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U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555

THREE MILE ISLAND NUCLEAR STATION UNITS 1 AND 2
RENEWED OPERATING LICENSE NO. DPR-50 AND POSSESSION ONLY LICENSE NO. DPR-73
DOCKET NOS. 50-289 AND 50-320

SUBJECT: 2009 ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

In accordance with TMI-1 Technical Specification 6.9.3.1 and TMI-2 Technical Specification 6.8.1.1, enclosed is the Annual Radiological Environmental Operating Report covering the time-period of January 1 through December 31, 2009, for the Three Mile Island Nuclear Station.

Please contact Laura Weber of TMI-1 Chemistry at (717) 948-8947 if you have any questions regarding this submittal.

Sincerely,

Richard W. Libra
Plant Manager

RWL/dbn

Enclosure

cc: Region I Administrator
TMI-1 Senior Project Manager
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THREE MILE ISLAND NUCLEAR STATION
UNITS 1 and 2

Annual Radiological
Environmental Operating Report

1 January Through 31 December 2009

Prepared By
Teledyne Brown Engineering
Environmental Services

Exelon SM
Nuclear
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Middletown, PA 17057

April 2010

Table Of Contents

I. Summary and Conclusions 1

II. Introduction 3
- A. Objectives of the REMP 3
- B. Implementation of the Objectives 4

III. Program Description 4
- A. Sample Collection 4
- B. Sample Analysis 6
- C. Data Interpretation 7
- D. Program Exceptions 8
- E. Program Changes 12

IV. Results and Discussion 12
- A. Aquatic Environment 12
  - 1. Surface Water 12
  - 2. Drinking Water 13
  - 3. Effluent Water 14
  - 4. Storm Water 15
  - 5. Ground Water 15
  - 6. Fish 16
  - 7. Sediment 16
- B. Atmospheric Environment 17
  - 1. Airborne Particulates 17
    - a. Air Particulates 17
    - b. Airborne Iodine 18
  - 2. Terrestrial 18
    - a. Milk 18
    - b. Food Products 19
- C. Ambient Gamma Radiation 19
- D. Land Use Survey 20
- E. Radiological Impact of TMINS Operations 21
- F. Summary of Results – Inter-laboratory Comparison Program 29

V. References 30

Appendices

Appendix A Radiological Environmental Monitoring Report Summary

Tables

Table A-1 Radiological Environmental Monitoring Program Annual Summary for the Three Mile Island Nuclear Station, 2009

Appendix B Location Designation, Distance & Direction And Sample Collection & Analytical Methods

Tables

Table B-1: Location Designation and Identification System for the Three Mile Island Nuclear Station

Table B-2: Radiological Environmental Monitoring Program - Sampling Locations, Distance and Direction, Three Mile Island Nuclear Station, 2009

Table B-3: Radiological Environmental Monitoring Program - Summary of Sample Collection and Analytical Methods, Three Mile Island Nuclear Station, 2009

Figures

Figure B-1: Environmental Sampling Locations Within One Mile of the Three Mile Island Nuclear Station, 2009

Figure B-2: Environmental Sampling Locations Between One and Five Miles from the Three Mile Island Nuclear Station, 2009

Figure B-3: Environmental Sampling Locations Greater Than Five Miles from the Three Mile Island Nuclear Station, 2009

Appendix C Data Tables and Figures - Primary Laboratory

Tables

Table C-I.1 Concentrations of Tritium in Surface Water Samples Collected in the Vicinity of Three Mile Island Nuclear Station, 2009.

Table C-I.2	Concentrations of I-131 in Surface Water Samples Collected in the Vicinity of Three Mile Island Nuclear Station, 2009.
Table C-I.3	Concentrations of Gamma Emitters in Surface Water Samples Collected in the Vicinity of Three Mile Island Nuclear Station, 2009.
Table C-II.1	Concentrations of Gross Beta in Drinking Water Samples Collected in the Vicinity of Three Mile Island Nuclear Station, 2009.
Table C-II.2	Concentrations of I-131 in Drinking Water Samples Collected in the Vicinity of Three Mile Island Nuclear Station, 2009.
Table C-II.3	Concentrations of Tritium in Drinking Water Samples Collected in the Vicinity of Three Mile Island Nuclear Station, 2009.
Table C-II.4	Concentrations of Gamma Emitters in Drinking Water Samples Collected in the Vicinity of Three Mile Island Nuclear Station, 2009.
Table C-III.1	Concentrations of Gross Beta, I-131, Tritium, and Strontium in Effluent Water Samples for Station K1-1 Collected in the Vicinity of Three Mile Island Nuclear Station, 2009.
Table C-III.2	Concentrations of Gamma Emitters in Effluent Water Samples Collected in the Vicinity of Three Mile Island Nuclear Station, 2009.
Table C-IV.1	Concentrations of Tritium and Gamma Emitters in Storm Water Samples Collected in the Vicinity of Three Mile Island Nuclear Station, 2009.
Table C-V.1	Concentrations of Strontium in Predator and Bottom Feeder (Fish) Samples Collected in the Vicinity of Three Mile Island Nuclear Station, 2009.
Table C-V.2	Concentrations of Gamma Emitters in Predator and Bottom Feeder (Fish) Samples Collected in the Vicinity of Three Mile Island Nuclear Station, 2009.
Table C-VI.1	Concentrations of Gamma Emitters in Sediment Samples Collected in the Vicinity of Three Mile Island Nuclear Station, 2009.
Table C-VII.1	Concentrations of Gross Beta in Air Particulate Samples Collected in the Vicinity of Three Mile Island Nuclear Station, 2009.
Table C-VII.2	Monthly and Yearly Mean Values of Gross Beta Concentrations (E-3 pCi/cu meter) in Air Particulate Samples Collected in the Vicinity of Three Mile Island Nuclear Station, 2009.
Table C-VII.3	Concentrations of Gamma Emitters in Air Particulate Samples Collected in the Vicinity of Three Mile Island Nuclear Station, 2009.
Table C-VII.4	Concentrations of Strontium and Gamma Emitters in Air Particulate Samples Collected in the Vicinity of Three Mile Island Nuclear Station, 2009

Table C-VIII.1 Concentrations of I-131 in Air Iodine Samples Collected in the Vicinity of Three Mile Island Nuclear Station, 2009.

Table C-IX.1 Concentrations of I-131 in Milk Samples Collected in the Vicinity of Three Mile Island Nuclear Station, 2009.

Table C-IX.2 Concentrations of Strontium in Milk Samples Collected in the Vicinity of Three Mile Island Nuclear Station, 2009.

Table C-IX.3 Concentrations of Gamma Emitters in Milk Samples Collected in the Vicinity of Three Mile Island Nuclear Station, 2009.

Table C-X.1 Concentrations of Strontium and Gamma Emitters in Food Product Samples Collected in the Vicinity of Three Mile Island Nuclear Station, 2009.

Table C-XI.1 Quarterly TLD Results for Three Mile Island Nuclear Station, 2009.

Table C-XI.2 Mean Quarterly TLD Results for the Site Boundary, Indicator and Control Locations for Three Mile Island Nuclear Station, 2009.

Table C-XI.3 Summary of the Ambient Dosimetry Program for Three Mile Island Nuclear Station, 2009.

Figures

Figure C-1 Monthly Tritium Concentrations in Surface Water and Effluent Water Three Mile Island Nuclear Station, 2009.

Figure C-2 Mean Quarterly Tritium Concentrations in Surface Water Three Mile Island Nuclear Station, 1974 - 2009.

Figure C-3 Mean Monthly Gross Beta Concentrations in Drinking Water Three Mile Island Nuclear Station, 2009.

Figure C-4 Mean Monthly Tritium Concentrations in Drinking Water and Effluent Water Three Mile Island Nuclear Station, 2009.

Figure C-5 Mean Cesium-137 Concentrations in Aquatic Sediments Three Mile Island Nuclear Station, 1984 - 2009.

Figure C-6 Mean Quarterly Gross Beta Concentrations in Air Particulates Three Mile Island Nuclear Station, 1972 - 2009.

Figure C-7 Mean Weekly Gross Beta Concentrations in Air Particulates Three Mile Island Nuclear Station, 2009.

Figure C-8 Mean Quarterly Strontium-90 Concentrations in Cow Milk Three Mile Island Nuclear Station, 1979 - 2009.

Figure C-9 Mean Quarterly Gamma Exposure Rates Three Mile Island Nuclear Station, 1974 - 2009.

Appendix D Data Tables and Figures – Comparison Laboratory

Tables

Table D-I.1 Concentrations of Gross Beta in Drinking Water Samples Collected in the Vicinity Of Three Mile Island Nuclear Station, 2009.

Table D-I.2 Concentration of Tritium in Drinking Water Samples Collected in the Vicinity of Three Mile Island Nuclear Station, 2009.

Table D-I.3 Concentrations of Iodine-131 in Drinking Water Samples Collected in the Vicinity of Three Mile Island Nuclear Station, 2009.

Table D-I.4 Concentrations of Gamma Emitters in Drinking Water Samples Collected in the Vicinity of Three Mile Island Nuclear Station, 2009.

Table D-II.1 Concentrations of Strontium and Gamma Emitters in Fish Samples Collected in the Vicinity of Three Mile Island Nuclear Station, 2009.

Table D-III.1 Concentrations of Gamma Emitters in Sediment Samples Collected in the Vicinity of Three Mile Island Nuclear Station, 2009.

Table D-IV.1 Concentrations of Gamma Emitters and Strontium in Food Product Samples Collected in the Vicinity of Three Mile Island Nuclear Station, 2009.

Table D-V.1 Concentrations of Gross Beta in Air Particulate Samples Collected in the Vicinity of Three Mile Island Nuclear Station, 2009.

Table D-V.2 Concentrations of Gamma Emitters in Air Particulate Samples Collected in the Vicinity of Three Mile Island Nuclear Station, 2009.

Table D-VI.1 Concentrations of I-131 by Chemical Separation, Gamma Emitters, and Strontium in Milk Samples Collected in the Vicinity of Three Mile Island Nuclear Station, 2009.

Figures

Figure D-1 Monthly Gross Beta Concentrations in Drinking Water Samples Collected From TMINS Location Q9-1Q, 2009.

Figure D-2 Weekly Gross Beta Concentrations in Air Particulate Samples Collected from TMINS Location E1-2Q, 2009.

Appendix E Inter-Laboratory Comparison Program

Tables

Table E-1 Analytics Environmental Radioactivity Cross Check Program Teledyne Brown Engineering, 2009

Table E-2 ERA Environmental Radioactivity Cross Check Program Teledyne Brown Engineering, 2009

Table E-3 DOE's Mixed Analyte Performance Evaluation Program (MAPEP) Teledyne Brown Engineering, 2009

Table E-4 ERA Statistical Summary Proficiency Testing Program Environmental, Inc., 2009

Table E-5 DOE's Mixed Analyte Performance Evaluation Program (MAPEP) Environmental, Inc., 2009

Appendix F Annual Radiological Groundwater Protection Program Report (ARGPPR)

I. Summary and Conclusions

This report on the Radiological Environmental Monitoring Program conducted for the Three Mile Island Nuclear Station (TMINS) by Exelon covers the period 1 January 2009 through 31 December 2009. During that time period, 1,715 analyses were performed on 1,320 samples. In assessing all the data gathered for this report and comparing these results with preoperational data and operational REMP data, it was concluded that the operation of TMINS had no adverse radiological impact on the environment.

Surface, drinking, effluent, and storm water samples were analyzed for concentrations of tritium and gamma emitting nuclides. Surface, drinking, and effluent water samples were also analyzed for concentrations of I-131. Drinking and effluent water samples were also analyzed for concentrations of gross beta. Effluent water samples were also analyzed for concentrations of Sr-89 and Sr-90. All groundwater results are now being reported in the ARGPPR, Appendix F. No Sr-89 and Sr-90 activities were detected. Iodine-131 and gross beta concentrations detected were consistent with those detected in previous years. Tritium activity in one drinking water sample and several monthly effluent water samples was due to TMINS activities or releases. No other fission or activation products potentially attributed to TMI liquid releases were detected.

Fish (predator and bottom feeder) and sediment samples were analyzed for concentrations of gamma emitting nuclides. Fish samples were also analyzed for concentrations of Sr-90. No Sr-90 activity was detected. No fission or activation products were detected in fish samples. Cesuim-137 was detected in sediment samples at very low levels (just above LLD) and are not distinguishable from background levels.

Air particulate samples were analyzed for concentrations of gross beta and gamma emitting nuclides. Cosmogenic Be-7 was detected at levels consistent with those detected in previous years. Cobalt-58, Co-60, Nb-95, and Zr-95 were detected in air particulate samples from a release to the environment in November 2009. No Sr-90 activity was detected. The dose to a member of the public based on this environmental sample result was calculated as 0.02 mrem. No other activation products were detected.

High sensitivity I-131 analyses were performed on weekly air samples. All results were less than the minimum detectable activity.

Cow milk samples were analyzed for concentrations of I-131, gamma emitting nuclides, Sr-89 and Sr-90. No I-131 and Sr-89 activities were detected. Concentrations of naturally occurring K-40 were consistent with those detected in previous years. Sr-90 activities detected were consistent with those detected in previous years and were attributed to fallout from nuclear weapons testing. No other fission or activation products were found.

Food Product samples were analyzed for concentrations of gamma emitting nuclides (including I-131) and Sr-90. Sr-90 activities were detected in both the

indicator and control samples. This was a result of plant uptake of Sr-90 in soil as a result of past nuclear weapons testing. Concentrations of naturally occurring Be-7 and K-40 were consistent with those detected in previous years. No other fission or activation products were detected.

Environmental gamma radiation measurements were performed quarterly using thermoluminescent dosimeters. Levels detected were consistent with those observed in previous years.

In conclusion, radioactive materials related to TMINS operations were detected in environmental samples, but the measured concentrations were low and consistent with measured effluents. The environmental sample results verified that the doses received by the public from TMINS effluents in 2009 were well below applicable dose limits and only a small fraction of the doses received from natural background radiation. Additionally, the results indicated that there was no permanent buildup of radioactive materials in the environment and no increase in background radiation levels.

Therefore, based on the results of the radiological environmental monitoring program (REMP) and the doses calculated from measured effluents, TMINS operations in 2009 did not have any adverse effects on the health of the public or on the environment.

II. Introduction

The Three Mile Island Nuclear Station (TMINS), consisting of two pressurized water reactors (PWR), is located on the northern one-half of Three Mile Island in the Susquehanna River approximately 2.5 miles south of Middletown in Londonderry Township, Dauphin County, Pennsylvania. TMI-1 is owned and operated by Exelon and became operational in 1974. TMI-2 is operated by GPU Nuclear, Inc. and owned by Metropolitan Edison (50%), Pennsylvania Electric (25%) and Jersey Central Power & Light (25%). TMI-2 became operational in 1978 and was shut down following the 1979 accident. At the end of 1993, TMI-2 was placed in a condition called Post-Defueling Monitored Storage. TMI-2 is maintained by Exelon under contract with GPU Nuclear.

A Radiological Environmental Monitoring Program (REMP) for TMINS was initiated in 1974. This report covers those analyses performed by Teledyne Brown Engineering (TBE), Global Dosimetry Solutions, Inc., and Environmental Inc. (Midwest Labs) on samples collected during the period 1 January 2009 through 31 December 2009.

A. Objective of the REMP

The objectives of the REMP are to:

1. Evaluate the relationship between quantities of radioactive material released from the plant and resultant radiation doses to individuals from principal pathways of exposure.

2. Provide data on measurable levels of radiation and radioactive materials in the site environs.

3. To verify inplant controls for the containment of radioactive materials.

4. To determine buildup of long-lived radionuclides in the environment and changes in background radiation levels.

5. To provide reassurance to the public that the program is capable of adequately assessing impacts and identifying noteworthy changes in the radiological status of the environment.

6. To fulfill the requirements of the TMI-1 and TMI-2 Technical Specifications.

B. Implementation of the Objectives

The implementation of the objectives is accomplished by:

1. Identifying significant exposure pathways.

2. Establishing baseline radiological data of media within those pathways.

3. Continuously monitoring those media before and during Station operation to assess Station radiological effects (if any) on man and the environment.

III. Program Description

A. Sample Collection

Samples for the TMINS REMP were collected for Exelon by Normandeau Associates, RMC Environmental Services Division (RMC). This section describes the general collection methods used by RMC to obtain environmental samples for the TMINS REMP in 2009. Sample locations and descriptions can be found in Tables B–1 and B–2, and Figures B–1 through B–3, Appendix B. The collection procedures used by RMC are listed in Table B–3.

Aquatic Environment

The aquatic environment was evaluated by performing radiological analyses on samples of surface water, drinking water, effluent water, storm water, fish, and sediment. Two gallon water samples were collected monthly from continuous samplers located at three surface water locations (A3-2, J1-2 and Q9-1), three drinking water locations (G15-2, G15-3 and Q9-1), and one effluent water location (K1-1). Control locations were A3-2 and Q9-1. Monthly water samples composited quarterly for analysis were taken from one storm water runoff location (EDCB). All groundwater results are now being reported in the ARGPPR, Appendix F. All water samples were collected in unused plastic bottles, which were rinsed at least twice with source water prior to collection. Fish samples comprising the flesh of two groups, bottom feeders and predators, were collected semiannually at an upstream control (BKG) and a downstream Indicator (IND) location. Location IND could be affected by TMINS' effluent releases. Sediment samples composed of recently deposited substrate were collected semiannually at three locations (J2-1, K1-3 and A1-3). In addition, one sediment sample was collected annually

at the EDCB. Location A1-3 was the control.

Atmospheric Environment

The atmospheric environment was evaluated by performing radiological analyses on samples of air particulates, airborne iodine, milk, and food product. Airborne iodine and particulate samples were collected and analyzed weekly at seven locations (A3-1, E1-2, F1-3, G2-1, H3-1, M2-1, and Q15-1). The control location was Q15-1. Airborne iodine and particulate samples were obtained at each location, using a vacuum pump with charcoal and glass fiber filters attached. The pumps were run continuously and sampled air at the rate of approximately one cubic foot per minute. The filters were replaced weekly and sent to the laboratory for analysis.

