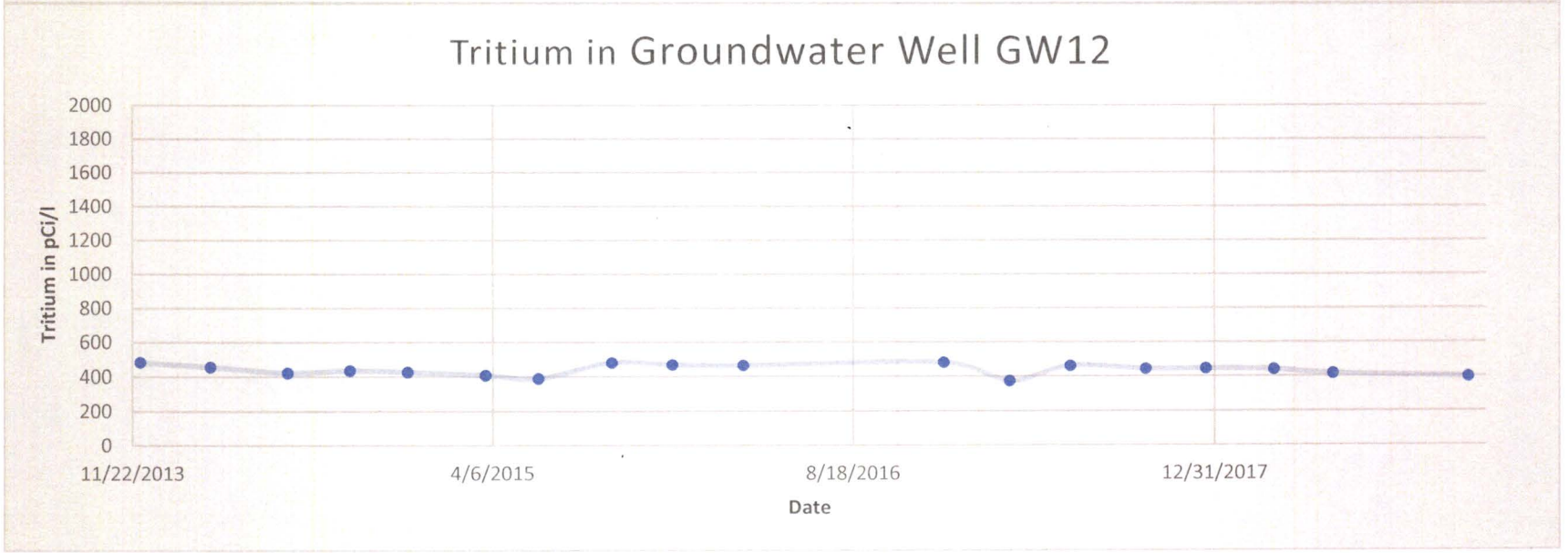

Tritium in Groundwater Well GW05
2000
1800
1600
1400
1200
1000
800
600
400
200
0
Tritium in pCi/l
1/1/2012
5/15/2013
9/27/2014
2/9/2016
6/23/2017
11/5/2018
Date

