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May 10, 2017

L-MT-17-037
10 CFR 50, Appendix I

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

Monticello Nuclear Generating Plant
Docket 50-263
Renewed Facility Operating License No. DPR-22

2016 Annual Radiological Environmental Operating Report

Pursuant to 10 CFR 50, Appendix I, Section IV.B.2, IV.B.3, IV.C and, in accordance with Monticello Nuclear Generating Plant (MNGP) Technical Specifications 5.6.1, the Northern States Power Company, a Minnesota corporation (NSPM), d/b/a Xcel Energy, is submitting the Annual Radiological Environmental Operating Report, under MNGP's "Radiological Environmental Monitoring Program," for year 2016.

Summary of Commitments

This letter makes no new commitments and no revisions to existing commitments.

Kurt Scott for P. Gardner

Peter A. Gardner
Site Vice President, Monticello Nuclear Generating Plant
Northern States Power Company – Minnesota

Enclosures (1)

cc: Administrator, Region III, USNRC
Project Manager, Monticello,
Resident Inspector, Monticello
Minnesota Department of Commerce

ENCLOSURE 1

RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
JANUARY 1 – DECEMBER 31, 2016

89 pages follow

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XCEL ENERGY CORPORATION

MONTICELLO NUCLEAR GENERATING PLANT
DOCKET NO. 50-263 LICENSE NO. DPR-22

ANNUAL REPORT
TO THE
UNITED STATES NUCLEAR REGULATORY COMMISSION

Radiological Environmental Monitoring Program

January 1 to December 31, 2016

Prepared under Contract by

ENVIRONMENTAL, Inc.
Midwest Laboratory

Project No. 8010

Approved: _____

Bronia Grob, M.S.
Laboratory Manager

PREFACE

The staff of Environmental, Inc., Midwest Laboratory was responsible for the acquisition of data presented in this report. Samples were collected by personnel of the Monticello Nuclear Generating Plant, operated by Northern States Power Co., Minnesota for XCEL Energy Corporation. This report was prepared by Environmental, Inc., Midwest Laboratory.

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Appendix D

1.0 INTRODUCTION

This report summarizes and interprets results of the Radiological Environmental Monitoring Program (REMP) conducted by Environmental, Inc., Midwest Laboratory for the Monticello Nuclear Generating Plant, Monticello, Minnesota, during the period January - December, 2016. This Program monitors the levels of radioactivity in the air, terrestrial, and aquatic environments in order to assess the impact of the Plant on its surroundings.

Tabulations of the individual analyses made during the year are included in Part II of this report.

The Monticello Nuclear Generating Plant is a boiling water reactor with a nominal generating capacity of 681 MWe. It is located on the Mississippi River in Wright County, Minnesota, owned by Xcel Energy Corporation and operated by Northern States Power Co. Minnesota. Initial criticality was achieved on December 10, 1970. Full power was achieved March 5, 1971 and commercial operation began on June 30, 1971.

2.0 SUMMARY

The Radiological Environmental Monitoring Program (REMP) is described; this program is required by the U.S. Nuclear Regulatory Commission (NRC) as well as Technical Specifications and the Offsite Dose Calculation Manual (ODCM) for the Monticello Nuclear Generating Plant. Results for the year 2016 are summarized and discussed.

Program findings show background levels of radioactivity in the environmental samples collected in the vicinity of the Monticello Nuclear Generating Plant.

3.1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM (REMP)

3.2 Program Design and Data Interpretation

The purpose of the Radiological Environmental Monitoring Program (REMP) at the Monticello Nuclear Generating Plant is to assess the impact of the Plant on its environment. For this purpose, samples are collected from the air, terrestrial, and aquatic environments and analyzed for radioactive content. In addition, ambient gamma radiation levels are monitored by thermoluminescent dosimeters (TLD's).

Sources of environmental radiation include the following:

(1) Natural background radiation arising from cosmic rays and primordial radionuclides;
(2) Fallout from atmospheric nuclear detonations;
(3) Releases from nuclear power plants;
(4) Industrial and medical radioactive waste; and
(5) Fallout from nuclear accidents.

In interpreting the data, effects due to the Plant must be distinguished from those due to other sources.

A major interpretive aid in assessment of these effects is the design of the monitoring program at the Monticello Plant which is based on the indicator-control concept. Most types of samples are collected both at indicator locations (nearby, downwind, or downstream) and at control locations (distant, upwind, or upstream). A plant effect would be indicated if the radiation level at an indicator location was significantly larger than that at the control location. The difference would have to be greater than could be accounted for by typical fluctuations in radiation levels arising from other sources.

An additional interpretive technique involves analyses for specific radionuclides present in environmental samples collected from the Plant site. The Plant's monitoring program includes analyses for tritium and iodine-131. Most samples are also analyzed for gamma-emitting isotopes with results for the following groups quantified: zirconium-95, cesium-137, cerium-144, beryllium-7, and potassium-40. The first three gamma-emitting isotopes were selected as radiological impact indicators because of the different characteristic proportions in which they appear in the fission product mix produced by a nuclear reactor and that produced by a nuclear detonation. Each of the three isotopes is produced in roughly equivalent amounts by a reactor: each constitutes about 10% of the total activity of fission products 10 days after reactor shutdown. On the other hand, 10 days after a nuclear explosion, the contributions of zirconium-95, cerium-144, and cesium-137 to the activity of the resulting debris are in the approximate ratio 4:1:0.03 (Eisenbud, 1963). Beryllium-7 is of cosmogenic origin and potassium-40 is a naturally-occurring isotope. They were chosen as calibration monitors and should not be considered as radiological impact indicators. The other group quantified consists of niobium-95, ruthenium-103 and -106, cesium-134, barium-lanthanum-140, and cerium-141. These isotopes are released in small quantities by nuclear power plants, but to date their major source of injection into the general environment has been atmospheric nuclear testing. Nuclides of the final group, manganese-54, iron-59, cobalt-58 and -60, and zinc-65, are activation products and arise from activation of corrosion products. They are typical components of a nuclear power plant's effluents, but are not produced in significant quantities by nuclear detonations.

Other means of distinguishing sources of environmental radiation are employed in interpreting the data. Current radiation levels are compared with previous levels, including those measured before the plant became operational. Results of the Plant's Monitoring Program can be related to those obtained in other parts of the world. Finally, results can be related to events known to cause elevated levels of radiation in the environment, e.g., atmospheric nuclear detonations.

3.3 Program Description

The sampling and analysis schedule for the Radiological Environmental Monitoring Program (REMP) at the Monticello Plant is summarized in Table 5.1 and briefly reviewed below. Table 5.2 defines the sampling location codes used in Table 5.1 and specifies for each location its type (indicator or control) and its distance, direction, and sector relative to the plant site. To assure that sampling is carried out in a reproducible manner, detailed sampling procedures have been prescribed (Monticello Generating Plant REMP Surveillances, Current Revision). Maps of sampling locations are included in Appendix D.

To monitor the air environment, airborne particulates are collected on membrane filters by continuous pumping at five locations. Also, airborne iodine is collected by continuous pumping through charcoal filters at all of these locations. Both types of filters are changed and counted weekly. Particulate filters are analyzed for gross beta activity and charcoal filters for iodine-131. Quarterly composites of particulate filters from each location are determined by gamma spectroscopy. One of the five locations is a control (M-1), and four are indicators (M-2, M-3, M-4, M-5). One of the indicators is located in the geographical sector expected to be most susceptible to any atmospheric emissions from the Plant (highest D/Q sector).

Ambient gamma radiation is monitored at forty locations, using $CaSO_4$:Dy dosimeters with four sensitive areas at each location: fourteen in an inner ring in the general area of the site boundary, sixteen in the outer ring within 4-5 mile radius, six at special interest locations and four control locations, outside a 10 mile radius from the plant. They are replaced and measured quarterly.

As substitute for dairy sampling, vegetation is collected from locations M-41, M-42, and M-43 (C). The samples are analyzed for iodine-131 and other gamma emitting isotopes.

Corn and potatoes are collected annually if fields are irrigated by water in which liquid radioactive effluent has been discharged. Analysis is done for gamma-emitting isotopes.

Well water is monitored by quarterly collections from three off-site locations (one control and two indicators) and one on-site Plant well.

Quarterly collections of storm water runoff were added to monitor another possible pathway to the groundwater aquifer. The samples are also analyzed for tritium and gamma emitting isotopes.

River water is collected weekly at two locations, one upstream of the plant and one downstream. Monthly composites are analyzed for gamma-emitting isotopes. Quarterly composites are analyzed for tritium.

Drinking water is collected weekly from the City of Minneapolis water supply, which is taken from the Mississippi River downstream of the Plant. Monthly composites are analyzed for gross beta, iodine-131, and gamma-emitting isotopes. Quarterly composites are analyzed for tritium.

The aquatic environment is also monitored by semi-annual upstream and downstream collections of fish, invertebrates, and shoreline sediments. Shoreline sediment is also collected from one downstream recreational location. All samples are analyzed for gamma-emitting isotopes.

3.4 Program Execution

The Program was executed as described in the preceding section with the following exceptions:

(1) TLD's

M-2C, TLD found missing in the field for the third quarter of 2016. TLD's were also found missing in the field from locations M-3A, M-11A and M-12A for the fourth quarter of 2016.

(2) Air Particulates / Air Iodine:

M-05, Air particulate / air iodine sample for the week ending 9/7/16 was calculated to have a reduced sample volume due to a reduced air sampler run time of 29.4 hours.

M-04, Air particulate filter sample for the week ending 9/14/16 was found offset in sample head.

(3) Surface Water:

M-008, River water was frozen for the months of January 2016 and February 2016 and the week of 3/2/16.

M-001, Water was frozen from 12/14/16 through 12/28/16.

(4) Drinking Water:

M-14, weekly sample from 6/29/16 was lost and not included in the June monthly composite sample.

(5) Bottom Organisms:

M-8 and M-9 were not collected in 2016 due to dangerous river conditions. Unavailability due to cold water temperature once the river was at a safe level.

(6) Shoreline Sediment:

M-8, M-9 and M-15 were not collected in the first half of the year due to dangerous river conditions.

Deviations from the program are summarized in Table 5.3.

3.5 Program Modifications

No significant modifications were made to the MNGP Radiological Environmental Monitoring Program in 2016.

3.6 Laboratory Procedures

The iodine-131 analyses in drinking water were made using a sensitive radiochemical procedure which involves separation of the iodine using an ion-exchange method and solvent extraction and subsequent beta counting.

Gamma-spectroscopic analyses are performed using high-purity germanium (HPGe) detectors. Levels of iodine-131 in natural vegetation and concentrations of airborne iodine-131 in charcoal samples were determined by gamma spectroscopy.

Tritium concentrations are determined by liquid scintillation.

Analytical Procedures used by Environmental, Inc. are on file and are available for inspection. Procedures are based on those prescribed by the Health and Safety Laboratory of the U.S. Dep't of Energy, Edition 28, 1997, U.S. Environmental Protection Agency for Measurement of Radioactivity in Drinking Water, 1980, and the U.S. Environmental Protection Agency, EERF, Radiochemical Procedures Manual, 1984.

Environmental, Inc., Midwest Laboratory has a comprehensive quality control/quality assurance program designed to assure the reliability of data obtained. Details of the QA Program are presented elsewhere (ATI Environmental, Inc., Midwest Laboratory, 2016). The QA Program includes participation in Interlaboratory Comparison (crosscheck) Programs. Results obtained in the crosscheck programs are presented in Appendix A.

3.7 Land Use Census

In accordance with the MNGP Chemistry Manual, Procedure I.05.41, “Annual Land Use Census and Critical Receptor Identification”, a land use census shall be conducted and shall identify the location of the nearest milk animal, meat animal, the nearest residence, and the nearest garden of greater than 500 ft^2 producing fresh leafy vegetables, in each of the 16 meteorological sectors within a 5 mile radius. The census shall also identify the locations of all milk animals, meat animals and all gardens of greater than 500 ft^2 producing broad leaf vegetation in each of the meteorological sectors within a distance of three miles. This census shall be conducted at least once per year between the dates of May 1 and October 31. New locations shall be added to the radiation environmental monitoring program within 30 days and sampling locations having lower calculated doses or a lower dose commitment may be deleted from this monitoring program after October 31 of the year in which the land use census was conducted.

The 2016 land use census was conducted between September 12 and September 20, 2016. The survey was performed using door-to-door surveys and visual observations while driving; additionally, inputs from the 2015 field data forms and Homeland Security Emergency Management Monticello Basemap were used in determining changes in land use. All locations identified were mapped on Delorme Street Atlas using a hand-held GPS unit.

There was one sector in which the highest D/Q values for gardens increased by greater than 20%. The change in this sector is due to a closer residence planting a garden in 2016 where there was no garden in 2015. The highest D/Q garden for 2016 did not change from the 2015 highest D/Q garden. There were five sectors where the highest D/Q values for Meat animals increased by greater than 20%. The changes in the sectors are due to a closer residence raising animals for meat consumption in the affected sectors. The highest D/Q meat animal changed in the 2016 census. There were no sectors were the highest D/Q values for the nearest residence increased by more than 20%. There currently are no milking animals within a five mile radius of the plant. Vegetation sampling is currently being performed in lieu of milk sampling. There are no crops being irrigated from the Mississippi River.

The Critical Receptor for 2016 remained the same as 2015 and 2014 (Child, Thyroid located 1.15 mi SSE with exposure to Ground, Plume, Inhalation and Vegetable Pathways). Details of the land use census are contained in the Land Use Census and Critical Receptor Report, Monticello Nuclear Generating Plant, Chemistry and Radiation Protection Department.

4.1 RESULTS AND DISCUSSION

All of the scheduled collections and analyses were made except those listed in Table 5.3.

All results are summarized in Table 5.4 in a format recommended by the Nuclear Regulatory Commission in Regulatory Guide 4.8. For each type of analysis of each sampled medium, this table lists the mean and range for all indicator locations and for all control locations. The locations with the highest mean and range are also shown.

4.2 Atmospheric Nuclear Detonations and Nuclear Accidents

There were no reported accidents involving significant release to the environment at nuclear reactor facilities in 2016. The Fukushima Daiichi nuclear accident occurred March 11, 2011.

There were no reported atmospheric nuclear tests in 2016. The last reported test was conducted on October 16, 1980 by the People's Republic of China.

4.3 Summary of Preoperational Data

The following constitutes a summary of preoperational studies conducted at the Monticello Nuclear Generating Plant during the years 1968 to 1970, to determine background levels expected in the environment, and provided, where applicable, as a means for comparison with present day levels. Strict comparisons, however, are difficult to make, since background levels of radiation were much higher in these years due to radioactive fallout from the atmosphere. Gross beta measurements in fallout averaged 20,600 pCi/m^3 in 1969 and 12,000 pCi/m^3 in 1970. These levels are reflected throughout the various media tested.

In the air environment, ambient gamma radiation (TLDs) averaged 9.1 mRem/4 weeks during preoperational studies (1970). Gross beta in air particulates in 1969 and 1970 averaged 0.20 pCi/m^3. Present day levels have stabilized at around 0.025 pCi/m^3. Airborne radioiodine remained below detection levels of 0.03 pCi/m^3

In the terrestrial environment of 1968 to 1970, milk, agricultural crops, and soil were monitored. In milk samples, low levels of Cs-137 and Sr-90 were detected. Cs-137 levels averaged 16.7 pCi/L. Soybean crop measurements in 1969 averaged 35.5 pCi/g for gross beta and 0.3 pCi/g for Cs-137. Gross beta measured in soil averaged 51.7 pCi/g . Present day measurements for cesium-137 are below detection levels in milk and agricultural crops.

The aqueous environment was monitored by testing of river water, bottom sediments, fish, aquatic vegetation, and periphyton. Specific location comparison of drinking, river, and well water concentrations for tritium and gross beta are not possible. However, tritium background levels, measured at seven separate locations from 1968 to 1970, averaged 970 pCi/L. Present day environmental samples measure below detection levels. Values for gross beta, measured from 1968 to 1970, averaged 9.8 pCi/L in upstream and downstream Mississippi River water, 4.4 pCi/L for well waters, and 18.6 pCi/L for lake waters. Gamma emitters were below the lower limit of detection (LLD). In shoreline sediments, gross beta background levels in 1970 averaged 49.8 pCi/g for both upstream and downstream samples. Cs-137 activity averaged 0.10 pCi/g for both upstream and downstream samples. Low levels of Cs-137, occasionally observed today can still be attributed to residual activity from atmospheric fallout. Gross beta levels in fish flesh averaged 5.3 pCi/g in 1968 and 1969. Cs-137, measured in 1969 and 1970, averaged 0.044 pCi/g. Gross beta background levels, in 1970, for aquatic vegetation, algae, and periphyton samples measured 86.7 pCi/g, 76.5 pCi/g, and 28.1 pCi/g respectively.

4.4 Program Findings

Results obtained show background levels of radioactivity in environmental samples collected outside of the Site Protected Area in 2016.

Tritium was identified in some groundwater samples collected within the site Protected Area, but not in offsite or domestic well samples.

Ambient Radiation (TLD's)

Ambient radiation was measured in the general area of the site boundary(inner ring), at an outer ring 4 - 5 mi. distant from the Plant, at special interest areas and at four control locations. The means were similar for both inner and outer rings (15.1 and 14.3 mRem/91 days, respectively). The mean for special interest locations was 14.6 mRem/91 days and the mean for the control locations was
15.4 mRem/91 days. Dose rates measured at the inner and outer ring locations were similar to those observed from 1999 through 2016 and are tabulated below. No plant effect on ambient gamma radiation is indicated (Figure 5-1).

Year	Inner Ring	Outer Ring
	Dose rate (mRem/91 days)	
1999	15.1	14.3
2000	15.1	14.5
2001	14.3	13.7
2002	15.9	14.8
2003	15.6	15.0
2004	16.0	15.4
2005	15.6	15.2
2006	16.5	15.6
2007	16.1	15.1
2008	15.2	14.6
2009	14.9	14.4
2010	14.7	14.3
2011	14.8	14.3
2012	16.2	15.5
2013	14.4	14.0
2014	13.5	12.9
2015	14.8	14.2
2016	15.1	14.3

Ambient gamma radiation as measured by thermoluminescent dosimetry.
Average quarterly dose rates, Inner vs. Outer Ring locations.

Airborne Particulates

The average annual gross beta concentrations in airborne particulates were almost identical at both indicator and control locations (0.024 and 0.026 pCi/m^3,respectively), similar to levels observed from 1999 through 2015. The results are tabulated below.

Year	Indicators	Control
	Concentration (pCi/m^3)	
1999	0.023	0.025
2000	0.027	0.026
2001	0.027	0.026
2002	0.028	0.028
2003	0.027	0.027
2004	0.024	0.024
2005	0.025	0.025
2006	0.024	0.025
2007	0.027	0.028
2008	0.028	0.029
2009	0.029	0.030
2010	0.026	0.026
2011	0.029	0.027
2012	0.032	0.031
2013	0.029	0.032
2014	0.027	0.028
2015	0.030	0.028
2016	0.026	0.024

Average annual gross beta concentrations in airborne particulates.

Typically, the highest average readings occur during the months of January and December, and the first and fourth quarters, as observed in 1999 through 2015.

Gamma spectroscopic analysis of quarterly composites of air particulate filters yielded similar results for indicator and control locations. Beryllium-7, which is produced continuously in the upper atmosphere by cosmic radiation (Arnold and Al-Salih, 1955) was detected in all samples, with an average activity of 0.076 pCi/m^3 for the indicator locations and 0.069 pCi/m^3 for the control locations. All other gamma-emitting isotopes were below their respective LLD limits.

Airborne Iodine

Weekly levels of airborne iodine-131 were below the lower limit of detection (LLD) of 0.03 pCi/m^3 in all samples.

River Water and Drinking Water

Tritium activity measured below 500 pCi/L in all samples. Gamma isotopic results were all below detection limits. Gross beta activity in Minneapolis drinking water averaged 2.6 pCi/L and was similar to average levels observed from 1998 through 2015. Gross beta averages are tabulated below. No indication plant operational effects were indicated.

Year	Gross Beta (pCi/L)		Year	Gross Beta (pCi/L)
1999	2.2		2008	2.1
2000	2.5		2009	2.3
2001	2.5		2010	2.9
2002	2.9		2011	2.2
2003	3.0		2012	2.4
2004	2.7		2013	2.6
2005	2.8		2014	2.8
2006	2.1		2015	2.3
2007	2.8		2016	2.6

Average annual concentrations; Gross beta in drinking water.

Well Water

At the four indicator and control locations, tritium was below the detection limit for all samples. Gamma isotopic results were also below detection limits.

The data for 2016 were consistent with previous year's results and no plant operational effects were indicated.

Vegetation in lieu of Milk Sampling

Vegetation samples were collected in July, August and September, 2016. Iodine-131 concentrations measured below 0.054 pCi/g wet weight in all samples. These samples are required when milk samples are not available.

Crops

A vegetation collection was not required for 2016. No crops within five miles of the plant were found using irrigation water from the Mississippi River, and the plant did not discharge radioactive liquid effluents.

Fish

Eight fish were analyzed in 2016 consisting of two fish collected from upstream locations and two collected from downstream locations in May and then again in September. Flesh was separated from the bones and analyzed by gamma spectroscopy. Only naturally-occurring potassium-40 was found with an average of 3.35 pCi/g wet weight for four upstream samples and 3.28 pCi/g wet weight for the four downstream samples. These results agree with 2015 results. Other gamma-emitting isotopes remained below detection limits. There was no indication of a plant effect.

Shoreline Sediments

Upstream, downstream and downstream recreational area shoreline sediment collections were made in November, 2016, and analyzed for gamma-emitting isotopes. A level of cesium-137 was detected in one downstream samples (M-9), at a concentration of 0.030 pCi/g dry weight. Similar levels of activity have been observed since 1978, and are indicative of the influence of fallout deposition. Naturally-occurring beryllium-7 and potassium-40 were also detected. There was no indication of a plant effect.

Storm Water Run-off (on-site)

All of five storm water run-off samples were below detection limits. Gamma isotopic analysis results also measured below detection limits for all five samples analyzed in 2016.

ISFSI TLD Monitoring

Gamma and Neutron TLDs are located around the Independent Spent Fuel Storage Installation (ISFSI) to monitor direct radiation from stored fuel. Results for gamma monitoring are included in the Complete Data Analysis Tables. In the 2015 AREOR it was stated that MNGP intended to begin reporting results for neutron TLD's. Benchmarking of other nuclear plant annual reports indicates that neutron dose is not reported. MNGP is awaiting industry guidance on how neutron TLD dose should be treated in an environmental monitoring context before reporting neutron monitoring results. Neutron TLD results are used internally for trending of neutron dose rates around the ISFSI.

5.0 FIGURES AND TABLES

Table 5.1. Sample collection and analysis program, Monticello Nuclear Generating Plant.

Medium	No.	Location Codes (and Type) [a]	Collection Type and Frequency [b]	Analysis Type and Frequency [c]
REMP Ambient radiation(TLDs)	40	M-01A - M-14A, M-01B - M-16B M-01S - M-06S, M-01C - M-04C	C/Q	Ambient gamma
ISFSI Ambient radiation (TLDs)	13	I-01 to I-13	C/Q	Ambient Gamma
Airborne Particulates	5	M-1(C), M-2, M-3, M-4, M-5	C/W	GB, GS (QC of each location)
Airborne Iodine	5	M-1(C), M-2, M-3, M-4, M-5	C/W	I-131
Pasture grass, Vegetation [d]	3	M-41, M-42, M-43(C)	3x/year	GS
Surface water	2	M-8(C), M-9	G/W	GS(MC), H-3(QC)
Drinking water	1	M-14	G/W	GB(MC), I-131(MC) GS (MC), H-3 (QC)
Well water	4	M-11, M-12, M-55, M-43(C)	G/Q	H-3, GS
Fish (two species, edible portion)	2	M-8(C), M-9	G/SA	GS
Periphyton or invertebrates	2	M-8(C), M-9	G/SA	GS
Shoreline sediment	3	M-8(C), M-9, M-15	G/SA	GS

[a] Location codes are defined in Table 5.2. Control stations are indicated by (C). All other stations are indicators.

[b] Collection type is coded as follows: C/ = continuous, G/ = grab. Collection frequency is coded as follows: W= weekly, M = monthly, Q = quarterly, SA = semiannually, A = annually.

[c] Analysis type is coded as follows: GB = gross beta, GS = gamma spectroscopy, H-3 = tritium, I-131 = iodine-131. Analysis frequency is coded as follows: MC = monthly composite, QC = quarterly composite.

[d] Pasture grass and vegetation collections added to supplement dairy sampling.

Table 5.2. Sampling locations, Monticello Nuclear Generating Plant.

Code	Type [a]	Collection Site	Sample Type [b]	Distance and Direction from Reactor
M-1	C	Air Station M-1	AP, AI	11.0 mi @ 307°/NW
M-2		Air Station M-2	AP, AI	0.8 mi @ 140°/SE
M-3		Air Station M-3	AP, AI	0.6 mi @ 104°/ESE
M-4		Air Station M-4	AP, AI	0.8 mi @ 147°/SSE
M-5		Air Station M-5	AP, AI	2.6 mi @ 134°/SE
M-8	C	Upstream of Plant Intake	SW, SS, BO, F	< 1000' upstream
M-9		Downstream of Plant Discharge	SW, SS, BO, F	< 1000' downstream
M-11		City of Monticello	WW	3.3 mi @ 127°/SE
M-12		Plant Well #11	WW	0.26 mi @ 252°/WSW
M-14		City of Minneapolis	DW	37.0 mi @ 132°/SE
M-15		Montissippi Park	SS	1.27 mi @ 114°/ESE
M-27		Highest D/Q garden		1.15 mi @ 148°/SSE
M-41		Training Center	VE	0.8 mi @ 151°/SSE
M-42		Biology Station Road	VE	0.6 mi @ 134°/SE
M-43	C	Imholte Farm	VE, WW	12.3 mi @ 313°/NW
M-55		Hasbrouck Residence	WW	1.60 mi @ 255°/WSW

Table 5.2. Sampling locations, Monticello Nuclear Generating Plant.

Code	Type[a]	Collection Site	Sample Type[b]	Distance and Direction from Reactor
General Area of the Site Boundary				
M-01A		Sherburne Ave. So.	TLD	0.75 mi @ 353°/N
M-02A		Sherburne Ave. So.	TLD	0.79 mi @ 23°/NNE
M-03A		Sherburne Ave. So.	TLD	1.29 mi @ 56°/NE
M-04A		Biology Station Road	TLD	0.5 mi @ 92°/E
M-05A		Biology Station Road	TLD	0.48 mi @ 122°/ESE
M-06A		Biology Station Road	TLD	0.54 mi @ 138°/SE
M-07A		Parking Lot H	TLD	0.47 mi @ 158°/SSE
M-08A		Parking Lot F	TLD	0.45 mi @ 175°/S
M-09A		County Road 75	TLD	0.38 mi @ 206°/SSW
M-10A		County Road 75	TLD	0.38 mi @ 224°/SW
M-11A		County Road 75	TLD	0.4 mi @ 237°/WSW
M-12A		County Road 75	TLD	0.5 mi @ 262°/W
M-13A		North Boundary Road	TLD	0.89 mi @ 322°/NW
M-14A		North Boundary Road	TLD	0.78 mi @ 335°/NNW
Approximately 4 to 5 miles Distant from the Plant				
M-01B		117th Street	TLD	4.65 mi @ 01°/N
M-02B		County Road 11	TLD	4.4 mi @ 18°/NNE
M-03B		County Road 73 & 81	TLD	4.3 mi @ 51°/NE
M-04B		County Road 73 (196th St.)	TLD	4.2 mi @ 67°/ENE
M-05B		City of Big Lake	TLD	4.3 mi @ 89°/E
M-06B		County Road 14 and 196th St.	TLD	4.3 mi @ 117°/ESE
M-07B		Monticello Industrial Drive	TLD	4.3 mi @ 136°/SE
M-08B		Residence, Hwy 25 & Davidson Ave.	TLD	4.6 mi @ 162°/SSE
M-09B		Weinand Farm	TLD	4.7 mi @ 178°/S
M-10B		Reisewitz Farm, Acacia Ave.	TLD	4.2 mi @ 204°/SSW
M-11B		Vanlith Farm, 97th Ave.	TLD	4.0 mi @ 228°/SW
M-12B		Lake Maria State Park	TLD	4.2 mi @ 254°/WSW
M-13B		Bridgewater Station	TLD	4.1 mi @ 270°/W
M-14B		Anderson Residence, Cty Rd. 111	TLD	4.3 mi @ 289°/WNW
M-15B		Red Oak Wild Bird Farm	TLD	4.3 mi @ 309°/NW
M-16B		Sand Plain Research Farm	TLD	4.4 mi @ 341°/NNW

Table 5.2. Sampling locations, Monticello Nuclear Generating Plant.