Milk samples were collected biweekly at six locations (K15-3, D2-1, E2-2, F4-1, G2-1 and P4-1) from March through November, and monthly from December through February. The control location was K15-3. All samples were collected in new unused two gallon plastic bottles from the bulk tank at each location, preserved with sodium bisulfite, and shipped promptly to the laboratory.

Food products were collected monthly at two locations (B10-2 and H1-2), in lieu of milk sampling, and annually from the four food product groups at two locations (E1-2 and B10-2). B10-2 was the control location for both annual and monthly sampling. Five different kinds of vegetation samples and four different kinds of vegetation leaves were collected and placed in new unused plastic bags, and sent to the laboratory for analysis.

Ambient Gamma Radiation

Direct radiation measurements were made using Panasonic 814 calcium sulfate ($CaSO_4$) thermoluminescent dosimeters (TLD). The TLD locations are arranged in generally concentric rings on and around the TMINS site as follows:

A site boundary ring consisting of 19 locations (A1-4, B1-2, C1-2, D1-1, E1-4, F1-2, F1-4, G1-3, G1-5, G1-6, H1-1, J1-3, K1-4, L1-1, M1-1, N1-3, P1-2, Q1-2, and R1-1) near and within the site perimeter representing fence post doses (i.e., at locations where the doses will be potentially greater than maximum annual off–site doses) from TMINS release.

An indicator ring consisting of 60 locations (A3-1, A5-1, A9-3, B1-1, B2-1, B5-1, B10-1, C1-1, C2-1, C5-1, C8-1, D1-2, D2-2, D6-1, E1-2, E2-3, E5-1, E7-1, F1-1, F2-1, F5-1, F10-1, G1-2, G2-4, G5-1, H3-1, H5-1, H8-1, J1-1,

J3-1, J5-1, J7-1 K2-1, K3-1, K5-1, K8-1, L1-2, L2-1, L5-1, L8-1, M1-2, M2-1, M5-1, M9-1, N1-1, N2-1, N5-1, N8-1, P1-1, P2-1, P5-1, P8-1, Q1-1, Q2-1, Q5-1, Q9-1, R1-2, R3-1, R5-1, and R9-1) extending to approximately 10 miles from the site designed to measure possible exposures to close-in population.

The balance of 11 locations (D15-1, F25-1, G10-1, G15-1, H15-1, J15-1, K15-1, L15-1, N15-2, Q15-1, and R15-1) represent control areas.

The specific TLD locations were determined by the following criteria:

1. The presence of relatively dense population;

2. Site meteorological data taking into account distance and elevation for each of the sixteen–22 1/2 degree sectors around the site, where estimated annual dose from TMINS, if any, would be most significant;

3. On hills free from local obstructions and within sight of the vents (where practical);

4. And near the closest dwelling to the vents in the prevailing downwind direction.

Each TLD station consists of two primary program TLD badges, each of which has three $CaSO_4$ thermoluminescent phosphors enclosed in plastic, placed at each location in a frame located approximately three to six feet above ground level. Since each TLD responds to radiation independently, this provides six independent detectors at each station. The TLDs were exchanged quarterly and sent to Global Dosimetry for analysis.

B. Sample Analysis

This section describes the general analytical methods used by TBE and Midwest Labs to analyze the environmental samples for radioactivity for the TMINS REMP in 2009. The analytical procedures used by the laboratories are listed in Table B–3.

In order to achieve the stated objectives, the current program includes the following analyses:

1. Concentrations of beta emitters in drinking and effluent water, and air particulates.

2. Concentrations of gamma emitters in surface, drinking, effluent,

and storm water, air particulates, milk, fish, sediment, and food products.

3. Concentrations of tritium in surface, drinking, effluent, and storm water.

4. Concentrations of I-131 in surface, drinking, and effluent water, air, milk and food products.

5. Concentrations of strontium in effluent water, fish, milk, and food products.

6. Ambient gamma radiation levels at various site environs.

C. Data Interpretation

Data were compared to previous years' operational data for consistency and trending. In addition, comparison to pre-operational data is sometimes made. For the purpose of this report, TMINS was considered operational at initial criticality. Several factors were important in the interpretation of the data:

1. Lower Limit of Detection and Minimum Detectable Concentration

The lower limit of detection (LLD) was defined as the smallest concentration of radioactive material in a sample that would yield a net count (above background) that would be detected with only a 5% probability of falsely concluding that a blank observation represents a "real" signal. The LLD was intended as a before the fact estimate of a system (including instrumentation, procedure and sample type) and not as an after the fact criteria for the presence of activity. All analyses were designed to achieve the required TMINS detection capabilities for environmental sample analysis.

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

2. Net Activity Calculation and Reporting of Results

Net activity for a sample was calculated by subtracting background activity from the sample activity. Since the REMP measures extremely small changes in radioactivity in the environment, background variations may result in sample activity being lower than the background activity effecting a negative number. An MDC

was reported in all cases where positive activity was not detected.

Gamma spectroscopy results for each type of sample were grouped as follows:

For surface, drinking, effluent, storm, and ground water 11 nuclides, Mn-54, Co-58, Fe-59, Co-60, Zn-65, Zr-95, Nb-95, Cs-134, Cs-137, Ba-140 and La-140 were reported.

For fish eight nuclides, K-40, Mn-54, Co-58, Fe-59, Co-60, Zn-65, Cs-134 and Cs-137 were reported.

For sediment six nuclides, K-40, Mn-54, Co-58, Co-60, Cs-134 and Cs-137 were reported.

For air particulate eight nuclides, Be-7, Mn-54, Co-58, Co-60, Nb-95, Zn-95, Cs-134 and Cs-137 were reported.

For milk five nuclides, K-40, Cs-134, Cs-137, Ba-140 and La-140 were reported.

For food products five nuclides, Be-7, K-40, I-131, Cs-134 and Cs-137 were reported.

Means and standard deviations of the results were calculated. The standard deviations represent the variability of measured results for different samples rather than single analysis uncertainty.

D. Program Exceptions

For 2009 the TMINS REMP had a sample recovery rate in excess of 99%. Exceptions are listed below:

<u>AIR</u>

1. On 04/08/09 these air sample stations were found not operating. Sample pumps were replaced, but it was determined to be an AC power problem. On 04/21/09 the samplers were returned to service after the First Energy electricians repaired the main power supply. IR 905491 describes the issue for the following samples:

   04/01/09 – 04/08/09, Locations E1-2, E1-2Q, LLDs not met

   04/08/09 – 04/16/09, Locations E1-2, E1-2Q, No samples due to AC power problems

04/16/09 – 04/21/09, Locations E1-2, E1-2Q, No samples due to AC power problems

2. Slightly lower than expected sample volumes were due to power outages for the following samples:

   08/05/09 – 08/12/09, Locations E1-2, E1-2Q, G2-1, H3-1
   10/07/09 – 10/14/09, Locations E1-2, E1-2Q, G2-1
   12/02/09 – 12/09/09, Location A3-1

3. "Noisy" vacuum pump was replaced for the following sampler:

   10/22/09, Location M2-1

WATER

1. Surface water - During the following weekly sampling periods some of the hourly composite samples were missed due to weather related conditions. IR 870904 describes this issue. Insufficient sample was available for sampling periods so grab samples were required, except as noted, for the following samples.

   12/30/08 – 01/06/09, Location J1-2, all samples missed
   01/06/09 – 01/13/09, Location J1-2, all samples missed
   01/13/08 – 01/20/09, Location J1-2, all samples missed
   01/20/09 – 01/27/09, Location J1-2, all samples missed
   01/27/09 – 02/03/09, Location J1-2, all samples missed
   02/03/09 – 02/10/09, Location A3-2, 22 samples missed, no grab sample required
   02/10/09 – 02/17/09, Location J1-2, 80 samples missed
   02/17/09 – 02/24/09, Location J1-2, 53 samples missed
   02/24/09 – 03/03/09, Location J1-2, 47 samples missed
   03/03/09 – 03/10/09, Location J1-2, 38 samples missed
   03/10/09 – 03/17/09, Location J1-2, 9 samples missed, no grab sample required
   04/15/09 – 04/21/09, Location J1-2, 5 samples missed, no grab sample required
   04/21/09 – 04/28/09, Location J1-2, 9 samples missed, no grab sample required
   10/27/09 – 11/03/09, Location J1-2, 3 samples missed, no grab sample required
   12/01/09 – 12/08/09, Location J1-2, 2 samples missed, no grab sample required
   12/08/09 – 12/15/09, Location J1-2, approximately 50 samples missed, no grab sample required

12/15/09 – 12/21/09, Location J1-2, approximately 75 samples missed
12/21/09 – 12/28/09, Location J1-2, approximately 70 samples missed

2. Surface water - During the sampling periods, the sampler had an error message stating that no sample was collected, but the collection bucket was half full. It was determined that a crimp in the line was causing air to become trapped in the sample stream fooling the liquid detector. The crimp was corrected. The following samples were affected:

   08/11/09 – 08/18/09, Location J2-1
   08/18/09 – 08/25/09, Location J2-1

3. Drinking water - During the weekly sampling periods, numerous samples were missed due to a pump jam error. The ISCO was calibrated and functioning normally. IR 1025964 describes this issue. Sufficient sample was available for sampling periods so no grab samples were required.

   12/09/09 – 12/15/09, Location Q9-1, approximately 60 samples missed

4. Effluent water - During the weekly sampling periods, the sampler liquid detector was malfunctioning and causing a missed sample message. The sampler was replaced. The malfunction affected the following samples:

   08/11/09 – 08/18/09, Location K1-1
   08/18/09 – 08/25/09, Location K1-1

5. Effluent water - During the weekly sampling period, insufficient sample was available for the sampling period so a grab sample was required. The ISCO was re-calibrated and returned to service. IR 1025964 describes this issue.

   12/15/09 – 12/21/09, Location K1-1

6. Effluent water - During the weekly sampling period, a refueling outage caused power interruptions. IR 1025964 describes this issue. Sufficient volume was available, so no grab sample was required for the following sample.

   12/21/09 – 12/28/09, Location K1-1, 13 samples missed

7. Drinking water - Maintenance and construction at the facility caused power interruptions. Sufficient sample was available for sampling

period, so no grab samples were required for the following sample.

09/15/09 – 09/22/09, Location G15-3

TLD

1. Frozen river condition made it unsafe to travel by boat to the TLDs located on the islands west of the plant. Therefore, the TLD stations were not changed out for the 4th quarter 2008. The TLDs were collected in the first quarter of 2009 with a six month exposure period for the following samples:

   10/10/08 – 04/23/09, Location K2-1
   10/10/08 – 04/23/09, Location L1-2
   10/10/08 – 04/23/09, Location M1-2
   10/10/08 – 04/23/09, Location N1-1
   10/10/08 – 04/23/09, Location P1-1
   10/10/08 – 04/23/09, Location Q1-1
   10/10/08 – 04/23/09, Location R1-2

2. During the second quarter sampling period, the TLD badges were found missing during collection. It appears that someone cut the plastic pouches and took the badges. IR 958396 describes this issue for the following sample:

   04/23/09 – 07/18/09, Location F10-1

3. During the fourth quarter sampling period, the 1 of 2 TLD badges were found missing during collection. It appears that someone cut the plastic pouch and took the badge. IR 1025964 describes this issue for the following sample:

   10/19/09 – 01/22/10, Location R15-1

4. Frozen river conditions made it unsafe to travel by boat to the TLDs located on the islands west of the plant. Therefore, the TLDs were not collected with other 4th quarter 2009 TLDs. The TLDs were successfully collected two weeks later when the river thawed. These seven TLD locations and their outer island control have significantly higher exposure levels than the remaining fourth quarter TLDs. This exposure is not related to TMI, but had to occur in transit to the vendor analysis lab because the control is kept in a shielded pig except for traveling to collect the badges and shipping to the vendor. In addition, other TLDs in the same sectors as these badges were located closer to the plant and received lower exposures more typical of historical

averages. The data from these badges is not considered valid and will not be included in this report. IR 1025964 describes this issue for the following samples:

10/19/09 – 01/22/10, Location K2-1
10/19/09 – 01/22/10, Location L1-2
10/19/09 – 01/22/10, Location M1-2
10/19/09 – 01/22/10, Location N1-1
10/19/09 – 01/22/10, Location P1-1
10/19/09 – 01/22/10, Location Q1-1
10/19/09 – 01/22/10, Location R1-2

Each program exception was reviewed to understand the causes of the program exception. Sampling and maintenance errors were reviewed with the personnel involved to prevent recurrence. Occasional equipment breakdowns and power outages were unavoidable.

The overall sample recovery rate indicates that the appropriate procedures and equipment are in place to assure reliable program implementation.

E. Program Changes

The D2-1 farm sold their milk herd in November. A new milk farm, P4-1, was added to the REMP. IR 976028 describes this change.

IV. Results and Discussion

A. Aquatic Environment

1. Surface Water

Samples were taken weekly from a continuous sampler at three locations (A3-2, J1-2, and Q9-1) and composited on a monthly schedule. Of these locations only J1-2 located downstream, could be affected by TMINS' effluent releases. The following analyses were performed.

<u>Tritium</u>

Monthly samples from J1-2 and Q9-1 were analyzed for tritium activity (Table C–I.1, Appendix C). Positive tritium activity was detected in eight of 12 samples at location J1-2 which is located immediately downstream of the TMINS effluent outfall. The

concentrations ranged from 227 to 9,250 pCi/l. The increased tritium concentrations detected were a result of TMINS releasing radwaste treatment system effluent water under permitted discharges in accordance with NRC regulations. The indicator surface water sample is taken just downstream of the liquid discharge outfall where mixing of liquid effluents with the river water is incomplete. More complete mixing is not achieved until liquid effluents pass over the York Haven Dam. This water is normally not consumed by humans. The concentrations detected were well below any regulatory limits. (Figures C–1 and C–2, Appendix C).

Iodine

Monthly samples from location A3-2 were analyzed for I-131 activity (Table C–I.2, Appendix C). This is a control or background station sampled because known medical discharges of radiopharmaceuticals occur into the surface water upstream of TMI from a nearby hospital. Iodine-131 was detected in two of 12 samples. The concentration ranged from 1.4 to 1.8 pCi/l.

Gamma Spectrometry

Samples from all locations were analyzed for gamma emitting nuclides (Table C–I.3, Appendix C). All nuclides were less than the MDC.

2. Drinking Water

Monthly samples were collected from continuous water samplers at three locations (G15-2, G15-3, and Q9-1). Two locations (G15-2 and G15-3) could be affected by TMINS' effluent releases. The following analyses were performed:

Gross Beta

Monthly samples from all locations were analyzed for concentrations of gross beta. (Tables C–II.1, Appendix C). Gross beta activity was detected in 20 of 36 samples. The concentrations ranged from 2.0 to 5.5 pCi/l. Concentrations detected were consistent with those detected in previous years (Figures C–3, Appendix C).

Iodine

Monthly samples from all locations were analyzed for

concentrations of iodine (Tables C–II.2, Appendix C). Iodine activity was not detected in any samples.

Tritium

Monthly samples from all locations were analyzed for tritium activity (Table C–II.3, Appendix C). Tritium was detected in one sample at a concentration of 448 pCi/l (Figures C–4, Appendix C). The dose to a member of the public based on this environmental sample result was calculated as 0.0053 mrem.

Exelon specified that its laboratories achieve a lower limit of detection 10 times lower than that required by federal regulation.

Gamma Spectrometry

Samples from all locations were analyzed for gamma emitting nuclides (Table C–II.4, Appendix C). All nuclides were less than the MDC.

3. Effluent Water

Monthly samples were collected from a continuous water sampler at one location (K1-1). The following analyses were performed:

Gross Beta

Monthly samples from location K1-1 were analyzed for concentrations of gross beta. (Tables C–III.1, Appendix C). Gross beta was detected in eleven of 12 samples. The concentrations ranged from 3.1 to 6.1 pCi/l. Concentrations detected were consistent with those detected in previous years.

Iodine-131

Monthly samples from location K1-1 were analyzed for concentrations of I-131. (Tables C–III.1, Appendix C). Iodine-131 was not detected. Historically, I-131 has been detected sporadically in effluent water and not in the control stations. No I-131 was identified in any tank effluent pre-release samples, and I-131 was not detected in any other downstream surface or drinking water samples. Effluent water is not consumed by humans.

Tritium

Monthly samples from location K1-1 were analyzed for tritium activity (Table C–III.1, Appendix C). Tritium activity was detected in eight of 12 samples. The concentrations ranged from 2,970 to 101,000 pCi/l. The elevated results were a result of TMI releasing radwaste treatment system effluent water under permitted discharges in accordance with NRC regulations. These results were from the liquid discharge mixing basin. The concentrations detected agree with those obtained from the TMINS Effluent Monitoring Program. The concentrations were well below any regulatory limits.

Strontium

Semiannual samples from location K1-1 were analyzed for Sr-89 and Sr-90 (Table C–III.1, Appendix C). No strontium activity was detected. The highest MDC was calculated at 2.2 pCi/l for Sr-89 and at 0.5 pCi/l for Sr-90.

Gamma Spectrometry

Samples from location K1-1 were analyzed for gamma emitting nuclides (Table C–III.2, Appendix C). All nuclides were less than the MDC.

4. Storm Water

Monthly grabs from the storm water collection basin (EDCB) were composited quarterly. The following analyses were performed:

Tritium

All samples from location EDCB were analyzed for tritium activity (Table C–IV.1, Appendix C). Tritium activity was not detected.

Gamma Spectrometry

Samples from location EDCB were analyzed for gamma emitting nuclides (Table C–IV.1, Appendix C). All nuclides were less than the MDC.

5. Ground Water

During 2006, Exelon initiated a fleetwide Environmental

Assessment program. Comprehensive groundwater studies and reports were developed. As a result of this assessment and the NEI initiative on groundwater protection, TMI developed a new Radiological Groundwater Protection Program (RGPP) that was implemented by the end of the year. For 2009, this more comprehensive groundwater program replaced TMI's previous groundwater monitoring program. The results from these special investigations and studies are discussed in Appendix F.

6. Fish

Fish samples comprised of bottom feeders and predators were collected at two locations (IND and BKG) semiannually. Location IND could be affected by TMINS' effluent releases. The following analyses were performed:

Strontium

The edible portions of fish samples from both locations were analyzed for Sr-90. (Table C–V.1, Appendix C). No strontium activity was detected. The highest MDC was calculated at <5 pCi/kg wet for Sr-90.