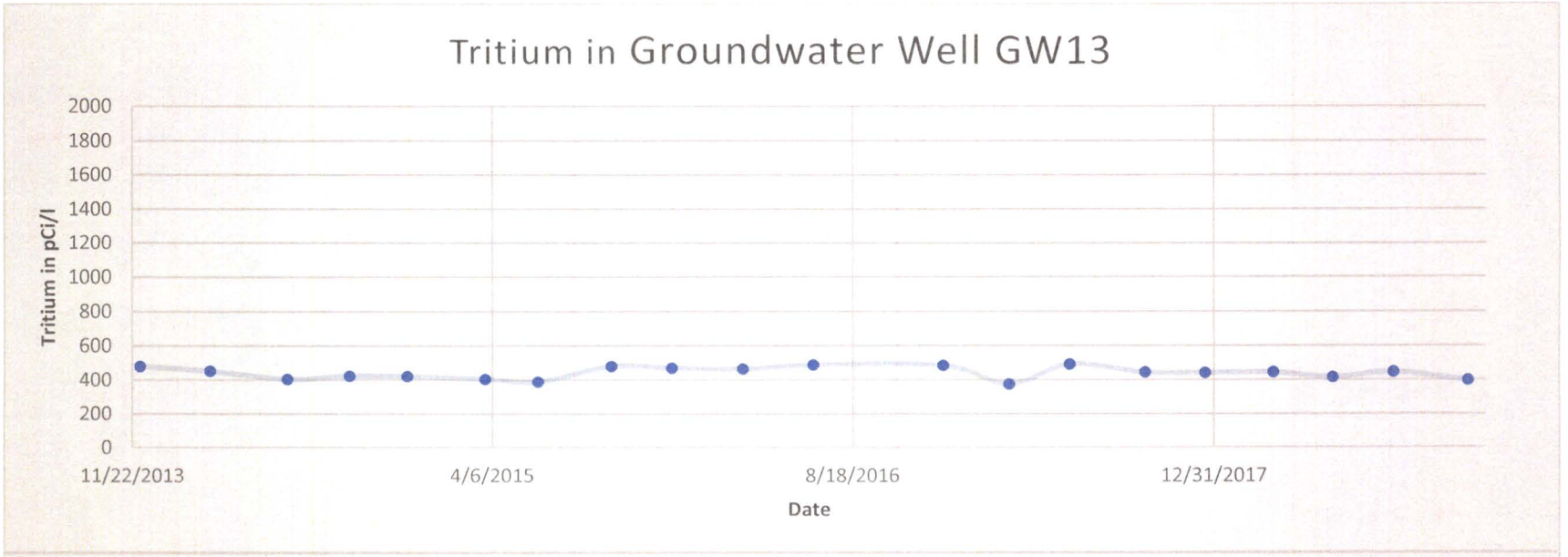

Tritium in Groundwater Well GW06
Tritium in pCi/l
2000
1800
1600
1400
1200
1000
800
600
400
200
0
1/1/2012
5/15/2013
9/27/2014
2/9/2016
6/23/2017
11/5/2018
Date
Tritium in Groundwater Well GW07
Tritium in pCi/l
2000
1800
1600
1400
1200
1000
800
600
400
200
0
1/1/2012
5/15/2013
9/27/2014
2/9/2016
6/23/2017
11/5/2018
Date