Code	Type[a]	Collection Site	Sample Type[b]	Distance and Direction from Reactor
Special Interest Locations				
M-01S		Osowski Fun Market	TLD	0.66 mi @ 241°/WSW
M-02S		Krone Residence	TLD	0.5 mi @ 220°/SW
M-03S		Big Oaks Park	TLD	1.53 mi @ 103°/ESE
M-04S		Pinewood School	TLD	2.3 mi @ 131°/SE
M-05S		Rivercrest Christian Academy	TLD	3.0 mi @ 118°/ESE
M-06S		Monticello Public Works	TLD	2.6 mi @ 134°/SE
ISFSI-11		I-11 (gamma)	TLD	OCA fence south, on exit road
ISFSI 12		I-12 (gamma)	TLD	OCA fence middle, on exit road
IFSFI 13		I-13 (gamma	TLD	OCA fence north, on exit road
Control Locations				
M-01C	C	Kirchenbauer Farm	TLD	11.5 mi @ 323°/NW
M-02C	C	County Roads 4 and 15	TLD	11.2 mi @ 47°/NE
M-03C	C	County Rd 19 and Jason Ave.	TLD	11.6 mi @ 130°/SE
M-04C	C	Maple Lake Water Tower	TLD	10.3 mi @ 226°/ SW
ISFSI TLD Locations		(Non-REMP TLD's)		
ISFSI-1		I-01 (gamma)	TLD	NE corner of ISFSI
ISFSI-2		I-02 (gamma)	TLD	North side of ISFSI, center
ISFSI-3		I-03 (gamma)	TLD	NW corner of ISFSI
ISFSI-4		I-04 (gamma)	TLD	West side of ISFSI, middle
ISFSI-5		I-05 (gamma)	TLD	West side of ISFSI, at center of array
ISFSI-6		I-06 (gamma)	TLD	SW corner of ISFSI
ISFSI-7		I-07 (gamma)	TLD	South side of ISFSI, center
ISFSI-8		I-08 (gamma)	TLD	SE corner of ISFSI
ISFSI-9		I-09 (gamma)	TLD	East side of ISFSI, at center of array
ISFSI-10		I-10 (gamma)	TLD	East side of ISFSI, middle

[a] "C" denotes control location. All other locations are indicators.

[b] Sample Codes:

AP	Airborne particulates	F	Fish
AI	Airborne Iodine	SW	River Water
BS	Bottom (river) sediments	SS	Shoreline Sediments
BO	Bottom organisms	TLD	Thermoluminescent Dosimeter
DW	Drinking Water	VE	Vegetation / vegetables
		WW	Well Water

[c] Collected only if the plant discharges radioactive effluent into the river, then only from river irrigated fields.

Table 5.3 Missed Collections and Analyses.

All required samples were collected and analyzed as scheduled with the following exceptions:					
Sample Type	Analysis	Location	Collection Date or Period	Reason for not conducting REMP as required	Plans for Preventing Recurrence
SW	Gamma	M-008	January '16	Water frozen entire month; No composite.	None
SW	Gamma	M-008	February '16	Water frozen entire month; No composite.	None
SW	Gamma	M-008	3/2/16	Water frozen.	None
SS	Gamma	M-8	Spring '16	Dangerous river conditions.	None
SS	Gamma	M-9	Spring '16	Dangerous river conditions.	None
SS	Gamma	M-15	Spring '16	Dangerous river conditions.	None
DW	Beta, I-131, Gamma	M-014	6/29/16	Weekly sample lost; Not included in June '16 Composite	None
TLD	Gamma	M-2C	3rd QTR	TLD missing in field.	None
AP/AI	Beta, I-131	M-05	9/7/16	29.4 hours run time.	None
AP/AI	Beta, I-131	M-04	9/14/16	Filter offset in sample head.	Counsel Technicians.
TLD	Gamma	M-3A	4th Qtr	TLD missing in field.	None
TLD	Gamma	M-11A	4th Qtr	TLD missing in field.	None
TLD	Gamma	M-12A	4th Qtr	TLD missing in field.	None
BO	Gamma	M-8	2016	Dangerous river conditions.	None
BO	Gamma	M-9	2016	Dangerous river conditions.	None
SW	Gamma	M-001	12/14/16 to 12/28/16	Water Frozen.	None

Figure 5-1. Offsite Ambient Radiation (TLDs); Inner Ring versus Outer Ring locations.

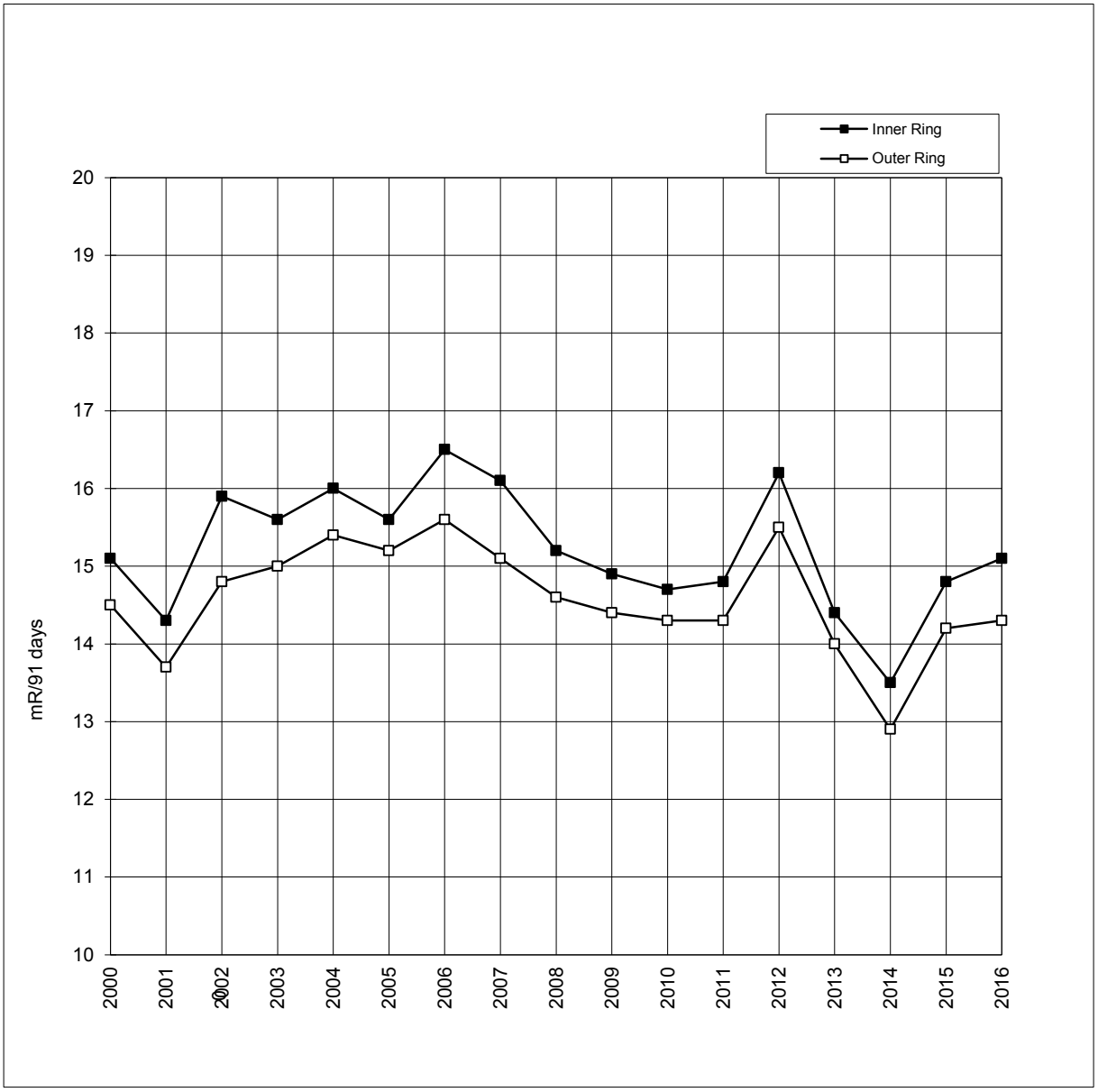

Figure 5-2. Airborne Particulates; analysis for gross beta, average mean of all indicator locations versus control location.

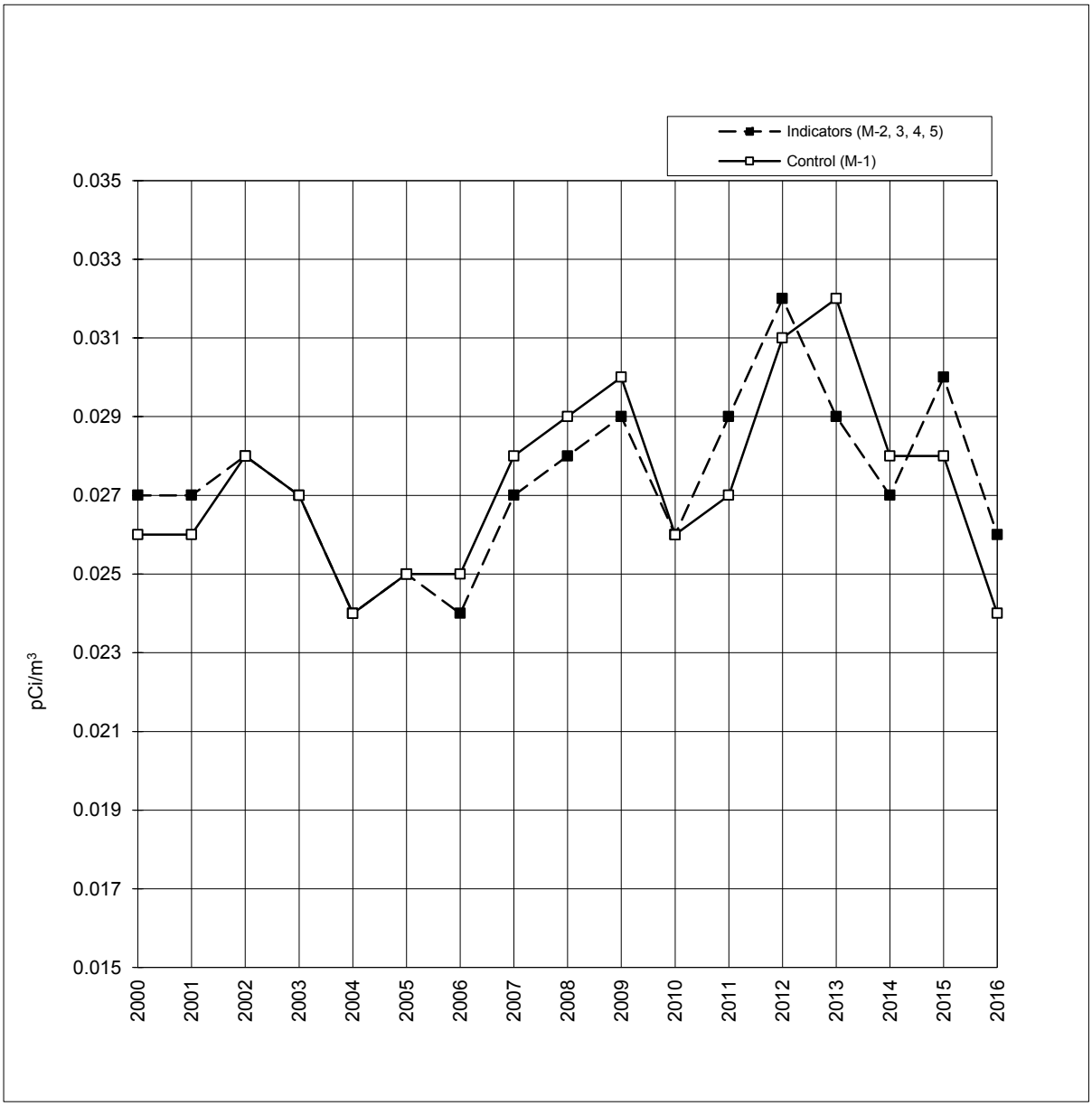

Table 5.4 Radiological Environmental Monitoring Program Summary

Name of Facility	Monticello Nuclear Generating Plant	Docket No.	50-263
Location of Facility	Wright, Minnesota	Reporting Period	January-December, 2016
	(County, State)		

Sample Type (Units)	Type and Number of Analyses[a]	LLD[b]	Indicator Locations Mean (F)[c] Range[c]	Location with Highest Annual Mean		Control Locations Mean (F)[c] Range[c]	Number Non-Routine Results[e]
				Location[d]	Mean (F)[c] Range[c]		
Direct Radiation							
TLD (Inner Ring, General Area at Site Boundary) mRem/91 days)	Gamma 53	3.0	15.1 (53/53) (11.4-19.2)	M-06A, 0.6 mi @ 133°/SE	17.2 (4/4) (15.3-18.9)	(See Control below.)	0
TLD (Outer Ring, 4-5 mi. distant) mRem/91 days)	Gamma 64	3.0	14.3 (64/64) (11.0-19.6)	M-14B 4.5 mi @ 228°/NW	16.2 (4/4) (14.1-18.2)	(See Control below.)	0
TLD (Special Interest Areas) mRem/91 days)	Gamma 36	3.0	15.1 (36/36) (9.4-23.0)	M-I-13 OCA fence north	17.4 (4/4) (15.2-23.0)	(See Control below.)	0
TLD (Control) mRem/91 days)	Gamma 15	3.0	None	M-02C 11.2 mi @ 47°/NE	17.5 (4/4) (16.7-18.4)	15.4 (15/15) (13.3-18.4)	0
Airborne Pathway							
Airborne Particulates (pCi/m^3)	GB 258	0.002	0.026 (204/204) (0.010-0.060)	M-3, Air Station 0.6 mi @ 104°/ESE	0.027 (51/51) (0.009-0.088)	0.028 (52/52) (0.013-0.060)	0
	GS 20						
	Be-7	0.015	0.070 (16/16) (0.049-0.087)	M-3, Air Station 0.6 mi @ 104°/ESE	0.081 (4/4) (0.071-0.095)	0.069 (4/4) (0.050-0.082)	0
	Mn-54	0.0010	< LLD	-	-	< LLD	0
	Co-58	0.0012	< LLD	-	-	< LLD	0
	Co-60	0.0009	< LLD	-	-	< LLD	0
	Zn-65	0.0018	< LLD	-	-	< LLD	0
	Zr-Nb-95	0.0018	< LLD	-	-	< LLD	0
	Ru-103	0.0018	< LLD	-	-	< LLD	0
	Ru-106	0.0081	< LLD	-	-	< LLD	0
	Cs-134	0.0011	< LLD	-	-	< LLD	0
	Cs-137	0.0011	< LLD	-	-	< LLD	0
	Ba-La-140	0.0046	< LLD	-	-	< LLD	0
	Ce-141	0.0023	< LLD	-	-	< LLD	0
	Ce-144	0.0053	< LLD	-	-	< LLD	0
Airborne Iodine (pCi/m^3)	I-131 258	0.03	< LLD	-	-	< LLD	0

Table 5.4 Radiological Environmental Monitoring Program Summary

Name of Facility	Monticello Nuclear Generating Plant	Docket No.	50-263
Location of Facility	Wright, Minnesota	Reporting Period	January-December,2016
	(County, State)		

Sample Type (Units)	Type and Number of Analyses[a]	LLD[b]	Indicator Locations Mean (F)[c] Range[c]	Location with Highest Annual Mean Location[d]	Location with Highest Annual Mean Mean (F)[c] Range[c]	Control Locations Mean (F)[c] Range[c]	Number Non-Routine Results[e]
Waterborne Pathway							
River Water (pCi/L)	H-3 8	500	< LLD	-	-	< LLD	0
	GS 22						
	Mn-54	10	< LLD	-	-	< LLD	0
	Fe-59	30	< LLD	-	-	< LLD	0
	Co-58	10	< LLD	-	-	< LLD	0
	Co-60	10	< LLD	-	-	< LLD	0
	Zn-65	30	< LLD	-	-	< LLD	0
	Zr-Nb-95	15	< LLD	-	-	< LLD	0
	Cs-134	10	< LLD	-	-	< LLD	0
	Cs-137	10	< LLD	-	-	< LLD	0
	Ba-La-140	15	< LLD	-	-	< LLD	0
	Ce-144	35	< LLD	-	-	< LLD	0
Drinking Water (pCi/L)	GB 12	1.0	2.6 (12/12) (1.2-3.2)	M-14, Minneapolis 37.0 mi. @ 132° /SE	2.6 (12/12) (1.2-3.2)	None	0
	I-131 12	1.0	< LLD	-	-	None	0
	H-3 4	500	< LLD	-	-	None	0
	GS 12						
	Mn-54	10	< LLD	-	-	None	0
	Fe-59	30	< LLD	-	-	None	0
	Co-58	10	< LLD	-	-	None	0
	Co-60	10	< LLD	-	-	None	0
	Zn-65	30	< LLD	-	-	None	0
	Zr-Nb-95	15	< LLD	-	-	None	0
	Cs-134	10	< LLD	-	-	None	0
	Cs-137	10	< LLD	-	-	None	0
	Ba-La-140	15	< LLD	-	-	None	0
	Ce-144	28	< LLD	-	-	None	0
Well Water (pCi/L)	H-3 16	500	< LLD	-	-	< LLD	0
	GS 16						
	Mn-54	10	< LLD	-	-	< LLD	0
	Fe-59	30	< LLD	-	-	< LLD	0
	Co-58	10	< LLD	-	-	< LLD	0
	Co-60	10	< LLD	-	-	< LLD	0
	Zn-65	30	< LLD	-	-	< LLD	0
	Zr-Nb-95	15	< LLD	-	-	< LLD	0
	Cs-134	10	< LLD	-	-	< LLD	0
	Cs-137	10	< LLD	-	-	< LLD	0
	Ba-La-140	15	< LLD	-	-	< LLD	0
	Ce-144	29	< LLD	-	-	< LLD	0

Table 5.4 Radiological Environmental Monitoring Program Summary

Name of Facility	Monticello Nuclear Generating Plant	Docket No.	50-263
Location of Facility	Wright, Minnesota	Reporting Period	January-December, 2016
	(County, State)		

Sample Type (Units)	Type and Number of Analyses[a]	LLD [b]	Indicator Locations Mean (F)[c] Range[c]	Location with Highest Annual Mean		Control Locations Mean (F)[c] Range[c]	Number Non-Routine Results[e]
				Location[d]	Mean (F)[c] Range[c]		
Waterborne Pathway							
Shoreline Sediments (pCi/g dry)	GS 3						
	Be-7	0.28	< LLD	M-09, Downstream < 1000' of discharge	-	< LLD	0
	K-40	0.10	10.28 (2/2) (10.27-10.28)	M-09, Downstream < 1000' of discharge	10.28 (1/1) -	9.90 (1/1)	0
	Mn-54	0.017	< LLD	-	-	< LLD	0
	Fe-59	0.054	< LLD	-	-	< LLD	0
	Co-58	0.023	< LLD	-	-	< LLD	0
	Co-60	0.015	< LLD	-	-	< LLD	0
	Zn-65	0.044	< LLD	-	-	< LLD	0
	Nb-95	0.032	< LLD	-	-	< LLD	0
	Zr-95	0.047	< LLD	-	-	< LLD	0
	Ru-103	0.030	< LLD	-	-	< LLD	0
	Ru-106	0.16	< LLD	-	-	< LLD	0
	Cs-134	0.014	< LLD	-	-	< LLD	0
	Cs-137	0.019	0.029 (2/4) (0.024-0.034)	M-09, Downstream < 1000' of discharge	(0.030 (1/3)- -	< LLD	0
	Ba-La-140	0.12	< LLD	-	-	< LLD	0
	Ce-144	0.12	< LLD	-		< LLD	0

Table 5.4 Radiological Environmental Monitoring Program Summary

Name of Facility	Monticello Nuclear Generating Plant	Docket No.	50-263
Location of Facility	Wright, Minnesota (County, State)	Reporting Period	January-December, 2016

Sample Type (Units)	Type and Number of Analyses[a]	LLD[b]	Indicator Locations Mean (F)[c] Range[c]	Location with Highest Annual Mean Location[d]	Location with Highest Annual Mean Mean (F)[c] Range[c]	Control Locations Mean (F)[c] Range[c]	Number Non-Routine Results[e]
Ingestion Pathway							
Vegetation	GS 9						
(Pasture Grass, Weeds, Leaves)	Mn-54	0.011	< LLD	-	-	< LLD	0
	Fe-59	0.028	< LLD	-	-	< LLD	0
	Co-58	0.009	< LLD	-	-	< LLD	0
(pCi/gwet)	Co-60	0.008	< LLD	-	-	< LLD	0
	Zn-65	0.024	< LLD	-	-	< LLD	0
	Nb-95	0.013	< LLD	-	-	< LLD	0
	I-131	0.054	< LLD	-	-	< LLD	0
	Cs-134	0.013	< LLD	-	-	< LLD	0
	Cs-137	0.014	< LLD	-	-	< LLD	0
Fish	GS 8						
(pCi/g wet)	K-40	0.10	3.35 (4/4) (3.01-3.86)	M-09, Downstream < 1000' of discharge	3.35 (4/4) (3.01-3.86)	3.28 (4/4) (2.86-3.97)	0
	Mn-54	0.025	< LLD	-	-	< LLD	0
	Fe-59	0.070	< LLD	-	-	< LLD	0
	Co-58	0.030	< LLD	-	-	< LLD	0
	Co-60	0.017	< LLD	-	-	< LLD	0
	Zn-65	0.070	< LLD	-	-	< LLD	0
	Zr-Nb-95	0.037	< LLD	-	-	< LLD	0
	Cs-134	0.025	< LLD	-	-	< LLD	0
	Cs-137	0.025	< LLD	-	-	< LLD	0
	Ba-La-140	0.112	< LLD	-	-	< LLD	0
	Ce-144	0.158	< LLD	-	-	< LLD	0

[a] GB = gross beta, GS = gamma scan.

[b] LLD = nominal lower limit of detection based on a 4.66 sigma counting error for background sample.

[c] Mean and range are based on detectable measurements only. Fraction of detectable measurements at specified locations is indicated in parentheses (F).

[d] Locations are specified: (1) by name, and/or station code and (2) by distance (miles) and direction relative to reactor site.

[e] Non-routine results are those which exceed ten times the control station value. If no control station value is available, the result is considered non-routine if it exceeds ten time the typical preoperational value for the medium or location.

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APPENDIX A

INTERLABORATORY COMPARISON PROGRAM RESULTS

NOTE: Environmental Inc., Midwest Laboratory participates in intercomparison studies administered by Environmental Resources Associates, and serves as a replacement for studies conducted previously by the U.S. EPA Environmental Monitoring Systems Laboratory, Las Vegas, Nevada. Results are reported in Appendix A. TLD Intercomparison results, in-house spikes, blanks, duplicates and mixed analyte performance evaluation program results are also reported. Appendix A is updated four times a year; the complete Appendix is included in March, June, September and December monthly progress reports only.

January, 2016 through December, 2016

Appendix A

Interlaboratory Comparison Program Results

Environmental, Inc., Midwest Laboratory has participated in interlaboratory comparison (crosscheck) programs since the formulation of it's quality control program in December 1971. These programs are operated by agencies which supply environmental type samples containing concentrations of radionuclides known to the issuing agency but not to participant laboratories. The purpose of such a program is to provide an independent check on a laboratory's analytical procedures and to alert it of any possible problems.

Participant laboratories measure the concentration of specified radionuclides and report them to the issuing agency. Several months later, the agency reports the known values to the participant laboratories and specifies control limits. Results consistently higher or lower than the known values or outside the control limits indicate a need to check the instruments or procedures used.

Results in Table A-1 were obtained through participation in the RAD PT Study Proficiency Testing Program administered by Environmental Resources Associates, serving as a replacement for studies conducted previously by the U.S. EPA Environmental Monitoring Systems Laboratory, Las Vegas, Nevada.

Table A-2 lists results for thermoluminescent dosimeters (TLDs), via irradiation and evaluation by the University of Wisconsin-Madison Radiation Calibration Laboratory at the University of Wisconsin Medical Radiation Research Center.

Table A-3 lists results of the analyses on in-house "spiked" samples for the past twelve months. All samples are prepared using NIST traceable sources. Data for previous years available upon request.

Table A-4 lists results of the analyses on in-house "blank" samples for the past twelve months. Data for previous years available upon request.

Table A-5 lists REMP specific analytical results from the in-house "duplicate" program for the past twelve months. Acceptance is based on the difference of the results being less than the sum of the errors. Complete analytical data for duplicate analyses is available upon request.

The results in Table A-6 were obtained through participation in the Mixed Analyte Performance Evaluation Program.

Results in Table A-7 were obtained through participation in the MRAD PT Study Proficiency Testing Program administered by Environmental Resources Associates, serving as a replacement for studies conducted previously by the Environmental Measurement Laboratory Quality Assessment Program (EML).

Attachment A lists the laboratory precision at the 1 sigma level for various analyses. The acceptance criteria in Table A-3 is set at ± 2 sigma.

Out-of-limit results are explained directly below the result.

Attachment A

ACCEPTANCE CRITERIA FOR "SPIKED" SAMPLES

LABORATORY PRECISION: ONE STANDARD DEVIATION VALUES FOR VARIOUS ANALYSES[a]

Analysis	Level	One standard deviation for single determination
Gamma Emitters	5 to 100 pCi/liter or kg > 100 pCi/liter or kg	5.0 pCi/liter 5% of known value
Strontium-89[b]	5 to 50 pCi/liter or kg > 50 pCi/liter or kg	5.0 pCi/liter 10% of known value
Strontium-90[b]	2 to 30 pCi/liter or kg > 30 pCi/liter or kg	5.0 pCi/liter 10% of known value
Potassium-40	≥ 0.1 g/liter or kg	5% of known value
Gross alpha	≤ 20 pCi/liter > 20 pCi/liter	5.0 pCi/liter 25% of known value
Gross beta	≤ 100 pCi/liter > 100 pCi/liter	5.0 pCi/liter 5% of known value
Tritium	≤ 4,000 pCi/liter > 4,000 pCi/liter	$\pm 1\sigma$ = 169.85 x (known)$^{0.0933}$ 10% of known value
Radium-226,-228	≥ 0.1 pCi/liter	15% of known value
Plutonium	≥ 0.1 pCi/liter, gram, or sample	10% of known value
Iodine-131, Iodine-129[b]	≤ 55 pCi/liter > 55 pCi/liter	6 pCi/liter 10% of known value
Uranium-238, Nickel-63[b] Technetium-99[b]	≤ 35 pCi/liter > 35 pCi/liter	6 pCi/liter 15% of known value
Iron-55[b]	50 to 100 pCi/liter > 100 pCi/liter	10 pCi/liter 10% of known value
Other Analyses [b]	---	20% of known value

[a] From EPA publication, "Environmental Radioactivity Laboratory Intercomparison Studies Program", Fiscal Year, 1981-1982, EPA-600/4-81-004.

[b] Laboratory limit.

TABLE A-1. Interlaboratory Comparison Crosscheck program, Environmental Resource Associates (ERA)[a].
RAD study

Lab Code	Date	Concentration (pCi/L)				
		Analysis	Laboratory Result	ERA Result	Control Limits	Acceptance
ERW-1392	4/4/2016	Sr-89	43.5 ± 4.3	48.2	37.8 - 55.6	Pass
ERW-1392	4/4/2016	Sr-90	27.5 ± 1.9	28.5	20.7 - 33.1	Pass
ERW-1394 [b]	4/4/2016	Ba-133	65.2 ± 3.8	58.8	48.7 - 64.9	Fail
ERW-1394 [c]	4/4/2016	Ba-133	57.8 ± 5.3	58.8	48.7 - 64.9	Pass
ERW-1394	4/4/2016	Cs-134	43.7 ± 3.0	43.3	34.6 - 47.6	Pass
ERW-1394	4/4/2016	Cs-137	86.1 ± 5.3	78.4	70.6 - 88.9	Pass
ERW-1394	4/4/2016	Co-60	108 ± 44	102	91.8 - 114	Pass
ERW-1394	4/4/2016	Zn-65	240 ± 13	214	193 - 251	Pass
ERW-1397	4/4/2016	Gr. Alpha	52.0 ± 2.2	62.7	32.9 - 77.8	Pass
ERW-1397	4/4/2016	Gr. Beta	33.9 ± 1.2	39.2	26.0 - 46.7	Pass
ERW-1400	4/4/2016	I-131	24.7 ± 0.6	26.6	22.1 - 31.3	Pass
ERW-1402	4/4/2016	Ra-226	15.6 ± 0.5	15.2	11.3 - 17.4	Pass
ERW-1402	4/4/2016	Ra-228	5.28 ± 0.76	5.19	3.12 - 6.93	Pass
ERW-1403	4/4/2016	Uranium	4.02 ± 0.42	4.64	3.39 - 5.68	Pass
ERW-1405	4/4/2016	H-3	8,150 ± 270	7,840	6,790 - 8,620	Pass
SPW-2845	7/7/2015	Ba-133	60.3 ± 5.7	64.7	53.9 - 71.2	Pass
SPW-2845	7/7/2015	Cs-134	48.8 ± 9.3	50.1	40.3 - 55.1	Pass
SPW-2845	7/7/2015	Cs-137	101 ± 8	89.8	80.8 - 101	Pass
SPW-2845	7/7/2015	Co-60	65.1 ± 5.8	59.9	53.9 - 68.4	Pass
SPW-2845	7/7/2015	Zn-65	288 ± 29	265	238 - 310	Pass
ERW-3485	7/11/2016	Sr-89	43.3 ± 6.5	53.3	42.3 - 60.9	Pass
ERW-3485	7/11/2016	Sr-90	39.0 ± 2.8	39.2	28.8 - 45.1	Pass
ERW-3487	7/11/2016	Ba-133	83.3 ± 4.9	82.9	69.7 - 91.2	Pass
ERW-3487	7/11/2016	Cs-134	62.5 ± 4.4	65.3	53.1 - 71.8	Pass
ERW-3487	7/11/2016	Cs-137	98.1 ± 5.6	95.2	85.7 - 107	Pass
ERW-3487	7/11/2016	Co-60	122 ± 5	117	105 - 131	Pass
ERW-3487	7/11/2016	Zn-65	124 ± 9	113	102 - 134	Pass
ERW-3490	7/11/2016	Gr. Alpha	46.6 ± 2.2	48.1	25.0 - 60.5	Pass
ERW-3490	7/11/2016	Gr. Beta	26.8 ± 1.1	28.6	18.2 - 36.4	Pass
ERW-3492	7/11/2016	I-131	23.7 ± 1.0	24.9	20.7 - 29.5	Pass
ERW-3493	7/11/2016	Ra-226	12.9 ± 0.4	12.3	9.2 - 14.2	Pass
ERW-3493	7/11/2016	Ra-228	5.8 ± 0.8	5.8	3.5 - 7.6	Pass
ERW-3493	7/11/2016	Uranium	32.8 ± 0.8	25.2	28.4 - 39.3	Pass
ERW-3495	7/11/2016	H-3	12,400 ± 334	12,400	10,800 - 13,600	Pass

[a] Results obtained by Environmental, Inc., Midwest Laboratory as a participant in the crosscheck program for proficiency testing in drinking water conducted by Environmental Resources Associates (ERA).