Gamma Spectrometry

The edible portions of fish samples from both locations were analyzed for gamma emitting nuclides (Table C–V.2, Appendix C). Naturally occurring K-40 was found at all stations and ranged from 2,090 to 3,300 pCi/kg wet and was consistent with levels detected in previous years. No fission or activation products were found.

7. Sediment

Aquatic sediment samples were collected at three locations (A1-3, J2-1 and K1-3) semiannually. In addition, location EDCB was sampled annually. Of these locations two (J2-1 and K1-3) could be affected by TMINS' effluent releases. The following analysis was performed:

Gamma Spectrometry

Sediment samples from all four locations were analyzed for gamma emitting nuclides (Table C–VI.1, Appendix C). Potassium-40 was found at all stations and ranged from 9,960 to 17,600 pCi/kg dry. Cesuim-137 was detected in sediment samples at very low levels

(just above LLD) and are not distinguishable from background levels. No other fisson or activation products were found.

B. Atmospheric Environment

1. Airborne Particulates

a. Air Particulates

Continuous air particulate samples were collected from seven locations on a weekly basis. Six locations (E1-2, F1-3, G2-1, A3-1, M2-1 and H3-1) were indicator stations located in the highest D/Q sectors and the nearest communities to TMI. One sample (Q15-1) represents the control location at a remote distance from TMINS. The following analyses were performed:

Gross Beta

Weekly samples were analyzed for concentrations of beta emitters (Table C–VII.1 and C–VII.2, Appendix C).

Detectable gross beta activity was observed at all locations. Comparison of results aid in determining the effects, if any, resulting from the operation of TMINS. The results from the closest to the site boundary locations (Group I) ranged from 8 to 30 E–3 pCi/m^3 with a mean of 17 E–3 pCi/m^3. The results from the intermediate offsite locations (Group II) ranged from 8 to 204 E–3 pCi/m^3 with a mean of 18 E–3 pCi/m^3. The results from the Control location (Group III) ranged from 9 to 28 E–3 pCi/m^3 with a mean of 18 E–3 pCi/m^3. Comparison of the 2009 air particulate data with previous years data indicate no effects from the operation of TMINS (Figure C–6, Appendix C). In addition a comparison of the weekly mean values for 2009 indicate no notable differences between indicator and control stations except for the sample period 11/18/09-11/24/09. The higher activity during this time is related to a release from TMI's temporary containment opening. The dose to a member of the public based on this environmental sample result was calculated to be 0.02 mrem. (Figure C–7, Appendix C).

Gamma Spectrometry

Weekly samples were composited quarterly and analyzed

for gamma emitting nuclides (Table C–VII.3, Appendix C). Naturally occurring Be-7 due to cosmic ray activity was detected in all 28 samples. These concentrations ranged from 56 to 125 E–3 pCi/m^3. Fourth quarter composite for G2-1 and F1-3 did not include the sample period 11/18/09-11/24/09 because an individual gamma scan was performed on these samples and the filter was needed for Sr-90 analysis. All other nuclides were less than the MDC.

Strontium

Samples collected during the time period of 11/18/09 – 11/24/09 were analyzed for concentrations of Sr-90. No Sr-90 was detected in any of the samples (Table C–VII.4, Appendix C).

b. Airborne Iodine

Continuous air samples were collected from seven (A3-1, E1-2, F1-3, G2-1, H3-1, M2-1, and Q15-1) locations and analyzed weekly for I-131 (Table C–VIII.1, Appendix C). All results were less than the MDC.

2. Terrestrial

a. Milk

Samples were collected from six locations (K15-3, D2-1, E2-2, F4-1 G2-1 and P4-1) biweekly March through November and monthly December through February. The following analyses were performed:

Iodine–131

Milk samples from all locations were analyzed for concentrations of I-131 (Table C–IX.1, Appendix C). All results were less than the MDC.

Strontium

Milk samples from all locations were composited quarterly and analyzed for Sr-89 and Sr-90 (Table C–IX.2, Appendix C). No Sr-89 activity was detected. Strontium-90 activity was detected in 10 of 21 samples. The concentrations ranged from 0.5 to 1.2 pCi/l. The activity detected was

consistent with those detected in the pre–operational years (Figure C–8, Appendix C).

Gamma Spectrometry

Milk samples from all locations were analyzed for concentrations of gamma emitting nuclides (Table C–IX.3, Appendix C).

Naturally occurring K-40 activity was found in all samples. The concentrations ranged from 915 to 1,440 pCi/l. All other nuclides were less than the MDC.

b. Food Products

Samples were collected from two locations (B10-2 and H1-2) monthly, in lieu of milk sampling. Samples from the four food product groups were collected from two locations (B10-2 and E1-2) annually. The following analyses were performed:

Strontium

Twenty of 26 food product sample was analyzed for concentrations of Sr-90 (Table C–X.1, Appendix C). Strontium-90 activity was detected in 18 of 20 samples. The concentrations ranged from 2 to 49 pCi/kg wet.

Gamma Spectrometry

Each food product sample was analyzed for concentrations of gamma emitting nuclides (Table C–X.1, Appendix C). Naturally occurring Be-7 due to cosmic ray activity was detected in 11 of 26 samples. These concentrations ranged from 200 to 1,690 pCi/l. Naturally occurring K-40 activity was found in all samples. The concentrations ranged from 1,990 to 5,650 pCi/l. All other nuclides were less than the MDC.

C. Ambient Gamma Radiation

Ambient gamma radiation levels were measured utilizing Panasonic 814 ($CaSO_4$) thermoluminescent dosimeters. Ninety TLD locations were established around the site. Results of TLD measurements are listed in Tables C–XI.1 to C–XI.3, Appendix C.

All of the TLD measurements were below 10 mR/standard month, with a range of 2.7 to 7.7 mR/standard month. A comparison of the Site Boundary and Indicator data to the Control Location data, indicate that the ambient gamma radiation levels from the Control Locations D15-1, F25-1, G10-1, G15-1, H15-1, J15-1, K15-1, L15-1, N15-2, Q15-1, and R15-1 were consistently higher. The historical ambient gamma radiation data from Locations D15-1, F25-1, G10-1, G15-1, H15-1, J15-1, K15-1, L15-1, N15-2, Q15-1, and R15-1 were plotted along with similar data from the Site, Indicator and Control Ring Locations (Figure C–9, Appendix C). Locations D15-1, F25-1, G10-1, G15-1, H15-1, J15-1, K15-1, L15-1, N15-2, Q15-1, and R15-1 have a historical high bias, but tracked with the data from all three groups, this bias is most likely due to radon and other naturally occurring nuclides, e.g. K-40, emanating from the ground.

D. Land Use Survey

A Land Use Survey conducted in the September, October and November 2009 growing season around the Three Mile Island Nuclear Station (TMINS) was performed by Normandeau Associates, RMC Environmental Services Division for Exelon to comply with Sections 2.15 and 3.4.2 of the Plant's Offsite Dose Calculation Manual (ODCM). The purpose of the survey was to document the nearest resident, milk-producing animal and garden of greater than 500 ft2 in each of the sixteen 22 ½ degree sectors around the site. There were no changes required to the TMINS REMP, as a result of this survey. Six gardens from the 2008 census were not established (or were not the closest) in 2009. As such, six new gardens were identified and included in the 2009 land use census. The locations where new gardens were identified include sectors B (NNE), C (NE), D (ENE), G (SE), N (W) and Q (NW). The results of this survey are summarized below.

Distance in Miles from the TMINS Reactor Buildings				
Sector		Residence Miles	Garden Miles	Milk Farm Miles
1	N	1.1	1.6	2.1
2	NNE	0.7	0.9	-
3	NE	0.5	1.5	4.1
4	ENE	0.5	0.5	1.1
5	E	0.4	0.5	1.1
6	ESE	1.1	1.2	3.2
7	SE	0.7	1.0	1.4
8	SSE	0.7	0.8	-
9	S	2.3	2.7	-
10	SSW	0.6	2.5	4.9, 14.5
11	SW	0.5	0.6	
12	WSW	0.5	1.3	-
13	W	0.7	1.3	-
14	WNW	0.4	2.2	3.7
15	NW	0.4	1.2	-
16	NNW	1.1	2.4	-

E. Radiological Impact of TMINS Operations

An assessment of potential radiological impact indicated that radiation doses to the public from 2009 operations at TMINS were well below all applicable regulatory limits and were significantly less than doses received from natural sources of radiation. The 2009 whole body dose potentially received by an assumed maximum exposed individual from TMI-1 and TMI-2 liquid and airborne effluents was conservatively calculated to be 0.085 mrem. This dose is equivalent to <0.03% of the dose that an individual living in the TMI area receives each year from natural background radiation.

1. Determination of Radiation Doses to the Public

Dose assessments can be performed by using either effluent data and an environmental transport model or environmental sample data. To the extent possible, doses to the public are based on the direct measurement of dose rates from external sources and the measurement of radionuclide concentrations in environmental media which may contribute to an internal dose of radiation. Thermoluminescent dosimeters (TLDs) positioned in the environment around TMINS provide measurements to determine external radiation doses to humans. Samples of air, water and food products are used to determine internal doses.

The quantity of radioactive materials released during normal

operations are typically too small to be measured once distributed in the offsite environment. Therefore, the potential offsite doses are more effectively calculated for TMINS operations using a computerized model that predicts concentrations of radioactive materials in the environment and subsequent radiation doses based on measured effluents.

Doses are calculated using an advanced "class A" dispersion model. This model incorporates the guidelines and methodology set forth by the USNRC in Regulatory Guide 1.109. Due to the conservative assumptions that are used in the model, the calculated doses are generally higher than the doses based on actual environmental sample concentrations.

Therefore, the model predicts doses that are higher than actual doses received by people. The type and amount of radioactivity released from TMINS is calculated using measurements from effluent sample analyses. Once released, the dispersion of radionuclides in the environment is readily determined by computer modeling.

Airborne releases are diluted and carried away from the site by atmospheric diffusion, which continuously acts to disperse radioactivity. Variables that affect atmospheric dispersion include wind speed, temperature at different elevations, terrain, and shift in wind direction. A weather station on the north end of TMI is linked to a data logger that records the meteorological data.

Computer models also are used to predict the downstream dilution and travel times for liquid releases into the Susquehanna River. Actual monthly Susquehanna River flows are obtained from the York Haven Hydroelectric Station.

The human exposure pathways also are included in the model and are depicted in Figure 1. The exposure pathways that are considered for the discharge of TMINS liquid effluents are consumption of drinking water and fish, and shoreline exposure. The exposure pathways considered for the discharge of TMINS airborne effluents are plume exposure, inhalation, cow milk consumption, goat milk consumption, fruit and vegetable consumption, meat consumption and land deposition.

Numerous data files are used in the calculations that describe the area around TMI in terms of population distribution and foodstuffs production. Data files include such information as the distance from

the plant stack to the site boundary in each sector, the population groupings, milk cows, milk goats, gardens of more than 500 square feet, meat animals, downstream drinking water users, and crop yields.

When determining the dose to humans, it is necessary to consider all applicable pathways and all exposed tissues, summing the dose from each to provide the total dose for each organ as well as the whole body from a given radionuclide. Dose calculations involve determining the energy absorbed per unit mass in the various tissues. Thus, for radionuclides taken into the body, the metabolism of the radionuclide in the body must be known along with the physical characteristics of the nuclide such as energies, types of radiations emitted and half-life. The dose assessment model also contains dose conversion factors for the radionuclides for each of four age groups (adults, teenagers, children and infants) and eight organs (total body, thyroid, liver, skin, kidney, lung, bone and GI tract).

Doses are calculated for what is termed the "maximum hypothetical individual". This individual is assumed to be affected by the combined maximum environmental concentrations wherever they occur.

For liquid releases, the maximum hypothetical individual would consume 193 gallons of Susquehanna River water per year from the first downstream drinking water supplier, eat 46 pounds of fish each year that reside in the plant discharge area and stand 67 hours per year on the shoreline influenced by the plant discharge.
For airborne releases, the maximum hypothetical individual would live at the location of highest radionuclide concentration for inhalation and direct plume exposure. Additionally, this individual each year would consume 106 gallons of cow milk, 141 pounds of leafy vegetables, 1389 pounds of non-leafy vegetables and fruits and 243 pounds of meat produced at the locations with the highest predicted radionuclide concentrations. Consumption of goat milk is not included, since this exposure pathway does not currently exist.

2. Result of Dose Calculations

The maximum hypothetical doses due to 2009 TMI-1 and TMI-2 liquid and airborne effluents are summarized in Tables 1 and 2. Table 1 compares the calculated maximum hypothetical individual doses to the USNRC 10 CFR 50 App. I guidelines. This table also compares the calculated doses (to an individual of the public) from

effluents and direct radiation to USEPA 40 CFR 190 dose limits.

Table 2 presents the maximum hypothetical whole body doses to an individual.

As shown in Table 1, the doses calculated for 2009 operations at TMINS were well below the Federal dose limits (USEPA 40 CFR 190) and the guidelines of USNRC 10 CFR 50 App. I. This conclusion was supported by radionuclide concentrations detected in actual environmental samples.

Doses from natural background radiation provide a baseline for assessing the potential public health significance of radioactive effluents. Natural background radiation from cosmic, terrestrial and natural radionuclides in the human body (not including radon), averages about 100 mrem/yr (Ref. 5). Additionally, the average individual living in the United States receives an annual dose of about 2,400 mrem to the lung from natural radon gas. This lung dose is considered to be equivalent to a whole (or total) body dose of 200 mrem (Ref. 5). Therefore, the average person in the United States receives a whole body dose of about 300 mrem/yr from natural background radiation sources.

As shown on Table 2, the maximum hypothetical whole body dose received by an individual from 2009 TMI-1 and TMI-2 liquid and airborne effluents combined was conservatively calculated to be 0.085 mrem. This dose is equivalent to <0.03% percent of the dose that an individual living in the TMI area receives each year from natural background radiation (300 mrem).
The low doses calculated for 2009 TMINS operations were the result of efforts to maintain releases "as low as reasonably achievable" (ALARA).

In conclusion, radioactive materials related to TMINS operations were detected in environmental samples, but the measured concentrations were low and consistent with measured effluents. The environmental sample results verified that the doses received by the public from TMINS effluents in 2009 were well below applicable dose limits and only a small fraction of the doses received from natural background radiation. Additionally, the results indicated that there was no permanent buildup of radioactive materials in the environment and no increase in background radiation levels.

Therefore, based on the results of the radiological environmental

monitoring program (REMP) and the doses calculated from measured effluents, TMINS operations in 2009 did not have any adverse effects on the health of the public or on the environment.

TABLE 1

Calculated Maximum Hypothetical Doses to an Individual from 2009 TMI-1 and TMI-2 Liquid and Airborne Effluents

	Maximum Hypothetical Doses To An Individual		
	USNRC 10 CFR 50 APP. I Guidelines (mrem/yr)	Calculated Dose (mrem/yr) TMI-1	TMI-2
From Radionuclides In Liquid Releases	3 total body, or	2.77E-2	3.28E-4
	10 any organ	2.86E-2	5.22E-4
From Radionuclides In Airborne Releases (Noble Gases)	5 total body, or	2.98E-5	0*
	15 skin	7.07E-5	0*
From Radionuclides In Airborne Releases (Iodines, Tritium and Particulates)	15 any organ	5.59E-2	4.38E-5

*No noble gases were released from TMI-2.

	USEPA 40 CFR 190 Limits (mrem/yr)	Calculated Dose (mrem/yr) TMI-1 and TMI-2 Combined**
Total from Site	75 thyroid	0.43
	25 total body or other organs	0.46

* *This sums together TMI-1 and TMI-2 maximum doses regardless of age group for different pathways. The combined doses include those due to radioactive effluents and direct radiation from TMINS. The direct radiation dose is calculated from environmental TLD data. For this calculation, exposure is assumed to be equal to dose.

The direct radiation dose from 2009 TMINS operations was 0.37 mrem. This dose was based on a maximum net fence-line exposure rate of 6.8 mR/std month and a shoreline/fence-line occupancy factor of 67 hours (Regulatory Guide 1.109). The combination of the maximum organ dose from TMI-1 and TMI-2 effluents (0.085 mrem) and the dose from direct radiation (0.37 mrem) yielded a maximum hypothetical dose of 0.46 mrem.

TABLE 2

Calculated Whole Body Doses to the Maximum Individual From 2009 TMI-1 and TMI-2 Liquid and Airborne Effluents

	Calculated Maximum Individual Whole Body Dose (mrem/yr)	
	TMI-1	**TMI-2**
From Radionuclides In Liquid Releases	2.77E-2	3.28E-4
From Radionuclides in Airborne Releases (Noble Gases)	2.98E-5	0*
From Radionuclides In Airborne Releases (Iodines, Tritium and Particulates)	5.59E-2	4.38E-5

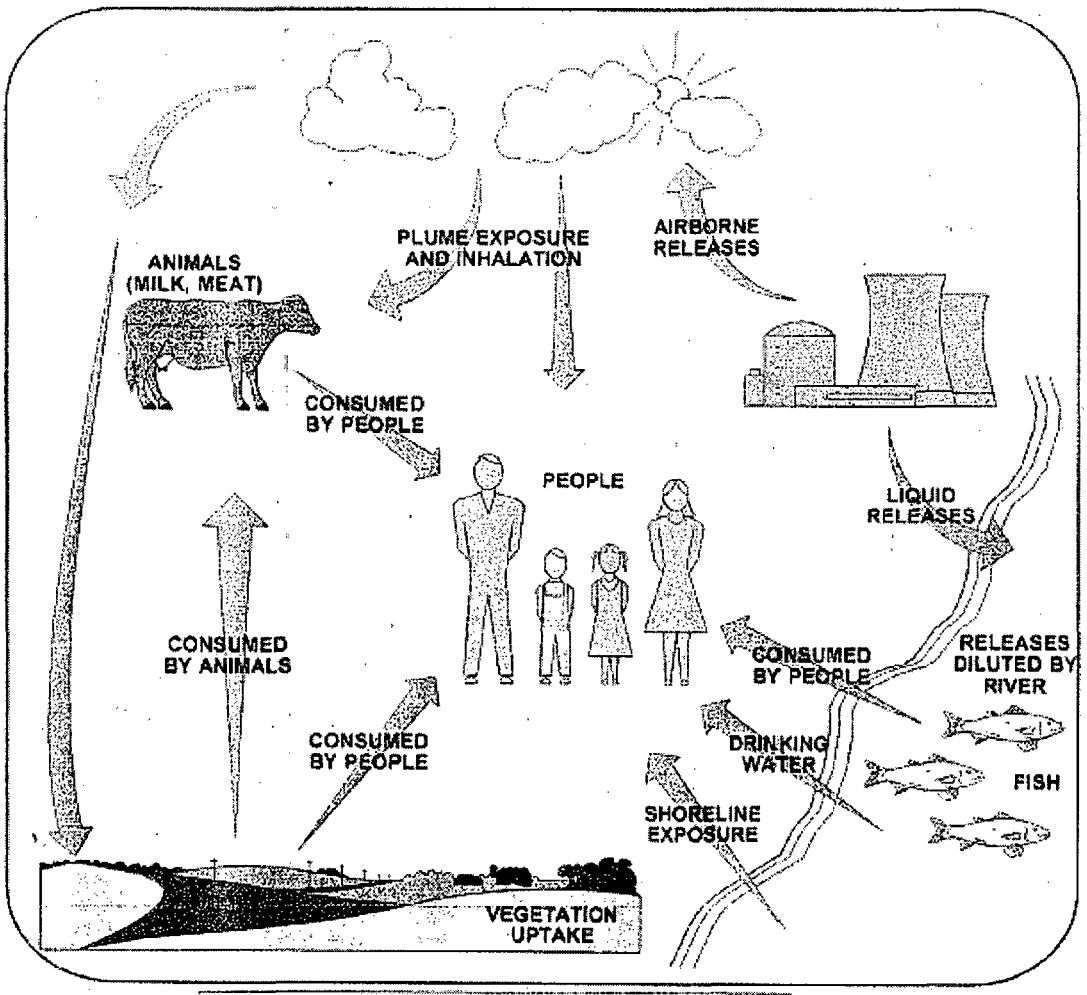
*No noble gases were released from TMI-2.