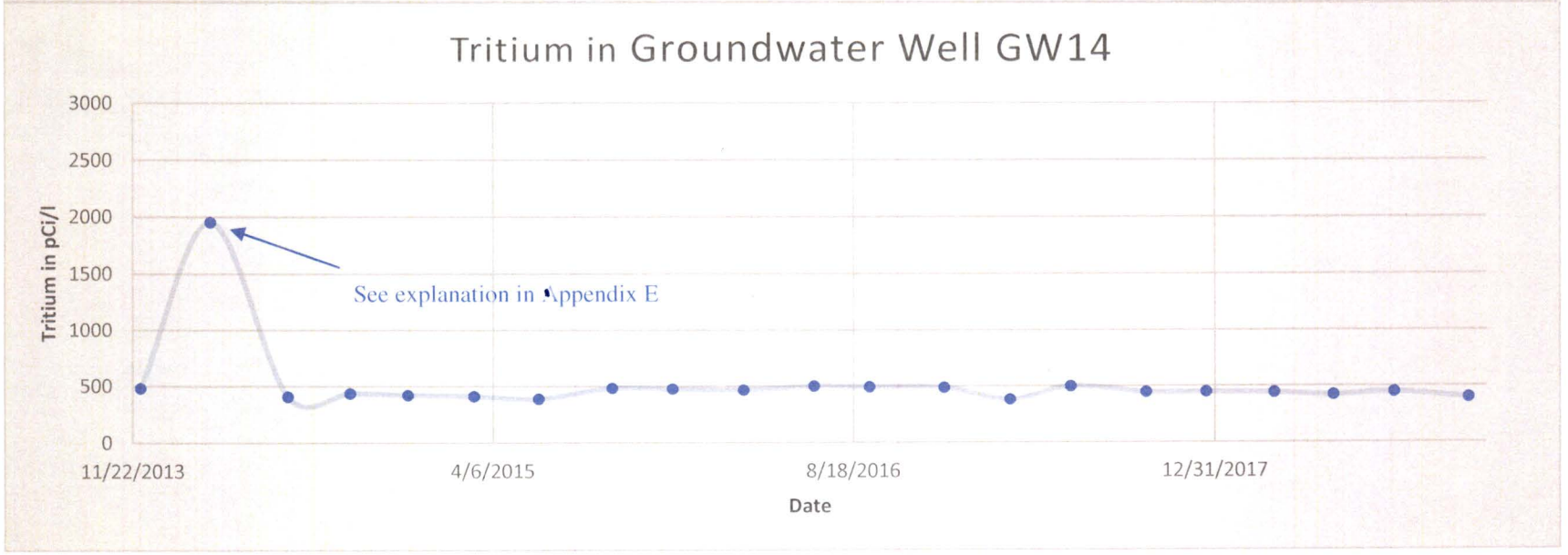

Tritium in Groundwater Well GW08
Tritium in pCi/l
2000
1800
1600
1400
1200
1000
800
600
400
200
0
1/1/2012
5/15/2013
9/27/2014
2/9/2016
6/23/2017
11/5/2018
Date

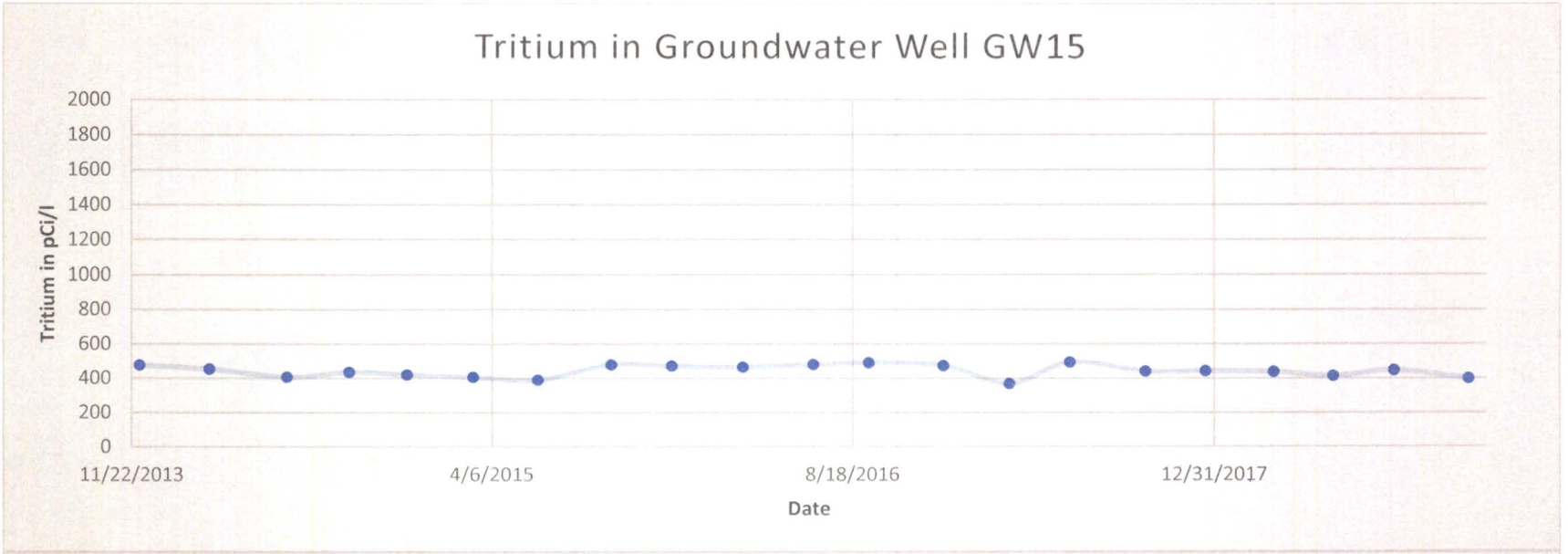

Tritium in Groundwater Well GW10
Tritium in pCi/l
2000
1800
1600
1400
1200
1000
800
600
400
200
0
1/1/2012
5/15/2013
9/27/2014
2/9/2016
6/23/2017
11/5/2018
Date