[b] No reason determined for failure of Ba-133 result.

[c] The result of reanalysis (Compare to original result, footnoted "b" above).

TABLE A-2. Thermoluminescent Dosimetry, (TLD, $CaSO_4$: Dy Cards). [a] [b]

			mrem			
Lab Code	Irradiation Date	Description	Delivered Dose	Reported Dose	Performance [c] Quotient (P)	
Environmental, Inc.		Group 1				
2016-1	10/7/2016	Spike 1	135.0	148.3	0.10	
2016-1	10/7/2016	Spike 2	135.0	144.3	0.07	
2016-1	10/7/2016	Spike 3	135.0	133.2	-0.01	
2016-1	10/7/2016	Spike 4	135.0	139.6	0.03	
2016-1	10/7/2016	Spike 5	135.0	128.4	-0.05	
2016-1	10/7/2016	Spike 6	135.0	123.9	-0.08	
2016-1	10/7/2016	Spike 7	135.0	124.0	-0.08	
2016-1	10/7/2016	Spike 8	135.0	121.5	-0.10	
2016-1	10/7/2016	Spike 9	135.0	148.3	0.10	
2016-1	10/7/2016	Spike 10	135.0	126.8	-0.06	
2016-1	10/7/2016	Spike 11	135.0	123.3	-0.09	
2016-1	10/7/2016	Spike 12	135.0	137.9	0.02	
2016-1	10/7/2016	Spike 13	135.0	126.0	-0.07	
2016-1	10/7/2016	Spike 14	135.0	127.2	-0.06	
2016-1	10/7/2016	Spike 15	135.0	144.5	0.07	
2016-1	10/7/2016	Spike 16	135.0	140.5	0.04	
2016-1	10/7/2016	Spike 17	135.0	146.0	0.08	
2016-1	10/7/2016	Spike 18	135.0	127.7	-0.05	
2016-1	10/7/2016	Spike 19	135.0	146.8	0.09	
2016-1	10/7/2016	Spike 20	135.0	122.6	-0.09	
2016-1	10/7/2016	Spike 21	135.0	108.6	-0.20	
2016-1	10/7/2016	Spike 22	135.0	119.6	-0.11	
2016-1	10/7/2016	Spike 23	135.0	135.1	0.00	
2016-1	10/7/2016	Spike 24	135.0	116.2	-0.14	
2016-1	10/7/2016	Spike 25	135.0	118.9	-0.12	
2016-1	10/7/2016	Spike 26	135.0	128.5	-0.05	
2016-1	10/7/2016	Spike 27	135.0	115.6	-0.14	
2016-1	10/7/2016	Spike 28	135.0	126.4	-0.06	
2016-1	10/7/2016	Spike 29	135.0	115.0	-0.15	
2016-1	10/7/2016	Spike 30	135.0	147.3	0.09	
Mean (Spike 1-30)				130.4	0.03	Pass[d]
Standard Deviation (Spike 1-30)				11.5	0.09	Pass[d]

[a] Table A-2 assumes 1 roentgen = 1 rem (NRC -Health Physics Questions and Answers 10 CFR Part 20 - Question 96 - Page Last Reviewed/Updated Thursday, October 01, 2015).

[b] TLD's were irradiated by the University of Wisconsin-Madison Radiation Calibration Laboratory following ANSI N13.37 protocol from a known air kerma rate. TLD's were read and the results were submitted by Environmental Inc. to the University of Wisconsin-Madison Radiation Calibration Laboratory for comparison to the delivered dose.

[c] Performance Quotient (P) is calculated as ((reported dose - conventially true value) ÷ conventially true value) where the conventially true value is the delivered dose.

[d] Acceptance is achieved when neither the absolute value of mean of the P values, nor the standard deviation of the P values exceed 0.15.

TABLE A-2 Thermoluminescent Dosimetry, (TLD, $CaSO_4$: Dy Cards). [a] [b]

			mrem			
Lab Code	Irradiation Date	Description	Delivered Dose	Reported Dose	Performance [c] Quotient (P)	Acceptance [d]
Environmental, Inc.		Group 2				
2016-2	10/7/2016	Spike 31	87.0	83.0	-0.05	
2016-2	10/7/2016	Spike 32	87.0	88.3	0.01	
2016-2	10/7/2016	Spike 33	87.0	83.1	-0.04	
2016-2	10/7/2016	Spike 34	87.0	81.4	-0.06	
2016-2	10/7/2016	Spike 35	87.0	78.9	-0.09	
2016-2	10/7/2016	Spike 36	87.0	80.3	-0.08	
2016-2	10/7/2016	Spike 37	87.0	101.1	0.16	
2016-2	10/7/2016	Spike 38	87.0	78.3	-0.10	
2016-2	10/7/2016	Spike 39	87.0	86.6	0.00	
2016-2	10/7/2016	Spike 40	87.0	81.8	-0.06	
2016-2	10/7/2016	Spike 41	87.0	84.8	-0.03	
2016-2	10/7/2016	Spike 42	87.0	79.9	-0.08	
2016-2	10/7/2016	Spike 43	87.0	80.8	-0.07	
2016-2	10/7/2016	Spike 44	87.0	80.2	-0.08	
2016-2	10/7/2016	Spike 45	87.0	82.7	-0.05	
2016-2	10/7/2016	Spike 46	87.0	104.0	0.20	
2016-2	10/7/2016	Spike 47	87.0	86.1	-0.01	
2016-2	10/7/2016	Spike 48	87.0	104.0	0.20	
2016-2	10/7/2016	Spike 49	87.0	86.1	-0.01	
2016-2	10/7/2016	Spike 50	87.0	90.8	0.04	
2016-2	10/7/2016	Spike 51	87.0	85.7	-0.01	
2016-2	10/7/2016	Spike 52	87.0	86.5	-0.01	
2016-2	10/7/2016	Spike 53	87.0	86.4	-0.01	
2016-2	10/7/2016	Spike 54	87.0	92.6	0.06	
2016-2	10/7/2016	Spike 55	87.0	88.6	0.02	
2016-2	10/7/2016	Spike 56	87.0	78.9	-0.09	
2016-2	10/7/2016	Spike 57	87.0	82.6	-0.05	
2016-2	10/7/2016	Spike 58	87.0	80.6	-0.07	
2016-2	10/7/2016	Spike 59	87.0	89.9	0.03	
2016-2	10/7/2016	Spike 60	87.0	85.0	-0.02	
Mean (Spike 31-60)				86.0	0.01	Pass
Standard Deviation (Spike 31-60)				6.9	0.08	Pass

[a] Table A-2 assumes 1 roentgen = 1 rem (NRC -Health Physics Questions and Answers 10 CFR Part 20 - Question 96 - Page Last Reviewed/Updated Thursday, October 01, 2015).

[b] TLD's were irradiated by the University of Wisconsin-Madison Radiation Calibration Laboratory following ANSI N13.37 protocol from a known air kerma rate. TLD's were read and the results were submitted by Environmental Inc. to the University of Wisconsin-Madison Radiation Calibration Laboratory for comparison to the delivered dose.

[c] Performance Quotient (P) is calculated as ((reported dose - conventially true value) ÷ conventially true value) where the conventially true value is the delivered dose.

[d] Acceptance is achieved when neither the absolute value of mean of the P values, nor the standard deviation of the P values exceed 0.15.

TABLE A-3. In-House "Spiked" Samples

Lab Code [b]	Date	Concentration [a]				
		Analysis	Laboratory results 2s, n=1 [c]	Known Activity	Control Limits [d]	Acceptance
SPW-290	1/21/2016	Sr-90	38.6 ± 1.5	37.3	22.4 - 52.2	Pass
SPW-292	1/21/2016	Sr-90	35.8 ± 1.6	37.3	22.4 - 52.2	Pass
SPW-294	1/21/2016	C-14	4,689 ± 18	4,735	2,841 - 6,629	Pass
SPW-414	2/1/2016	Ra-228	18.4 ± 2.2	17.7	10.6 - 24.8	Pass
W-020416	2/4/2016	Gr. Alpha	20.8 ± 0.4	20.1	12.0 - 28.1	Pass
W-020416	2/4/2016	Gr. Beta	29.7 ± 0.3	28.9	17.3 - 40.4	Pass
W-021716	2/17/2016	Ra-226	17.9 ± 0.5	16.7	10.0 - 23.4	Pass
W-030716	3/7/2016	Gr. Alpha	16.3 ± 0.8	20.1	12.0 - 28.1	Pass
W-030716	3/7/2016	Gr. Beta	27.0 ± 0.7	28.9	17.3 - 40.4	Pass
SPDW-70046	3/29/2016	Ra-226	13.4 ± 0.4	16.7	10.0 - 23.4	Pass
SPW-1163	3/22/2016	Ra-228	4.2 ± 0.7	4.4	2.6 - 6.2	Pass
SPW-1235	3/29/2016	Gr. Alpha	21.0 ± 0.4	20.1	12.0 - 28.1	Pass
SPW-1235	3/29/2016	Gr. Beta	29.4 ± 0.3	28.9	17.3 - 40.4	Pass
SPW-1739	4/21/2016	Ra-228	16.2 ± 2.0	17.7	10.6 - 24.8	Pass
SPW-2052	4/21/2016	Ra-226	16.0 ± 0.5	16.7	10.0 - 23.4	Pass
W-042616	4/21/2016	Fe-55	1,519 ± 61	1,482	889 - 2,075	Pass
SPW-1823	4/23/2016	Gr. Alpha	21.0 ± 0.4	20.1	12.0 - 28.1	Pass
SPW-1823	4/23/2016	Gr. Beta	26.6 ± 0.3	28.9	17.3 - 40.4	Pass
SPW-1998	4/29/2016	Cs-134	35.9 ± 6.0	36.2	21.7 - 50.6	Pass
SPW-1998	4/29/2016	Cs-137	82.5 ± 7.6	71.9	43.1 - 100.6	Pass
SPW-2097	5/3/2016	H-3	3,349 ± 184	3,280	1,968 - 4,592	Pass
SPW-2132	5/4/2016	H-3	3,174 ± 178	3,280	1,968 - 4,592	Pass
SPW-2229	5/7/2016	H-3	3,182 ± 179	3,280	1,968 - 4,592	Pass
SPW-2313	5/13/2016	H-3	3,183 ± 179	3,280	1,968 - 4,592	Pass
SPW-2341	5/13/2016	H-3	3,201 ± 178	3,280	1,968 - 4,592	Pass
SPW-2374	5/14/2016	H-3	3,037 ± 175	3,280	1,968 - 4,592	Pass
SPW-2411	5/17/2016	Sr-90	37.3 ± 1.6	37.3	22.4 - 52.2	Pass
SPW-2455	5/19/2016	Gr. Alpha	19.3 ± 0.4	20.1	12.0 - 28.1	Pass
SPW-2455	5/19/2016	Gr. Beta	28.6 ± 0.3	28.9	17.3 - 40.4	Pass
SPW-2457	5/19/2016	U-238	48.2 ± 2.4	41.7	25.0 - 58.4	Pass
SPW-2504	5/20/2016	H-3	3,181 ± 178	3,280	1,968 - 4,592	Pass
SPW-2528	5/23/2016	H-3	2,998 ± 175	3,280	1,968 - 4,592	Pass
SPW-2566	5/24/2016	Gr. Alpha	19.8 ± 0.5	20.1	12.0 - 28.1	Pass
SPW-2566	5/24/2016	Gr. Beta	30.4 ± 0.3	28.9	17.3 - 40.4	Pass
W-053116	4/29/2016	Cs-134	34.0 ± 5.0	36.2	21.7 - 50.6	Pass
W-053116	4/29/2016	Cs-137	78.8 ± 7.0	71.9	43.1 - 100.6	Pass
SPW-2704	6/1/2016	Sr-90	38.0 ± 1.6	37.3	22.4 - 52.2	Pass
SPW-2719	6/2/2016	Ra-228	18.1 ± 2.1	17.7	10.6 - 24.8	Pass
SPW-2749	6/3/2016	H-3	3,197 ± 180	3,280	1,968 - 4,592	Pass
SPW-2843	6/7/2016	H-3	3,133 ± 179	3,280	1,968 - 4,592	Pass
SPW-3227	6/17/2016	Ra-226	18.6 ± 0.4	16.7	10.0 - 23.4	Pass
W-061716	4/29/2016	Cs-134	37.3 ± 8.2	36.2	21.7 - 50.6	Pass
W-061716	4/29/2016	Cs-137	79.7 ± 10.8	71.9	43.1 - 100.6	Pass
SPW-3240	6/28/2016	Gr. Alpha	25.3 ± 0.5	20.1	12.0 - 28.1	Pass
SPW-3240	6/28/2016	Gr. Beta	27.1 ± 0.3	28.9	17.3 - 40.4	Pass

TABLE A-3. In-House "Spiked" Samples

Lab Code [b]	Date	Concentration [a] Analysis	Laboratory results 2s, n=1 [c]	Known Activity	Control Limits [d]	Acceptance
SPW-3241	7/1/2016	H-3	8,821 ± 283	8,650	5,190 - 12,110	Pass
SPW-3309	7/1/2016	H-3	8,619 ± 278	8,650	5,190 - 12,110	Pass
SPW-3313	7/1/2016	Ra-228	16.6 ± 2.0	17.7	10.6 - 24.8	Pass
SPW-3328	7/6/2016	Sr-89	13.4 ± 9.2	14.8	8.9 - 20.7	Pass
SPW-3328	7/6/2016	Sr-90	12.3 ± 1.3	11.4	6.8 - 16.0	Pass
SPAP-3365	7/7/2016	Gr. Beta	39.7 ± 0.1	42.2	25.3 - 59.0	Pass
SPAP-3367	7/7/2016	Cs-134	1.2 ± 0.7	1.2	0.7 - 1.7	Pass
SPAP-3367	7/7/2016	Cs-137	94.4 ± 2.8	94.0	56.4 - 131.6	Pass
SPW-3370	7/7/2016	C-14	4,444 ± 17	4,735	2,841 - 6,629	Pass
SPW-3373	7/7/2016	Ni-63	446 ± 5	401	241 - 561	Pass
SPW-3375	7/7/2016	Tc-99	545 ± 9	539	324 - 755	Pass
SPW-3519	7/14/2016	H-3	8,621 ± 279	8650	5,190 - 12,110	Pass
SPW-3688	6/29/2016	Ra-226	17.5 ± 0.4	16.7	10.0 - 23.4	Pass
SPW-3711	7/20/2016	H-3	44,368 ± 612	43,766	26,260 - 61,273	Pass
SPW-3774	7/22/2016	H-3	45,259 ± 619	43,766	26,260 - 61,273	Pass
SPW-3776	7/22/2016	Gr. Alpha	23.3 ± 0.5	20.1	12.0 - 28.1	Pass
SPW-3776	7/22/2016	Gr. Beta	27.5 ± 0.3	28.9	17.3 - 40.4	Pass
SPW-3884	7/26/2016	H-3	45,850 ± 623	43,766	26,260 - 61,273	Pass
SPW-3950	7/28/2016	Ra-228	17.8 ± 1.8	16.7	10 - 23	Pass
SPW-3982	7/29/2016	H-3	45,273 ± 619	43,766	26,260 - 61,273	Pass
W-073016	4/29/2016	Cs-134	36.5 ± 6.1	36.2	21.7 - 50.6	Pass
W-073016	4/29/2016	Cs-137	80.6 ± 7.5	71.9	43.1 - 100.6	Pass
SPW-4134	8/4/2016	Ra-228	5.5 ± 0.8	6.7	4.0 - 9.3	Pass
SPW-4340	8/17/2016	Ra-228	19.9 ± 2.0	16.7	10.0 - 23.4	Pass
SPW-4386	7/15/2016	Ra-226	18.0 ± 0.4	16.7	10.0 - 23.4	Pass
W-082716	4/29/2016	Ra-228	32.5 ± 5.2	36.2	21.7 - 50.6	Pass
W-082716	4/29/2016	Ra-226	78.5 ± 8.3	71.9	43.1 - 100.6	Pass
SPW-4642	9/6/2016	U-238	45.8 ± 2.5	41.7	25.0 - 58.4	Pass
SPW-4999	9/26/2016	Sr-90	35.1 ± 2.2	36.8	22.1 - 51.5	Pass
SPW-5091	9/12/2016	Ra-226	18.2 ± 0.4	16.7	10.0 - 23.4	Pass
W-092716	4/29/2016	Cs-134	37.3 ± 11.8	36.2	21.7 - 50.6	Pass
W-092716	4/29/2016	Cs-137	78.3 ± 11.2	71.9	43.1 - 100.6	Pass
SPW-5165	9/30/2016	Gr. Alpha	22.2 ± 0.4	20.1	12.0 - 28.1	Pass
SPW-5165	9/30/2016	Gr. Beta	27.2 ± 0.3	28.9	17.3 - 40.4	Pass
SPW-5426	9/28/2016	Ra-226	18.2 ± 0.4	16.7	10.0 - 23.4	Pass
SPW-5510	10/18/2016	H-3	44,398 ± 618	43,766	26,260 - 61273	Pass
SPW-5553	10/19/2016	U-238	50.0 ± 2.6	41.7	25.0 - 58.4	Pass
SPW-5555	10/19/2016	Ra-228	17.4 ± 1.9	16.7	10.0 - 23.4	Pass
SPW-5612	10/20/2016	H-3	44,681 ± 622	43,766	26,260 - 61,273	Pass
SPW-5741	10/25/2016	H-3	44,946 ± 624	43,766	26,260 - 61,273	Pass
SPU-5833	10/26/2016	H-3	10,018 ± 946	8,622	5,173 - 12,071	Pass
SPW-5862	10/28/2016	H-3	18,061 ± 374	17,244	10,346 - 24,141	Pass
W-103116	4/29/2016	Cs-134	36.0 ± 4.6	36.2	21.7 - 50.6	Pass
W-103116	4/29/2016	Cs-137	81.1 ± 7.3	71.9	43.1 - 100.6	Pass

TABLE A-3. In-House "Spiked" Samples

Lab Code [b]	Date	Concentration [a] Analysis	Laboratory results 2s, n=1 [c]	Known Activity	Control Limits [d]	Acceptance
SPW-5984	11/2/2016	H-3	17,727 ± 399	17,244	10,346 - 24,141	Pass
SPW-6008	11/4/2016	H-3	17,854 ± 402	17,244	10,346 - 24,141	Pass
SPW-6124	11/8/2016	Ra-228	14.4 ± 1.9	16.0	9.6 - 22.4	Pass
SPW-6132	11/9/2016	H-3	18,135 ± 374	17,243	10,346 - 24,140	Pass
SPW-6135	10/12/2016	Ra-226	18.9 ± 0.4	16.7	10.0 - 23.4	Pass
SPW-6146	11/10/2016	H-3	17,488 ± 398	17,243	10,346 - 24,140	Pass
SPW-6222	11/12/2016	H-3	17,787 ± 408	17,243	10,346 - 24,140	Pass
SPW-6318	11/16/2016	H-3	17,379 ± 408	17,243	10,346 - 24,140	Pass
SPW-6349	11/17/2016	H-3	17,893 ± 371	17,243	10,346 - 24,140	Pass
SPW-6424	11/19/2016	H-3	18,258 ± 379	17,243	10,346 - 24,140	Pass
W-112616	4/29/2016	Cs-134	35.0 ± 6.0	36.2	21.7 - 50.6	Pass
W-112616	4/29/2016	Cs-137	75.0 ± 7.1	71.9	43.1 - 100.6	Pass
SPW-6456	11/28/2016	Sr-90	41.9 ± 2.5	36.8	22.1 - 51.5	Pass
SPW-6486	11/30/2016	Sr-90	35.6 ± 2.2	36.6	21.9 - 51.2	Pass
SPW-6490	11/29/2016	Ra-226	18.8 ± 0.4	16.7	10.0 - 23.4	Pass
SPW-6519	11/30/2016	Ni-63	438 ± 4	400	240 - 560	Pass
SPW-6527	12/1/2016	U-238	49.5 ± 2.5	41.7	25.0 - 58.4	Pass
SPW-6616	12/3/2016	H-3	18,018 ± 374	17,243	10,346 - 24,140	Pass
SPW-6669	12/5/2016	H-3	18,237 ± 377	17,243	10,346 - 24,140	Pass
SPW-6735	12/9/2016	H-3	17,939 ± 396	17,243	10,346 - 24,140	Pass
SPW-6880	12/21/2016	H-3	17,835 ± 396	17,243	10,346 - 24,140	Pass
SPW-6947	12/22/2016	Ni-63	450 ± 4	400	240 - 560	Pass
W-122316	4/29/2016	Cs-134	36.0 ± 2.2	36.2	21.7 - 50.6	Pass
W-122316	4/29/2016	Cs-134	76.1 ± 2.9	71.9	43.1 - 100.6	Pass
SPW-6948	12/30/2016	H-3	17,999 ± 398	17,243	10,346 - 24,140	Pass
SPW-6974	12/29/2016	Ra-226	17.6 ± 0.4	16.7	10.0 - 23.4	Pass

[a] Liquid sample results are reported in pCi/Liter, air filters (pCi/m3), charcoal (pCi/charcoal canister), and solid samples (pCi/kg).

[b] Laboratory codes : W (Water), MI (milk), AP (air filter), SO (soil), VE (vegetation), CH (charcoal canister), F (fish), U (urine).

[c] Results are based on single determinations.

[d] Control limits are established from the precision values listed in Attachment A of this report, adjusted to ± 2s.

NOTE: For fish, gelatin is used for the spike matrix. For vegetation, cabbage is used for the spike matrix.

TABLE A-4. In-House "Blank" Samples

Lab Code	Sample Type	Date	Analysis[b]	Concentration [a]		
				Laboratory results (4.66σ)		Acceptance
				LLD	Activity[c]	Criteria (4.66 σ)
SPW-289	Water	1/21/2016	Sr-90	0.55	0.28 ± 0.29	1
SPW-291	Water	1/21/2016	Sr-90	0.61	0.15 ± 0.30	1
SPW-293	Water	1/21/2016	C-14	147	-12 ± 89	200
SPW-413	Water	2/1/2016	Ra-228	0.86	1.86 ± 0.60	2
W-020416	Water	2/4/2016	Gr. Alpha	0.43	-0.17 ± 0.28	2
W-020416	Water	2/4/2016	Gr. Beta	0.73	0.36 ± 0.53	4
W-020916	Water	2/9/2016	Ra-226	0.02	0.01 ± 0.01	2
W-030716	Water	3/7/2016	Gr. Alpha	0.90	-0.36 ± 0.32	2
W-030716	Water	3/7/2016	Gr. Beta	1.59	-0.62 ± 0.71	4
SPDW-70045	Water	3/29/2016	Ra-226	0.03	0.01 ± 0.02	2
SPDW-1234	Water	3/30/2016	Gr. Alpha	0.44	-0.05 ± 0.30	2
SPDW-1234	Water	3/30/2016	Gr. Beta	0.79	-0.54 ± 0.54	4
SPW-1738	Water	4/21/2016	Ra-228	1.05	0.13 ± 0.50	2
SPW-1822	Water	4/23/2016	Gr. Alpha	0.50	-0.18 ± 0.33	2
SPW-1822	Water	4/23/2016	Gr. Beta	0.08	-0.35 ± 0.51	4
SPW-2051	Water	4/12/2016	Ra-226	0.02	0.03 ± 0.02	2
SPW-2069	Water	5/3/2016	I-131	0.15	0.06 ± 0.09	1
SPW-2133	Water	5/4/2016	H-3	148	55 ± 76	200
SPW-2230	Water	5/7/2016	H-3	149	-11 ± 73	200
SPW-2314	Water	5/13/2016	H-3	150	-29 ± 72	200
SPW-2342	Water	5/13/2016	H-3	143	50 ± 74	200
SPW-2364	Water	5/13/2016	I-131	0.22	-0.03 ± 0.12	1
SPW-2375	Water	5/14/2016	H-3	146	1 ± 70	200
SPW-2410	Water	5/17/2016	Sr-90	0.59	0.10 ± 0.29	1
SPW-2454	Water	5/19/2016	Gr. Alpha	0.47	-0.21 ± 0.31	2
SPW-2454	Water	5/19/2016	Gr. Beta	0.77	-0.49 ± 0.52	4
SPW-2456	Water	5/19/2016	U-238	0.15	0.00 ± 0.09	1
SPW-2485	Water	5/20/2016	I-131	0.18	-0.01 ± 0.10	1
SPW-2505	Water	5/20/2016	H-3	144	64 ± 75	200
SPW-2529	Water	5/23/2016	H-3	152	-3 ± 75	200
SPW-2530	Water	5/23/2016	Ra-228	0.96	-0.12 ± 0.43	2
SPW-2565	Water	5/24/2016	Gr. Alpha	0.47	0.03 ± 0.33	2
SPW-2565	Water	5/24/2016	Gr. Beta	0.77	-0.23 ± 0.53	4
SPW-2703	Water	6/1/2016	Sr-89	0.68	-0.13 ± 0.50	5
SPW-2703	Water	6/1/2016	Sr-90	0.55	0.11 ± 0.27	1
SPW-2718	Water	6/2/2016	Ra-228	0.67	0.23 ± 0.34	2
SPW-2720	Water	6/2/2016	I-131	0.16	0.01 ± 0.09	1
SPW-2750	Water	6/3/2016	H-3	151	-31 ± 73	200
SPW-2844	Water	6/7/2016	H-3	148	-55 ± 75	200
SPMI-2959	Milk	6/14/2016	I-131	0.16	0.09 ± 0.10	1
SPW-3137	Water	6/23/2016	I-131	0.15	-0.03 ± 0.08	1
SPW-3226	Water	6/17/2016	Ra-226	0.02	-0.01 ± 0.04	2
SPW-3239	Water	6/28/2016	Gr. Alpha	0.40	-0.15 ± 0.26	2
SPW-3239	Water	6/28/2016	Gr. Beta	0.73	0.14 ± 0.52	4
SPW-3687	Water	6/29/2016	Ra-226	0.04	0.03 ± 0.03	2

[a] Liquid sample results are reported in pCi/Liter, air filters (pCi/m^3), charcoal (pCi/charcoal canister), and solid samples (pCi/g).

[b] I-131(G); iodine-131 as analyzed by gamma spectroscopy.

[c] Activity reported is a net activity result.