Individual Whole Body Dose Due to TMI-1 and TMI-2 Operations: **0.085 mrem/yr**

Individual Whole Body Dose Due to Natural Background Radiation **300 mrem/yr**

Figure 1

Exposure Pathways For Radionuclides Routinely Released From TMINS



PREDOMINANT RADIONUCLIDES

NOBLE GASES (Xe,Kr)
Plume exposure

RADIOIODINES (I-131, I-133)
Inhalation and consumption of milk, water, fruits, and vegetables

RADIOSTRONTIUMS (Sr-89, Sr-90)
Consumption of milk, meat, fruits, and vegetables

ACTIVATION PRODUCTS (Co-60, Mn-54)
Shoreline exposure

RADIOCESIUMS (Cs-134, Cs-137)
Shoreline exposure and consumption of milk, meat, fish, water, fruits, and vegetables

TRITIUM (H-3)
Inhalation and consumption of water, milk, fruits, and vegetables

F. Summary of Results – Inter-Laboratory Comparison Program

The primary and secondary laboratories analyzed Performance Evaluation (PE) samples of air particulate, air iodine, milk, soil, vegetation and water matrices (Appendix E). The PE samples, supplied by Analytics Inc., Environmental Resource Associates (ERA) and DOE's MAPEP, were evaluated against the following pre-set acceptance criteria:

1. Analytics Evaluation Criteria

   Analytics' evaluation report provides a ratio of TBE's result and Analytics' known value. Since flag values are not assigned by Analytics, TBE-ES evaluates the reported ratios based on internal QC requirements, which are based on the DOE MAPEP criteria.

2. ERA Evaluation Criteria

   ERA's evaluation report provides an acceptance range for control and warning limits with associated flag values. ERA's acceptance limits are established per the USEPA, NELAC, state specific PT program requirements or ERA's SOP for the Generation of Performance Acceptance Limits, as applicable. The acceptance limits are either determined by a regression equation specific to each analyte or a fixed percentage limit promulgated under the appropriate regulatory document.

3. DOE Evaluation Criteria

   MAPEP's evaluation report provides an acceptance range with associated flag values.

   The MAPEP defines three levels of performance: Acceptable (flag = "A"), Acceptable with Warning (flag = "W"), and Not Acceptable (flag = "N"). Performance is considered acceptable when a mean result for the specified analyte is ± 20% of the reference value. Performance is acceptable with warning when a mean result falls in the range from ±20% to ±30% of the reference value (i.e., 20% < bias < 30%). If the bias is greater than 30%, the results are deemed not acceptable.

1. For the primary laboratory, 17 out of 18 analytes met the specified acceptance criteria. One sample did not meet the specified acceptance criteria for the following reason:

1. Teledyne Brown Engineering's Analytics June 2009 Zn-65 in AP result of 137 pCi/L was higher than the known value of 101 pCi/L, resulting in a found to known ratio of 1.36. NCR 09-23 was initiated to investigate this failure. The failure appears to be a result of a slightly high bias on Detector 7. A recount on Detector 17 resulted in a Zn-65 result of 101 pCi/L. The detector has been tagged out-of-service until a recalibration can be performed. Detector 7 is not used for client samples.

For the secondary laboratory, Environmental, Inc., 11 out of 14 analytes met the specified acceptance criteria. Three samples did not meet the specified criteria for the following reasons:

1. Environmental Inc.'s ERA April 2009 Cs-137 in water result of 147.7 pCi/L exceeded the lower control limit of 151.0 pCi/L. All gamma emitters showed a low bias. A large plastic burr found on the base of the Marinelli kept the beaker from sitting directly on the detector. Recounting in a different beaker gave an acceptable result of 155.33 ± 14.55 pCi/L.
2. Environmental Inc.'s ERA April 2009 H-3 in water result of 22819 pCi/L exceeded the upper control limit of 22300 pCi/L. A recount of the original vials averaged 23,009 pCi/L. Reanalysis results were acceptable at 19,170 pCi/L. No cause could be found for the failure.
3. Environmental Inc.'s MAPEP January 2009 Sr-90 in AP result of 0.93 exceeded the upper control limit of 0.83. Reanalysis results were acceptable at 0.54 ± 0.12 Bq/filter. No cause could be found for the failure.
4. Environmental Inc.'s MAPEP July 2009 Sr-90 in soil result of 310.5 Bq/kg exceeded the lower control limit of 319 Bq/kg. Reanalysis results were acceptable at 363.3 Bq/kg. Incomplete separation of strontium from calcium could result in a higher recovery percentage and consequently lower reported activity.

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

V. References

1. Three Mile Island Nuclear Station, Unit 1, Technical Specifications, DPR 50.

2. Three Mile Island Nuclear Station, Unit 2, PDMS Technical Specifications, DPR 73.

3. Radiation Management Corporation. "Three Mile Island Nuclear Station, Preoperational Radiological Environmental Monitoring Program, January 1, 1974 - June5, 1974." RMC-TR-75-17, January 1975.

4. Exelon. "Three Mile Island Nuclear Station Offsite Dose Calculation Manual (ODCM)."

5. National Council of Radiation Protection and Measurements Report No. 93. "Ionizing Radiation Exposure of the Population of the United States." 1987.

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APPENDIX A

RADIOLOGICAL ENVIRONMENTAL MONITORING REPORT SUMMARY

TABLE A-1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY FOR THE THREE MILE ISLAND NUCLEAR STATION, 2009

Name of Facility: THREE MILE ISLAND NUCLEAR STATION **DOCKET NUMBER: 50-289 & 50-320**
Location of Facility: MIDDLETOWN COUNTY PA **REPORTING PERIOD: 2009**

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPES OF ANALYSIS PERFORMED	NUMBER OF ANALYSIS PERFORMED	REQUIRED LOWER LIMIT OF DETECTION (LLD)	INDICATOR LOCATIONS MEAN (M) (F) RANGE	CONTROL LOCATION MEAN (M) (F) RANGE	LOCATION WITH HIGHEST ANNUAL MEAN (M) MEAN (M) (F) RANGE	STATION # NAME DISTANCE AND DIRECTION	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
SURFACE WATER (PCI/LITER)	H-3	24	2000	3271 (8/12) (227/9250)	<LLD	3271 (8/12) (227/9250)	TM-SW-J1-2 INDICATOR WEST SHORE; TMI 0.5 MILES S OF SITE	0
	I-131	12	1	NA	1.6 (2/12) (1.4/1.8)	1.6 (2/12) (1.4/1.8)	TM-SW-A3-2 CONTROL SWATARA CREEK 2.5 MILES N OF SITE	0
	GAMMA	24						
	MN-54		15	<LLD	<LLD	-		0
	CO-58		15	<LLD	<LLD	-		0
	FE-59		30	<LLD	<LLD	-		0
	CO-60		15	<LLD	<LLD	-		0
	ZN-65		30	<LLD	<LLD	-		0

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SURFACE WATER (PCI/LITER)	NB-95		15	<LLD	<LLD	-		0
	ZR-95		30	<LLD	<LLD	-		0
	CS-134		15	<LLD	<LLD	-		0
	CS-137		18	<LLD	<LLD	-		0
	BA-140		60	<LLD	<LLD	-		0
	LA-140		15	<LLD	<LLD	-		0
DRINKING WATER (PCI/LITER)	GR-B	36	4	3.3 (14/24) (2.6/4.2)	2.9 (6/12) (2.0/5.5)	3.3 (9/12) (2.6/4.2)	TM-DW-G15-2 INDICATOR WRIGHTS WATER SUPPLY 13.6 MILES SE OF SITE	0
	I-131	36	1	<LLD	<LLD	-		0

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DRINKING WATER (PCI/LITER)	H-3	36	2000	448 (1/24)	<LLD	448 (1/12)	TM-DW-G15-3 INDICATOR LANCASTER WATER AUTHORITY 14.8 MILES SE OF SITE	0
	GAMMA	36						
	MN-54		15	<LLD	<LLD	-		0
	CO-58		15	<LLD	<LLD	-		0
	FE-59		30	<LLD	<LLD	-		0
	CO-60		15	<LLD	<LLD	-		0
	ZN-65		30	<LLD	<LLD	-		0
	NB-95		15	<LLD	<LLD	-		0

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DRINKING WATER (PCI/LITER)	ZR-95		30	<LLD	<LLD	-		0
	CS-134		15	<LLD	<LLD	-		0
	CS-137		18	<LLD	<LLD	-		0
	BA-140		60	<LLD	<LLD	-		0
	LA-140		15	<LLD	<LLD	-		0
EFFLUENT WATER (PCI/LITER)	GR-B	12	4	4.6 (11/12) (3.1/6.1)	NA	4.6 (11/12) (3.1/6.1)	TM-EW-K1-1 INDICATOR MAIN STATION LIQ. DISCHARGE ONSITE	0
	I-131	12	1	<LLD	NA	-		0

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EFFLUENT WATER (PCI/LITER)	H-3	12	2000	33789 (8/12) (2970/101000)	NA	33789 (8/12) (2970/101000)	TM-EW-K1-1 INDICATOR MAIN STATION LIQ. DISCHARGE ONSITE	0
	SR-89	2	5	<LLD	NA	-		0
	SR-90	2	2	<LLD	NA	-		0
	GAMMA	12						
	MN-54		15	<LLD	NA	-		0
	CO-58		15	<LLD	NA	-		0
	FE-59		30	<LLD	NA	-		0
	CO-60		15	<LLD	NA	-		0

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EFFLUENT WATER (PCI/LITER)	ZN-65		30	<LLD	NA	-		0
	NB-95		15	<LLD	NA	-		0
	ZR-95		30	<LLD	NA	-		0
	CS-134		15	<LLD	NA	-		0
	CS-137		18	<LLD	NA	-		0
	BA-140		60	<LLD	NA	-		0
	LA-140		15	<LLD	NA	-		0
STORM WATER (PCI/LITER)	H-3	4	200	<LLD	NA	-		0

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STORM WATER (PCI/LITER)	GAMMA	4						
	MN-54		15	<LLD	NA	-		0
	CO-58		15	<LLD	NA	-		0
	FE-59		30	<LLD	NA	-		0
	CO-60		15	<LLD	NA	-		0
	ZN-65		30	<LLD	NA	-		0
	NB-95		15	<LLD	NA	-		0
	ZR-95		30	<LLD	NA	-		0

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STORM WATER (PCI/LITER)	CS-134		15	<LLD	NA	-		0
	CS-137		18	<LLD	NA	-		0
	BA-140		60	<LLD	NA	-		0
	LA-140		15	<LLD	NA	-		0
BOTTOM FEEDER (PCI/KG WET)	SR-90	4	10	<LLD	<LLD	-		0
	GAMMA K-40	4	NA	3170 (2/2) (3120/3220)	2775 (2/2) (2730/2820)	3170 (2/2) (3120/3220)	INDB INDICATOR YORK HAVEN DAM DOWNSTREAM OF DISCHARGE	0
	MN-54		130	<LLD	<LLD	-		0

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BOTTOM FEEDER (PCI/KG WET)	CO-58		130	<LLD	<LLD	-		0
	FE-59		260	<LLD	<LLD	-		0
	CO-60		130	<LLD	<LLD	-		0
	ZN-65		260	<LLD	<LLD	-		0
	CS-134		130	<LLD	<LLD	-		0
	CS-137		150	<LLD	<LLD	-		0
PREDATOR (PCI/KG WET)	SR-90	4	10	<LLD	<LLD	-		0

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PREDATOR (PCI/KG WET)	GAMMA	4						
	K-40		NA	3190 (2/2) (3080/3300)	2655 (2/2) (2090/3220)	3190 (2/2) (3080/3300)	INDP INDICATOR YORK HAVEN DAM DOWNSTREAM OF DISCHARGE	0
	MN-54		130	<LLD	<LLD	-		0
	CO-58		130	<LLD	<LLD	-		0
	FE-59		260	<LLD	<LLD	-		0
	CO-60		130	<LLD	<LLD	-		0
	ZN-65		260	<LLD	<LLD	-		0
	CS-134		130	<LLD	<LLD	-		0

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PREDATOR (PCI/KG WET)	CS-137		150	<LLD	<LLD	-		0
SEDIMENT (PCI/KG DRY)	GAMMA	7						
	K-40		NA	14232 (5/5) (9960/17600)	12200 (2/2) (10200/14200)	17500 (2/2) (17400/17600)	J2-1 INDICATOR YORK HAVEN DAM 1.5 MILES S OF SITE	0
	MN-54		NA	<LLD	<LLD	-		0
	CO-58		NA	<LLD	<LLD	-		0
	CO-60		NA	<LLD	<LLD	-		0
	CS-134		150	<LLD	<LLD	-		0
	CS-137		180	129 (2/5) (128/130)	346 (2/2) (336/355)	346 (2/2) (336/355)	A1-3 CONTROL SUSQUEHANNA RIVER 0.5 MILES N OF SITE	0

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AIR PARTICULATE (E-3 PCI/CU.METER)	GR-B	362	10	18 (302/310) (8/204)	18 (52/52) (9/28)	20 (50/52) (8/204)	TM-AP-G2-1 INDICATOR BECKER FARM 1.4 MILES SE OF SITE	0
	GAMMA	28						
	BE-7		NA	88 (24/24) (56/125)	92 (4/4) (89/94)	94 (4/4) (77/105)	TM-AP-E1-2 INDICATOR TMI VISITOR'S CENTER 0.4 MILES E OF SITE	0
	MN-54		NA	<LLD	<LLD	-		0
	CO-58		NA	<LLD	<LLD	-		0
	CO-60		NA	<LLD	<LLD	-		0
	NB-95		NA	<LLD	<LLD	-		0
	ZR-95		NA	<LLD	<LLD	-		0
	CS-134		50	<LLD	<LLD	-		0

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AIR PARTICULATE (E-3 PCI/CU.METER)	CS-137		60	<LLD	<LLD	-		0
AIR IODINE (E-3 PCI/CU.METER)	GAMMA	362						
	I-131		70	<LLD	<LLD	-		0
MILK (PCI/LITER)	I-131	115	1	<LLD	<LLD	-		0
	SR-89	21	5	<LLD	<LLD	-		0
	SR-90	21	2	0.7 (7/17) (0.5/1.0)	0.8 (3/4) (0.5/1.2)	0.8 (1/4)	TM-M-E2-2 INDICATOR NISSLEY FARM 1.1 MILES E OF SITE	0
	GAMMA	115						
	K-40		NA	1270 (92/92) (915/1440)	1259 (23/23) (1030/1430)	1343 (23/23) (1170/1430)	TM-M-F4-1 INDICATOR TURNPIKE ROAD FARM 3.0 MILES ESE OF SITE	0
	CS-134		15	<LLD	<LLD	-		0

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MILK (PCI/LITER)	CS-137		18	<LLD	<LLD	-		0
	BA-140		60	<LLD	<LLD	-		0
	LA-140		15	<LLD	<LLD	-		0
VEGETATION (PCI/KG WET)	SR-90	20	10	20.5 (9/10) (2.2/49.4)	18.2 (9/10) (3.4/37.9)	21.6 (8/9) (2.2/49.4)	H1-2 INDICATOR RED HILL MARKET 1.0 MILES SSE OF SITE	0
	GAMMA BE-7	26	NA	659 (6/13) (200/1690)	725 (5/13) (332/1400)	725 (5/13) (332/1400)	B10-2 CONTROL MILTON HERSHEY SCHOOL 10.1 MILES NNE OF SITE	0
	K-40		NA	3773 (13/13) (2130/5300)	3470 (13/13) (1990/5650)	4074 (9/9) (2130/5300)	H1-2 INDICATOR RED HILL MARKET 1.0 MILES SSE OF SITE	0
	I-131		60	<LLD	<LLD	-		0

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VEGETATION (PCI/KG WET)	CS-134		60	<LLD	<LLD	-		0
	CS-137		80	<LLD	<LLD	-		0
DIRECT RADIATION (MILLI-ROENTGEN/STD.MO.)	TLD-QUARTERLY	352	NA	4.5 (308/308) (2.7/7.7)	5.1 (44/44) (4.1/7.0)	7.3 (4/4) (6.9/7.7)	H8-1 INDICATOR SAGINAW ROAD 7.4 MILES SSE OF SITE	0

THE MEAN AND 2 STANDARD DEVIATION VALUES ARE CALCULATED USING THE POSITIVE VALUE
FRACTION OF DETECTABLE MEASUREMENT AT SPECIFIED LOCATIONS IS INDICATED IN PARENTHESIS (F)

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APPENDIX B

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

TABLE B-1: Location Designation and Identification System for the Three Mile Island Nuclear Station

XYY-Z-		General code for identification of locations, where:
X	-	Angular Sector of Sampling Location. The compass is divided into 16 sectors of 22 1/2 degrees each with center at Three Mile Island's Units 1 and 2 off-gas vents. Sector A is centered due North, and others are alphabetical in a clockwise direction.
YY	-	Radial Zone of Sampling Location in miles.
Z	-	Station's Numerical Designation within sector and zone, using 1, 2, 3... in each sector and zone.