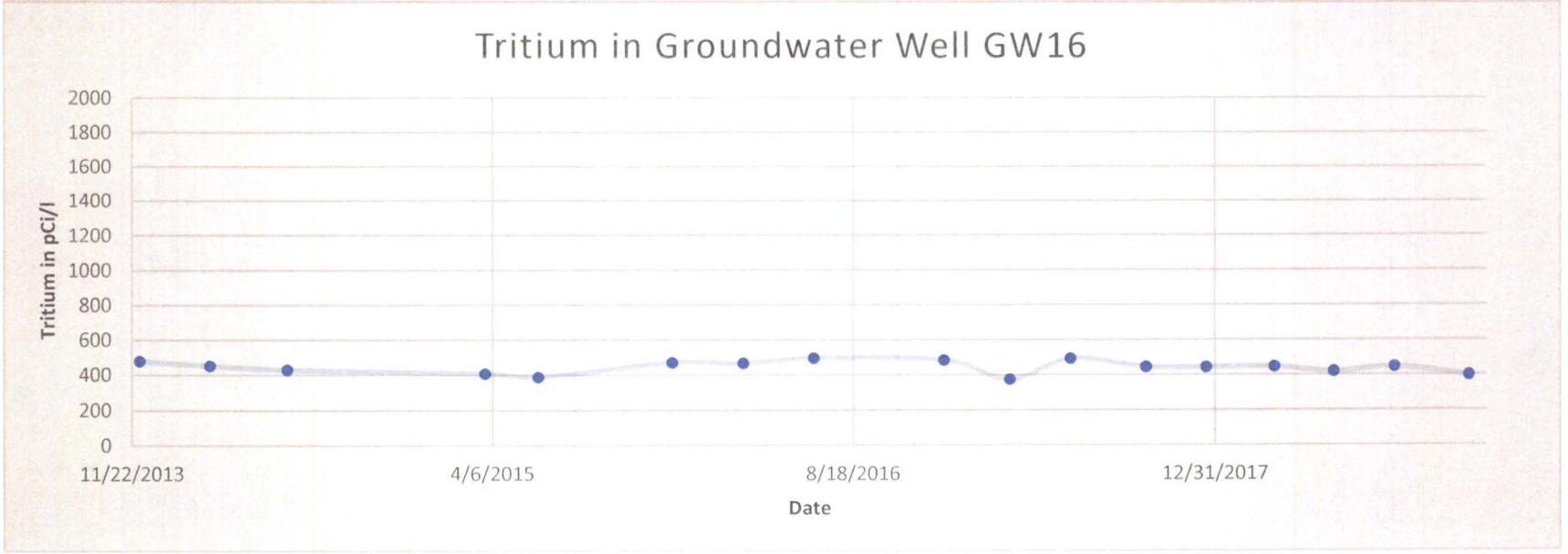

Tritium in Groundwater Well GW11
Tritium in pCi/l
2000
1800
1600
1400
1200
1000
800
600
400
200
0
1/1/2012
5/15/2013
9/27/2014
2/9/2016
6/23/2017
11/5/2018
Date


Tritium in Groundwater Well GW12
Tritium in pCi/l
2000
1800
1600
1400
1200
1000
800
600
400
200
0
11/22/2013
4/6/2015
8/18/2016
12/31/2017
Date


Tritium in Groundwater Well GW13
Tritium in pCi/l
2000
1800
1600
1400
1200
1000
800
600
400
200
0
11/22/2013
4/6/2015
8/18/2016
12/31/2017
Date


Tritium in Groundwater Well GW14
Tritium in pCi/l
3000
2500
2000
1500
1000
500
0
See explanation in Appendix E
11/22/2013
4/6/2015
8/18/2016
12/31/2017
Date


Tritium in Groundwater Well GW15
2000
1800
1600
1400
1200
1000
800
600
400
200
0
Tritium in pCi/l
11/22/2013
4/6/2015
8/18/2016
12/31/2017
Date


Tritium in Groundwater Well GW16
2000
1800
1600
1400
1200
1000
800
600
400
200
0
Tritium in pCi/l
11/22/2013
4/6/2015
8/18/2016
12/31/2017
Date