TABLE A-4. In-House "Blank" Samples

Lab Code	Sample Type	Date	Analysis[b]	Concentration [a]		
				Laboratory results (4.66σ)		Acceptance
				LLD	Activity[c]	Criteria (4.66 σ)
SPW-3312	Water	7/1/2016	Ra-228	0.67	0.35 ± 0.35	2
SPW-3327	Water	7/6/2016	Sr-89	0.67	0.51 ± 0.51	5
SPW-3327	Water	7/6/2016	Sr-90	0.60	-0.14 ± 0.26	1
SPAP-3364	AP	7/7/2016	Gr.Beta	0.002	0.005 ± 0.001	0.01
SPW-3370	Water	7/7/2016	C-14	115	49 ± 71	200
SPW-3372	Water	7/7/2016	Ni-63	122	115 ± 76	200
SPW-3374	Water	7/7/2016	Tc-99	6.07	1.00 ± 3.70	10
SPW-3710	Water	7/20/2016	H-3	147	35 ± 75	200
SPW-3775	Water	7/22/2016	Gr. Alpha	0.73	0.41 ± 0.53	2
SPW-3775	Water	7/22/2016	Gr. Beta	0.45	-0.14 ± 0.30	4
SPW-3884	Water	7/26/2016	H-3	151	-1 ± 73	200
SPW-3949	Water	7/28/2016	Ra-228	0.76	0.32 ± 0.39	2
SPW-3982	Water	7/29/2016	H-3	145	49 ± 75	200
SPW-4133	Water	8/4/2016	Ra-228	0.80	0.26 ± 0.40	2
SPW-4257	Water	8/11/2016	I-131	0.17	-0.01 ± 0.10	1
SPW-4339	Water	8/17/2016	Ra-228	0.73	0.36 ± 0.39	2
SPW-4385	Water	7/15/2016	Ra-226	0.09	0.75 ± 0.09	2
SPW-4641	Water	9/6/2016	U-238	0.21	0.00 ± 0.13	1
SPW-4684	Water	9/8/2016	H-3	151	48 ± 78	200
SPW-4872	Water	9/16/2016	I-131	0.21	0.05 ± 0.11	1
SPW-4998	Water	9/26/2016	Sr-89	0.54	0.06 ± 0.39	5
SPW-4998	Water	9/26/2016	Sr-90	0.53	-0.03 ± 0.24	1
SPW-5090	Water	8/19/2016	Ra-226	0.03	0.03 ± 0.02	2
SPW-5164	Water	9/30/2016	Gr. Alpha	0.46	-0.05 ± 0.32	2
SPW-5164	Water	9/30/2016	Gr. Beta	0.74	-0.02 ± 0.52	4
SPW-5425	Water	9/28/2016	Ra-226	0.02	0.07 ± 0.05	2
SPW-5323	Water	10/7/2016	H-3	157	-12 ± 75	200
SPW-5552	Water	10/19/2016	U-238	0.18	0.00 ± 0.11	1
SPW-5554	Water	10/19/2016	Ra-228	0.72	0.22 ± 0.36	2
SPW-5611	Water	10/20/2016	H-3	153	67 ± 80	200
SPW-5613	Water	10/21/2016	Gr. Alpha	0.76	-0.55 ± 0.51	2
SPW-5613	Water	10/21/2016	Gr. Beta	0.42	0.02 ± 0.29	4
SPW-5740	Water	10/25/2016	H-3	154	-2 ± 72	200
SPW-5743	Water	10/25/2016	Sr-90	1.26	0.72 ± 0.67	1
SPW-5861	Water	10/28/2016	H-3	179	129 ± 91	200
SPW-5983	Water	11/2/2016	H-3	156	8 ± 78	200
SPW-6007	Water	11/4/2016	H-3	156	-34 ± 73	200
SPW-6131	Water	11/9/2016	H-3	180	80 ± 92	200
SPW-6134	Water	10/12/2016	Ra-226	0.05	-0.02 ± 0.12	2
SPW-6145	Water	11/10/2016	H-3	171	-46 ± 80	200
SPW-6317	Water	11/16/2016	H-3	180	-43 ± 82	200
SPW-6348	Water	11/17/2016	H-3	182	-45 ± 88	200
SPW-6423	Water	11/19/2016	H-3	181	8 ± 95	200
SPW-6455	Water	11/28/2016	Sr-89	0.58	-0.15 ± 0.46	5
SPW-6455	Water	11/28/2016	Sr-90	0.67	0.09 ± 0.32	1
SPW-6489	Water	11/29/2016	Ra-226	0.03	0.03 ± 0.02	2

[a] Liquid sample results are reported in pCi/Liter, air filters (pCi/m^3), charcoal (pCi/charcoal canister), and solid samples (pCi/g).

[b] I-131(G); iodine-131 as analyzed by gamma spectroscopy.

[c] Activity reported is a net activity result.

TABLE A-4. In-House "Blank" Samples

Lab Code	Sample Type	Date	Analysis[b]	Concentration [a]		
				Laboratory results (4.66σ)		Acceptance
				LLD	Activity[c]	Criteria (4.66 σ)
SPW-6529	Water	12/1/2016	I-131	0.18	-0.03 ± 0.10	1
SPW-6616	Water	12/3/2016	H-3	180	72 ± 92	200
SPW-6670	Water	12/5/2016	H-3	174	28 ± 92	200
SPW-6735	Water	12/9/2016	H-3	152	2 ± 73	200
SPW-6792	Water	12/15/2016	I-131	0.17	0.03 ± 0.12	1
SPW-6819	Water	12/16/2016	H-3	158	14 ± 77	200
SPW-6879	Water	12/21/2016	H-3	147	80 ± 75	200
SPW-6947	Water	12/22/2016	Ni-63	93	26 ± 57	200
SPW-6973	Water	12/29/2016	Ra-226	0.03	0.03 ± 0.02	2

[a] Liquid sample results are reported in pCi/Liter, air filters (pCi/m^3), charcoal (pCi/charcoal canister), and solid samples (pCi/g).

[b] I-131(G); iodine-131 as analyzed by gamma spectroscopy.

[c] Activity reported is a net activity result.

TABLE A-5. In-House "Duplicate" Samples

			Concentration [a]			
Lab Code	Date	Analysis	First Result	Second Result	Averaged Result	Acceptance
AP-010416	1/4/2016	Gr. Beta	0.044 ± 0.006	0.051 ± 0.006	0.047 ± 0.004	Pass
SPS-62, 63	1/7/2016	K-40	21.1 ± 1.9	21.2 ± 2.1	21.2 ± 1.4	Pass
WW-125, 126	1/7/2016	H-3	659 ± 102	748 ± 106	703 ± 74	Pass
SPS-199, 200	1/7/2016	Cs-137	0.09 ± 0.02	0.08 ± 0.03	0.08 ± 0.02	Pass
SPS-199, 200	1/7/2016	K-40	7.60 ± 0.60	8.62 ± 0.62	8.11 ± 0.43	Pass
AP-011116	1/11/2016	Gr. Beta	0.024 ± 0.005	0.027 ± 0.005	0.026 ± 0.003	Pass
AP-011216	1/12/2016	Gr. Beta	0.030 ± 0.004	0.034 ± 0.004	0.032 ± 0.003	Pass
WW-262, 263	1/14/2016	H-3	153 ± 78	141 ± 78	147 ± 55	Pass
WW-346, 347	1/14/2016	H-3	1,036 ± 117	959 ± 115	997 ± 82	Pass
WW-283, 284	1/18/2016	H-3	437 ± 92	427 ± 91	432 ± 65	Pass
AP-011916	1/19/2016	Gr. Beta	0.042 ± 0.005	0.037 ± 0.004	0.040 ± 0.003	Pass
AP-012016	1/20/2016	Gr. Beta	0.023 ± 0.003	0.030 ± 0.004	0.027 ± 0.002	Pass
AP-020116	2/1/2016	Gr. Beta	0.023 ± 0.005	0.023 ± 0.005	0.023 ± 0.004	Pass
SWU-472, 473	2/2/2016	Gr. Beta	4.37 ± 0.47	4.60 ± 0.49	4.49 ± 0.34	Pass
SG-493, 494	2/6/2016	Ac-228	2.10 ± 0.20	2.13 ± 0.20	2.12 ± 0.14	Pass
SG-493, 494	2/6/2016	K-40	5.79 ± 0.57	5.50 ± 0.69	5.65 ± 0.45	Pass
SG-493, 494	2/6/2016	Pb-214	1.84 ± 0.11	1.91 ± 0.11	1.88 ± 0.08	Pass
AP-020816	2/8/2016	Gr. Beta	0.020 ± 0.004	0.019 ± 0.004	0.020 ± 0.003	Pass
AP-020916	2/9/2016	Be-7	0.032 ± 0.005	0.041 ± 0.006	0.036 ± 0.004	Pass
SPS-619, 620	2/18/2016	K-40	20.0 ± 1.8	19.1 ± 1.6	19.5 ± 1.2	Pass
WW-640, 641	2/18/2016	H-3	90.1 ± 75.0	153.6 ± 78.4	121.8 ± 54.2	Pass
AP-021916	2/19/2016	Gr. Beta	0.021 ± 0.003	0.025 ± 0.004	0.023 ± 0.002	Pass
WW-822, 823	2/26/2016	H-3	2,770 ± 173	2,974 ± 178	2,872 ± 124	Pass
DW-70010, 70011	2/29/2016	Ra-226	4.88 ± 0.29	4.93 ± 0.28	4.91 ± 0.20	Pass
DW-70010, 70011	2/29/2016	Ra-228	3.00 ± 0.77	1.90 ± 0.62	2.45 ± 0.49	Pass
SW-934, 935	3/1/2016	Gr. Beta	0.94 ± 0.52	1.36 ± 0.60	1.15 ± 0.40	Pass
SPS-913, 914	3/3/2016	Cs-137	0.08 ± 0.03	0.10 ± 0.03	0.09 ± 0.02	Pass
SPS-913, 914	3/3/2016	K-40	17.45 ± 0.94	16.83 ± 0.95	17.14 ± 0.67	Pass
SPS-913, 914	3/3/2016	Ra-226	1.02 ± 0.08	1.13 ± 0.17	1.07 ± 0.09	Pass
SPS-913, 914	3/3/2016	Ra-228	1.09 ± 0.15	1.13 ± 0.17	1.11 ± 0.11	Pass
AP-030716	3/7/2016	Gr. Beta	0.018 ± 0.005	0.021 ± 0.005	0.019 ± 0.003	Pass
F-1303,1304	3/7/2016	K-40	3.320 ± 0.475	3.508 ± 0.396	3.414 ± 0.309	Pass
SG-976, 977	3/8/2016	Ra-226	6.75 ± 0.25	6.28 ± 0.22	6.52 ± 0.17	Pass
SG-976, 977	3/8/2016	Ra-228	9.21 ± 0.49	9.09 ± 0.49	9.15 ± 0.35	Pass
PM-1094, 1095	3/9/2016	K-40	14.01 ± 0.68	14.47 ± 0.72	14.24 ± 0.49	Pass
MI-1042,1043	3/7/2016	K-40	1,684 ± 124	1,804 ± 119	1,744 ± 86	Pass
DW-70023, 70024	3/7/2016	Ra-226	3.40 ± 0.43	2.68 ± 0.35	3.04 ± 0.28	Pass
DW-70023, 70024	3/7/2016	Ra-228	4.46 ± 0.83	5.74 ± 0.94	5.10 ± 0.63	Pass
DW-70014, 70015	3/7/2016	Gr. Alpha	13.38 ± 1.58	11.40 ± 1.43	12.39 ± 1.07	Pass
DW-70026, 70027	3/7/2016	Gr. Alpha	3.46 ± 0.79	3.08 ± 0.74	3.27 ± 0.54	Pass
DW-70038, 70039	3/8/2016	Gr. Alpha	1.14 ± 0.89	1.73 ± 0.95	1.44 ± 0.65	Pass
DW-70035, 70036	3/8/2016	Ra-226	0.47 ± 0.10	0.45 ± 0.09	0.46 ± 0.07	Pass
DW-70035, 70036	3/8/2016	Ra-228	0.56 ± 0.45	0.47 ± 0.44	0.52 ± 0.31	Pass
AP-031516	3/15/2016	Gr. Beta	0.014 ± 0.003	0.016 ± 0.004	0.015 ± 0.002	Pass
AP-032116	3/21/2016	Gr. Beta	0.014 ± 0.004	0.020 ± 0.004	0.017 ± 0.003	Pass
AP-1218,1219	3/24/2016	Be-7	0.135 ± 0.065	0.167 ± 0.081	0.151 ± 0.052	Pass
AP-1719,1720	3/28/2016	Be-7	0.075 ± 0.008	0.076 ± 0.007	0.076 ± 0.005	Pass
AP-033016	3/30/2016	Gr. Beta	0.023 ± 0.004	0.025 ± 0.004	0.024 ± 0.003	Pass
SPS-1260, 1261	3/30/2016	K-40	18.00 ± 1.92	19.67 ± 1.77	18.84 ± 1.30	Pass
XW-1467, 1468	3/30/2016	H-3	310 ± 87	295 ± 86	303 ± 61	Pass
XWW-1530, 1531	3/30/2016	H-3	198 ± 84	162 ± 82	180 ± 59	Pass
AP-1827, 1828	3/30/2016	Be-7	0.069 ± 0.011	0.072 ± 0.011	0.071 ± 0.008	Pass
AP-1323,1324	3/31/2016	Be-7	0.206 ± 0.120	0.197 ± 0.091	0.202 ± 0.076	Pass
LW-1446,1447	3/31/2016	Gr. Beta	2.36 ± 0.93	2.23 ± 1.01	2.29 ± 0.69	Pass

TABLE A-5. In-House "Duplicate" Samples

			Concentration [a]			
Lab Code	Date	Analysis	First Result	Second Result	Averaged Result	Acceptance
AP-010416	1/4/2016	Gr. Beta	0.044 ± 0.006	0.051 ± 0.006	0.047 ± 0.004	Pass
SPS-62, 63	1/7/2016	K-40	21.1 ± 1.9	21.2 ± 2.1	21.2 ± 1.4	Pass
WW-125, 126	1/7/2016	H-3	659 ± 102	748 ± 106	703 ± 74	Pass
SPS-199, 200	1/7/2016	Cs-137	0.09 ± 0.02	0.08 ± 0.03	0.08 ± 0.02	Pass
SPS-199, 200	1/7/2016	K-40	7.60 ± 0.60	8.62 ± 0.62	8.11 ± 0.43	Pass
AP-011116	1/11/2016	Gr. Beta	0.024 ± 0.005	0.027 ± 0.005	0.026 ± 0.003	Pass
AP-011216	1/12/2016	Gr. Beta	0.030 ± 0.004	0.034 ± 0.004	0.032 ± 0.003	Pass
WW-262, 263	1/14/2016	H-3	153 ± 78	141 ± 78	147 ± 55	Pass
WW-346, 347	1/14/2016	H-3	1,036 ± 117	959 ± 115	997 ± 82	Pass
WW-283, 284	1/18/2016	H-3	437 ± 92	427 ± 91	432 ± 65	Pass
AP-011916	1/19/2016	Gr. Beta	0.042 ± 0.005	0.037 ± 0.004	0.040 ± 0.003	Pass
AP-012016	1/20/2016	Gr. Beta	0.023 ± 0.003	0.030 ± 0.004	0.027 ± 0.002	Pass
AP-020116	2/1/2016	Gr. Beta	0.023 ± 0.005	0.023 ± 0.005	0.023 ± 0.004	Pass
SWU-472, 473	2/2/2016	Gr. Beta	4.37 ± 0.47	4.60 ± 0.49	4.49 ± 0.34	Pass
SG-493, 494	2/6/2016	Ac-228	2.10 ± 0.20	2.13 ± 0.20	2.12 ± 0.14	Pass
SG-493, 494	2/6/2016	K-40	5.79 ± 0.57	5.50 ± 0.69	5.65 ± 0.45	Pass
SG-493, 494	2/6/2016	Pb-214	1.84 ± 0.11	1.91 ± 0.11	1.88 ± 0.08	Pass
AP-020816	2/8/2016	Gr. Beta	0.020 ± 0.004	0.019 ± 0.004	0.020 ± 0.003	Pass
AP-020916	2/9/2016	Be-7	0.032 ± 0.005	0.041 ± 0.006	0.036 ± 0.004	Pass
SPS-619, 620	2/18/2016	K-40	20.0 ± 1.8	19.1 ± 1.6	19.5 ± 1.2	Pass
WW-640, 641	2/18/2016	H-3	90.1 ± 75.0	153.6 ± 78.4	121.8 ± 54.2	Pass
AP-021916	2/19/2016	Gr. Beta	0.021 ± 0.003	0.025 ± 0.004	0.023 ± 0.002	Pass
WW-822, 823	2/26/2016	H-3	2,770 ± 173	2,974 ± 178	2,872 ± 124	Pass
DW-70010, 70011	2/29/2016	Ra-226	4.88 ± 0.29	4.93 ± 0.28	4.91 ± 0.20	Pass
DW-70010, 70011	2/29/2016	Ra-228	3.00 ± 0.77	1.90 ± 0.62	2.45 ± 0.49	Pass
SW-934, 935	3/1/2016	Gr. Beta	0.94 ± 0.52	1.36 ± 0.60	1.15 ± 0.40	Pass
SPS-913, 914	3/3/2016	Cs-137	0.08 ± 0.03	0.10 ± 0.03	0.09 ± 0.02	Pass
SPS-913, 914	3/3/2016	K-40	17.45 ± 0.94	16.83 ± 0.95	17.14 ± 0.67	Pass
SPS-913, 914	3/3/2016	Ra-226	1.02 ± 0.08	1.13 ± 0.17	1.07 ± 0.09	Pass
SPS-913, 914	3/3/2016	Ra-228	1.09 ± 0.15	1.13 ± 0.17	1.11 ± 0.11	Pass
AP-030716	3/7/2016	Gr. Beta	0.018 ± 0.005	0.021 ± 0.005	0.019 ± 0.003	Pass
F-1303,1304	3/7/2016	K-40	3.320 ± 0.475	3.508 ± 0.396	3.414 ± 0.309	Pass
SG-976, 977	3/8/2016	Ra-226	6.75 ± 0.25	6.28 ± 0.22	6.52 ± 0.17	Pass
SG-976, 977	3/8/2016	Ra-228	9.21 ± 0.49	9.09 ± 0.49	9.15 ± 0.35	Pass
PM-1094, 1095	3/9/2016	K-40	14.01 ± 0.68	14.47 ± 0.72	14.24 ± 0.49	Pass
MI-1042,1043	3/7/2016	K-40	1,684 ± 124	1,804 ± 119	1,744 ± 86	Pass
DW-70023, 70024	3/7/2016	Ra-226	3.40 ± 0.43	2.68 ± 0.35	3.04 ± 0.28	Pass
DW-70023, 70024	3/7/2016	Ra-228	4.46 ± 0.83	5.74 ± 0.94	5.10 ± 0.63	Pass
DW-70014, 70015	3/7/2016	Gr. Alpha	13.38 ± 1.58	11.40 ± 1.43	12.39 ± 1.07	Pass
DW-70026, 70027	3/7/2016	Gr. Alpha	3.46 ± 0.79	3.08 ± 0.74	3.27 ± 0.54	Pass
DW-70038, 70039	3/8/2016	Gr. Alpha	1.14 ± 0.89	1.73 ± 0.95	1.44 ± 0.65	Pass
DW-70035, 70036	3/8/2016	Ra-226	0.47 ± 0.10	0.45 ± 0.09	0.46 ± 0.07	Pass
DW-70035, 70036	3/8/2016	Ra-228	0.56 ± 0.45	0.47 ± 0.44	0.52 ± 0.31	Pass
AP-031516	3/15/2016	Gr. Beta	0.014 ± 0.003	0.016 ± 0.004	0.015 ± 0.002	Pass
AP-032116	3/21/2016	Gr. Beta	0.014 ± 0.004	0.020 ± 0.004	0.017 ± 0.003	Pass
AP-1218,1219	3/24/2016	Be-7	0.135 ± 0.065	0.167 ± 0.081	0.151 ± 0.052	Pass
AP-1719,1720	3/28/2016	Be-7	0.075 ± 0.008	0.076 ± 0.007	0.076 ± 0.005	Pass
AP-033016	3/30/2016	Gr. Beta	0.023 ± 0.004	0.025 ± 0.004	0.024 ± 0.003	Pass
SPS-1260, 1261	3/30/2016	K-40	18.00 ± 1.92	19.67 ± 1.77	18.84 ± 1.30	Pass
XW-1467, 1468	3/30/2016	H-3	310 ± 87	295 ± 86	303 ± 61	Pass
XWW-1530, 1531	3/30/2016	H-3	198 ± 84	162 ± 82	180 ± 59	Pass
AP-1827, 1828	3/30/2016	Be-7	0.069 ± 0.011	0.072 ± 0.011	0.071 ± 0.008	Pass
AP-1323,1324	3/31/2016	Be-7	0.206 ± 0.120	0.197 ± 0.091	0.202 ± 0.076	Pass
LW-1446,1447	3/31/2016	Gr. Beta	2.36 ± 0.93	2.23 ± 1.01	2.29 ± 0.69	Pass

TABLE A-5. In-House "Duplicate" Samples

			Concentration [a]			
Lab Code	Date	Analysis	First Result	Second Result	Averaged Result	Acceptance
WW-1740,1741	4/2/2016	H-3	21,162 ± 120	21,091 ± 427	21,126 ± 222	Pass
SPS-1344, 1345	4/4/2016	K-40	17.98 ± 0.93	17.14 ± 0.96	17.56 ± 0.67	Pass
SPS-1344, 1345	4/4/2016	Pb-214	1.12 ± 0.09	1.04 ± 0.08	1.08 ± 0.06	Pass
SPS-1344, 1345	4/4/2016	Ac-228	1.23 ± 0.15	1.33 ± 0.19	1.28 ± 0.12	Pass
SPS-1344, 1345	4/4/2016	Cs-137	0.13 ± 0.03	0.13 ± 0.03	0.13 ± 0.02	Pass
P-1509,1510	4/8/2016	H-3	1,084 ± 120	1,038 ± 119	1,061 ± 85	Pass
AP-041116	4/11/2016	Gr. Beta	0.020 ± 0.004	0.019 ± 0.004	0.019 ± 0.003	Pass
SS-1551,1552	4/12/2016	Gr. Beta	8.71 ± 1.11	8.88 ± 1.13	8.80 ± 0.79	Pass
SS-1551,1552	4/12/2016	K-40	3.50 ± 0.25	3.06 ± 0.28	3.28 ± 0.19	Pass
SS-1551,1552	4/12/2016	Tl-208	0.05 ± 0.02	0.05 ± 0.02	0.05 ± 0.01	Pass
SS-1551,1552	4/12/2016	Bi-214	0.10 ± 0.02	0.09 ± 0.02	0.10 ± 0.02	Pass
SS-1551,1552	4/12/2016	Pb-212	0.13 ± 0.02	0.11 ± 0.02	0.12 ± 0.01	Pass
SS-1551,1552	4/12/2016	Ra-226	0.35 ± 0.17	0.30 ± 0.17	0.32 ± 0.12	Pass
SS-1551,1552	4/12/2016	Ac-228	0.16 ± 0.05	0.17 ± 0.05	0.17 ± 0.04	Pass
SS-1593,1594	4/12/2016	K-40	14.80 ± 0.73	14.89 ± 0.78	14.85 ± 0.53	Pass
WW-1677, 1678	4/14/2016	Ra-226	0.23 ± 0.13	0.35 ± 0.15	0.29 ± 0.10	Pass
WW-1783,1784	4/14/2016	H-3	768 ± 111	632 ± 107	700 ± 77	Pass
BS-1804,1805	4/18/2016	K-40	0.79 ± 0.02	0.87 ± 0.19	0.83 ± 0.10	Pass
WW-2021,2022	4/18/2016	H-3	5,548 ± 221	5,707 ± 224	5,627 ± 157	Pass
XWW-2240, 2241	4/18/2016	H-3	638 ± 104	543 ± 101	591 ± 72	Pass
XWW-2109, 2110	4/19/2016	H-3	3461 ± 185	3250 ± 180	3356 ± 129	Pass
SPS-2130, 2131	4/25/2016	K-40	7.80 ± 0.84	6.80 ± 0.60	7.30 ± 0.52	Pass
AP-042516	4/25/2016	Gr. Beta	0.020 ± 0.004	0.023 ± 0.004	0.022 ± 0.003	Pass
BS-2065, 2066	4/25/2016	K-40	14.40 ± 1.50	14.72 ± 1.19	14.56 ± 0.96	Pass
AP-042716	4/27/2016	Gr. Beta	0.023 ± 0.003	0.019 ± 0.003	0.021 ± 0.002	Pass
SPS-1999, 2000	4/28/2016	K-40	19.84 ± 1.76	18.963 ± 2.42	19.40 ± 1.50	Pass
SO-2153,2154	5/2/2016	K-40	21.80 ± 0.81	21.17 ± 0.85	21.48 ± 0.59	Pass
SO-2153,2154	5/2/2016	Cs-137	0.11 ± 0.03	0.11 ± 0.07	0.11 ± 0.04	Pass
SO-2153,2154	5/2/2016	Ra-226	1.50 ± 0.29	1.22 ± 0.29	1.36 ± 0.21	Pass
SO-2153,2154	5/2/2016	Pb-214	0.56 ± 0.06	0.57 ± 0.06	0.57 ± 0.04	Pass
W-2394,2395	5/5/2016	H-3	736 ± 106	631 ± 102	683 ± 74	Pass
VE-2284,2285	5/9/2016	K-40	3.50 ± 0.25	3.06 ± 0.28	3.28 ± 0.19	Pass
AP-051016	5/10/2016	Gr. Beta	0.020 ± 0.005	0.018 ± 0.005	0.019 ± 0.003	Pass
SG-2261, 2262	5/10/2016	Ac-228	34.4 ± 1.2	34.4 ± 1.4	34.4 ± 0.9	Pass
SG-2261, 2262	5/10/2016	Pb-214	29.5 ± 3.0	31.9 ± 3.3	30.7 ± 2.2	Pass
BS-2439, 2440	5/12/2016	K-40	9.96 ± 0.91	10.27 ± 0.76	10.11 ± 0.59	Pass
WW-2534,2535	5/16/2016	H-3	14,342 ± 354	14,613 ± 357	14,477 ± 252	Pass
AP-051716	5/17/2016	Gr. Beta	0.014 ± 0.004	0.015 ± 0.004	0.014 ± 0.003	Pass
SPS-2945, 2946	5/19/2016	K-40	30.71 ± 0.74	31.75 ± 0.78	31.23 ± 0.54	Pass
SPS-2945, 2946	5/19/2016	Be-7	1.55 ± 0.24	1.90 ± 0.35	1.73 ± 0.21	Pass
SPS-2578, 2579	5/24/2016	Pb-214	0.96 ± 0.12	0.80 ± 0.14	0.88 ± 0.09	Pass
AP-052516	5/25/2016	Gr. Beta	0.022 ± 0.004	0.022 ± 0.004	0.022 ± 0.003	Pass
G-2642,2643	5/26/2016	Be-7	0.443 ± 0.178	0.247 ± 0.247	0.345 ± 0.152	Pass
SO-2663, 2664	5/26/2016	Cs-137	0.08 ± 0.03	0.07 ± 0.03	0.07 ± 0.02	Pass
SO-2663, 2664	5/26/2016	K-40	12.44 ± 0.68	11.64 ± 0.63	12.04 ± 0.46	Pass
SO-2663, 2664	5/26/2016	Tl-208	0.13 ± 0.02	0.14 ± 0.03	0.14 ± 0.02	Pass
SO-2663, 2664	5/26/2016	Pb-212	0.43 ± 0.04	0.41 ± 0.04	0.42 ± 0.03	Pass
SO-2663, 2664	5/26/2016	Ra-226	1.19 ± 0.34	0.87 ± 0.28	1.03 ± 0.22	Pass
SO-2663, 2664	5/26/2016	Ac-228	0.45 ± 0.09	0.53 ± 0.10	0.49 ± 0.07	Pass
SPS-2817, 2818	5/31/2016	K-40	12.10 ± 0.70	11.05 ± 0.70	11.58 ± 0.49	Pass
DW-70091, 70092	6/1/2016	Ra-226	5.61 ± 0.29	5.53 ± 0.30	5.57 ± 0.21	Pass
DW-70091, 70092	6/1/2016	Ra-228	1.45 ± 0.58	1.91 ± 0.62	1.68 ± 0.42	Pass
BS-2925,2926	6/3/2016	K-40	7.74 ± 0.44	7.86 ± 0.42	7.80 ± 0.30	Pass
SPS-2796, 2797	6/2/2016	K-40	20.91 ± 2.38	21.16 ± 1.82	21.04 ± 1.50	Pass
SPS-2882, 2883	6/7/2016	K-40	14.64 ± 0.52	14.60 ± 0.52	14.62 ± 0.37	Pass
SPS-2882, 2883	6/7/2016	Be-7	2.00 ± 0.25	1.94 ± 0.20	1.97 ± 0.16	Pass
DW-70102, 70103	6/13/2016	Ra-226	0.34 ± 0.09	0.36 ± 0.08	0.35 ± 0.06	Pass