TABLE B-2: Radiological Environmental Monitoring Program - Sampling Locations, Distance and Direction, Three Mile Island Nuclear Station, 2009

Sample Medium	Station Code	Map Number	Distance (miles)	Azimuth	Description
AQS	A1-3	1	0.5	359°	N of site off north tip of TMI in Susquehanna River
ID	A1-4	1	0.3	6°	N of Reactor Building on W fence adjacent to North Weather Station, TMI
AP,AI,ID	A3-1	2	2.7	357°	N of site at Mill Street Substation
SW	A3-2	2	2.7	356°	N of site at Swatara Creek, Middletown
ID	A5-1	2	4.4	3°	N of site on Vine Street Exit off Route 283
ID	A9-3	3	8.0	2°	N of site at Duke Street Pumping Station, Hummelstown
ID	B1-1	1	0.6	25°	NNE of site on light pole in middle of North Bridge, TMI
ID	B1-2	1	0.4	23°	NNE of Reactor Building on top of dike, TMI
ID	B2-1	2	1.9	17°	NNE of site on Sunset Dr. (off Hillsdale Rd.)
ID	B5-1	2	4.9	19°	NNE of site at intersection of School House and Miller Roads
ID	B10-1	3	9.2	21°	NNE of site at intersection of West Areba Avenue and Mill Street, Hershey
FP	B10-2	3	10	31°	NNE of site at Milton Hershey School, Hershey
ID	C1-1	1	0.7	37°	NE of site along Route 441 N
ID	C1-2	1	0.3	50°	NE of Reactor Building on top of dike, TMI
ID	C2-1	2	1.5	44°	NE of site at Middletown Junction
ID	C5-1	2	4.7	43°	NE of site on Kennedy Lane
ID	C8-1	3	7.1	48°	NE of site at Schenk's Church on School House Road
AQF	Control	-	-	-	All locations where finfish are collected above Dock St. Dam, Harrisburg
ID	D1-1	1	0.2	76°	ENE of Reactor Building on top of dike, TMI
ID	D1-2	1	0.5	67°	ENE of site off Route 441 along lane between garden center and residence
M	D2-1	2	1.1	62°	ENE of site at farm on Gingrich Road
ID	D2-2	2	1.6	74°	ENE of site along Hillsdale Rd. (S of Zion Rd.)
ID	D6-1	3	5.2	66°	ENE of site off Beagle Road
ID	D15-1	3	10.8	64°	ENE of site along Route 241, Lawn
AP,AI,ID,FP	E1-2	1	0.4	97°	E of site at TMI Visitor's Center
ID	E1-4	1	0.2	97°	E of Reactor Building on top of dike, TMI
M	E2-2	2	1.1	96°	E of site at farm on Pecks Road
ID	E2-3	2	2.0	97°	E of site along Hillsdale Rd. (N of Creek Rd.)
ID	E5-1	2	4.7	82°	E of site at intersection of North Market Street (Route 230) and Zeager Road
ID	E7-1	3	6.7	88°	E of site along Hummelstown Street, Elizabethtown
ID	F1-1	1	0.5	117°	ESE of site near entrance to 500 kV Substation
ID	F1-2	1	0.2	112°	ESE of Reactor Building on top of dike midway within ISWSF, TMI
AP,AI	F1-3	1	0.6	112°	ESE of site in 500 kV Substation
ID	F1-4	1	0.2	122°	ESE of Reactor Building on top of dike, TMI
ID	F2-1	2	1.3	119°	ESE of site along Engle Road
M	F4-1	2	3.2	104°	ESE of site at farm on Turnpike Road
ID	F5-1	2	4.7	109°	ESE of site along Amosite Road
ID	F10-1	3	9.4	112°	ESE of site along Donegal Springs Road, Donegal Springs
ID	F25-1	3	22	106°	ESE of site at intersection of Steel Way and Loop Roads, Lancaster
ID	G1-2	1	0.7	145°	SE of site along Route 441 S
ID	G1-3	1	0.2	130°	SE of Reactor Building on top of dike, TMI
ID	G1-5	1	0.3	143°	SE of Reactor Building on top of dike, TMI
ID	G1-6	1	0.3	139°	SE of Reactor Building on top of dike, TMI
AI,AP,M	G2-1	2	1.4	126°	SE of site at farm on Becker Road
ID	G2-4	2	1.7	138°	SE of site on Becker Road
ID	G5-1	2	4.8	131°	SE of site at intersection of Bainbridge and Risser Roads
ID	G10-1	3	9.7	128°	SE of site at farm along Engles Tollgate Road, Marietta
ID	G15-1	3	14.4	126°	SE of site at Columbia Water Treatment Plant
DW	G15-2	3	13.3	129°	SE of site at Wrightsville Water Treatment Plant
DW	G15-3	3	15.7	124	SE of site at Lancaster Water Treatment Plant

TABLE B-2: Radiological Environmental Monitoring Program - Sampling Locations, Distance and Direction, Three Mile Island Nuclear Station, 2009

Sample Medium	Station Code	Map Number	Distance (miles)	Azimuth	Description
ID	H1-1	1	0.5	167°	SSE of site, TMI
FP	H1-2	1	1.0	151°	SSE of site along Route 441, Red Hill Market
AP,AI,ID	H3-1	2	2.2	160°	SSE of site in Falmouth-Collins Substation
ID	H5-1	2	4.1	158°	SSE of site by Guard Shack at Brunner Island Steam Electric Station
ID	H8-1	3	7.4	163°	SSE of site along Saginaw Road, Starview
ID	H15-1	3	13.2	157°	SSE of site at intersection of Orchard and Stonewood Roads, Wilshire Hills
AQF	Indicator	-	-	-	All locations where finfish are collected downstream of the TMINS liquid discharge outfall
ID	J1-1	1	0.8	176°	S of site, TMI
SW	J1-2	1	0.5	188°	S of site downstream of the TMINS liquid discharge outfall in Susquehanna River
ID	J1-3	1	0.3	189°	S of Reactor Building just S of SOB, TMI
AQS	J2-1	2	1.4	179°	S of site in Susquehanna River just upstream of the York Haven Dam
ID	J3-1	2	2.7	179°	S of site at York Haven/Cly
ID	J5-1	2	4.9	181°	S of site along Canal Road, Conewago Heights
ID	J7-1	3	6.5	176°	S of site off of Maple Street, Manchester
ID	J15-1	3	12.6	183°	S of site in Met-Ed York Load Dispatch Station
EW	K1-1	1	0.2	210°	On site at RML-7 Main Station Discharge Building
AQS	K1-3	1	0.2	212°	SSW of site downstream of the TMINS liquid discharge outfall in the Susquehanna River
ID	K1-4	1	0.2	209°	SSW of Reactor Building on top of dike behind Warehouse 2, TMI
ID	K2-1	2	1.2	200°	SSW of site on S Shelley Island
ID	K3-1	2	2.0	206°	SSW of site along Rt. 262, N of Cly
ID	K5-1	2	4.9	202°	SSW of site along Conewago Creek Road, Strinestown
ID	K8-1	3	7.5	196°	SSW of site at intersection of Coppenhaffer Road and Route 295, Zions View
ID	K15-1	3	12.8	203°	SSW of site behind McDonald's and next to child care center, Weiglestown
M	K15-3	3	14.4	205°	SSW of site at farm along S Salem Church Rd, Dover
ID	L1-1	1	0.1	236°	SW of site on top of dike W of Mech. Draft Cooling Tower, TMI
ID	L1-2	1	0.5	221°	SW of site on Beech Island
ID	L2-1	2	1.8	224°	SW of site along Route 262
ID	L5-1	2	4.1	228°	SW of site at intersection of Stevens and Wilson Roads
ID	L8-1	3	8.0	225°	SW of site along Rohlers Church Rd., Andersontown
ID	L15-1	3	11.8	226°	SW of site on W side of Route 74, rear of church, Mt. Royal
ID	M1-1	1	0.1	250°	WSW of Reactor Building on SE corner of U-2 Screenhouse fence, TMI
ID	M1-2	1	0.4	252°	WSW of site on E side of Shelley Island, Lot #157
AP,AI,ID	M2-1	2	1.3	256°	WSW of site along Route 262 and adjacent to Fishing Creek, Goldsboro
ID	M5-1	2	4.3	249°	WSW of site at intersection of Lewisberry and Roxberry Roads, Newberrytown
ID	M9-1	3	8.7	243°	WSW of site along Alpine Road, Maytown
ID	N1-1	1	0.7	274°	W of site on W side of Shelley Island, between lots #13 and #14
ID	N1-3	1	0.1	274°	W of Reactor Building on fence adjacent to Screenhouse entrance gate, TMI
ID	N2-1	2	1.2	261°	W of site at Goldsboro Marina
ID	N5-1	2	5.0	268°	W of site off of Old York Road along Robin Hood Drive
ID	N8-1	3	7.7	262°	W of site along Route 382, 1/2 mile north of Lewisberry
ID	N15-2	3	10.4	275°	W of site at intersection of Lisburn Road and Main Street, Lisburn
ID	P1-1	1	0.4	303°	WNW of site on Shelley Island

TABLE B-2: Radiological Environmental Monitoring Program - Sampling Locations, Distance and Direction, Three Mile Island Nuclear Station, 2009

Sample Medium	Station Code	Map Number	Distance (miles)	Azimuth	Description
ID	P1-2	1	0.1	292°	WNW of Reactor Building on fence N of Unit 1 Screenhouse, TMI
ID	P2-1	2	2.0	283°	WNW of site along Route 262
M	P4-1	2	3.7	295	WNW of site at farm on Valley Road
ID	P5-1	2	5.0	284°	WNW of site at intersection of Valley Road (Route 262) and Beinhower Road
ID	P8-1	3	8.0	292°	WNW of site along Evergreen Road, Reesers Summit
ID	Q1-1	1	0.5	317°	NW of site on E side of Shelley Island
ID	Q1-2	1	0.2	321°	NW of Reactor Building on fence W of Warehouse 1, TMI
ID	Q2-1	2	1.9	310°	NW of site along access road along river
ID	Q5-1	2	5.0	317°	NW of site along Lumber Street, Highspire
SW,DW,ID	Q9-1	3	8.5	310°	NW of site at the Steelton Water Company
AP,AI,ID	Q15-1	3	13.4	309°	NW of site behind West Fairview Fire Dept. Social Hall (abandoned)
ID	R1-1	3	0.2	335°	NNW of Reactor Building along W fence, TMI
ID	R1-2	1	0.7	334°	NNW of site on central Henry Island
ID	R3-1	2	2.6	341°	NNW of site at Crawford Station, Middletown
ID	R5-1	2	4.9	339°	NNW of site at intersection of Spring Garden Drive and Route 441
ID	R9-1	3	8.0	341°	NNW of site at intersection of Derry and 66th Streets, Rutherford Heights
ID	R15-1	3	11.2	332°	NNW of site at intersection of Route 22 and Colonial Road, Colonial Park

IDENTIFICATION KEY

ID = Immersion Dose (TLD)
SW = Surface Water
AI = Air Iodine
AP = Air Particulate
FP = Food Products (Green Leafy Vegetation, Fruits, Vegetables)
EW = Effluent Water
DW = Drinking Water
M = Milk (Cow)
AFT = Finfish
AQS = Aquatic Sediment

TABLE B-3: Radiological Environmental Monitoring Program – Summary of Sample Collection and Analytical Methods, Three Mile Island Nuclear Station, 2009

Sample Medium	Analysis	Sampling Method	Collection Procedure Number	Sample Size	Analytical Procedure Number
Surface Water	Gamma Spectroscopy	Monthly composite from a continuous water compositor.	ER-TMI-06 Collection of water samples for radiological analysis (Three Mile Island Nuclear Station)	2 gallon	TBE, TBE-2007 Gamma emitting radioisotope analysis Env. Inc., GS-01 Determination of gamma emitters by gamma spectroscopy
Surface Water	Tritium	Monthly composite from a continuous water compositor.	ER-TMI-06 Collection of water samples for radiological analysis (Three Mile Island Nuclear Station)	2 gallon	TBE, TBE-2010 Tritium and carbon-14 analysis by liquid scintillation Env. Inc., T-02 Determination of tritium in water (direct method)
Surface Water	Iodine- 131	Monthly composite from a continuous water compositor.	ER-TMI-06 Collection of water samples for radiological analysis (Three Mile Island Nuclear Station)	2 gallon	TBE, TBE-2012 Radioiodine in various matrices Env. Inc., I-131-01 Determination of I-131 in milk by anion exchange
Drinking Water	Gross Beta	Monthly composite from a continuous water compositor.	ER-TMI-06 Collection of water samples for radiological analysis (Three Mile Island Nuclear Station)	2 gallon	TBE, TBE-2008 Gross alpha and/or gross beta activity in various matrices Env. Inc., W(DS)-01 Determination of gross alpha and/or gross beta in water (dissolved solids or total residue)
Drinking Water	Gamma Spectroscopy	Monthly composite from a continuous water compositor.	ER-TMI-06 Collection of water samples for radiological analysis (Three Mile Island Nuclear Station)	2 gallon	TBE, TBE-2007 Gamma emitting radioisotope analysis Env. Inc., GS-01 Determination of gamma emitters by gamma spectroscopy
Drinking Water	Tritium	Monthly composite from a continuous water compositor.	ER-TMI-06 Collection of water samples for radiological analysis (Three Mile Island Nuclear Station)	2 gallon	TBE, TBE-2010 Tritium and carbon-14 analysis by liquid scintillation Env. Inc., T-02 Determination of tritium in water (direct method)
Drinking Water	Iodine-131	Monthly composite from a continuous water compositor.	ER-TMI-06 Collection of water samples for radiological analysis (Three Mile Island Nuclear Station)	2 gallon	TBE, TBE-2012 Radioiodine in various matrices Env. Inc., I-131-01 Determination of I-131 in milk by anion exchange
Effluent Water	Iodine-131	Monthly composite from a continuous water compositor.	ER-TMI-06 Collection of water samples for radiological analysis (Three Mile Island Nuclear Station)	2 gallon	TBE, TBE-2012 Radioiodine in various matrices Env. Inc., I-131-01 Determination of I-131 in milk by anion exchange
Effluent Water	Gross Beta	Monthly composite from a continuous water compositor.	ER-TMI-06 Collection of water samples for radiological analysis (Three Mile Island Nuclear Station)	2 gallon	TBE, TBE-2008 Gross alpha and/or gross beta activity in various matrices Env. Inc., W(DS)-01 Determination of gross alpha and/or gross beta in water (dissolved solids or total residue)

TABLE B-3: Radiological Environmental Monitoring Program – Summary of Sample Collection and Analytical Methods, Three Mile Island Nuclear Station, 2009

Sample Medium	Analysis	Sampling Method	Collection Procedure Number	Sample Size	Analytical Procedure Number
Effluent Water	Gamma Spectroscopy	Monthly composite from a continuous water compositor.	ER-TMI-06 Collection of water samples for radiological analysis (Three Mile Island Nuclear Station)	2 gallon	TBE, TBE-2007 Gamma emitting radioisotope analysis Env. Inc., GS-01 Determination of gamma emitters by gamma spectroscopy
Effluent Water	Tritium	Monthly composite from a continuous water compositor.	ER-TMI-06 Collection of water samples for radiological analysis (Three Mile Island Nuclear Station)	2 gallon	TBE, TBE-2010 Tritium and carbon-14 analysis by liquid scintillation Env. Inc., T-02 Determination of tritium in water (direct method)
Effluent Water	Strontium 89/90	Semi-annual composite from monthly samples.	TBE, TBE-2023 Compositing of samples	2 gallon	TBE, TBE-2019 Radiostrontium analysis by ion exchange
Storm Water	Gamma Spectroscopy	Quarterly composite of monthly grab samples	ER-TMI-06 Collection of water samples for radiological analysis (Three Mile Island Nuclear Station)	1 gallon	TBE, TBE-2007 Gamma emitting radioisotope analysis Env. Inc., GS-01 Determination of gamma emitters by gamma spectroscopy
Storm Water	Tritium	Quarterly composite of monthly grab samples	ER-TMI-06 Collection of water samples for radiological analysis (Three Mile Island Nuclear Station)	1 gallon	TBE, TBE-2010 Tritium and carbon-14 analysis by liquid scintillation Env. Inc., T-02 Determination of tritium in water (direct method)
Fish	Gamma Spectroscopy	Semi-annual samples collected via electroshocking or other techniques	ER-TMI-13 Collection of fish samples for radiological analysis (Three Mile Island Nuclear Station)	1000 grams (wet)	TBE, TBE-2007 Gamma emitting radioisotope analysis Env. Inc., GS-01 Determination of gamma emitters by gamma spectroscopy
Fish	Strontium 90	Semi-annual samples collected via electroshocking or other techniques	ER-TMI-13 Collection of fish samples for radiological analysis (Three Mile Island Nuclear Station)	1000 grams (wet)	TBE, TBE-2019 Radiostrontium analysis by ion exchange

TABLE B-3: Radiological Environmental Monitoring Program – Summary of Sample Collection and Analytical Methods, Three Mile Island Nuclear Station, 2009