TABLE A-5. In-House "Duplicate" Samples

			Concentration [a]			
Lab Code	Date	Analysis	First Result	Second Result	Averaged Result	Acceptance
DW-70102, 70103	6/13/2016	Ra-228	0.93 ± 0.47	1.11 ± 0.53	1.02 ± 0.35	Pass
AP-061416	6/14/2016	Gr. Beta	0.026 ± 0.004	0.023 ± 0.004	0.024 ± 0.003	Pass
SG-3144, 3145	6/17/2016	Be-7	2.23 ± 0.12	2.24 ± 0.12	2.24 ± 0.08	Pass
SG-3144, 3145	6/17/2016	K-40	7.57 ± 0.25	7.09 ± 0.23	7.33 ± 0.17	Pass
SPS-3165, 3166	6/22/2016	K-40	21.14 ± 2.27	22.88 ± 1.60	22.01 ± 1.39	Pass
SPS-3323, 3324	6/24/2016	K-40	18.67 ± 1.57	21.53 ± 1.65	20.10 ± 1.14	Pass
WW-3231, 3232	6/27/2016	H-3	414 ± 104	498 ± 108	456 ± 75	Pass
AP-3830,3831	6/29/2016	Gr. Beta	0.088 ± 0.012	0.093 ± 0.015	0.091 ± 0.010	Pass
AP-070516A	7/5/2016	Gr. Beta	0.018 ± 0.002	0.014 ± 0.002	0.016 ± 0.002	Pass
AP-070516B	7/5/2016	Gr. Beta	0.025 ± 0.005	0.026 ± 0.005	0.025 ± 0.004	Pass
XWW-3605,3606	7/7/2016	H-3	3,316 ± 186	3,316 ± 181	3,316 ± 130	Pass
DW-70135,70136	7/8/2016	Gr. Alpha	3.68 ± 1.01	2.76 ± 0.98	3.22 ± 0.70	Pass
DW-70132,70133	7/8/2016	Ra-226	1.32 ± 0.14	1.11 ± 0.15	1.22 ± 0.10	Pass
DW-70132,70133	7/8/2016	Ra-228	3.92 ± 0.94	2.94 ± 0.90	3.43 ± 0.65	Pass
AP-071216	7/12/2016	Gr. Beta	0.014 ± 0.004	0.018 ± 0.004	0.016 ± 0.003	Pass
DW-70150,70151	7/14/2016	Gr. Alpha	5.00 ± 1.06	4.43 ± 1.04	4.72 ± 0.74	Pass
SPS-3649,3650	7/15/2016	Cs-137	0.12 ± 0.03	0.12 ± 0.03	0.12 ± 0.02	Pass
SPS-3649,3650	7/15/2016	K-40	16.68 ± 0.79	16.52 ± 0.86	16.6 ± 0.58	Pass
SPS-3649,3650	7/15/2016	Pb-214	1.20 ± 0.08	1.17 ± 0.08	1.19 ± 0.06	Pass
SPS-3649,3650	7/15/2016	Ac-228	1.28 ± 0.16	1.28 ± 0.16	1.28 ± 0.11	Pass
AP-071816	7/18/2016	Gr. Beta	0.022 ± 0.005	0.024 ± 0.005	0.023 ± 0.003	Pass
DW-70163,70164	7/19/2016	Gr. Alpha	1.08 ± 0.66	1.36 ± 0.70	1.22 ± 0.48	Pass
WW-3761,3762	7/20/2016	H-3	347 ± 90	466 ± 96	407 ± 66	Pass
SPS-4003,4004	7/23/2016	K-40	7.15 ± 1.59	6.86 ± 1.21	7.00 ± 1.00	Pass
AP-072516	7/25/2016	Gr. Beta	0.023 ± 0.004	0.020 ± 0.004	0.022 ± 0.003	Pass
VE-3936,3937	7/25/2016	Sr-90	0.048 ± 0.007	0.058 ± 0.010	0.053 ± 0.006	Pass
VE-3936,3937	7/25/2016	Be-7	0.49 ± 0.15	0.51 ± 0.15	0.50 ± 0.10	Pass
VE-3936,3937	7/25/2016	K-40	4.70 ± 0.35	4.86 ± 0.37	4.78 ± 0.25	Pass
VE-3959,3960	7/27/2016	Sr-90	0.002 ± 0.002	0.003 ± 0.001	0.003 ± 0.001	Pass
VE-3959,3960	7/27/2016	Be-7	0.30 ± 0.14	0.25 ± 0.12	0.27 ± 0.09	Pass
VE-3959,3960	7/27/2016	K-40	4.01 ± 0.37	4.16 ± 0.34	4.08 ± 0.25	Pass
DW-70169,70170	7/28/2016	Ra-226	0.83 ± 0.11	0.69 ± 0.11	0.76 ± 0.08	Pass
DW-70169,70170	7/28/2016	Ra-228	1.85 ± 0.63	1.31 ± 0.84	1.58 ± 0.53	Pass
AP-080116	8/1/2016	Gr. Beta	0.029 ± 0.003	0.033 ± 0.003	0.031 ± 0.002	Pass
SS-4131,4132	8/1/2016	K-40	12.47 ± 0.71	13.24 ± 0.81	12.86 ± 0.54	Pass
SS-4131,4132	8/1/2016	Cs-137	0.10 ± 0.03	0.13 ± 0.04	0.12 ± 0.02	Pass
SPS-4087,4088	8/2/2016	K-40	17.06 ± 1.58	19.5 ± 1.97	18.28 ± 1.26	Pass
WW-4976,4977	8/4/2016	H-3	17,043 ± 390	16,821 ± 388	16,932 ± 275	Pass
SPS-4266,4267	8/10/2016	K-40	1.06 ± 0.47	1.69 ± 0.52	1.375 ± 0.35	Pass
AP-081616	8/16/2016	Gr. Beta	0.029 ± 0.005	0.025 ± 0.004	0.027 ± 0.003	Pass
VE-4399,4400	8/18/2016	K-40	3.85 ± 0.23	3.27 ± 0.41	3.56 ± 0.24	Pass
VE-4399,4400	8/18/2016	Be-7	0.30 ± 0.08	0.45 ± 0.20	0.37 ± 0.11	Pass
WW-5394,5395	8/18/2016	H-3	947 ± 122	846 ± 119	896 ± 85	Pass
SPS-4441,4442	8/22/2016	K-40	20.55 ± 2.23	19.69 ± 1.74	20.12 ± 1.41	Pass
AP-082216	8/22/2016	Gr. Beta	0.021 ± 0.005	0.015 ± 0.005	0.018 ± 0.003	Pass
VE-4462,4463	8/22/2016	Be-7	0.91 ± 0.09	0.89 ± 0.11	0.90 ± 0.07	Pass
VE-4462,4463	8/22/2016	K-40	7.48 ± 0.26	7.60 ± 0.23	7.54 ± 0.17	Pass
WW-4594,4595	8/26/2016	H-3	675 ± 107	788 ± 111	731 ± 77	Pass
WW-4663,4664	8/26/2016	H-3	607 ± 104	501 ± 100	554 ± 72	Pass
SPS-4529,4530	8/26/2016	K-40	21.98 ± 2.52	21.85 ± 1.56	21.92 ± 1.48	Pass
AP-083016A	8/30/2016	Gr. Beta	0.030 ± 0.003	0.035 ± 0.004	0.033 ± 0.002	Pass
AP-083016B	8/30/2016	Gr. Beta	0.032 ± 0.009	0.026 ± 0.004	0.029 ± 0.005	Pass
VE-4615,4616	8/31/2016	K-40	2.96 ± 0.16	3.11 ± 0.17	3.03 ± 0.11	Pass

TABLE A-5. In-House "Duplicate" Samples

			Concentration [a]			
Lab Code	Date	Analysis	First Result	Second Result	Averaged Result	Acceptance
AP-110116	11/1/2016	Gr. Beta	0.021 ± 0.004	0.024 ± 0.004	0.023 ± 0.003	Pass
S-5963, 5964	11/1/2016	K-40	20.35 ± 2.29	18.59 ± 1.90	19.47 ± 1.49	Pass
SG-6119, 6120	11/1/2016	Ac-228	5.70 ± 0.44	6.28 ± 0.57	5.99 ± 0.36	Pass
SG-6119, 6120	11/1/2016	Gr. Alpha	21.59 ± 1.88	24.35 ± 1.93	22.97 ± 1.35	Pass
SG-6119, 6120	11/1/2016	K-40	4.89 ± 1.10	5.90 ± 1.08	5.40 ± 0.77	Pass
SG-6119, 6120	11/1/2016	Pb-214	3.99 ± 0.21	4.35 ± 0.32	4.17 ± 0.19	Pass
S-6051, 6052	11/4/2016	K-40	7.05 ± 0.60	7.56 ± 0.53	7.31 ± 0.40	Pass
WW-6297, 6298	11/8/2016	H-3	207 ± 98	165 ± 97	186 ± 69	Pass
WW-6341,6342	11/8/2016	H-3	1,356 ± 140	1,404 ± 141	1,380 ± 99	Pass
SO-6406,6407	11/9/2016	Cs-137	0.36 ± 0.04	0.43 ± 0.05	0.40 ± 0.03	Pass
SO-6406,6407	11/9/2016	K-40	10.90 ± 0.68	11.29 ± 0.74	11.09 ± 0.50	Pass
AP-111416	11/14/2016	Gr. Beta	0.024 ± 0.005	0.021 ± 0.006	0.022 ± 0.004	Pass
WW-6829,6830	11/15/2016	H-3	39,982 ± 589	40,315 ± 591	40,149 ± 417	Pass
DW-70239, 70240	11/17/2016	Gr. Alpha	7.99 ± 1.15	6.41 ± 1.05	7.20 ± 0.78	Pass
AP-112216	11/22/2016	Gr. Beta	0.049 ± 0.005	0.045 ± 0.005	0.047 ± 0.003	Pass
S-6473, 6474	11/24/2016	K-40	19.37 ± 1.97	23.80 ± 3.54	21.58 ± 2.02	Pass
SG-6938, 6939	11/28/2016	Ac-228	18.99 ± 0.59	19.92 ± 0.79	19.46 ± 0.49	Pass
SG-6938, 6939	11/28/2016	Pb-214	15.28 ± 0.34	14.96 ± 0.43	15.12 ± 0.27	Pass
AP-120116	12/1/2016	Gr. Beta	0.029 ± 0.003	0.030 ± 0.003	0.030 ± 0.002	Pass
F-6567,6568	12/1/2016	K-40	3.76 ± 0.40	3.83 ± 0.46	3.80 ± 0.30	Pass
S-6522, 6523	12/1/2016	Ac-228	1.08 ± 0.13	1.29 ± 0.16	1.19 ± 0.10	Pass
S-6522, 6523	12/1/2016	Pb-214	1.00 ± 0.08	1.01 ± 0.09	1.01 ± 0.06	Pass
S-6609, 6610	12/1/2016	K-40	15.57 ± 1.01	15.99 ± 0.78	15.78 ± 0.64	Pass
S-6718, 6719	12/7/2016	K-40	18.19 ± 2.13	18.76 ± 1.80	18.48 ± 1.39	Pass
WW-6784, 6785	12/7/2016	H-3	922 ± 117	905 ± 116	914 ± 82	Pass
AP-121216	12/12/2016	Gr. Beta	0.026 ± 0.005	0.028 ± 0.005	0.027 ± 0.003	Pass
AP-7178,7179	1/3/2017	Be-7	0.047 ± 0.015	0.062 ± 0.017	0.054 ± 0.012	Pass

Note: Duplicate analyses are performed on every twentieth sample received in-house. Results are not listed for those analyses with activities that measure below the LLD.

[a] Results are reported in units of pCi/L, except for air filters (pCi/Filter or pCi/m3), food products, vegetation, soil and sediment (pCi/g).

TABLE A-6. Department of Energy's Mixed Analyte Performance Evaluation Program (MAPEP).

			Concentration [a]			
Lab Code [b]	Reference Date	Analysis	Laboratory result	Known Activity	Control Limits [c]	Acceptance
MASO-1053	2/1/2016	Ni-63	1,206 ± 20	1250	875 - 1625	Pass
MASO-1053	2/1/2016	Sr-90	0.65 ± 1.27	0.00	NA [c]	Pass
MASO-1053	2/1/2016	Tc-99	0.1 ± 5.5	0.0	NA [c]	Pass
MASO-1053	2/1/2016	Cs-134	908 ± 26	1030	721 - 1339	Pass
MASO-1053	2/1/2016	Cs-137	0.10 ± 6.20	0.00	NA [c]	Pass
MASO-1053	2/1/2016	Co-57	1058 ± 26	992	694 - 1290	Pass
MASO-1053	2/1/2016	Co-60	1229 ± 28	1190	833 - 1547	Pass
MASO-1053	2/1/2016	Mn-54	1235 ± 43	1160	812 - 1508	Pass
MASO-1053	2/1/2016	Zn-65	753 ± 64	692	484 - 900	Pass
MASO-1053	2/1/2016	K-40	753 ± 140	607	425 - 789	Pass
MASO-1053	2/1/2016	Am-241	79 ± 6	103	72 - 134	Pass
MASO-1053	2/1/2016	Pu-238	73.9 ± 9.2	63.6	44.5 - 82.7	Pass
MASO-1053	2/1/2016	Pu-239/240	0.76 ± 1.34	0.21	NA [d]	Pass
MASO-1053	2/1/2016	U-234/233	45.0 ± 5.1	45.9	32.1 - 59.7	Pass
MASO-1053	2/1/2016	U-238	129 ± 9	146	102 - 190	Pass
MAW-989	2/1/2016	Am-241	0.018 ± 0.015	0.00	NA [c]	Pass
MAW-989	2/1/2016	H-3	0.2 ± 2.8	0.0	NA [c]	Pass
MAW-989	2/1/2016	Ni-63	12.8 ± 2.7	12.3	8.6 - 16.0	Pass
MAW-989	2/1/2016	Sr-90	8.70 ± 1.20	8.74	6.12 - 11.36	Pass
MAW-989	2/1/2016	Tc-99	-1.1 ± 0.6	0.0	NA [c]	Pass
MAW-989	2/1/2016	Cs-134	15.5 ± 0.3	16.1	11.3 ± 20.9	Pass
MAW-989	2/1/2016	Cs-137	23.7 ± 0.5	21.2	14.8 - 27.6	Pass
MAW-989[e]	2/1/2016	Co-57	1.38 ± 0.12	0.00	NA [c]	Fail
MAW-989	2/1/2016	Co-60	12.5 ± 0.3	11.8	8.3 - 15.3	Pass
MAW-989	2/1/2016	Mn-54	12.2 ± 0.4	11.1	7.8 - 14.4	Pass
MAW-989	2/1/2016	Zn-65	15.7 ± 0.7	13.6	9.5 - 17.7	Pass
MAW-989	2/1/2016	K-40	288 ± 5	251	176 - 326	Pass
MAW-989	2/1/2016	Fe-55	17.3 ± 7.0	16.2	11.3 - 21.1	Pass
MAW-989	2/1/2016	Ra-226	0.710 ± 0.070	0.718	0.503 - 0.933	Pass
MAW-989	2/1/2016	Pu-238	1.280 ± 0.110	1.244	0.871 ± 1.617	Pass
MAW-989	2/1/2016	Pu-239/240	0.640 ± 0.080	0.641	0.449 - 0.833	Pass
MAW-989	2/1/2016	U-234/233	1.39 ± 0.12	1.48	1.04 - 1.92	Pass
MAW-989	2/1/2016	U-238	1.43 ± 0.12	1.53	1.07 - 1.99	Pass
MAW-893	2/1/2016	Gross Alpha	0.600 ± 0.050	0.673	0.202 - 1.144	Pass
MAW-893	2/1/2016	Gross Beta	2.10 ± 0.06	2.15	1.08 - 3.23	Pass
MAW-896	2/1/2016	I-129	3.67 ± 0.20	3.85	2.70 - 5.01	Pass
MAAP-1056	2/1/2016	Gross Alpha	0.39 ± 0.05	1.20	0.36 - 2.04	Pass
MAAP-1056	2/1/2016	Gross Beta	1.03 ± 0.07	0.79	0.40 - 1.19	Pass

TABLE A-6. Department of Energy's Mixed Analyte Performance Evaluation Program (MAPEP).

			Concentration [a]			
Lab Code [b]	Reference Date	Analysis	Laboratory result	Known Activity	Control Limits [c]	Acceptance
MAAP-1057	2/1/2016	Sr-90	1.34 ± 0.15	1.38	0.97 ± 1.79	Pass
MAAP-1057	2/1/2016	Cs-134	-0.01 ± 0.03	0.00	NA [c]	Pass
MAAP-1057	2/1/2016	Cs-137	2.57 ± 0.10	2.30	1.61 - 2.99	Pass
MAAP-1057	2/1/2016	Co-57	3.01 ± 0.06	2.94	2.06 - 3.82	Pass
MAAP-1057	2/1/2016	Co-60	4.28 ± 0.10	4.02	2.81 - 5.23	Pass
MAAP-1057	2/1/2016	Mn-54	4.90 ± 0.13	4.53	3.17 - 5.89	Pass
MAAP-1057	2/1/2016	Zn-65	4.09 ± 0.18	3.57	2.50 - 4.64	Pass
MAAP-1057	2/1/2016	Am-241	0.059 ± 0.015	0.0805	0.0564 - 0.1047	Pass
MAAP-1057	2/1/2016	Pu-238	0.066 ± 0.020	0.0637	0.0446 - 0.0828	Pass
MAAP-1057	2/1/2016	Pu-239/240	0.074 ± 0.020	0.099	NA [d]	Pass
MAAP-1057	2/1/2016	U-234/233	0.151 ± 0.026	0.165	0.116 - 0.215	Pass
MAAP-1057	2/1/2016	U-238	0.160 ± 0.026	0.172	0.120 - 0.224	Pass
MAVE-1050	2/1/2016	Cs-134	9.83 ± 0.19	10.62	7.43 - 13.81	Pass
MAVE-1050	2/1/2016	Cs-137	6.06 ± 0.19	5.62	3.93 - 7.31	Pass
MAVE-1050	2/1/2016	Co-57	13.8 ± 0.2	11.8	8.3 - 15.3	Pass
MAVE-1050	2/1/2016	Co-60	0.022 ± 0.040	0.00	NA [c]	Pass
MAVE-1050	2/1/2016	Mn-54	0.009 ± 0.044	0.000	NA [c]	Pass
MAVE-1050	2/1/2016	Zn-65	10.67 ± 0.39	9.60	6.70 - 12.50	Pass
MASO-4780[f]	8/1/2016	Ni-63	648 ± 14	990	693 - 1287	Fail
MASO-4780[g]	8/1/2016	Ni-63	902 ± 46	990	693 - 1287	Pass
MASO-4780	8/1/2016	Sr-90	757 ± 16	894	626 - 1162	Pass
MASO-4780	8/1/2016	Tc-99	559 ± 12	556	389 - 723	Pass
MASO-4780	8/1/2016	Cs-134	0.93 ± 2.92	0.00	NA [c]	Pass
MASO-4780	8/1/2016	Cs-137	1061 ± 12	1067	747 - 1387	Pass
MASO-4780	8/1/2016	Co-57	1178 ± 8	1190	833 - 1547	Pass
MASO-4780	8/1/2016	Co-60	841 ± 9	851	596 - 1106	Pass
MASO-4780	8/1/2016	Mn-54	0.69 ± 2.53	0.00	NA [c]	Pass
MASO-4780	8/1/2016	Zn-65	724 ± 19	695	487 - 904	Pass
MASO-4780	8/1/2016	K-40	566 ± 52	588	412 - 764	Pass
MASO-4780	8/1/2016	Am-241	0.494 ± 0.698	0.000	NA [c]	Pass
MASO-4780	8/1/2016	Pu-238	69.7 ± 7.4	70.4	49.3 - 91.5	Pass
MASO-4780	8/1/2016	Pu-239/240	53.9 ± 6.3	53.8	37.7 - 69.9	Pass
MASO-4780[h]	8/1/2016	U-233/234	46.8 ± 3.9	122	85 - 159	Fail
MASO-4780[h]	8/1/2016	U-238	46.6 ± 3.9	121	85 - 157	Fail
MAW-4776	8/1/2016	I-129	4.40 ± 0.20	4.54	3.18 - 5.90	Pass
MAVE-4782	8/1/2016	Cs-134	-0.01 ± 0.05	0.00	NA [c]	Pass
MAVE-4782	8/1/2016	Cs-137	6.18 ± 0.20	5.54	3.88 - 7.20	Pass
MAVE-4782	8/1/2016	Co-57	8.13 ± 0.16	6.81	4.77 - 8.85	Pass
MAVE-4782	8/1/2016	Co-60	5.30 ± 0.15	4.86	3.40 - 6.32	Pass
MAVE-4782	8/1/2016	Mn-54	8.08 ± 0.24	7.27	5.09 - 9.45	Pass
MAVE-4782	8/1/2016	Zn-65	6.24 ± 0.36	5.40	3.78 - 7.02	Pass

TABLE A-6. Department of Energy's Mixed Analyte Performance Evaluation Program (MAPEP).

			Concentration [a]			
Lab Code [b]	Reference Date	Analysis	Laboratory result	Known Activity	Control Limits [c]	Acceptance
MAAP-4784	8/1/2016	Sr-90	1.18 ± 0.10	1.03	0.72 - 1.34	Pass
MAAP-4784	8/1/2016	Cs-134	1.58 ± 0.08	2.04	1.43 - 2.65	Pass
MAAP-4784	8/1/2016	Cs-137	1.85 ± 0.09	1.78	1.25 - 2.31	Pass
MAAP-4784	8/1/2016	Co-57	2.39 ± 0.52	2.48	1.74 - 3.22	Pass
MAAP-4784	8/1/2016	Co-60	3.22 ± 0.08	3.26	2.28 - 4.24	Pass
MAAP-4784	8/1/2016	Mn-54	2.82 ± 0.12	2.75	1.93 - 3.58	Pass
MAAP-4784	8/1/2016	Zn-65	-0.015 ± 0.062	0.00	NA [c]	Pass
MAAP-4784	8/1/2016	Am-241	-0.001 ± 0.006	0.00	NA [c]	Pass
MAAP-4784	8/1/2016	Pu-238	0.075 ± 0.022	0.069	0.049 - 0.090	Pass
MAAP-4784	8/1/2016	Pu-239/240	0.048 ± 0.015	0.054	0.038 - 0.070	Pass
MAAP-4784	8/1/2016	U-234/233	0.151 ± 0.036	0.150	0.105 - 0.195	Pass
MAAP-4784	8/1/2016	U-238	0.147 ± 0.034	0.156	0.109 - 0.203	Pass
MAW-4778	8/1/2016	H-3	365 ± 11	334	234 - 434	Pass
MAW-4778	8/1/2016	Fe-55	23.6 ± 16.3	21.5	15.1 ± 28.0	Pass
MAW-4778	8/1/2016	Ni-63	17.0 ± 2.8	17.2	12.0 ± 22.4	Pass
MAW-4778	8/1/2016	Sr-90	0.17 ± 0.28	0.00	NA [c]	Pass
MAW-4778	8/1/2016	Tc-99	9.50 ± 0.41	11.60	8.10 - 15.10	Pass
MAW-4778	8/1/2016	Cs-134	22.6 ± 0.4	23.9	16.7 - 31.1	Pass
MAW-4778	8/1/2016	Cs-137	0.018 ± 0.117	0.00	NA [c]	Pass
MAW-4778	8/1/2016	Co-57	27.6 ± 0.2	27.3	19.1 ± 35.5	Pass
MAW-4778	8/1/2016	Co-60	0.018 ± 0.090	0.00	NA [c]	Pass
MAW-4778	8/1/2016	Mn-54	16.2 ± 0.4	14.8	10.4 - 19.2	Pass
MAW-4778	8/1/2016	Zn-65	19.3 ± 0.7	17.4	12.2 - 22.6	Pass
MAW-4778	8/1/2016	K-40	286 ± 6	252	176 - 328	Pass
MAW-4778	8/1/2016	Ra-226	1.48 ± 0.09	1.33	0.93 - 1.73	Pass
MAW-4778	8/1/2016	Pu-238	1.09 ± 0.13	1.13	0.79 - 1.47	Pass
MAW-4778	8/1/2016	Pu-239/240	0.003 ± 0.011	0.016	NA [d]	Pass
MAW-4778	8/1/2016	U-234/233	1.80 ± 0.13	1.86	1.30 - 2.42	Pass
MAW-4778	8/1/2016	U-238	1.77 ± 0.13	1.92	1.34 - 2.50	Pass
MAW-4778	8/1/2016	Am-241	0.678 ± 0.086	0.814	0.570 ± 1.058	Pass

[a] Results are reported in units of Bq/kg (soil), Bq/L (water) or Bq/total sample (filters, vegetation).

[b] Laboratory codes as follows: MAW (water), MAAP (air filter), MASO (soil), MAVE (vegetation).

[c] MAPEP results are presented as the known values and expected laboratory precision (1 sigma, 1 determination) and control limits as defined by the MAPEP. A known value of "zero" indicates an analysis was included in the testing series as a "false positive". MAPEP does not provide control limits.

[d] Provided in the series for "sensitivity evaluation". MAPEP does not provide control limits.

[e] The laboratory properly identified the Sn-75 interfering peak in the vicinity of Co-57 and stated so in the comment field. MAPEP requires results to be reported as an activity with an uncertainty. Since the calculated uncertainty was less than the activity MAPEP interpreted the submitted result as a "false positive" resulting in a failure.

[f] Original analysis for Ni-63 failed.

[g] Reanalysis with a smaller aliquot resulted in acceptable results. An investigation is in process to identify better techniques for analyzing samples with complex matrices.

[h] MAPEP states that samples contain two fractions of Uranium; one that is soluble in concentrated HNO^3 and HCl acid and one that is "fundamentally insoluble in these acids". They also state that HF treatment can not assure complete dissolution. Results are consistent with measuring the soluble form.

TABLE A-7. Interlaboratory Comparison Crosscheck Program, Environmental Resource Associates (ERA)[a].

MRAD Study

Lab Code [b]	Concentration [a]					
	Date	Analysis	Laboratory Result	ERA Result	Control Limits	Acceptance
ERAP-1101	3/14/2016	Am-241	37.3	45.9	28.3 - 62.1	Pass
ERAP-1101	3/14/2016	Co-60	637	623	482 - 778	Pass
ERAP-1101	3/14/2016	Cs-134	251	304	193 - 377	Pass
ERAP-1101	3/14/2016	Cs-137	1,273	1,150	864 - 1,510	Pass
ERAP-1101	3/14/2016	Fe-55	< 162	126	39.1 - 246	Pass
ERAP-1101	3/14/2016	Mn-54	< 2.64	< 50.0	0.00 - 50.0	Pass
ERAP-1101	3/14/2016	Pu-238	68.0	70.5	48.3 - 92.7	Pass
ERAP-1101	3/14/2016	Pu-239/240	54.1	54.8	39.70 - 71.60	Pass
ERAP-1101	3/14/2016	Sr-90	139	150	73.3 - 225.0	Pass
ERAP-1101	3/14/2016	U-233/234	59.3	64.8	40.2 - 97.7	Pass
ERAP-1101	3/14/2016	U-238	55.5	64.2	41.5 - 88.8	Pass
ERAP-1101	3/14/2016	Zn-65	428	356	255 - 492	Pass
ERAP-1101	3/14/2016	Gr. Alpha	98.0	70.1	23.5 - 109	Pass
ERAP-1101	3/14/2016	Gr. Beta	78.6	54.4	34.4 - 79.3	Pass
ERSO-1105	3/14/2016	Am-241	1,030	1,360	796 - 1,770	Pass
ERSO-1105	3/14/2016	Ac-228	1,540	1,240	795 - 1,720	Pass
ERSO-1105	3/14/2016	Bi-212	1,550	1,240	330 - 1,820	Pass
ERSO-1105	3/14/2016	Bi-214	3,100	3,530	2,130 - 5,080	Pass
ERSO-1105	3/14/2016	Co-60	5,600	5,490	3,710 - 7,560	Pass
ERSO-1105	3/14/2016	Cs-134	3,030	3,450	2,260 - 4,140	Pass
ERSO-1105	3/14/2016	Cs-137	4,440	4,310	3,300 - 5,550	Pass
ERSO-1105	3/14/2016	K-40	10,300	10,600	7,740 - 14,200	Pass
ERSO-1105	3/14/2016	Mn-54	< 50.8	< 1000	0.0 - 1,000	Pass
ERSO-1105	3/14/2016	Pb-212	1,140	1,240	812 - 1,730	Pass
ERSO-1105	3/14/2016	Pb-214	3,190	3,710	2,170 - 5,530	Pass
ERSO-1105	3/14/2016	Pu-238	680	658	396 - 908	Pass
ERSO-1105	3/14/2016	Pu-239/240	460	496	324 - 0,685	Pass
ERSO-1105	3/14/2016	Sr-90	7,740	8,560	3,260 - 13,500	Pass
ERSO-1105	3/14/2016	Th-234	3,630	3,430	1,080 - 6,450	Pass
ERSO-1105	3/14/2016	U-233/234	3,090	3,460	2,110 - 4,430	Pass
ERSO-1105	3/14/2016	U-238	3,280	3,430	2,120 - 4,350	Pass
ERSO-1105	3/14/2016	Zn-65	2,940	2,450	1,950 - 3,260	Pass
ERW-1115	3/14/2016	Gr. Alpha	105.0	117.0	41.5 - 181.0	Pass
ERW-1115	3/14/2016	Gr. Beta	76.2	75.5	43.2 - 112.0	Pass
ERW-1117	3/14/2016	H-3	8,870	8,650	5,800 - 12,300	Pass

TABLE A-7. Interlaboratory Comparison Crosscheck Program, Environmental Resource Associates (ERA)[a].

MRAD Study

Lab Code [b]	Date	Analysis	Concentration [a] Laboratory Result	ERA Result	Control Limits	Acceptance
ERVE-1108	3/14/2016	Am-241	1,930	2,120	1,300 - 2,820	Pass
ERVE-1108	3/14/2016	Cm-244	1,294	1,560	764 - 2,430	Pass
ERVE-1108	3/14/2016	Co-60	1,164	1,100	759 - 1,540	Pass
ERVE-1108	3/14/2016	Cs-134	1,056	1,070	687 - 1,390	Pass
ERVE-1108	3/14/2016	Cs-137	930	838	608 - 1,170	Pass
ERVE-1108	3/14/2016	K-40	32,200	31,000	22,400 - 43,500	Pass
ERVE-1108	3/14/2016	Mn-54	< 24.5	< 300	0.00 - 300	Pass
ERVE-1108	3/14/2016	Zn-65	3,320	2,820	2,030 - 3,960	Pass
ERVE-1108	3/14/2016	Pu-238	3,410	2,810	1,680 - 3,850	Pass
ERVE-1108	3/14/2016	Pu-239/240	4,120	3,640	2,230 - 5,010	Pass
ERVE-1108	3/14/2016	Sr-90	8,120	8,710	4,960 - 11,500	Pass
ERVE-1108	3/14/2016	U-233/234	4,350	4,160	2,740 - 5,340	Pass
ERVE-1108	3/14/2016	U-238	4,220	4,120	2,750 - 5,230	Pass
ERW-1111	3/14/2016	Am-241	113	121	81.5 - 162	Pass
ERW-1111	3/14/2016	Co-60	1,120	1,050	912 - 1,230	Pass
ERW-1111	3/14/2016	Cs-134	806	842	618 - 968	Pass
ERW-1111	3/14/2016	Cs-137	1,190	1,100	934 - 1,320	Pass
ERW-1111	3/14/2016	Mn-54	< 5.89	< 100	0.00 - 100	Pass
ERW-1111	3/14/2016	Pu-238	159	138	102 - 172	Pass
ERW-1111	3/14/2016	Pu-239/240	113	98.7	76.6 - 124	Pass
ERW-1111	3/14/2016	U-233/234	46.9	52.7	39.6 - 68.0	Pass
ERW-1111	3/14/2016	U-238	50.4	52.3	39.9 - 64.2	Pass
ERW-1111	3/14/2016	Zn-65	1,160	1,010	842 - 1,270	Pass
ERW-1111	3/14/2016	Fe-55	1,600	1,650	984 - 2,240	Pass
ERW-1111	3/14/2016	Sr-90	430	434	283 - 574	Pass

[a] Results obtained by Environmental, Inc., Midwest Laboratory as a participant in the crosscheck program for proficiency testing administered by Environmental Resources Associates, serving as a replacement for studies conducted previously by the Environmental Measurements Laboratory Quality Assessment Program (EML).

[b] Laboratory codes as follows: ERW (water), ERAP (air filter), ERSO (soil), ERVE (vegetation). Results are reported in units of pCi/L, except for air filters (pCi/Filter), vegetation and soil (pCi/kg).

[c] Results are presented as the known values, expected laboratory precision (1 sigma, 1 determination) and control limits as provided by ERA.

APPENDIX B. DATA REPORTING CONVENTIONS

Data Reporting Conventions

1.0. All activities, except gross alpha and gross beta, are decay corrected to collection time or the end of the collection period.

2.0. Single Measurements

Each single measurement is reported as follows: $x \pm s$

where: x = value of the measurement;

$s = 2\sigma$ counting uncertainty (corresponding to the 95% confidence level).

In cases where the activity is less than the lower limit of detection L, it is reported as: < L, where L = the lower limit of detection based on 4.66σ uncertainty for a background sample.

3.0. Duplicate analyses

If duplicate analyses are reported, the convention is as follows. :

3.1 Individual results: For two analysis results; $x_1 \pm s_1$ and $x_2 \pm s_2$

Reported result: $x \pm s$; where $x = (1/2)(x_1 + x_2)$ and $s = (1/2)\sqrt{s_1^2 + s_2^2}$

3.2. Individual results: $< L_1$, $< L_2$ Reported result: < L, where L = lower of L_1 and L_2

3.3. Individual results: $x \pm s$, < L Reported result: $x \pm s$ if $x \geq L$; < L otherwise.

4.0. Computation of Averages and Standard Deviations

4.1 Averages and standard deviations listed in the tables are computed from all of the individual measurements over the period averaged; for example, an annual standard deviation would not be the average of quarterly standard deviations. The average $\bar{x}$ and standard deviation "s" of a set of n numbers $x_1, x_2 \ldots x_n$ are defined as follows:

$$\bar{x} = \frac{1}{n} \sum x \qquad s = \sqrt{\frac{\sum (x - \bar{x})^2}{n-1}}$$

4.2 Values below the highest lower limit of detection are not included in the average.

4.3 If all values in the averaging group are less than the highest LLD, the highest LLD is reported.

4.4 If all but one of the values are less than the highest LLD, the single value x and associated two sigma error is reported.

4.5 In rounding off, the following rules are followed:

4.5.1. If the number following those to be retained is less than 5, the number is dropped, and the retained numbers are kept unchanged. As an example, 11.443 is rounded off to 11.44.

4.5.2. If the number following those to be retained is equal to or greater than 5, the number is dropped and the last retained number is raised by 1. As an example, 11.445 is rounded off to 11.45.

APPENDIX C

Table C-1. Maximum permissible concentrations of radioactivity in air and water above natural background in unrestricted areas[a].

	Air (pCi/m^3)		Water (pCi/L)
Gross alpha	1×10^{-3}	Strontium-89	8,000
Gross beta	1	Strontium-90	500
Iodine-131[b]	2.8×10^{-1}	Cesium-137	1,000
		Barium-140	8,000
		Iodine-131	1,000
		Potassium-40[c]	4,000
		Gross alpha	2
		Gross beta	10
		Tritium	1×10^6

[a] Taken from Table 2 of Appendix B to Code of Federal Regulations Title 10, Part 20, and appropriate footnotes. Concentrations may be averaged over a period not greater than one year.

[b] Value adjusted by a factor of 700 to reduce the dose resulting from the air-grass-cow-milk-child pathway.

[c] A natural radionuclide.

APPENDIX D

Sampling Location Maps

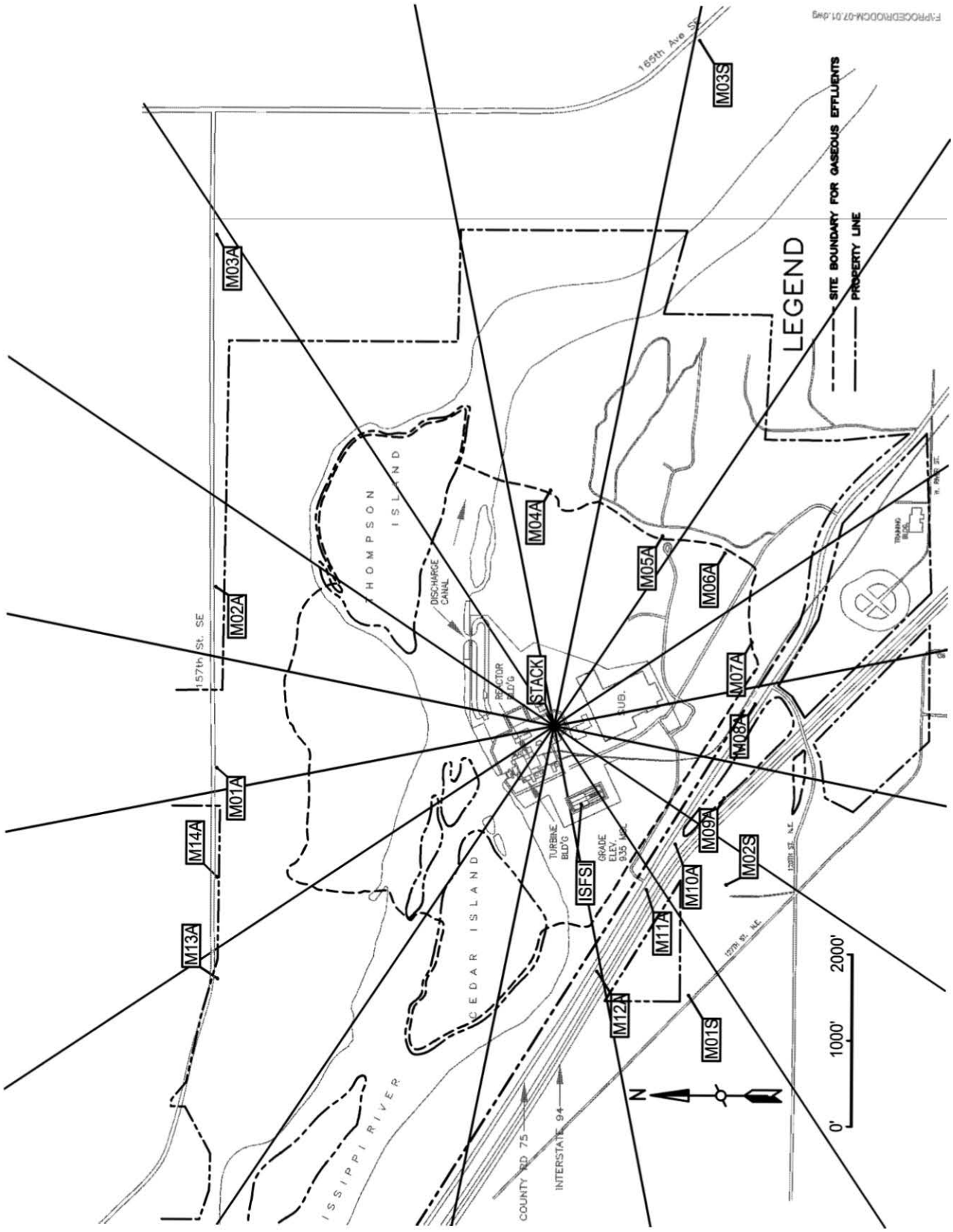
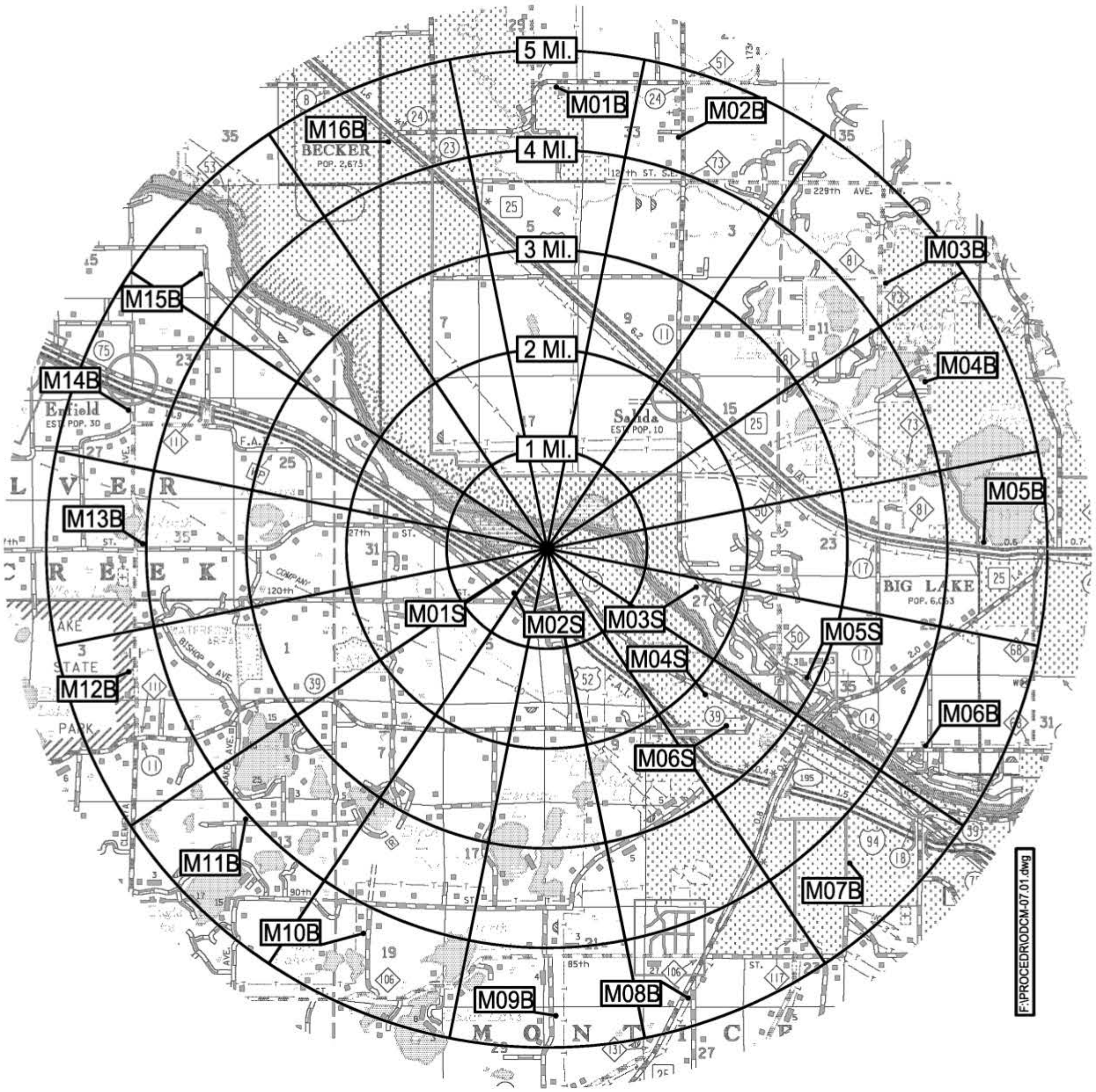


Figure D-1, Sample Collection and Analysis Program: TLD locations, Inner Ring (Table 5.2)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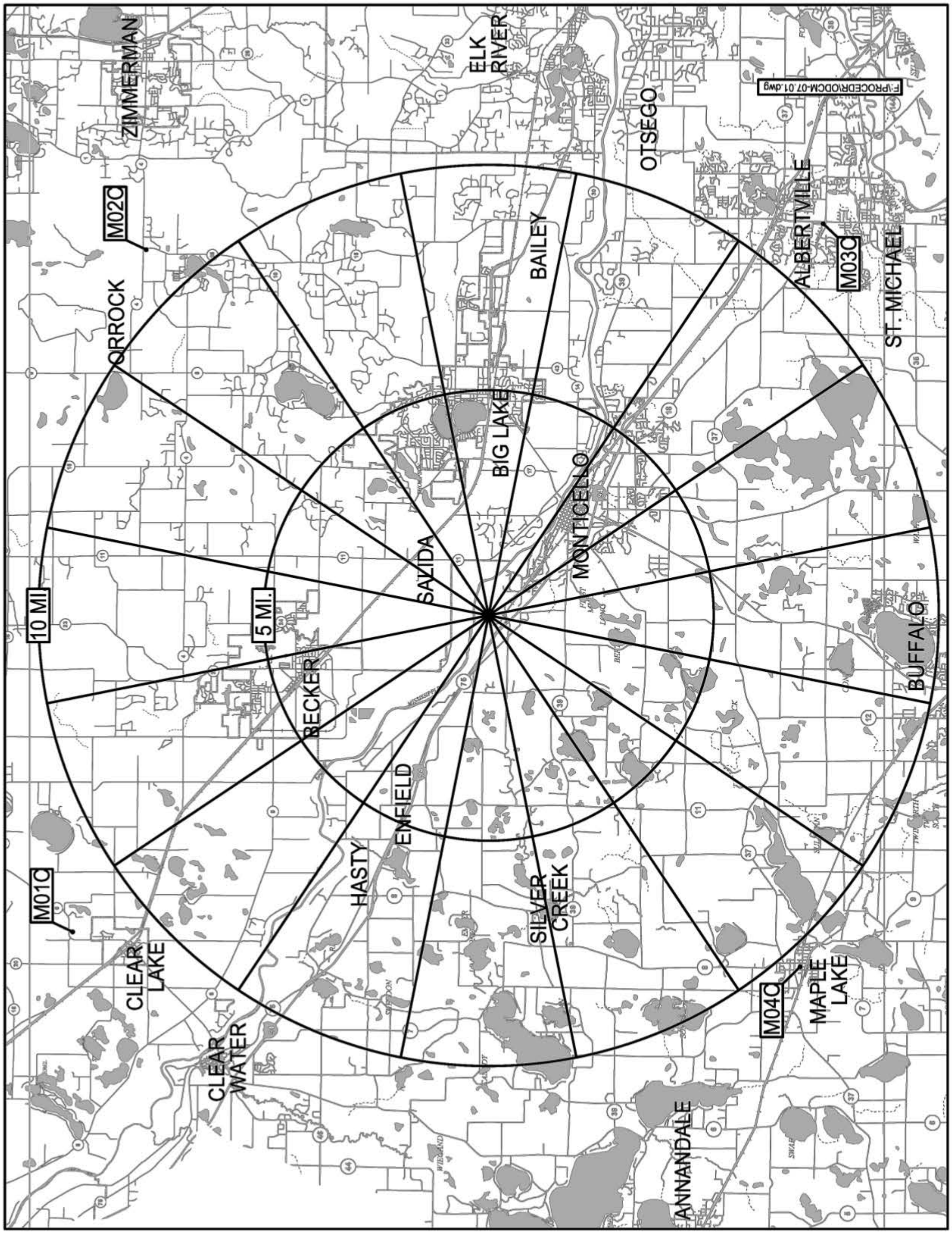

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OTSEGO
ALBERTVILLE
M03C
ST. MICHAEL
M02C
ORROCK
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MONTICELLO
SALIDA
10 MI
5 MI.
BECKER
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ENFIELD
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CLEAR WATER
M04C
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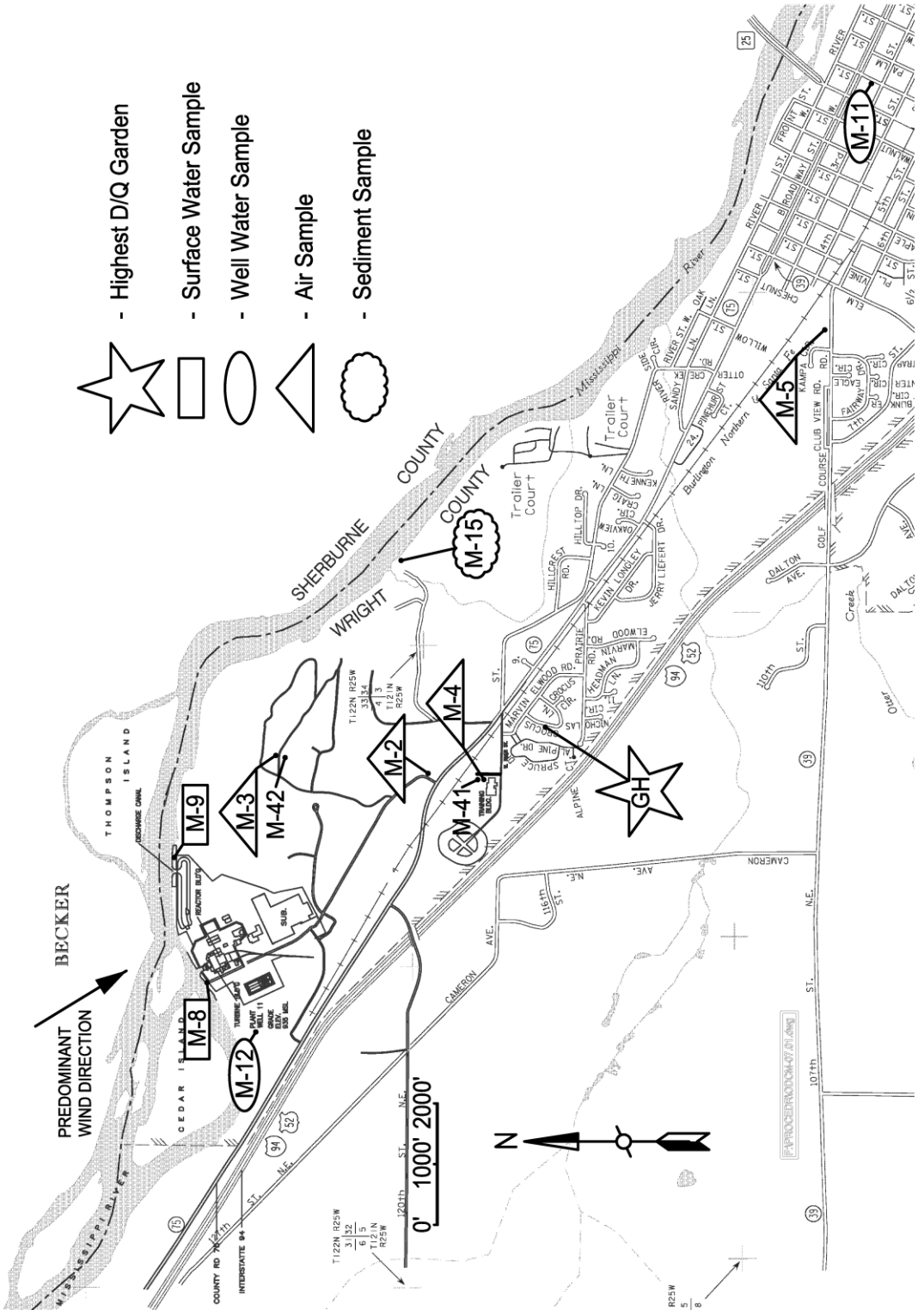
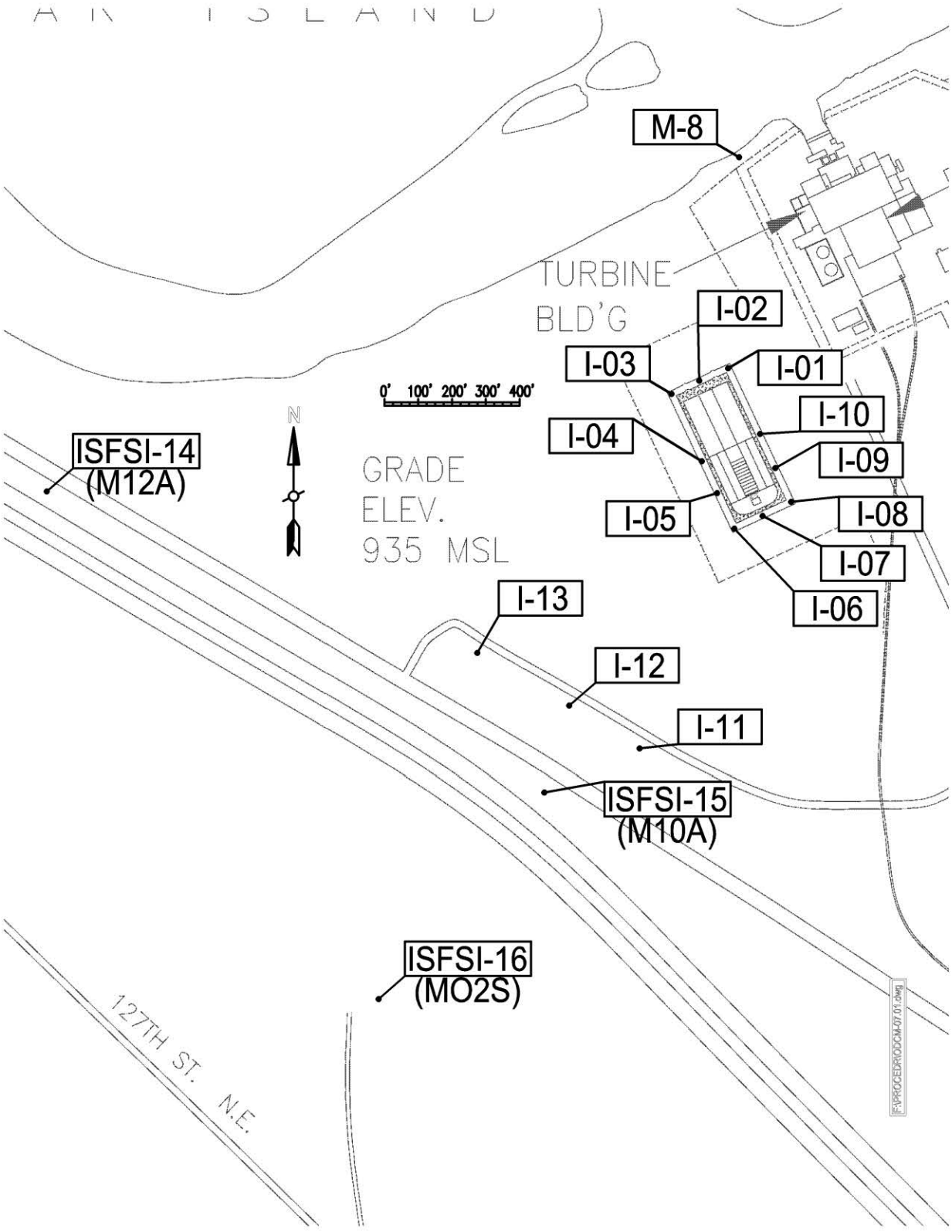


Figure D-4, Sample Collection and Analysis Program: Radiological Environmental Monitoring Program, Well Water and Shoreline sampling locations. (Table 5.2)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GRADE
ELEV.
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N
127TH ST. N.E.

ATI Environmental, Inc.
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XCEL ENERGY CORPORATION

MONTICELLO NUCLEAR GENERATING PLANT
DOCKET NO 50-263 LICENSE NO DPR-22

ANNUAL REPORT
TO THE
UNITED STATES NUCLEAR REGULATORY COMMISSION
PART II

Radiological Environmental Monitoring Program
Complete Analyses Data Tables

January - December, 2016

Prepared under contract by

ENVIRONMENTAL, INC
MIDWEST LABORATORY

PROJECT NO 8010

Reviewed and
Approved

Bronia Grob, MS
Laboratory Manager

TABLE OF CONTENTS

LIST OF TABLES

10 INTRODUCTION

The following constitutes the final 2016 report for the Environmental Radiological Monitoring Program conducted at the Monticello Nuclear Generating Plant in Monticello, Minnesota Results of completed analyses are presented in the attached tables

All concentrations, except gross beta, are decay corrected to the time of collection

All samples were collected within the scheduled period unless noted otherwise in the Listing of Missed Samples

20 LISTING OF MISSED SAMPLES

All required samples were collected and analyzed as scheduled with the following exceptions:					
Sample Type	Analysis	Location	Collection Date or Period	Reason for not conducting REMP as required	Plans for Preventing Recurrence
SW	Gamma	M-008	January ‘16	Water frozen entire month; No composite.	None
SW	Gamma	M-008	February ‘16	Water frozen entire month; No composite.	None
SW	Gamma	M-008	3/2/16	Water frozen.	None
SS	Gamma	M-8	Spring ‘16	Dangerous River Conditions.	None
SS	Gamma	M-9	Spring ‘16	Dangerous River Conditions.	None
SS	Gamma	M-15	Spring ‘16	Dangerous River Conditions.	None
DW	Beta,I-131, Gamma	M-014	6/29/16	Weekly sample lost; Not included in June ‘16 Composite	None
TLD	Gamma	M-2C	3rd Qtr.	TLD missing in field.	None
AP/AI	Beta, I-131	M-05	9/7/16	29.4 hours run time.	None
AP/AI	Beta, I-131	M-04	9/14/16	Filter offset in sample head.	Counsel Technicians.
TLD	Gamma	M-3A	4th Qtr	TLD missing in field.	None
TLD	Gamma	M-11A	4th Qtr	TLD missing in field.	None
TLD	Gamma	M-12A	4th Qtr	TLD missing in field.	None
BO	Gamma	M-8	2016	Dangerous river conditions.	None
BO	Gamma	M-9	2016	Dangerous river conditions.	None
SW	Gamma	M-001	12/14/16 to 12/28/16	Water Frozen.	None

30 DATA TABLES

Table 1. Ambient gamma radiation as measured by thermoluminescent dosimeters (TLD's).