Sample Medium	Analysis	Sampling Method	Collection Procedure Number	Sample Size	Analytical Procedure Number
Sediment	Gamma Spectroscopy	Semi-annual grab samples	ER-TMI-03 Collection of sediment samples for radiological analysis (Three Mile Island Nuclear Station)	500 grams (dry)	TBE, TBE-2007 Gamma emitting radioisotope analysis Env. Inc., GS-01 Determination of gamma emitters by gamma spectroscopy
Air Particulates	Gross Beta	One-week composite of continuous air sampling through glass fiber filter paper	ER-TMI-14 Collection of air particulate and air iodine samples for radiological analysis (Three Mile Island Nuclear Station)	1 filter (approximately 280 cubic meters weekly)	TBE, TBE-2008 Gross alpha and/or gross beta activity in various matrices Env. Inc., AP-02 Determination of gross alpha and/or gross beta in air particulate filters
Air Particulates	Gamma Spectroscopy	Quarterly composite of each station	TBE, TBE-2023 Compositing of samples Env. Inc., AP-03 Procedure for compositing air particulate filters for gamma spectroscopic analysis	13 filters (approximately 3600 cubic meters)	TBE, TBE-2007 Gamma emitting radioisotope analysis Env. Inc., GS-01 Determination of gamma emitters by gamma spectroscopy
Air Iodine	Gamma Spectroscopy	One-week composite of continuous air sampling through charcoal filter	ER-TMI-14 Collection of air particulate and air iodine samples for radiological analysis (Three Mile Island Nuclear Station)	1 filter (approximately 280 cubic meters weekly)	TBE, TBE-2007 Gamma emitting radioisotope analysis Env. Inc., I-131-02 Determination of I-131 in charcoal canisters by gamma spectroscopy (batch method)
Milk	I-131	Bi-weekly grab sample when cows are on pasture. Monthly all other times	ER-TMI-01 Collection of milk samples for radiological analysis (Three Mile Island Nuclear Station)	2 gallon	TBE, TBE-2012 Radioiodine in various matrices Env. Inc., I-131-01 Determination of I-131 in milk by anion exchange
Milk	Strontium-89/90	Quarterly composite of Bi-weekly and monthly grab samples	ER-TMI-01 Collection of milk samples for radiological analysis (Three Mile Island Nuclear Station) TBE, TBE-2023 Compositing of samples	2 gallon	TBE, TBE-2019 Radiostrontium analysis by ion exchange
Milk	Gamma Spectroscopy	Bi-weekly grab sample when cows are on pasture. Monthly all other times	ER-TMI-01 Collection of milk samples for radiological analysis (Three Mile Island Nuclear Station)	2 gallon	TBE, TBE-2007 Gamma emitting radioisotope analysis Env. Inc., GS-01 Determination of gamma emitters by gamma spectroscopy
Vegetation	Gamma Spectroscopy	Monthly and annual grab sample	ER-TMI-04 Collection of vegetation samples for radiological analysis (Three Mile Island Nuclear Station)	1000 grams	TBE, TBE-2007 Gamma emitting radioisotope analysis Env. Inc., GS-01 Determination of gamma emitters by gamma spectroscopy

TABLE B-3: Radiological Environmental Monitoring Program – Summary of Sample Collection and Analytical Methods, Three Mile Island Nuclear Station, 2009

Sample Medium	Analysis	Sampling Method	Collection Procedure Number	Sample Size	Analytical Procedure Number
Vegetation	Gamma Spectroscopy	Monthly and annual grab sample	ER-TMI-04 Collection of vegetation samples for radiological analysis (Three Mile Island Nuclear Station)	1000 grams	TBE, TBE-2007 Gamma emitting radioisotope analysis Env. Inc., GS-01 Determination of gamma emitters by gamma spectroscopy
Vegetation	Strontium-89/90	Monthly and annual grab sample	ER-TMI-04 Collection of vegetation samples for radiological analysis (Three Mile Island Nuclear Station)	1000 grams	TBE, TBE-2019 Radiostrontium analysis by ion exchange
TLD	Thermoluminescence Dosimetry	Quarterly TLDs comprised of two Panasonic 814 (containing 4 each $CaSO_4$ elements)	ER-TMI-02 Collection of TLD samples for radiological analysis (Three Mile Island Nuclear Station)	2 badges with 3 dosimeters	Global Dosimetry Solutions, Inc.

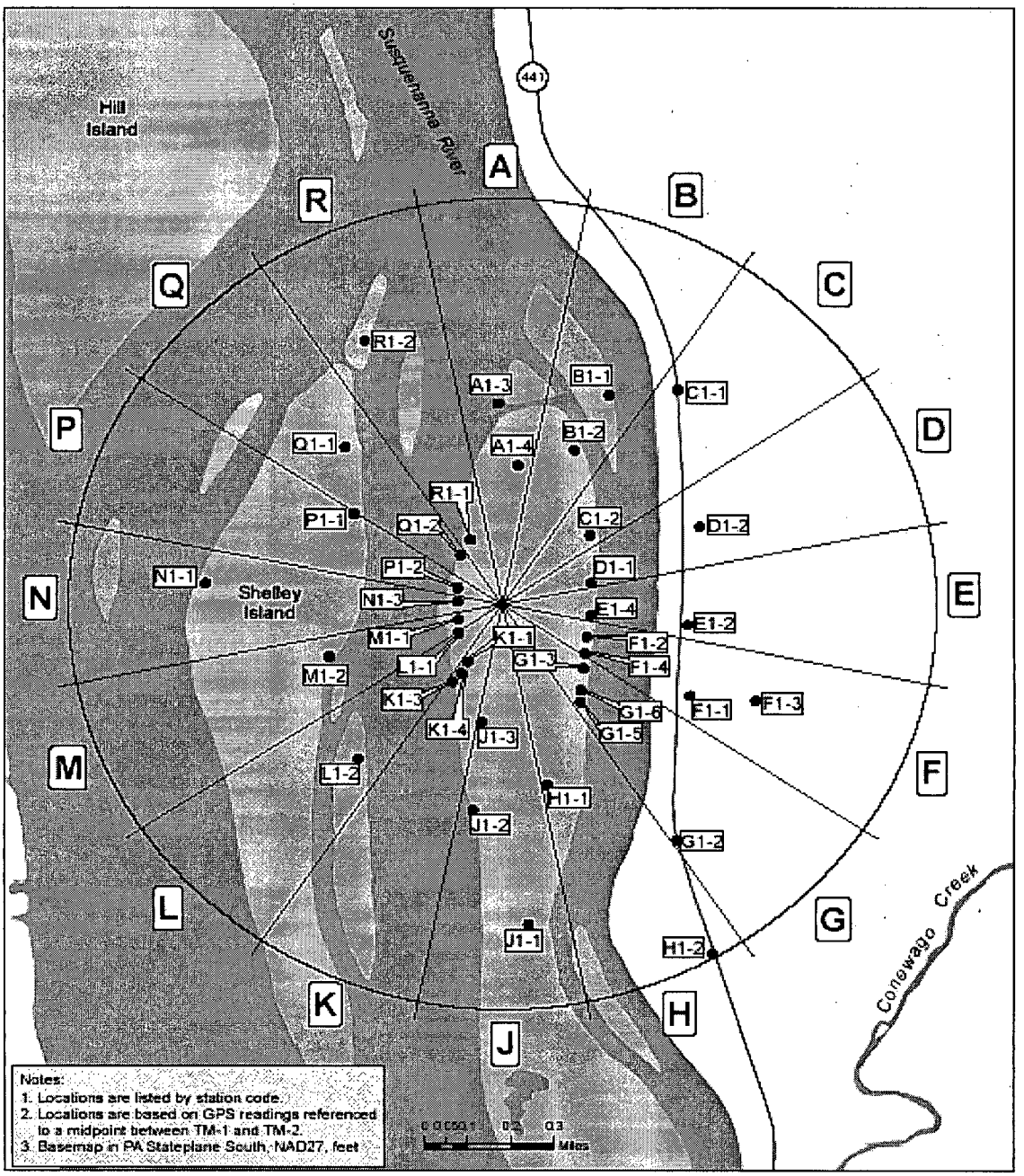

Figure B-1
Environmental Sampling Locations Within One Mile of the Three Mile Island Nuclear Station, 2009

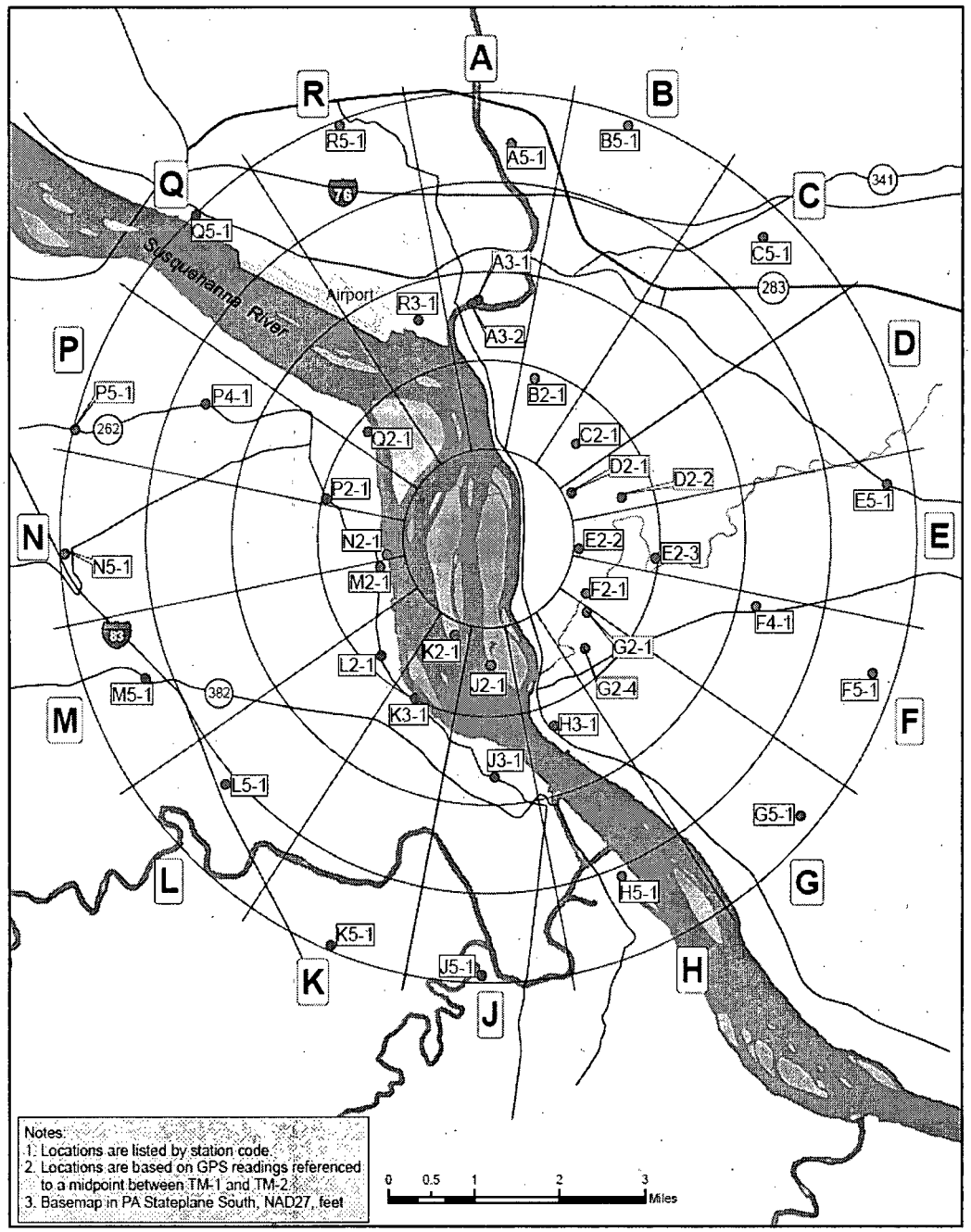

Figure B-2
Environmental Sampling Locations Between One and Five Miles of the Three Mile Island Nuclear Station, 2009

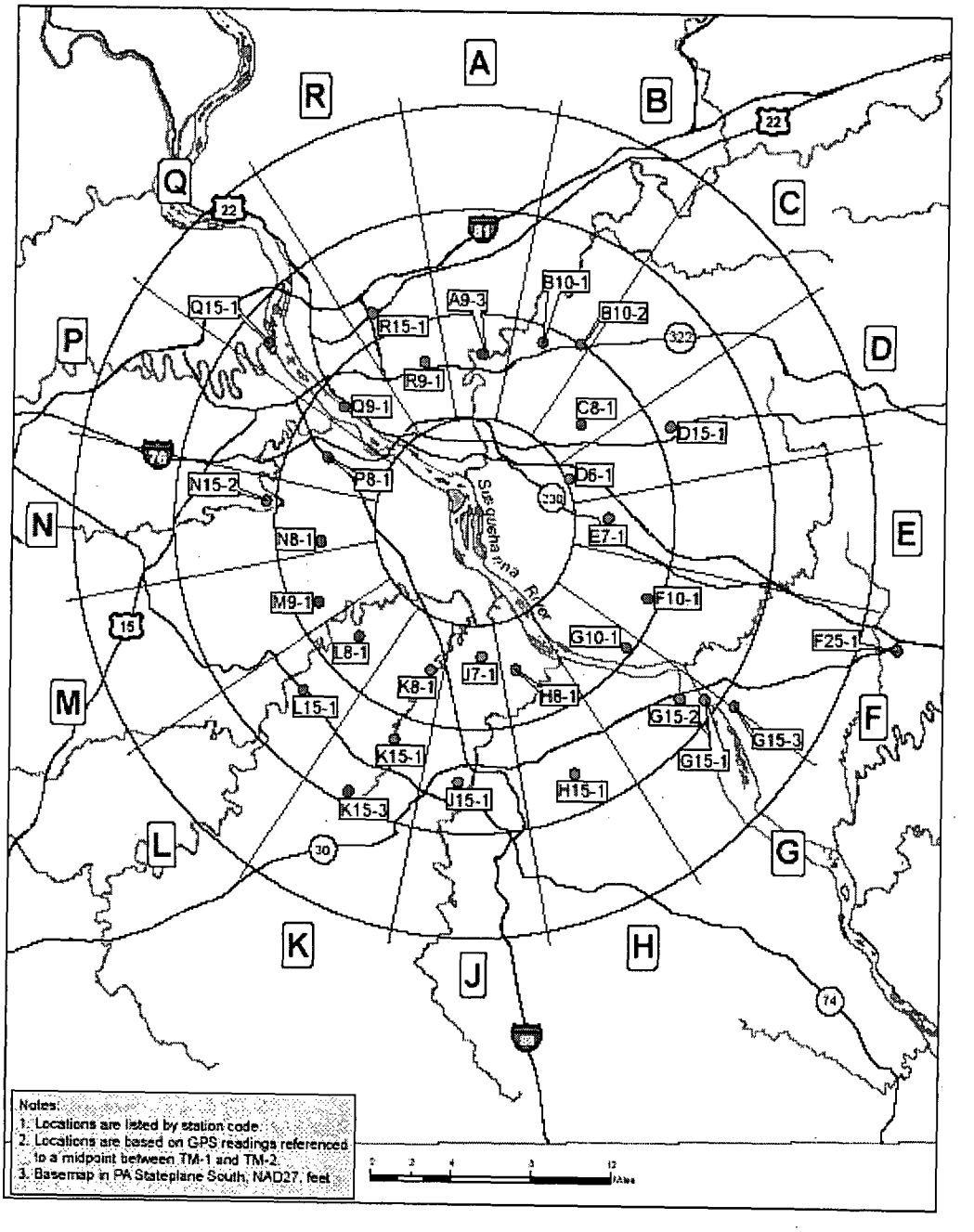

Figure B-3
Environmental Sampling Locations Greater than Five Miles of the Three Mile Island Nuclear Station, 2009

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APPENDIX C

DATA TABLES AND FIGURES - PRIMARY LABORATORY

TABLE C-I.1 CONCENTRATIONS OF TRITIUM IN SURFACE WATER SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2009

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	J1-2		Q9-1	
12/30/08 - 02/03/09	< 179	(1)	< 179	
02/03/09 - 03/03/09	2880 ± 354	(1)	< 187	
03/03/09 - 03/31/09	7540 ± 808	(1)	< 190	
03/31/09 - 04/28/09	< 159	(1)	< 159	
04/28/09 - 06/02/09	1680 ± 204		< 113	
06/02/09 - 06/30/09	431 ± 96		< 111	
06/30/09 - 07/28/09	9250 ± 958		< 125	
07/28/09 - 08/31/09	227 ± 137	(1)	< 198	
08/31/09 - 09/29/09	1820 ± 236		< 181	
09/29/09 - 11/03/09	2340 ± 292	(1)	< 179	
11/03/09 - 12/01/09	< 168		< 171	
12/01/09 - 12/28/09	< 170	(1)	< 169	(1)
MEAN	3271 ± 6632		-	

TABLE C-I.2 CONCENTRATIONS OF I-131 IN SURFACE WATER SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2009

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	A3-2	
12/30/08 - 02/03/09	< 0.6	(1)
02/03/09 - 03/03/09	1.8 ± 0.6	
03/03/09 - 03/31/09	< 0.5	
03/31/09 - 04/28/09	1.4 ± 0.5	
04/28/09 - 06/02/09	< 0.5	
06/02/09 - 06/30/09	< 0.6	
06/30/09 - 07/28/09	< 0.8	
07/28/09 - 08/31/09	< 0.7	
08/31/09 - 09/29/09	< 0.7	
09/29/09 - 11/03/09	< 0.7	
11/03/09 - 12/01/09	< 0.7	
12/01/09 - 12/28/09	< 0.5	
MEAN	1.6 ± 0.6	

* THE MEAN AND 2 STANDARD DEVIATION VALUES ARE CALCULATED USING THE POSITIVE VALUES

(1) SEE PROGRAM EXCEPTIONS SECTION FOR EXPLANATION

TABLE C-I.3 CONCENTRATIONS OF GAMMA EMITTERS IN SURFACE WATER SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2009

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

STC	COLLECTION PERIOD	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	Cs-134	Cs-137	Ba-140	La-140
J1-2	12/30/08 - 02/03/09	< 3	< 4	< 8	< 3	< 7	< 4	< 6	< 3	< 3	< 26	< 9
	02/03/09 - 03/03/09	< 4	< 4	< 11	< 4	< 7	< 5	< 8	< 4	< 4	< 32	< 11
	03/03/09 - 03/31/09	< 2	< 2	< 5	< 2	< 4	< 2	< 4	< 2	< 2	< 21	< 6
	03/31/09 - 04/28/09	< 1	< 1	< 2	< 1	< 2	< 1	< 2	< 1	< 1	< 19	< 6
	04/28/09 - 06/02/09	< 4	< 5	< 7	< 5	< 9	< 5	< 9	< 4	< 5	< 25	< 4
	06/02/09 - 06/30/09	< 4	< 4	< 9	< 4	< 10	< 6	< 7	< 4	< 4	< 31	< 12
	06/30/09 - 07/28/09	< 2	< 2	< 5	< 2	< 4	< 2	< 4	< 2	< 2	< 22	< 8
	07/28/09 - 08/31/09	< 2	< 2	< 5	< 2	< 3	< 2	< 4	< 2	< 2	< 19	< 6
	08/31/09 - 09/29/09	< 4	< 5	< 10	< 6	< 9	< 5	< 10	< 5	< 6	< 28	< 8
	09/29/09 - 11/03/09	< 2	< 2	< 6	< 2	< 4	< 3	< 4	< 2	< 2	< 16	< 5
	11/03/09 - 12/01/09	< 3	< 3	< 7	< 3	< 6	< 3	< 6	< 3	< 3	< 20	< 7
	12/01/09 - 12/28/09	< 1	< 1	< 3	< 1	< 3	< 1	< 3	< 1	< 1	< 15	< 5
	MEAN	-	-	-	-	-	-	-	-	-	-	-
Q9-1	12/30/08 - 02/03/09	< 3	< 4	< 8	< 3	< 7	< 4	< 6	< 3	< 3	< 27	< 8
	02/03/09 - 03/03/09	< 3	< 3	< 7	< 3	< 6	< 3	< 6	< 3	< 3	< 24	< 7
	03/03/09 - 03/31/09	< 2	< 2	< 5	< 2	< 4	< 2	< 4	< 2	< 2	< 21	< 7
	03/31/09 - 04/28/09	< 1	< 1	< 2	< 1	< 2	< 1	< 2	< 1	< 1	< 16	< 7
	04/28/09 - 06/02/09	< 4	< 4	< 8	< 4	< 9	< 5	< 7	< 4	< 4	< 21	< 6
	06/02/09 - 06/30/09	< 4	< 4	< 9	< 5	< 8	< 5	< 8	< 4	< 4	< 26	< 12
	06/30/09 - 07/28/09	< 1	< 1	< 4	< 1	< 3	< 2	< 3	< 1	< 1	< 15	< 5
	07/28/09 - 08/31/09	< 2	< 2	< 6	< 3	< 4	< 2	< 4	< 2	< 2	< 23	< 8
	08/31/09 - 09/29/09	< 4	< 4	< 9	< 5	< 9	< 5	< 9	< 5	< 4	< 20	< 8
	09/29/09 - 11/03/09	< 2	< 2	< 4	< 2	< 4	< 2	< 3	< 2	< 2	< 13	< 5
	11/03/09 - 12/01/09	< 3	< 3	< 7	< 3	< 5	< 3	< 6	< 3	< 3	< 19	< 7
	12/01/09 - 12/28/09	< 1	< 1	< 3	< 1	< 2	< 1	< 2	< 1	< 1	< 11	< 3
	MEAN	-	-	-	-	-	-	-	-	-	-	-

TABLE C-II.1 CONCENTRATIONS OF GROSS BETA IN DRINKING WATER SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2009

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	G15-2	G15-3	Q9-1
12/30/08 - 02/03/09	4.2 ± 1.6	2.7 ± 1.5	2.6 ± 1.4
02/03/09 - 03/03/09	3.3 ± 1.6	2.7 ± 1.5	2.6 ± 1.4
03/03/09 - 03/31/09	2.6 ± 1.5	< 1.9	2.0 ± 1.3
03/31/09 - 04/28/09	2.7 ± 1.5	< 2.0	2.3 ± 1.4
04/28/09 - 06/02/09	3.8 ± 1.6	< 2.1	< 2.0
06/02/09 - 06/30/09	4.2 ± 2.4	< 2.6	< 2.5
06/30/09 - 07/28/09	< 2.6	3.1 ± 1.8	< 2.4
07/28/09 - 08/31/09	< 2.9	< 2.9	< 2.8
08/31/09 - 09/29/09	3.4 ± 1.7	4.1 ± 1.8 (1)	2.5 ± 1.6
09/29/09 - 11/03/09	2.9 ± 1.7	< 2.5	< 2.4
11/03/09 - 12/01/09	3.2 ± 1.6	2.8 ± 1.6	5.5 ± 2.0
12/01/09 - 12/28/09	< 2.5	< 2.4	< 2.3
MEAN	3.3 ± 1.2	3.1 ± 1.2	2.9 ± 2.5

TABLE C-II.2 CONCENTRATIONS OF I-131 IN DRINKING WATER SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2009

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	G15-2	G15-3	Q9-1
12/30/08 - 02/03/09	< 0.5	< 0.5	< 0.7
02/03/09 - 03/03/09	< 0.7	< 0.6	< 0.8
03/03/09 - 03/31/09	< 0.7	< 0.7	< 0.9
03/31/09 - 04/28/09	< 0.8	< 0.9	< 0.8
04/28/09 - 06/02/09	< 0.5	< 0.5	< 0.5
06/02/09 - 06/30/09	< 0.8	< 0.6	< 0.6
06/30/09 - 07/28/09	< 0.6	< 0.6	< 0.7
07/28/09 - 08/31/09	< 0.8	< 0.5	< 0.5
08/31/09 - 09/29/09	< 0.8	< 0.9	< 0.7
09/29/09 - 11/03/09	< 0.6	< 0.7	< 0.6
11/03/09 - 12/01/09	< 0.9	< 0.7	< 0.7
12/01/09 - 12/28/09	< 0.5	< 0.6	< 0.6
MEAN	-	-	-

TABLE C-II.3 CONCENTRATIONS OF TRITIUM IN DRINKING WATER SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2009

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	G15-2	G15-3	Q9-1
12/30/08 - 02/03/09	< 180	< 181	< 182
02/03/09 - 03/03/09	< 192	< 189	< 187
03/03/09 - 03/31/09	< 189	< 183	< 190
03/31/09 - 04/28/09	< 157	< 161	< 158
04/28/09 - 06/02/09	< 112	< 112	< 111
06/02/09 - 06/30/09	< 111	< 110	< 113
06/30/09 - 07/28/09	< 122	448 ± 156	< 115
07/28/09 - 08/31/09	< 182	< 180	< 197
08/31/09 - 09/29/09	< 187	< 185	< 182
09/29/09 - 11/03/09	< 176	< 176	< 175
11/03/09 - 12/01/09	< 163	< 168	< 169
12/01/09 - 12/28/09	< 171	< 171	< 169
MEAN	-	448	-

* THE MEAN AND 2 STANDARD DEVIATION VALUES ARE CALCULATED USING THE POSITIVE VALUES
(1) SEE PROGRAM EXCEPTIONS SECTION FOR EXPLANATION

TABLE C-II.4 CONCENTRATIONS OF GAMMA EMITTERS IN DRINKING WATER SAMPLES COLLECTED COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2009

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

STC	COLLECTION PERIOD	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	Cs-134	Cs-137	Ba-140	La-140
G15-2	12/30/08 - 02/03/09	< 2	< 2	< 4	< 2	< 3	< 2	< 3	< 2	< 2	< 13	< 4
	02/03/09 - 03/03/09	< 4	< 4	< 7	< 4	< 6	< 5	< 8	< 4	< 4	< 26	< 11
	03/03/09 - 03/31/09	< 2	< 2	< 5	< 2	< 4	< 2	< 4	< 2	< 2	< 19	< 7
	03/31/09 - 04/28/09	< 1	< 1	< 2	< 1	< 2	< 1	< 2	< 1	< 1	< 13	< 4
	04/28/09 - 06/02/09	< 5	< 5	< 12	< 7	< 11	< 5	< 9	< 5	< 6	< 26	< 9
	06/02/09 - 06/30/09	< 4	< 4	< 9	< 5	< 10	< 5	< 6	< 5	< 4	< 30	< 11
	06/30/09 - 07/28/09	< 2	< 2	< 5	< 2	< 4	< 2	< 4	< 2	< 2	< 24	< 7
	07/28/09 - 08/31/09	< 2	< 2	< 6	< 2	< 3	< 3	< 5	< 2	< 2	< 21	< 8
	08/31/09 - 09/29/09	< 4	< 4	< 9	< 6	< 9	< 6	< 9	< 4	< 5	< 22	< 6
	09/29/09 - 11/03/09	< 1	< 2	< 3	< 2	< 3	< 2	< 3	< 1	< 2	< 11	< 3
	11/03/09 - 12/01/09	< 3	< 4	< 7	< 3	< 6	< 4	< 6	< 3	< 3	< 22	< 7
	12/01/09 - 12/28/09	< 2	< 3	< 6	< 2	< 5	< 3	< 5	< 2	< 2	< 24	< 8
	MEAN	-	-	-	-	-	-	-	-	-	-	-
G15-3	12/30/08 - 02/03/09	< 2	< 2	< 5	< 2	< 4	< 2	< 4	< 2	< 2	< 15	< 5
	02/03/09 - 03/03/09	< 4	< 5	< 11	< 4	< 8	< 6	< 8	< 5	< 5	< 31	< 8
	03/03/09 - 03/31/09	< 2	< 2	< 5	< 2	< 4	< 2	< 4	< 2	< 2	< 23	< 7
	03/31/09 - 04/28/09	< 1	< 1	< 2	< 1	< 2	< 1	< 2	< 1	< 1	< 14	< 5
	04/28/09 - 06/02/09	< 4	< 4	< 7	< 4	< 10	< 4	< 6	< 4	< 4	< 20	< 7
	06/02/09 - 06/30/09	< 5	< 4	< 11	< 5	< 11	< 7	< 9	< 5	< 6	< 31	< 11
	06/30/09 - 07/28/09	< 2	< 2	< 5	< 2	< 4	< 2	< 4	< 2	< 2	< 22	< 7
	07/28/09 - 08/31/09	< 2	< 3	< 5	< 2	< 5	< 3	< 5	< 2	< 3	< 23	< 9
	08/31/09 - 09/29/09	< 5	< 4	< 9	< 4	< 9	< 4	< 7	< 4	< 5	< 19	< 6
	09/29/09 - 11/03/09	< 2	< 2	< 5	< 2	< 4	< 2	< 4	< 2	< 2	< 16	< 5
	11/03/09 - 12/01/09	< 3	< 3	< 8	< 4	< 7	< 3	< 6	< 3	< 3	< 21	< 7
	12/01/09 - 12/28/09	< 1	< 1	< 2	< 1	< 2	< 1	< 2	< 1	< 1	< 11	< 4
	MEAN	-	-	-	-	-	-	-	-	-	-	-

TABLE C-II.4 CONCENTRATIONS OF GAMMA EMITTERS IN DRINKING WATER SAMPLES COLLECTED COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2009

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

STC	COLLECTION PERIOD	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	Cs-134	Cs-137	Ba-140	La-140
Q9-1	12/30/08 - 02/03/09	< 4	< 4	< 10	< 3	< 7	< 4	< 7	< 4	< 4	< 29	< 9
	02/03/09 - 03/03/09	< 4	< 4	< 10	< 5	< 11	< 6	< 9	< 4	< 5	< 30	< 11
	03/03/09 - 03/31/09	< 2	< 2	< 4	< 2	< 3	< 2	< 3	< 1	< 2	< 18	< 6
	03/31/09 - 04/28/09	< 1	< 1	< 2	< 1	< 2	< 1	< 2	< 1	< 1	< 15	< 5
	04/28/09 - 06/02/09	< 5	< 5	< 9	< 5	< 11	< 5	< 9	< 5	< 5	< 28	< 8
	06/02/09 - 06/30/09	< 3	< 3	< 5	< 3	< 6	< 2	< 3	< 2	< 3	< 14	< 7
	06/30/09 - 07/28/09	< 2	< 2	< 5	< 2	< 4	< 2	< 4	< 2	< 2	< 22	< 7
	07/28/09 - 08/31/09	< 2	< 3	< 6	< 2	< 5	< 3	< 5	< 2	< 2	< 24	< 9
	08/31/09 - 09/29/09	< 4	< 3	< 7	< 3	< 8	< 4	< 7	< 4	< 4	< 21	< 7
	09/29/09 - 11/03/09	< 2	< 2	< 5	< 3	< 5	< 2	< 4	< 2	< 2	< 17	< 6
	11/03/09 - 12/01/09	< 2	< 3	< 6	< 2	< 6	< 3	< 5	< 2	< 3	< 18	< 6
	12/01/09 - 12/28/09	< 1	< 1	< 3	< 1	< 2	< 1	< 2	< 1	< 1	< 12	< 4
	MEAN	-	-	-	-	-	-	-	-	-	-	-

TABLE C-III.1 CONCENTRATIONS OF GROSS BETA, IODINE-131, TRITIUM, AND STRONTIUM IN EFFLUENT WATER SAMPLES FOR STATION K1-1 COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2009

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	GROSS BETA	I-131	H-3	SR-89	SR-90
12/30/08 - 02/03/09	4.8 ± 1.7	< 0.4	< 183		
02/03/09 - 03/03/09	4.5 ± 1.7	< 0.8	19800 ± 2040		
03/03/09 - 03/31/09	4.0 ± 1.6	< 0.8	64700 ± 6500		
03/31/09 - 04/28/09	3.6 ± 1.6	< 0.8	< 156		
04/28/09 - 06/02/09	5.9 ± 1.9	< 0.5	38300 ± 3850		
06/02/09 - 06/30/09	4.4 ± 2.0	< 0.6	5140 ± 545	< 1.8	< 0.5
06/30/09 - 07/28/09	5.2 ± 2.1	< 0.7	101000 ± 10100		
07/28/09 - 08/31/09	3.3 ± 2.1 (1)	< 0.6	2970 ± 346		
08/31/09 - 09/29/09	6.1 ± 2.1	< 0.7	17700 ± 1790		
09/29/09 - 11/03/09	6.0 ± 2.0	< 0.7	20700 ± 2120		
11/03/09 - 12/01/09	3.1 ± 1.6	< 0.6	< 164		
12/01/09 - 12/28/09	< 2.3 (1)	< 0.5	< 170	< 2.2	< 0.5
MEAN	4.6 ± 2.1	-	33789 ± 67144	-	-

* THE MEAN AND 2 STANDARD DEVIATION VALUES ARE CALCULATED USING THE POSITIVE VALUES
(1) SEE PROGRAM EXCEPTIONS SECTION FOR EXPLANATION

TABLE C-III.2 CONCENTRATIONS OF GAMMA EMITTERS IN EFFLUENT WATER SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2009

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

STC	COLLECTION PERIOD	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	Cs-134	Cs-137	Ba-140	La-140
K1-1	12/30/08 - 02/03/09	< 4	< 3	< 8	< 4	< 6	< 4	< 6	< 4	< 3	< 26	< 8
	02/03/09 - 03/03/09	< 2	< 3	< 5	< 2	< 5	< 3	< 5	< 3	< 3	< 19	< 6
	03/03/09 - 03/31/09	< 2	< 2	< 4	< 2	< 3	< 2	< 3	< 1	< 2	< 18	< 6
	03/31/09 - 04/28/09	< 1	< 1	< 3	< 1	< 2	< 1	< 2	< 1	< 1	< 20	< 5
	04/28/09 - 06/02/09	< 5	< 5	< 11	< 6	< 10	< 6	< 9	< 6	< 6	< 27	< 9
	06/02/09 - 06/30/09	< 4	< 4	< 10	< 5	< 8	< 4	< 8	< 4	< 4	< 26	< 8
	06/30/09 - 07/28/09	< 1	< 2	< 4	< 2	< 3	< 2	< 3	< 1	< 1	< 17	< 6
	07/28/09 - 08/31/09	< 2	< 2	< 5	< 2	< 4	< 3	< 4	< 2	< 2	< 24	< 8
	08/31/09 - 09/29/09	< 5	< 5	< 8	< 4	< 9	< 5	< 9	< 5	< 6	< 24	< 8
	09/29/09 - 11/03/09	< 2	< 2	< 4	< 2	< 4	< 2	< 4	< 2	< 2	< 16	< 4
	11/03/09 - 12/01/09	< 3	< 3	< 6	< 3	< 5	< 3	< 5	< 2	< 3	< 17	< 6
	12/01/09 - 12/28/09	< 1	< 2	< 3	< 1	< 2	< 2	< 3	< 1	< 1	< 12	< 4
	MEAN	-	-	-	-	-	-	-	-	-	-	-

TABLE C-IV.1 CONCENTRATIONS OF TRITIUM AND GAMMA EMITTERS IN STORM WATER SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2009

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

STC	COLLECTION PERIOD	H-3	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	Cs-134	Cs-137	Ba-140	La-140
EDCB	02/03/09 - 03/31/09	< 182	< 1	< 2	< 3	< 1	< 3	< 2	< 3	< 1	< 1	< 15	< 4
	04/28/09 - 06/30/09	< 111	< 4	< 5	< 8	< 4	< 9	< 4	< 8	< 3	< 4	< 29	< 11
	07/28/09 - 09/29/09	< 179	< 4	< 4	< 7	< 4	< 8	< 4	< 7	< 4	< 4	< 21	< 6
	11/03/09 - 12/28/09	< 172	< 4	< 4	< 9	< 4	< 7	< 5	< 8	< 3	< 4	< 29	< 9
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-

TABLE C-V.1 **CONCENTRATIONS OF STRONTIUM IN PREDATOR AND BOTTOM FEEDER (FISH) SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2009**

RESULTS IN UNITS OF PCI/KG WET ± 2 SIGMA

STC	COLLECTION PERIOD	Sr-90
INDP	PREDATOR	
	06/12/09	< 4
	10/22/09	< 5
	MEAN	-
INDB	BOTTOM FEEDER	
	06/12/09	< 4
	11/02/09	< 3
	MEAN	-
BKGP	PREDATOR	
	06/11/09	< 2
	11/03/09	< 3
	MEAN	-
BKGB	BOTTOM FEEDER	
	06/11/09	< 3
	11/03/09	< 5
	MEAN	-

TABLE C-V.2 **CONCENTRATIONS OF GAMMA EMITTERS IN PREDATOR AND BOTTOM FEEDER (FISH) SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2009**