Location	mRem/91 days 1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	Cumulative Average	Previous Annual Average
			Indicators (Inner Ring, General Area of Site Boundary)			
M-01A	15.3 ± 1.3	12.9 ± 1.4	19.2 ± 0.9	16.0 ± 1.6	15.8	15.8
M-02A	12.8 ± 1.1	12.6 ± 0.9	17.7 ± 0.8	15.6 ± 0.7	14.7	14.1
M-03A	12.3 ± 1.3	13.1 ± 1.4	14.8 ± 1.3	ND[a]	13.4	14.4
M-04A	11.4 ± 1.1	14.3 ± 0.9	14.3 ± 2.1	17.3 ± 1.1	14.3	13.4
M-05A	13.3 ± 0.6	12.4 ± 1.1	17.1 ± 1.5	14.8 ± 0.8	14.4	13.7
M-06A	15.3 ± 0.8	15.6 ± 1.3	18.9 ± 1.7	18.9 ± 1.0	17.2	16.6
M-07A	12.2 ± 0.9	12.6 ± 1.1	14.6 ± 1.1	17.3 ± 0.8	14.2	12.5
M-08A	13.9 ± 0.9	14.0 ± 0.9	15.7 ± 2.0	17.6 ± 0.7	15.3	14.9
M-09A	13.3 ± 1.0	13.0 ± 1.2	15.6 ± 0.9	16.5 ± 1.1	14.6	14.1
M-10A	13.3 ± 1.2	13.3 ± 1.0	14.9 ± 0.8	16.3 ± 0.7	14.5	14.2
M-11A	15.5 ± 1.2	15.8 ± 1.3	17.2 ± 1.1	ND[a]	16.2	17.1
M-12A	15.0 ± 1.0	15.7 ± 0.9	17.0 ± 1.0	ND[a]	15.9	16.4
M-13A	13.7 ± 1.0	14.3 ± 1.8	15.1 ± 1.2	17.0 ± 1.1	15.0	15.1
M-14A	13.7 ± 1.0	14.5 ± 1.1	16.2 ± 1.1	17.1 ± 0.7	15.4	14.8
Mean ± s.d.	13.6 ± 1.3	13.9 ± 1.2	16.3 ± 1.6	16.8 ± 1.1	15.1	14.8
			Indicators (Outer Ring, 4-5 Miles Distant)			
M-01B	13.1 ± 1.0	13.9 ± 1.4	15.0 ± 0.7	16.8 ± 1.2	14.7	14.8
M-02B	13.3 ± 0.8	14.2 ± 1.0	15.3 ± 1.3	16.3 ± 0.9	14.8	14.2
M-03B	10.4 ± 0.8	10.8 ± 1.0	12.6 ± 0.9	13.0 ± 0.8	11.7	11.7
M-04B	13.4 ± 0.7	12.1 ± 0.8	15.0 ± 0.8	15.5 ± 1.5	14.0	13.6
M-05B	12.8 ± 0.7	11.7 ± 1.2	14.2 ± 0.9	15.9 ± 0.9	13.6	13.0
M-06B	12.3 ± 1.1	13.9 ± 0.9	13.5 ± 1.2	16.0 ± 0.7	13.9	15.1
M-07B	13.9 ± 1.1	13.5 ± 1.4	16.0 ± 1.2	15.9 ± 1.3	14.8	14.8
M-08B	13.1 ± 0.8	13.0 ± 1.0	14.6 ± 0.8	14.9 ± 1.1	13.9	13.9
M-09B	11.6 ± 1.0	14.8 ± 1.2	15.2 ± 1.4	17.2 ± 1.0	14.7	14.5
M-10B	14.9 ± 1.0	13.9 ± 1.4	16.4 ± 1.5	15.9 ± 1.2	15.3	14.8
M-11B	13.9 ± 1.1	12.7 ± 1.2	15.4 ± 1.3	16.7 ± 1.0	14.7	14.8
M-12B	13.5 ± 1.2	14.3 ± 1.0	13.8 ± 0.9	16.1 ± 1.0	14.4	15.3
M-13B	13.7 ± 1.2	12.2 ± 1.0	15.6 ± 1.2	14.5 ± 0.7	14.0	12.3
M-14B	14.1 ± 1.6	16.6 ± 1.0	15.8 ± 2.0	18.2 ± 0.7	16.2	16.6
M-15B	13.3 ± 0.8	13.7 ± 1.4	15.6 ± 0.7	15.7 ± 1.0	14.6	13.7
M-16B	14.3 ± 0.8	12.5 ± 1.2	15.0 ± 0.9	15.0 ± 0.9	14.2	13.5
Mean ± s.d.	13.2 ± 1.1	13.4 ± 1.4	14.9 ± 1.0	15.8 ± 1.2	14.3	14.2

[a] "ND" = No data; see Table 2.0, Listing of Missed Samples.

Table 1. Ambient gamma radiation as measured by thermoluminescent dosimeters (TLD's), (continued).

Location	mRem/91 days 1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	Cumulative Average	Previous Annual Average
			Control			
M-01C	13.3 ± 1.4	14.3 ± 1.1	13.9 ± 1.8	14.6 ± 1.1	14.0	13.4
M-02C	17.4 ± 0.9	18.4 ± 1.0	ND[a]	16.7 ± 0.8	17.5	17.5
M-03C	14.8 ± 0.8	15.8 ± 1.3	14.9 ± 1.3	16.0 ± 0.9	15.4	15.2
M-04C	14.6 ± 1.3	15.0 ± 0.9	14.6 ± 1.4	15.2 ± 0.7	14.9	15.1
Mean ± s.d.	15.0 ± 1.7	15.9 ± 1.8	14.5 ± 0.5	15.6 ± 0.9	15.4	15.3
			Indicators (Special Interest Areas)			
M-01S	9.4 ± 1.1	11.6 ± 0.9	10.8 ± 1.3	13.1 ± 0.6	11.2	11.6
M-02S	13.3 ± 1.3	12.8 ± 1.0	14.6 ± 1.3	14.9 ± 1.1	13.9	14.3
M-03S	12.9 ± 0.9	13.8 ± 1.1	14.7 ± 1.2	15.7 ± 1.4	14.3	14.3
M-04S	16.0 ± 1.5	13.7 ± 1.0	17.9 ± 1.5	17.0 ± 0.9	16.2	16.4
M-05S	14.9 ± 1.2	16.5 ± 1.2	14.5 ± 1.3	17.0 ± 1.0	15.7	15.6
M-06S	15.3 ± 0.8	16.9 ± 1.1	15.7 ± 0.9	16.5 ± 0.9	16.1	16.2
M-I-11	16.9 ± 2.0	15.6 ± 1.1	19.0 ± 1.4	14.3 ± 0.8	16.5	14.3
M-I-12	15.2 ± 0.9	14.7 ± 1.3	14.8 ± 1.9	14.6 ± 0.9	14.8	14.7
M-I-13	15.2 ± 2.0	15.7 ± 1.5	15.6 ± 2.2	23.0 ± 1.6	17.4	15.5
Mean ± s.d.	14.3 ± 2.2	14.6 ± 1.7	15.3 ± 2.3	16.2 ± 2.9	15.1	14.8
			ISFSI Fence (Non-REMP TLDs)			
M-I-01	41.5 ± 2.4	38.7 ± 2.4	39.5 ± 1.1	39.4 ± 2.2	39.8	37.7
M-I-02	35.8 ± 0.9	35.4 ± 1.0	35.0 ± 1.4	34.9 ± 0.7	35.3	33.9
M-I-03	31.9 ± 1.6	29.4 ± 1.9	31.9 ± 2.1	30.5 ± 1.8	30.9	29.3
M-I-04	35.5 ± 3.1	33.7 ± 2.1	36.5 ± 2.2	35.9 ± 2.2	35.4	34.5
M-I-05	74.9 ± 1.4	68.6 ± 3.4	66.4 ± 2.5	61.1 ± 1.9	67.7	73.9
M-I-06	29.0 ± 1.7	26.4 ± 1.4	29.0 ± 2.0	26.0 ± 1.4	27.6	26.8
M-I-07	33.4 ± 1.5	31.8 ± 2.8	31.3 ± 2.4	28.7 ± 1.2	31.3	30.4
M-I-08	30.1 ± 2.8	28.6 ± 2.3	30.4 ± 2.7	27.2 ± 0.7	29.1	27.9
M-I-09	64.5 ± 2.1	63.1 ± 3.1	50.0 ± 2.3	48.3 ± 2.7	56.5	146.6
M-I-10	41.4 ± 0.8	33.5 ± 1.8	38.9 ± 1.3	33.3 ± 1.3	36.8	37.2
Mean ± s.d.	41.8 ± 15.5	38.9 ± 14.7	38.9 ± 11.4	36.5 ± 10.8	39.0	40.2

[a] "ND" = No data; see Table 2.0, Listing of Missed Samples.

Table 2. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131[a].

Location: M-1 (C)

Units: pCi/m^3

Collection: Continuous, weekly exchange.

Date Collected	Volume (m^3)	Gross Beta	Date Collected	Volume (m^3)	Gross Beta
Required LLD		0.010	Required LLD		0.010
01-06-16	349	0.046 ± 0.004	07-06-16	323	0.019 ± 0.003
01-13-16	297	0.046 ± 0.005	07-13-16	326	0.014 ± 0.003
01-20-16	354	0.046 ± 0.004	07-20-16	355	0.018 ± 0.003
01-27-16	321	0.054 ± 0.005	07-27-16	320	0.021 ± 0.003
02-03-16	326	0.022 ± 0.003	08-03-16	292	0.030 ± 0.004
02-10-16	401	0.029 ± 0.003	08-10-16	296	0.021 ± 0.003
02-17-16	414	0.021 ± 0.003	08-16-16	276	0.020 ± 0.003
02-23-16	357	0.017 ± 0.003	08-24-16	336	0.026 ± 0.003
03-02-16	436	0.025 ± 0.003	08-30-16	252	0.023 ± 0.004
03-09-16	401	0.021 ± 0.003	09-07-16	431	0.019 ± 0.003
03-16-16	348	0.025 ± 0.003	09-14-16	371	0.018 ± 0.003
03-23-16	383	0.013 ± 0.003	09-21-16	343	0.024 ± 0.003
03-30-16	385	0.021 ± 0.003	09-28-16	342	0.017 ± 0.003
1st Quarter Mean ± s.d.		0.030 ± 0.013	3rd Quarter Mean ± s.d.		0.021 ± 0.004
04-06-16	386	0.024 ± 0.003	10-05-16	314	0.023 ± 0.003
04-13-16	382	0.017 ± 0.003	10-12-16	341	0.016 ± 0.003
04-20-16	386	0.025 ± 0.003	10-19-16	340	0.022 ± 0.003
04-27-16	332	0.019 ± 0.003	10-26-16	375	0.018 ± 0.003
			11-02-16	344	0.024 ± 0.003
05-04-16	351	0.015 ± 0.003			
05-11-16	324	0.021 ± 0.003	11-09-16	343	0.039 ± 0.004
05-18-16	321	0.013 ± 0.003	11-16-16	310	0.032 ± 0.004
05-25-16	325	0.029 ± 0.003	11-23-16	346	0.017 ± 0.003
06-01-16	322	0.020 ± 0.003	11-30-16	308	0.040 ± 0.004
06-08-16	323	0.012 ± 0.003	12-07-16	313	0.027 ± 0.004
06-15-16	325	0.022 ± 0.003	12-14-16	310	0.026 ± 0.004
06-22-16	355	0.019 ± 0.003	12-21-16	312	0.038 ± 0.004
06-29-16	353	0.015 ± 0.003	12-28-16	322	0.027 ± 0.003
2nd Quarter Mean ± s.d.		0.019 ± 0.005	4th Quarter Mean ± s.d.		0.027 ± 0.008
			Cumulative Average		0.024
			Previous Annual Average		0.028

[a] Iodine-131 concentrations are < 0.03 pCi/m^3 unless otherwise noted.

Table 3. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131[a].

Location: M-2

Units: pCi/m^3

Collection: Continuous, weekly exchange.

Date Collected	Volume (m^3)	Gross Beta	Date Collected	Volume (m^3)	Gross Beta
Required LLD		0.010			0.010
01-06-16	327	0.053 ± 0.005	07-06-16	296	0.020 ± 0.003
01-13-16	317	0.040 ± 0.004	07-13-16	328	0.014 ± 0.003
01-20-16	324	0.046 ± 0.004	07-20-16	323	0.023 ± 0.003
01-27-16	304	0.052 ± 0.005	07-27-16	326	0.020 ± 0.003
02-03-16	279	0.025 ± 0.004	08-03-16	323	0.023 ± 0.003
02-10-16	314	0.032 ± 0.004	08-10-16	303	0.024 ± 0.003
02-17-16	322	0.027 ± 0.004	08-16-16	253	0.015 ± 0.003
02-23-16	280	0.022 ± 0.004	08-24-16	310	0.029 ± 0.004
03-02-16	376	0.025 ± 0.003	08-30-16	234	0.024 ± 0.004
03-09-16	315	0.022 ± 0.003	09-07-16	384	0.021 ± 0.003
03-16-16	299	0.029 ± 0.004	09-14-16	326	0.020 ± 0.003
03-23-16	313	0.016 ± 0.003	09-21-16	312	0.025 ± 0.003
03-30-16	304	0.023 ± 0.004	09-28-16	285	0.020 ± 0.003
1st Quarter Mean ± s.d.		0.032 ± 0.012	3rd Quarter Mean ± s.d.		0.022 ± 0.004
04-06-16	324	0.024 ± 0.003	10-05-16	342	0.023 ± 0.003
04-13-16	304	0.024 ± 0.003	10-12-16	310	0.019 ± 0.003
04-20-16	325	0.024 ± 0.003	10-19-16	286	0.037 ± 0.004
04-27-16	326	0.013 ± 0.003	10-26-16	336	0.016 ± 0.003
			11-02-16	311	0.028 ± 0.004
05-04-16	305	0.018 ± 0.003			
05-11-16	352	0.020 ± 0.003	11-09-16	313	0.040 ± 0.004
05-18-16	350	0.011 ± 0.002	11-16-16	286	0.036 ± 0.004
05-25-16	327	0.025 ± 0.003	11-23-16	314	0.020 ± 0.003
06-01-16	353	0.018 ± 0.003	11-30-16	284	0.044 ± 0.005
06-08-16	352	0.010 ± 0.002	12-07-16	287	0.026 ± 0.004
06-15-16	327	0.022 ± 0.003	12-14-16	338	0.026 ± 0.003
06-22-16	325	0.020 ± 0.003	12-21-16	286	0.044 ± 0.004
06-29-16	352	0.015 ± 0.003	12-28-16	337	0.023 ± 0.003
2nd Quarter Mean ± s.d.		0.019 ± 0.005	4th Quarter Mean ± s.d.		0.029 ± 0.010
			Cumulative Average		0.025
			Previous Annual Average		0.029

[a] Iodine-131 concentrations are < 0.03 pCi/m^3 unless otherwise noted.

Table 4. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131[a].

Location: M-3

Units: pCi/m^3

Collection: Continuous, weekly exchange.

Date Collected	Volume (m^3)	Gross Beta	Date Collected	Volume (m^3)	Gross Beta
Required LLD		0.010			0.010
01-06-16	329	0.057 ± 0.005	07-06-16	351	0.020 ± 0.003
01-13-16	295	0.049 ± 0.005	07-13-16	355	0.016 ± 0.003
01-20-16	325	0.052 ± 0.005	07-20-16	377	0.021 ± 0.003
01-27-16	307	0.060 ± 0.005	07-27-16	381	0.024 ± 0.003
02-03-16	307	0.029 ± 0.004	08-03-16	377	0.024 ± 0.003
02-10-16	310	0.037 ± 0.004	08-10-16	358	0.021 ± 0.003
02-17-16	321	0.031 ± 0.004	08-16-16	322	0.019 ± 0.003
02-23-16	280	0.025 ± 0.004	08-24-16	434	0.025 ± 0.003
03-02-16	376	0.029 ± 0.003	08-30-16	327	0.022 ± 0.003
03-09-16	315	0.027 ± 0.004	09-07-16	371	0.023 ± 0.003
03-16-16	298	0.027 ± 0.004	09-14-16	335	0.021 ± 0.003
03-23-16	326	0.019 ± 0.003	09-21-16	321	0.023 ± 0.003
03-30-16	329	0.026 ± 0.004	09-28-16	326	0.021 ± 0.003
1st Quarter Mean ± s.d.		0.036 ± 0.014	3rd Quarter Mean ± s.d.		0.022 ± 0.003
04-06-16	323	0.027 ± 0.003	10-05-16	330	0.022 ± 0.003
04-13-16	304	0.019 ± 0.003	10-12-16	325	0.017 ± 0.003
04-20-16	324	0.024 ± 0.003	10-19-16	327	0.026 ± 0.003
04-27-16	326	0.018 ± 0.003	10-26-16	326	0.020 ± 0.003
			11-02-16	325	0.024 ± 0.003
05-04-16	331	0.016 ± 0.003			
05-11-16	353	0.019 ± 0.003	11-09-16	331	0.038 ± 0.004
05-18-16	377	0.013 ± 0.002	11-16-16	327	0.037 ± 0.004
05-25-16	355	0.030 ± 0.003	11-23-16	304	0.024 ± 0.003
06-01-16	352	0.019 ± 0.003	11-30-16	249	0.051 ± 0.005
06-08-16	352	0.014 ± 0.003	12-07-16	253	0.026 ± 0.004
06-15-16	354	0.021 ± 0.003	12-14-16	251	0.035 ± 0.004
06-22-16	352	0.021 ± 0.003	12-21-16	252	0.046 ± 0.005
06-29-16	352	0.016 ± 0.003	12-28-16	338	0.026 ± 0.003
2nd Quarter Mean ± s.d.		0.020 ± 0.005	4th Quarter Mean ± s.d.		0.030 ± 0.010
			Cumulative Average		0.027
			Previous Annual Average		0.030

[a] Iodine-131 concentrations are < 0.03 pCi/m^3 unless otherwise noted.

Table 5. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131[a].

Location: M-4

Units: pCi/m^3

Collection: Continuous, weekly exchange.

Date Collected	Volume (m^3)	Gross Beta	Date Collected	Volume (m^3)	Gross Beta
Required LLD		0.010			0.010
01-06-16	352	0.055 ± 0.005	07-06-16	403	0.016 ± 0.003
01-13-16	318	0.047 ± 0.005	07-13-16	435	0.016 ± 0.002
01-20-16	324	0.052 ± 0.005	07-20-16	405	0.021 ± 0.003
01-27-16	328	0.054 ± 0.005	07-27-16	433	0.023 ± 0.003
02-03-16	354	0.022 ± 0.003	08-03-16	404	0.027 ± 0.003
02-10-16	315	0.040 ± 0.004	08-10-16	410	0.022 ± 0.003
02-17-16	347	0.026 ± 0.004	08-16-16	370	0.020 ± 0.003
02-23-16	280	0.022 ± 0.004	08-24-16	465	0.028 ± 0.003
03-02-16	375	0.029 ± 0.003	08-30-16	373	0.020 ± 0.003
03-09-16	327	0.030 ± 0.004	09-07-16	415	0.018 ± 0.003
03-16-16	324	0.030 ± 0.004	09-14-16		ND[b]
03-23-16	326	0.017 ± 0.003	09-21-16	364	0.023 ± 0.003
03-30-16	328	0.028 ± 0.004	09-28-16	363	0.019 ± 0.003
1st Quarter Mean ± s.d.		0.035 ± 0.013	3rd Quarter Mean ± s.d.		0.021 ± 0.004
04-06-16	325	0.029 ± 0.004	10-05-16	327	0.024 ± 0.003
04-13-16	328	0.021 ± 0.003	10-12-16	336	0.015 ± 0.003
04-20-16	325	0.024 ± 0.003	10-19-16	363	0.024 ± 0.003
04-27-16	326	0.019 ± 0.003	10-26-16	337	0.022 ± 0.003
			11-02-16	363	0.025 ± 0.003
05-04-16	329	0.019 ± 0.003			
05-11-16	407	0.021 ± 0.003	11-09-16	362	0.041 ± 0.004
05-18-16	404	0.012 ± 0.002	11-16-16	364	0.032 ± 0.003
05-25-16	410	0.031 ± 0.003	11-23-16	340	0.021 ± 0.003
06-01-16	405	0.019 ± 0.003	11-30-16	336	0.042 ± 0.004
06-08-16	406	0.013 ± 0.002	12-07-16	313	0.026 ± 0.003
06-15-16	436	0.020 ± 0.003	12-14-16	303	0.030 ± 0.004
06-22-16	434	0.022 ± 0.003	12-21-16	339	0.036 ± 0.004
06-29-16	433	0.017 ± 0.002	12-28-16	337	0.026 ± 0.003
2nd Quarter Mean ± s.d.		0.021 ± 0.005	4th Quarter Mean ± s.d.		0.028 ± 0.008
			Cumulative Average		0.026
			Previous Annual Average		0.031

[a] Iodine-131 concentrations are < 0.03 pCi/m^3 unless otherwise noted.

[b] "ND" = No data; see Table 2.0, Listing of Missed Samples.

Table 6. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131[a].

Location: M-5

Units: pCi/m^3

Collection: Continuous, weekly exchange.

Date Collected	Volume (m^3)	Gross Beta	Date Collected	Volume (m^3)	Gross Beta
Required LLD		0.010			0.010
01-06-16	323	0.054 ± 0.005	07-06-16	296	0.027 ± 0.004
01-13-16	297	0.044 ± 0.005	07-13-16	326	0.015 ± 0.003
01-20-16	293	0.056 ± 0.005	07-20-16	322	0.024 ± 0.003
01-27-16	325	0.052 ± 0.005	07-27-16	322	0.023 ± 0.003
02-03-16	296	0.028 ± 0.004	08-03-16	292	0.029 ± 0.004
02-10-16	355	0.031 ± 0.004	08-10-16	296	0.025 ± 0.003
02-17-16	385	0.024 ± 0.003	08-16-16	251	0.024 ± 0.004
02-23-16	334	0.017 ± 0.003	08-24-16	336	0.026 ± 0.003
03-02-16	406	0.024 ± 0.003	08-30-16	253	0.020 ± 0.004
03-09-16	355	0.022 ± 0.003	09-07-16		ND[b]
03-16-16	351	0.024 ± 0.003	09-14-16	384	0.019 ± 0.003
03-23-16	353	0.015 ± 0.003	09-21-16	352	0.024 ± 0.003
03-30-16	356	0.019 ± 0.003	09-28-16	351	0.018 ± 0.003
1st Quarter Mean ± s.d.		0.032 ± 0.015	3rd Quarter Mean ± s.d.		0.023 ± 0.004
04-06-16	354	0.023 ± 0.003	10-05-16	322	0.026 ± 0.003
04-13-16	355	0.020 ± 0.003	10-12-16	350	0.017 ± 0.003
04-20-16	354	0.023 ± 0.003	10-19-16	320	0.028 ± 0.004
04-27-16	353	0.015 ± 0.003	10-26-16	350	0.021 ± 0.003
			11-02-16	352	0.023 ± 0.003
05-04-16	356	0.015 ± 0.003			
05-11-16	324	0.022 ± 0.003	11-09-16	354	0.039 ± 0.004
05-18-16	321	0.013 ± 0.003	11-16-16	320	0.038 ± 0.004
05-25-16	325	0.029 ± 0.004	11-23-16	354	0.020 ± 0.003
06-01-16	294	0.024 ± 0.003	11-30-16	317	0.042 ± 0.004
06-08-16	294	0.017 ± 0.003	12-07-16	321	0.027 ± 0.003
06-15-16	325	0.021 ± 0.003	12-14-16	319	0.028 ± 0.004
06-22-16	323	0.022 ± 0.003	12-21-16	320	0.044 ± 0.004
06-29-16	323	0.018 ± 0.003	12-28-16	322	0.027 ± 0.003
2nd Quarter Mean ± s.d.		0.020 ± 0.005	4th Quarter Mean ± s.d.		0.029 ± 0.009
			Cumulative Average		0.026
			Previous Annual Average		0.031

[a] Iodine-131 concentrations are < 0.03 pCi/m^3 unless otherwise noted.

[b] "ND" = No data; see Table 2.0, Listing of Missed Samples.

Table 7. Airborne particulate data, gross beta analyses, monthly averages, minima and maxima.

January

Location	Average	Minima	Maxima
Control	0.043	0.022	0.054
M-1	0.043	0.022	0.054
Indicators	0.046	0.022	0.060
M-2	0.043	0.025	0.053
M-3	0.049	0.029	0.060
M-4	0.046	0.022	0.055
M-5	0.047	0.028	0.056

February

Location	Average	Minima	Maxima
Control	0.023	0.017	0.029
M-1	0.023	0.017	0.029
Indicators	0.028	0.017	0.040
M-2	0.026	0.022	0.032
M-3	0.030	0.025	0.037
M-4	0.029	0.022	0.040
M-5	0.024	0.017	0.031

March

Location	Average	Minima	Maxima
Control	0.020	0.013	0.025
M-1	0.020	0.013	0.025
Indicators	0.023	0.015	0.030
M-2	0.023	0.016	0.029
M-3	0.025	0.019	0.027
M-4	0.026	0.017	0.030
M-5	0.020	0.015	0.024

April

Location	Average	Minima	Maxima
Control	0.021	0.017	0.025
M-1	0.021	0.017	0.025
Indicators	0.022	0.013	0.029
M-2	0.021	0.013	0.024
M-3	0.022	0.018	0.027
M-4	0.023	0.019	0.029
M-5	0.020	0.015	0.023

May

Location	Average	Minima	Maxima
Control	0.020	0.013	0.029
M-1	0.020	0.013	0.029
Indicators	0.020	0.011	0.031
M-2	0.018	0.011	0.025
M-3	0.019	0.013	0.030
M-4	0.020	0.012	0.031
M-5	0.020	0.013	0.029

June

Location	Average	Minima	Maxima
Control	0.017	0.012	0.022
M-1	0.017	0.012	0.022
Indicators	0.018	0.010	0.022
M-2	0.017	0.010	0.022
M-3	0.018	0.014	0.021
M-4	0.018	0.013	0.022
M-5	0.019	0.017	0.022

Note: unless otherwise specified, samples collected on the first, second or third day of the month are grouped with data of the previous month.

Table 7. Airborne particulate data, gross beta analyses, monthly averages, minima and maxima.

July

Location	Average	Minima	Maxima
Control	0.021	0.014	0.030
M-1	0.021	0.014	0.030
Indicators	0.021	0.014	0.030
M-2	0.020	0.014	0.023
M-3	0.021	0.016	0.024
M-4	0.021	0.016	0.027
M-5	0.024	0.015	0.030

August

Location	Average	Minima	Maxima
Control	0.022	0.020	0.026
M-1	0.022	0.020	0.026
Indicators	0.023	0.015	0.029
M-2	0.023	0.015	0.029
M-3	0.022	0.019	0.025
M-4	0.023	0.020	0.028
M-5	0.024	0.020	0.026

September

Location	Average	Minima	Maxima
Control			
M-1	0.019	0.017	0.024
Indicators	0.021	0.018	0.025
M-2	0.022	0.020	0.025
M-3	0.022	0.021	0.023
M-4	0.020	0.018	0.023
M-5	0.020	0.018	0.024

October

Location	Average	Minima	Maxima
Control	0.020	0.016	0.023
M-1	0.020	0.016	0.023
Indicators	0.022	0.015	0.037
M-2	0.024	0.016	0.037
M-3	0.022	0.017	0.026
M-4	0.021	0.015	0.024
M-5	0.023	0.017	0.028

November

Location	Average	Minima	Maxima
Control	0.032	0.017	0.040
M-1	0.032	0.017	0.040
Indicators	0.035	0.020	0.051
M-2	0.035	0.020	0.044
M-3	0.038	0.024	0.051
M-4	0.034	0.021	0.042
M-5	0.035	0.020	0.042

December

Location	Average	Minima	Maxima
Control	0.029	0.026	0.038
M-1	0.029	0.026	0.038
Indicators	0.032	0.023	0.046
M-2	0.033	0.023	0.044
M-3	0.033	0.026	0.046
M-4	0.030	0.026	0.036
M-5	0.031	0.027	0.044

Note: unless otherwise specified, samples collected on the first, second or third day of the month are grouped with data of the previous month.

Table 8. Airborne particulates, quarterly composites from each location, analysis for gamma-emitting isotopes.

	Activity (pCi/m^3)					
	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	Cumulative Average	Previous Average
M-1 (C)						
Lab Code	MAP- 1831	MAP- 3820	MAP- 5656	MAP- 7159		
Volume(m^3)	4773	4486	4262	4278		
Be-7	0.060 ± 0.010	0.082 ± 0.014	0.081 ± 0.016	0.050 ± 0.016	0.069	0.066
Mn-54	< 0.0006	< 0.0007	< 0.0010	< 0.0005	<0.0010	<0.0005
Co-58	< 0.0008	< 0.0008	< 0.0006	< 0.0007	<0.0008	<0.0007
Co-60	< 0.0006	< 0.0006	< 0.0008	< 0.0007	<0.0008	<0.0009
Zn-65	< 0.0007	< 0.0017	< 0.0012	< 0.0016	<0.0017	<0.0012
Zr-Nb-95	< 0.0009	< 0.0012	< 0.0011	< 0.0012	<0.0012	<0.0008
Ru-103	< 0.0008	< 0.0010	< 0.0007	< 0.0011	<0.0010	<0.0008
Ru-106	< 0.0056	< 0.0080	< 0.0055	< 0.0091	<0.0080	<0.0049
Cs-134	< 0.0007	< 0.0008	< 0.0008	< 0.0009	<0.0008	<0.0006
Cs-137	< 0.0008	< 0.0008	< 0.0006	< 0.0011	<0.0008	<0.0006
Ba-La-140	< 0.0034	< 0.0015	< 0.0042	< 0.0021	<0.0042	<0.0017
Ce-141	< 0.0012	< 0.0019	< 0.0022	< 0.0018	<0.0022	<0.0015
Ce-144	< 0.0036	< 0.0044	< 0.0044	< 0.0037	<0.0044	<0.0034
M-2						
Lab Code	MAP- 1832	MAP- 3821	MAP- 5657	MAP- 7160		
Volume(m^3)	4072	4319	4003	4030		
Be-7	0.079 ± 0.015	0.095 ± 0.016	0.071 ± 0.017	0.048 ± 0.015	0.073	0.068
Mn-54	< 0.0010	< 0.0010	< 0.0009	< 0.0009	<0.0010	<0.0008
Co-58	< 0.0009	< 0.0005	< 0.0007	< 0.0011	<0.0009	<0.0008
Co-60	< 0.0008	< 0.0005	< 0.0009	< 0.0007	<0.0009	<0.0007
Zn-65	< 0.0007	< 0.0020	< 0.0012	< 0.0007	<0.0020	<0.0017
Zr-Nb-95	< 0.0013	< 0.0012	< 0.0011	< 0.0015	<0.0013	<0.0011
Ru-103	< 0.0008	< 0.0011	< 0.0012	< 0.0012	<0.0012	<0.0012
Ru-106	< 0.0080	< 0.0081	< 0.0043	< 0.0059	<0.0081	<0.0085
Cs-134	< 0.0008	< 0.0011	< 0.0009	< 0.0009	<0.0011	<0.0009
Cs-137	< 0.0009	< 0.0006	< 0.0007	< 0.0004	<0.0009	<0.0010
Ba-La-140	< 0.0027	< 0.0029	< 0.0046	< 0.0021	<0.0046	<0.0024
Ce-141	< 0.0019	< 0.0022	< 0.0018	< 0.0022	<0.0022	<0.0018
Ce-144	< 0.0046	< 0.0047	< 0.0047	< 0.0038	<0.0047	<0.0046

Table 8. Airborne particulates, quarterly composites from each location, analysis for gamma-emitting isotopes.

Activity (pCi/m^3)						
	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	Cumulative Average	Previous Average
M-3						
Lab Code	MAP- 1833	MAP- 3822	MAP- 5658	MAP- 7161		
Volume(m^3)	4119	4453	4633	3936		
Be-7	0.078 ± 0.016	0.095 ± 0.013	0.077 ± 0.016	0.071 ± 0.016	0.081	0.067
Mn-54	< 0.0005	< 0.0006	< 0.0007	< 0.0006	<0.0007	<0.0007
Co-58	< 0.0008	< 0.0007	< 0.0008	< 0.0008	<0.0008	<0.0006
Co-60	< 0.0007	< 0.0005	< 0.0008	< 0.0008	<0.0008	<0.0006
Zn-65	< 0.0018	< 0.0012	< 0.0006	< 0.0014	<0.0018	<0.0014
Zr-Nb-95	< 0.0008	< 0.0008	< 0.0012	< 0.0010	<0.0012	<0.0010
Ru-103	< 0.0012	< 0.0008	< 0.0007	< 0.0012	<0.0012	<0.0009
Ru-106	< 0.0053	< 0.0048	< 0.0064	< 0.0075	<0.0064	<0.0061
Cs-134	< 0.0007	< 0.0006	< 0.0008	< 0.0010	<0.0008	<0.0007
Cs-137	< 0.0005	< 0.0004	< 0.0006	< 0.0007	<0.0006	<0.0006
Ba-La-140	< 0.0040	< 0.0036	< 0.0044	< 0.0020	<0.0044	<0.0018
Ce-141	< 0.0020	< 0.0013	< 0.0016	< 0.0013	<0.0020	<0.0013
Ce-144	< 0.0034	< 0.0022	< 0.0041	< 0.0044	<0.0041	<0.0035
M-4						
Lab Code	MAP- 1834	MAP- 3823	MAP- 5659 [a]	MAP- 7162		
Volume(m^3)	4297	4969	4840	4419		
Be-7	0.071 ± 0.015	0.10 ± 0.016	0.078 ± 0.014	0.051 ± 0.011	0.075	0.070
Mn-54	< 0.0009	< 0.0006	< 0.0010	< 0.0006	<0.0010	<0.0008
Co-58	< 0.0005	< 0.0006	< 0.0006	< 0.0008	<0.0006	<0.0008
Co-60	< 0.0003	< 0.0003	< 0.0006	< 0.0006	<0.0006	<0.0008
Zn-65	< 0.0017	< 0.0015	< 0.0023	< 0.0010	<0.0023	<0.0019
Zr-Nb-95	< 0.0014	< 0.0006	< 0.0018	< 0.0012	<0.0018	<0.0014
Ru-103	< 0.0014	< 0.0009	< 0.0010	< 0.0009	<0.0014	<0.0013
Ru-106	< 0.0069	< 0.0060	< 0.0061	< 0.0078	<0.0069	<0.0073
Cs-134	< 0.0009	< 0.0007	< 0.0009	< 0.0008	<0.0009	<0.0010
Cs-137	< 0.0005	< 0.0003	< 0.0007	< 0.0008	<0.0007	<0.0010
Ba-La-140	< 0.0033	< 0.0030	< 0.0041	< 0.0018	<0.0041	<0.0026
Ce-141	< 0.0020	< 0.0016	< 0.0019	< 0.0018	<0.0020	<0.0013
Ce-144	< 0.0039	< 0.0027	< 0.0031	< 0.0047	<0.0039	<0.0040

[a] No sample for week of 9/14/16 ; see Table 2.0, Listing of Missed Samples.

Table 8. Airborne particulates, quarterly composites from each location, analysis for gamma-emitting isotopes.

	Activity (pCi/m^3)					
	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	Cumulative Average	Previous Average
			M-5			
Lab Code	MAP- 1835	MAP- 3824	MAP- 5660	MAP- 7163		
Volume(m^3)	4427	4298	3843	4322		
Be-7	0.066 ± 0.012	0.091 ± 0.020	0.086 ± 0.019	0.050 ± 0.010	0.073	0.073
Mn-54	< 0.0008	< 0.0008	< 0.0009	< 0.0004	<0.0009	<0.0008
Co-58	< 0.0007	< 0.0012	< 0.0011	< 0.0004	<0.0012	<0.0007
Co-60	< 0.0004	< 0.0008	< 0.0009	< 0.0003	<0.0009	<0.0005
Zn-65	< 0.0003	< 0.0019	< 0.0011	< 0.0004	<0.0019	<0.0009
Zr-Nb-95	< 0.0007	< 0.0017	< 0.0012	< 0.0009	<0.0017	<0.0014
Ru-103	< 0.0009	< 0.0018	< 0.0013	< 0.0006	<0.0018	<0.0012
Ru-106	< 0.0057	< 0.0045	< 0.0079	< 0.0060	<0.0079	<0.0072
Cs-134	< 0.0006	< 0.0011	< 0.0009	< 0.0006	<0.0011	<0.0009
Cs-137	< 0.0004	< 0.0008	< 0.0008	< 0.0005	<0.0008	<0.0007
Ba-La-140	< 0.0017	< 0.0018	< 0.0045	< 0.0014	<0.0045	<0.0023
Ce-141	< 0.0013	< 0.0021	< 0.0023	< 0.0014	<0.0023	<0.0020
Ce-144	< 0.0036	< 0.0053	< 0.0029	< 0.0024	<0.0053	<0.0041

Table 9. Pasture grass, vegetation, analysis for gamma-emitting isotopes.
Collection: 3x per year

	Sample Description and Concentration (pCi/g wet)			Annual Average	Previous Annual Average
Location:	M-41 (Training Center)				
Date Collected	07-13-16	08-10-16	09-08-16		
Lab Code	MVE- 3541	MVE- 4244	MVE- 4763		
Mn-54	< 0.005	< 0.009	< 0.010	< 0.010	< 0.010
Fe-59	< 0.009	< 0.017	< 0.028	< 0.028	< 0.031
Co-58	< 0.004	< 0.009	< 0.008	< 0.009	< 0.009
Co-60	< 0.005	< 0.004	< 0.006	< 0.006	< 0.009
Zn-65	< 0.010	< 0.013	< 0.020	< 0.020	< 0.024
Nb-95	< 0.006	< 0.012	< 0.010	< 0.012	< 0.011
I-131	< 0.015	< 0.022	< 0.054	< 0.054	< 0.038
Cs-134	< 0.004	< 0.011	< 0.009	< 0.011	< 0.011
Cs-137	< 0.005	< 0.010	< 0.009	< 0.010	< 0.011
Location:	M-42 (Biology Station Road)				
Date Collected	07-13-16	08-10-16	09-08-16		
Lab Code	MVE- 3542	MVE- 4246	MVE- 4764		
Mn-54	< 0.002	< 0.008	< 0.011	< 0.011	< 0.008
Fe-59	< 0.010	< 0.022	< 0.022	< 0.022	< 0.022
Co-58	< 0.004	< 0.004	< 0.009	< 0.009	< 0.008
Co-60	< 0.004	< 0.005	< 0.008	< 0.008	< 0.008
Zn-65	< 0.006	< 0.024	< 0.016	< 0.024	< 0.024
Nb-95	< 0.005	< 0.013	< 0.008	< 0.013	< 0.012
I-131	< 0.010	< 0.026	< 0.043	< 0.043	< 0.030
Cs-134	< 0.004	< 0.012	< 0.009	< 0.012	< 0.011
Cs-137	< 0.005	< 0.008	< 0.013	< 0.013	< 0.010
Location:	M-43 (Imholte Farm, Control)				
Date Collected	07-13-16	08-10-16	09-08-16		
Lab Code	MVE- 3544	MVE- 4247	MVE- 4765		
Mn-54	< 0.003	< 0.008	< 0.008	< 0.008	< 0.012
Fe-59	< 0.008	< 0.017	< 0.018	< 0.018	< 0.030
Co-58	< 0.003	< 0.009	< 0.009	< 0.009	< 0.013
Co-60	< 0.002	< 0.005	< 0.007	< 0.007	< 0.014
Zn-65	< 0.008	< 0.012	< 0.020	< 0.020	< 0.029
Nb-95	< 0.005	< 0.013	< 0.011	< 0.013	< 0.015
I-131	< 0.014	< 0.026	< 0.034	< 0.034	< 0.037
Cs-134	< 0.003	< 0.013	< 0.009	< 0.013	< 0.014
Cs-137	< 0.003	< 0.014	< 0.011	< 0.014	< 0.013

Table 10. River water, analysis of monthly composites for gamma-emitting isotopes.
Location: M-8 (C)
Collection: Weekly

Sample Description and Concentration (pCi/L)

Period Collected	January	February	March [b]	April	May
Lab Code	NS[a]	NS[a]	MSW-1792	MSW-2378	MSW-3112
Mn-54	-	-	< 10	< 10	< 10
Fe-59	-	-	< 30	< 30	< 30
Co-58	-	-	< 10	< 10	< 10
Co-60	-	-	< 10	< 10	< 10
Zn-65	-	-	< 30	< 30	< 30
Zr-Nb-95	-	-	< 15	< 15	< 15
Cs-134	-	-	< 10	< 10	< 10
Cs-137	-	-	< 10	< 10	< 10
Ba-La-140	-	-	< 15	< 15	< 15
Ce-144	-	-	< 12	< 23	< 27

Period Collected	June	July	August	September	October
Lab Code	MSW-3549	MSW-4274	MSW-4638	MSW-5375	MSW-6401
Mn-54	< 10	< 10	< 10	< 10	< 10
Fe-59	< 30	< 30	< 30	< 30	< 30
Co-58	< 10	< 10	< 10	< 10	< 10
Co-60	< 10	< 10	< 10	< 10	< 10
Zn-65	< 30	< 30	< 30	< 30	< 30
Zr-Nb-95	< 15	< 15	< 15	< 15	< 15
Cs-134	< 10	< 10	< 10	< 10	< 10
Cs-137	< 10	< 10	< 10	< 10	< 10
Ba-La-140	< 15	< 15	< 15	< 15	< 15
Ce-144	< 7	< 26	< 31	< 28	< 23

Period Collected	November	December [c]	Cumulative	Previous Annual
Lab Code	MSW-6790	MSW-7080	Average	Average
Mn-54	< 10	< 10	< 10	< 10
Fe-59	< 30	< 30	< 30	< 30
Co-58	< 10	< 10	< 10	< 10
Co-60	< 10	< 10	< 10	< 10
Zn-65	< 30	< 30	< 30	< 30
Zr-Nb-95	< 15	< 15	< 15	< 15
Cs-134	< 10	< 10	< 10	< 10
Cs-137	< 10	< 10	< 10	< 10
Ba-La-140	< 15	< 15	< 15	< 15
Ce-144	< 28	< 10	< 31	< 39

[a] "NS" = No sample; see Table 2.0, Listing of Missed Samples.

[b] No sample for 03-02-16; Water frozen.

[c] No sample for 12-07-16; Water frozen.

Table 10. River water, analysis of monthly composites for gamma-emitting isotopes.
Location: M-9
Collection: Weekly

Sample Description and Concentration (pCi/L)					
Period Collected	January	February	March	April	May
Lab Code	MSW-520	MSW-1190	MSW-1793	MSW-2379	MSW-3113
Mn-54	< 10	< 10	< 10	< 10	< 10
Fe-59	< 30	< 30	< 30	< 30	< 30
Co-58	< 10	< 10	< 10	< 10	< 10
Co-60	< 10	< 10	< 10	< 10	< 10
Zn-65	< 30	< 30	< 30	< 30	< 30
Zr-Nb-95	< 15	< 15	< 15	< 15	< 15
Cs-134	< 10	< 10	< 10	< 10	< 10
Cs-137	< 10	< 10	< 10	< 10	< 10
Ba-La-140	< 15	< 15	< 15	< 15	< 15
Ce-144	< 28	< 7	< 12	< 18	< 32
Period Collected	June	July	August	September	October
Lab Code	MSW-3550	MSW-4275	MSW-4640	MSW-5376	MSW-6402
Mn-54	< 10	< 10	< 10	< 10	< 10
Fe-59	< 30	< 30	< 30	< 30	< 30
Co-58	< 10	< 10	< 10	< 10	< 10
Co-60	< 10	< 10	< 10	< 10	< 10
Zn-65	< 30	< 30	< 30	< 30	< 30
Zr-Nb-95	< 15	< 15	< 15	< 15	< 15
Cs-134	< 10	< 10	< 10	< 10	< 10
Cs-137	< 10	< 10	< 10	< 10	< 10
Ba-La-140	< 15	< 15	< 15	< 15	< 15
Ce-144	< 10	< 25	< 22	< 24	< 12
Period Collected	November	December		Cumulative	Previous Annual
Lab Code	MSW-6791	MSW-7081		Average	Average
Mn-54	< 10	< 10		< 10	< 10
Fe-59	< 30	< 30		< 30	< 30
Co-58	< 10	< 10		< 10	< 10
Co-60	< 10	< 10		< 10	< 10
Zn-65	< 30	< 30		< 30	< 30
Zr-Nb-95	< 15	< 15		< 15	< 15
Cs-134	< 10	< 10		< 10	< 10
Cs-137	< 10	< 10		< 10	< 10
Ba-La-140	< 15	< 15		< 15	< 15
Ce-144	< 35	< 17		< 35	< 33

Table 11. Drinking water, City of Minneapolis, M-14, analysis of monthly composites for gross beta, iodine-131, and gamma-emitting isotopes.
Collection: Weekly

Sample Description and Concentration (pCi/L)

Period Collected	January	February	March	April	May
Lab Code	MDW-519	MDW-1099	MDW-1461	MDW-2227	MDW-2933
Gross beta	1.2 ± 0.6	2.4 ± 1.0	2.5 ± 1.0	3.1 ± 1.0	2.6 ± 1.0
I-131	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Mn-54	< 10	< 10	< 10	< 10	< 10
Fe-59	< 30	< 30	< 30	< 30	< 30
Co-58	< 10	< 10	< 10	< 10	< 10
Co-60	< 10	< 10	< 10	< 10	< 10
Zn-65	< 30	< 30	< 30	< 30	< 30
Zr-Nb-95	< 15	< 15	< 15	< 15	< 15
Cs-134	< 10	< 10	< 10	< 10	< 10
Cs-137	< 10	< 10	< 10	< 10	< 10
Ba-La-140	< 15	< 15	< 15	< 15	< 15
Ce-144	< 18	< 27	< 23	< 25	< 23

Period Collected	June	July	August	September	October
Lab Code	MDW-3451	MDW-4180	MDW-4761	MDW-5377	MDW-6245
Gross beta	2.3 ± 0.7	2.7 ± 1.1	3.2 ± 0.7	3.1 ± 0.8	3.1 ± 1.1
I-131	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Mn-54	< 10	< 10	< 10	< 10	< 10
Fe-59	< 30	< 30	< 30	< 30	< 30
Co-58	< 10	< 10	< 10	< 10	< 10
Co-60	< 10	< 10	< 10	< 10	< 10
Zn-65	< 30	< 30	< 30	< 30	< 30
Zr-Nb-95	< 15	< 15	< 15	< 15	< 15
Cs-134	< 10	< 10	< 10	< 10	< 10
Cs-137	< 10	< 10	< 10	< 10	< 10
Ba-La-140	< 15	< 15	< 15	< 15	< 15
Ce-144	< 18	< 19	< 17	< 23	< 28

Period Collected	November	December		Cumulative	Previous
Lab Code	MDW-6664	MDW-7010		Average	Average
Gross beta	2.3 ± 0.9	2.5 ± 0.8		2.6	2.3
I-131	< 1.0	< 1.0		< 1.0	< 1.0
Mn-54	< 10	< 10		< 10	< 10
Fe-59	< 30	< 30		< 30	< 30
Co-58	< 10	< 10		< 10	< 10
Co-60	< 10	< 10		< 10	< 10
Zn-65	< 30	< 30		< 30	< 30
Zr-Nb-95	< 15	< 15		< 15	< 15
Cs-134	< 10	< 10		< 10	< 10
Cs-137	< 10	< 10		< 10	< 10
Ba-La-140	< 15	< 15		< 15	< 15
Ce-144	< 25	< 22		< 28	< 35

Table 12. River water and drinking water, analysis of quarterly composites for tritium.
Collection: Quarterly composites of weekly collections.

Sample Type, Location and Collection Period	Lab Code	Concentration (pCi/L) H-3	
River Water Upstream, M-8 (C)			
1st Quarter[a]	MSW - 1794	< 500	< 149
2nd Quarter	MSW - 3601	< 500	< 143
3rd Quarter	MSW - 5381	< 500	< 152
4th Quarter[b]	MSW - 7087	< 500	< 155
Cumulative Average		< 500	< 150
Previous Annual Average		< 500	< 151
River Water Downstream, M-9			
1st Quarter	MSW - 1795	< 500	< 149
2nd Quarter	MSW - 3602	< 500	< 143
3rd Quarter	MSW - 5382	< 500	< 152
4th Quarter	MSW - 7088	< 500	< 155
Cumulative Average		< 500	< 150
Previous Annual Average		< 500	< 151
Drinking Water Minneapolis, M-14			
1st Quarter	MDW - 1796	< 500	< 149
2nd Quarter	MDW - 3603	< 500	< 143
3rd Quarter	MDW - 5383	< 500	< 152
4th Quarter	MDW - 7089	< 500	< 155
Cumulative Average		< 500	< 150
Previous Annual Average		< 500	< 151

[a] Water frozen January, February and 03-02-16.

[b] Last collection for quarter on 12-07-16; water frozen remainder of December.

Table 13. Well water, analysis for tritium and gamma-emitting isotopes.

Sample Description and Concentration (pCi/L)													
Date Collected	Lab Code	H-3 (< 500 pCi/L)	Mn-54	Fe-59	Co-58	Co-60	Zn-65	Zr-Nb-95	Cs-134	Cs-137	Ba-La-140	Ce-144
						Monticello (M-11)							
1/20/2016	MWW-338	< 140	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 29
4/20/2016	MWW-1870	< 149	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 14
7/20/2016	MWW-3858	< 151	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 29
10/19/2016	MWW-5728	< 156	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 28
Cumulative Averages		< 500	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 29
						Plant Well No. 1 (M-12)							
1/20/2016	MWW-339	< 140	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 21
4/21/2016	MWW-1871	< 149	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 23
7/20/2016	MWW-3859	< 151	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 17
10/19/2016	MWW-5729	< 156	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 26
Cumulative Averages		< 500	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 26
						Hasbrouck (M-55)							
1/20/2016	MWW-340	< 140	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 22
4/20/2016	MWW-1874	< 149	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 10
7/20/2016	MWW-3861	< 151	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 21
10/19/2016	MWW-5731	< 156	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 20
Cumulative Averages		< 500	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 22
						Imholte (M-43C)							
1/20/2016	MWW-341	< 140	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 24
4/20/2016	MWW-1873	< 149	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 22
7/20/2016	MWW-3860	< 151	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 21
10/19/2016	MWW-5730	< 156	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 19
Cumulative Averages		< 500	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 24

Table 14. Fish, analysis of edible portions for gamma-emitting isotopes.
Collection: Semiannually

Sample Description and Concentration (pCi/g wet)

Upstream 1000' M-8 (C)

Date Collected	05-24-16	05-24-16	09-20-16	09-20-16
Lab Code	MF- 2618	MF- 2619	MF- 4954	MF- 4955
Sample Type	Smallmouth Bass	Shorthead Redhorse	Smallmouth Bass	Shorthead Redhorse
K-40	3.44 ± 0.39	3.97 ± 0.62	2.86 ± 0.41	2.86 ± 0.394
Mn-54	< 0.015	< 0.025	< 0.017	< 0.015
Fe-59	< 0.041	< 0.070	< 0.046	< 0.048
Co-58	< 0.019	< 0.024	< 0.018	< 0.017
Co-60	< 0.007	< 0.017	< 0.010	< 0.016
Zn-65	< 0.034	< 0.070	< 0.020	< 0.029
Nb-95	< 0.017	< 0.037	< 0.019	< 0.024
Zr-95	< 0.033	< 0.053	< 0.019	< 0.035
Cs-134	< 0.015	< 0.025	< 0.016	< 0.016
Cs-137	< 0.015	< 0.025	< 0.013	< 0.016
Ba-La-140	< 0.058	< 0.112	< 0.047	< 0.039
Ce-144	< 0.099	< 0.158	< 0.104	< 0.137

	Cumulative Average	Previous Average
K-40	3.28	3.31
Mn-54	< 0.025	< 0.017
Fe-59	< 0.070	< 0.056
Co-58	< 0.024	< 0.019
Co-60	< 0.017	< 0.018
Zn-65	< 0.070	< 0.033
Nb-95	< 0.037	< 0.031
Zr-95	< 0.053	< 0.043
Cs-134	< 0.025	< 0.020
Cs-137	< 0.025	< 0.018
Ba-La-140	< 0.112	< 0.073
Ce-144	< 0.158	< 0.130

Table 14. Fish, analysis of edible portions for gamma-emitting isotopes.
Collection: Semiannually

Sample Description and Concentration (pCi/g wet)

	Downstream 1000' M-9			
Date Collected	05-24-16	05-24-16	09-20-16	09-20-16
Lab Code	MF- 2620	MF- 2621	MF- 4957	MF- 4958
Sample Type	Shorthead Redhorse	Smallmouth Bass	Smallmouth Bass	Shorthead Redhorse
K-40	3.16 ± 0.44	3.37 ± 0.36	3.01 ± 0.44	3.86 ± 0.47
Mn-54	< 0.015	< 0.012	< 0.016	< 0.015
Fe-59	< 0.043	< 0.048	< 0.053	< 0.047
Co-58	< 0.017	< 0.015	< 0.014	< 0.030
Co-60	< 0.017	< 0.010	< 0.015	< 0.012
Zn-65	< 0.022	< 0.018	< 0.025	< 0.033
Nb-95	< 0.022	< 0.029	< 0.017	< 0.034
Zr-95	< 0.039	< 0.027	< 0.048	< 0.036
Cs-134	< 0.014	< 0.013	< 0.018	< 0.021
Cs-137	< 0.017	< 0.014	< 0.015	< 0.015
Ba-La-140	< 0.083	< 0.081	< 0.043	< 0.055
Ce-144	< 0.098	< 0.102	< 0.145	< 0.137

	Cumulative Average	Previous Average
K-40	3.35	3.39
Mn-54	< 0.016	< 0.025
Fe-59	< 0.053	< 0.046
Co-58	< 0.030	< 0.025
Co-60	< 0.017	< 0.025
Zn-65	< 0.033	< 0.070
Nb-95	< 0.029	< 0.030
Zr-95	< 0.048	< 0.058
Cs-134	< 0.021	< 0.025
Cs-137	< 0.017	< 0.020
Ba-La-140	< 0.083	< 0.122
Ce-144	< 0.145	< 0.141

Table 15. Algae or aquatic insects, analysis for gamma-emitting isotopes.
Collection: Semiannually

Sample Description and Concentration (pCi/g wet)	Cumulative Average	Previous Average
Upstream 1000' M-8 (C)[a]		
Date Collected		
Lab Code NS[a]		
Be-7		
K-40		
Mn-54		
Fe-59		
Co-58		
Co-60		
Zn-65		
Zr-Nb-95		
Ru-103		
Ru-106		
Cs-134		
Cs-137		
Ba-La-140		
Ce-144		
Downstream 1000' M-9		
Date Collected		
Lab Code NS[a]		
Be-7		
K-40		
Mn-54		
Fe-59		
Co-58		
Co-60		
Zn-65		
Zr-Nb-95		
Ru-103		
Ru-106		
Cs-134		
Cs-137		
Ba-La-140		
Ce-144		

a NS - No Sample. Refer to Section 20 table "listing of missed samples".

Table 16. Shoreline (SS) sediments, analysis for gamma-emitting isotopes.
Collection: Semiannually

Sample Description and Concentration (pCi/g dry)		Cumulative Average	Previous Average
	Upstream 1000' M-8 (C)		
Date Collected	11-09-16		
Lab Code	MSS- 6314		
Be-7	< 0.26	< 0.26	< 0.29
K-40	9.90 ± 0.49	9.90	11.55
Mn-54	< 0.016	< 0.016	< 0.017
Fe-59	< 0.043	< 0.043	< 0.073
Co-58	< 0.020	< 0.020	< 0.022
Co-60	< 0.015	< 0.015	< 0.016
Zn-65	< 0.037	< 0.037	< 0.044
Nb-95	< 0.023	< 0.023	< 0.035
Zr-95	< 0.047	< 0.047	< 0.048
Ru-103	< 0.030	< 0.030	< 0.039
Ru-106	< 0.13	< 0.13	< 0.13
Cs-134	< 0.012	< 0.012	< 0.014
Cs-137	< 0.017	< 0.017	< 0.017
Ba-La-140	< 0.092	< 0.09	< 0.21
Ce-144	< 0.083	< 0.08	< 0.12
	Downstream 1000' M-9		
Date Collected	11-09-16		
Lab Code	MSS- 6315		
Be-7	< 0.18	< 0.18	< 0.30
K-40	10.28 ± 0.51	10.28	10.46
Mn-54	< 0.014	< 0.014	< 0.018
Fe-59	< 0.054	< 0.054	< 0.076
Co-58	< 0.023	< 0.023	< 0.026
Co-60	< 0.013	< 0.013	< 0.017
Zn-65	< 0.031	< 0.031	< 0.039
Nb-95	< 0.032	< 0.032	< 0.051
Zr-95	< 0.023	< 0.023	< 0.052
Ru-103	< 0.025	< 0.025	< 0.036
Ru-106	< 0.12	< 0.12	< 0.12
Cs-134	< 0.010	< 0.010	< 0.017
Cs-137	0.030 ± 0.018	0.030	0.029
Ba-La-140	< 0.12	< 0.12	< 0.14
Ce-144	< 0.11	< 0.11	< 0.13

No Spring ’16 sample. Refer to Section 20 table "listing of missed samples".

Table 16. Shoreline (SS) sediments, analysis for gamma-emitting isotopes (continued).

Sample Description and Concentration (pCi/g dry)		Cumulative Average	Previous Average
	Montissippi Park M-15		
Date Collected	11-09-16		
Lab Code	MSS- 6316		
Be-7	< 0.28	< 0.28	< 0.33
K-40	10.27 ± 0.55	10.27	10.01
Mn-54	< 0.017	< 0.017	< 0.021
Fe-59	< 0.046	< 0.046	< 0.068
Co-58	< 0.020	< 0.020	< 0.022
Co-60	< 0.008	< 0.008	< 0.014
Zn-65	< 0.044	< 0.044	< 0.041
Nb-95	< 0.020	< 0.020	< 0.031
Zr-95	< 0.025	< 0.025	< 0.046
Ru-103	< 0.018	< 0.018	< 0.041
Ru-106	< 0.16	< 0.16	< 0.13
Cs-134	< 0.014	< 0.014	< 0.016
Cs-137	< 0.019	< 0.019	< 0.021
Ba-La-140	< 0.10	< 0.10	< 0.20
Ce-144	< 0.12	< 0.12	< 0.11

No Spring ’16 sample. Refer to Section 20 table "listing of missed samples".