RESULTS IN UNITS OF PCI/KG WET ± 2 SIGMA

STC	COLLECTION PERIOD	K-40	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Cs-134	Cs-137
BKGB	BOTTOM FEEDER								
	06/11/09	2820 ± 709	< 33	< 36	< 49	< 34	< 58	< 33	< 34
	11/03/09	2730 ± 861	< 60	< 59	< 108	< 57	< 127	< 61	< 65
	MEAN	2775 ± 127	-	-	-	-	-	-	-
BKGP	PREDATOR								
	06/11/09	3220 ± 796	< 44	< 37	< 97	< 47	< 91	< 38	< 53
	11/03/09	2090 ± 680	< 34	< 49	< 98	< 35	< 99	< 36	< 43
	MEAN	2655 ± 1598	-	-	-	-	-	-	-
INDB	BOTTOM FEEDER								
	06/12/09	3220 ± 661	< 35	< 49	< 80	< 37	< 82	< 35	< 37
	11/02/09	3120 ± 777	< 30	< 41	< 74	< 42	< 92	< 43	< 48
	MEAN	3170 ± 141	-	-	-	-	-	-	-
INDP	PREDATOR								
	06/12/09	3080 ± 588	< 39	< 43	< 104	< 37	< 89	< 35	< 41
	10/22/09	3300 ± 1220	< 49	< 56	< 174	< 66	< 126	< 52	< 61
	MEAN	3190 ± 311	-	-	-	-	-	-	-

TABLE C-VI.1 CONCENTRATIONS OF GAMMA EMITTERS IN SEDIMENT SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2009

RESULTS IN UNITS OF PCI/KG DRY ± 2 SIGMA

STC	COLLECTION PERIOD	K-40	Mn-54	Co-58	Co-60	Cs-134	Cs-137
A1-3	06/11/09	14200 ± 1580	< 77	< 69	< 81	< 61	336 ± 93
	11/23/09	10200 ± 1470	< 72	< 80	< 58	< 70	355 ± 90
	MEAN	12200 ± 5657	-	-	-	-	346 ± 27
EDCB	11/23/09	14800 ± 2010	< 113	< 117	< 109	< 103	< 94
	MEAN	14800	-	-	-	-	-
J2-1	06/11/09	17600 ± 1810	< 94	< 73	< 74	< 67	< 99
	11/23/09	17400 ± 1840	< 78	< 92	< 82	< 73	128 ± 78
	MEAN	17500 ± 283	-	-	-	-	128
K1-3	06/11/09	11400 ± 1420	< 79	< 91	< 80	< 70	130 ± 74
	11/23/09	9960 ± 2050	< 102	< 116	< 91	< 98	< 93
	MEAN	10680 ± 2036	-	-	-	-	130

* THE MEAN AND 2 STANDARD DEVIATION VALUES ARE CALCULATED USING THE POSITIVE VALUES

TABLE C-VII.1 CONCENTRATIONS OF GROSS BETA IN AIR PARTICULATE SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION. 2009

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

COLLECTION PERIOD	GROUP I		GROUP II				GROUP III
	E1-2	F1-3	A3-1	G2-1	H3-1	M2-1	Q15-1
12/31/08 - 01/07/09	19 ± 5	23 ± 6	13 ± 5	17 ± 5	14 ± 5	17 ± 5	22 ± 6
01/07/09 - 01/14/09	18 ± 5	15 ± 5	18 ± 5	19 ± 5	18 ± 5	19 ± 5	18 ± 5
01/14/09 - 01/21/09	27 ± 6	21 ± 5	19 ± 5	21 ± 5	21 ± 6	24 ± 6	24 ± 6
01/21/09 - 01/28/09	20 ± 5	23 ± 5	24 ± 6	20 ± 5	18 ± 5	21 ± 5	19 ± 5
01/28/09 - 02/04/09	21 ± 5	20 ± 5	23 ± 5	27 ± 5	24 ± 5	25 ± 5	22 ± 5
02/04/09 - 02/11/09	27 ± 6	30 ± 6	26 ± 5	23 ± 5	27 ± 6	22 ± 5	27 ± 6
02/11/09 - 02/18/09	9 ± 5	8 ± 5	< 7	11 ± 5	11 ± 5	8 ± 5	14 ± 5
02/18/09 - 02/25/09	16 ± 5	19 ± 5	16 ± 5	17 ± 5	15 ± 5	17 ± 5	18 ± 5
02/25/09 - 03/04/09	15 ± 5	26 ± 6	22 ± 5	17 ± 5	20 ± 5	20 ± 5	19 ± 5
03/04/09 - 03/11/09	16 ± 5	20 ± 5	20 ± 6	20 ± 6	20 ± 5	20 ± 6	22 ± 6
03/11/09 - 03/18/09	18 ± 5	25 ± 6	23 ± 6	23 ± 6	27 ± 6	19 ± 5	25 ± 6
03/18/09 - 03/25/09	20 ± 5	22 ± 5	20 ± 5	17 ± 5	16 ± 5	17 ± 5	18 ± 5
03/25/09 - 04/01/09	12 ± 5	10 ± 4	11 ± 5	14 ± 5	11 ± 5	12 ± 5	13 ± 5
04/01/09 - 04/08/09	< 19 (1)	< 6	14 ± 5	11 ± 5	10 ± 5	14 ± 5	9 ± 5
04/08/09 - 04/16/09	(1)	20 ± 5	14 ± 4	17 ± 5	17 ± 5	17 ± 4	17 ± 5
04/16/09 - 04/22/09	(1)	15 ± 6	16 ± 6	12 ± 6	16 ± 6	17 ± 6	15 ± 6
04/22/09 - 04/29/09	20 ± 5	15 ± 5	21 ± 5	26 ± 6	19 ± 5	19 ± 5	17 ± 5
04/29/09 - 05/06/09	15 ± 5	14 ± 5	16 ± 5	14 ± 5	11 ± 5	19 ± 5	16 ± 5
05/06/09 - 05/13/09	14 ± 5	10 ± 5	12 ± 5	10 ± 5	12 ± 5	16 ± 5	13 ± 5
05/13/09 - 05/20/09	13 ± 5	12 ± 5	13 ± 5	11 ± 5	12 ± 5	12 ± 5	14 ± 5
05/20/09 - 05/27/09	10 ± 5	13 ± 5	13 ± 5	14 ± 5	14 ± 5	11 ± 5	17 ± 5
05/27/09 - 06/03/09	14 ± 5	9 ± 5	12 ± 5	8 ± 4	9 ± 5	13 ± 5	13 ± 5
06/03/09 - 06/10/09	14 ± 5	16 ± 5	12 ± 5	12 ± 5	11 ± 5	14 ± 5	16 ± 5
06/10/09 - 06/18/09	9 ± 4	19 ± 5	13 ± 5	11 ± 5	10 ± 4	13 ± 5	14 ± 5
06/18/09 - 06/24/09	11 ± 6	13 ± 6	< 8	< 8	< 8	< 8	11 ± 6
06/24/09 - 07/01/09	17 ± 6	17 ± 5	15 ± 5	14 ± 5	16 ± 5	13 ± 5	18 ± 6
07/01/09 - 07/07/09	15 ± 6	17 ± 6	15 ± 6	< 8	12 ± 6	9 ± 6	12 ± 6
07/07/09 - 07/15/09	8 ± 4	10 ± 4	8 ± 4	14 ± 5	32 ± 6	9 ± 5	11 ± 5
07/15/09 - 07/22/09	19 ± 6	19 ± 6	17 ± 5	15 ± 5	20 ± 6	17 ± 5	17 ± 5
07/22/09 - 07/29/09	21 ± 5	19 ± 5	19 ± 5	16 ± 5	17 ± 5	19 ± 5	20 ± 5
07/29/09 - 08/05/09	22 ± 6	20 ± 6	19 ± 5	18 ± 5	18 ± 5	21 ± 6	17 ± 5
08/05/09 - 08/12/09	15 ± 5	17 ± 5	15 ± 5	16 ± 5	15 ± 5	20 ± 5	17 ± 5
08/12/09 - 08/19/09	21 ± 6	21 ± 6	20 ± 6	24 ± 6	14 ± 5	17 ± 6	20 ± 6
08/19/09 - 08/26/09	12 ± 5	13 ± 5	16 ± 5	16 ± 5	21 ± 6	15 ± 5	13 ± 5
08/26/09 - 09/02/09	20 ± 5	15 ± 5	19 ± 5	18 ± 5	20 ± 5	18 ± 5	23 ± 5
09/02/09 - 09/09/09	22 ± 6	22 ± 6	20 ± 6	22 ± 6	20 ± 6	15 ± 5	24 ± 6
09/09/09 - 09/16/09	21 ± 6	23 ± 6	20 ± 5	18 ± 5	18 ± 5	23 ± 6	19 ± 6
09/16/09 - 09/23/09	19 ± 5	12 ± 5	17 ± 5	15 ± 5	19 ± 5	18 ± 5	22 ± 6
09/23/09 - 09/30/09	19 ± 5	13 ± 5	19 ± 5	10 ± 5	13 ± 5	16 ± 5	17 ± 5
09/30/09 - 10/07/09	16 ± 5	13 ± 5	18 ± 5	13 ± 5	11 ± 5	19 ± 6	18 ± 6
10/07/09 - 10/14/09	13 ± 5	14 ± 5	10 ± 5	14 ± 5	16 ± 6	12 ± 5	13 ± 5
10/14/09 - 10/21/09	14 ± 5	15 ± 5	15 ± 5	16 ± 5	21 ± 5	17 ± 5	16 ± 5
10/21/09 - 10/28/09	18 ± 5	16 ± 5	21 ± 5	23 ± 5	18 ± 5	16 ± 5	18 ± 5
10/28/09 - 11/04/09	18 ± 5	15 ± 4	14 ± 4	16 ± 4	15 ± 4	15 ± 4	13 ± 4
11/04/09 - 11/11/09	28 ± 6	19 ± 6	27 ± 6	24 ± 6	20 ± 6	24 ± 6	26 ± 6
11/11/09 - 11/18/09	12 ± 5	9 ± 5	14 ± 5	14 ± 5	12 ± 5	12 ± 5	15 ± 6
11/18/09 - 11/24/09	19 ± 5	28 ± 6	25 ± 5	204 ± 10	23 ± 5	23 ± 5	19 ± 5
11/24/09 - 12/02/09	12 ± 4	19 ± 5	18 ± 5	14 ± 4	16 ± 5	19 ± 5	16 ± 5
12/02/09 - 12/09/09	17 ± 5	14 ± 5	17 ± 5	15 ± 5	13 ± 5	14 ± 5	15 ± 5
12/09/09 - 12/16/09	25 ± 6	22 ± 6	29 ± 6	22 ± 6	26 ± 6	23 ± 6	28 ± 6
12/16/09 - 12/22/09	26 ± 6	22 ± 5	21 ± 5	22 ± 6	21 ± 5	24 ± 6	20 ± 5
12/22/09 - 12/29/09	16 ± 4	18 ± 4	21 ± 4	20 ± 4	17 ± 4	26 ± 5	19 ± 5
MEAN	17 ± 10	17 ± 10	18 ± 9	20 ± 54	17 ± 10	17 ± 9	18 ± 9

* THE MEAN AND 2 STANDARD DEVIATION VALUES ARE CALCULATED USING THE POSITIVE VALUES

TABLE C-VII.2 **MONTHLY AND YEARLY MEAN VALUES OF GROSS BETA CONCENTRATIONS IN AIR PARTICULATE SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2009**

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

GROUP I - CLOSEST TO THE SITE BOUNDARY				GROUP II - INTERMEDIATE OFFSITE				GROUP III - CONTROL LOCATIONS			
COLLECTION PERIOD	MIN	MAX	MEAN ± 2SD	COLLECTION PERIOD	MIN	MAX	MEAN ± 2SD	COLLECTION PERIOD	MIN	MAX	MEAN ± 2SD
12/31/08 - 01/28/09	15	27	21 ± 7	12/31/08 - 01/28/09	13	24	19 ± 6	12/31/08 - 01/28/09	18	24	21 ± 6
01/28/09 - 02/25/09	8	30	19 ± 15	01/28/09 - 02/25/09	8	27	19 ± 13	01/28/09 - 02/25/09	14	27	20 ± 12
02/25/09 - 04/01/09	10	26	18 ± 10	02/25/09 - 04/01/09	11	27	18 ± 8	02/25/09 - 04/01/09	13	25	19 ± 9
04/08/09 - 04/29/09	15	20	18 ± 5	04/08/09 - 04/29/09	10	17	15 ± 5	04/08/09 - 04/29/09	9	17	14 ± 9
04/22/09 - 06/03/09	9	15	13 ± 4	04/22/09 - 06/03/09	8	26	14 ± 8	04/22/09 - 06/03/09	13	17	15 ± 4
06/03/09 - 07/01/09	9	19	14 ± 7	06/03/09 - 07/01/09	10	16	13 ± 4	06/03/09 - 07/01/09	11	18	15 ± 6
07/01/09 - 07/29/09	8	21	16 ± 10	07/01/09 - 07/29/09	8	32	16 ± 11	07/01/09 - 07/29/09	11	20	15 ± 8
07/29/09 - 09/02/09	12	22	18 ± 7	07/29/09 - 09/02/09	14	24	18 ± 5	07/29/09 - 09/02/09	13	23	18 ± 7
09/02/09 - 09/30/09	12	23	19 ± 8	09/02/09 - 09/30/09	10	23	18 ± 6	09/02/09 - 09/30/09	17	24	20 ± 6
09/30/09 - 10/28/09	13	18	15 ± 3	09/30/09 - 10/28/09	10	23	16 ± 7	09/30/09 - 10/28/09	13	18	16 ± 5
10/28/09 - 12/02/09	9	28	18 ± 13	10/28/09 - 12/02/09	12	204	27 ± 84	10/28/09 - 12/02/09	13	26	18 ± 10
12/02/09 - 12/29/09	14	26	20 ± 9	12/02/09 - 12/29/09	13	29	21 ± 9	12/02/09 - 12/29/09	15	28	21 ± 11
12/31/08 - 12/29/09	8	30	17 ± 10	12/31/08 - 12/29/09	8	204	18 ± 28	12/31/08 - 12/29/09	9	28	18 ± 9

* THE MEAN AND 2 STANDARD DEVIATION VALUES ARE CALCULATED USING THE POSITIVE VALUES

TABLE C-VII.3 **CONCENTRATIONS OF GAMMA EMITTERS IN AIR PARTICULATE SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2009**

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

STC	COLLECTION PERIOD	Be-7	Mn-54	Co-58	Co-60	Nb-95	Zr-95	Cs-134	Cs-137
A3-1	12/31/08 - 04/01/09	96 ± 34	< 3	< 5	< 3	< 5	< 8	< 4	< 3
	04/01/09 - 07/01/09	94 ± 39	< 5	< 5	< 3	< 6	< 10	< 4	< 5
	07/01/09 - 09/30/09	89 ± 40	< 3	< 4	< 4	< 4	< 7	< 3	< 3
	09/30/09 - 12/29/09	67 ± 26	< 3	< 3	< 4	< 4	< 7	< 4	< 3
	MEAN	87 ± 27	-	-	-	-	-	-	-
E1-2	12/31/08 - 04/01/09	99 ± 28	< 2	< 3	< 2	< 4	< 6	< 3	< 2
	04/01/09 - 07/01/09	105 ± 39	< 6	< 9	< 6	< 6	< 15	< 5	< 4
	07/01/09 - 09/30/09	95 ± 46	< 4	< 5	< 4	< 7	< 9	< 5	< 3
	09/30/09 - 12/29/09	77 ± 24	< 4	< 5	< 3	< 4	< 6	< 3	< 3
	MEAN	94 ± 24	-	-	-	-	-	-	-
F1-3	12/31/08 - 04/01/09	125 ± 39	< 4	< 7	< 4	< 6	< 8	< 3	< 4
	04/01/09 - 07/01/09	75 ± 38	< 3	< 4	< 5	< 5	< 10	< 5	< 4
	07/01/09 - 09/30/09	83 ± 29	< 3	< 4	< 3	< 3	< 7	< 3	< 3
	09/30/09 - 12/29/09	64 ± 41	< 6	< 6	< 6	< 8	< 11	< 6	< 3
	MEAN	87 ± 53	-	-	-	-	-	-	-
G2-1	12/31/08 - 04/01/09	92 ± 26	< 3	< 5	< 3	< 5	< 8	< 4	< 3
	04/01/09 - 07/01/09	114 ± 38	< 5	< 3	< 6	< 6	< 9	< 4	< 4
	07/01/09 - 09/30/09	86 ± 45	< 3	< 5	< 3	< 5	< 10	< 4	< 4
	09/30/09 - 12/29/09	61 ± 30	< 3	< 3	< 4	< 5	< 9	< 3	< 3
	MEAN	88 ± 44	-	-	-	-	-	-	-
H3-1	12/31/08 - 04/01/09	80 ± 39	< 2	< 5	< 1	< 4	< 8	< 3	< 3
	04/01/09 - 07/01/09	123 ± 41	< 5	< 5	< 6	< 6	< 11	< 4	< 3
	07/01/09 - 09/30/09	77 ± 33	< 3	< 5	< 3	< 5	< 8	< 4	< 3
	09/30/09 - 12/29/09	56 ± 32	< 4	< 5	< 6	< 6	< 12	< 4	< 4
	MEAN	84 ± 56	-	-	-	-	-	-	-
M2-1	12/31/08 - 04/01/09	95 ± 42	< 4	< 6	< 4	< 6	< 10	< 4	< 4
	04/01/09 - 07/01/09	106 ± 34	< 4	< 6	< 4	< 6	< 11	< 4	< 3
	07/01/09 - 09/30/09	96 ± 43	< 5	< 6	< 3	< 8	< 14	< 5	< 5
	09/30/09 - 12/29/09	59 ± 26	< 3	< 3	< 3	< 4	< 9	< 3	< 3
	MEAN	89 ± 41	-	-	-	-	-	-	-
Q15-1	12/31/08 - 04/01/09	94 ± 31	< 3	< 3	< 3	< 4	< 6	< 3	< 3
	04/01/09 - 07/01/09	92 ± 40	< 4	< 4	< 5	< 5	< 10	< 3	< 3
	07/01/09 - 09/30/09	93 ± 27	< 3	< 4	< 3	< 5	< 8	< 3	< 3
	09/30/09 - 12/29/09	89 ± 28	< 5	< 7	< 5	< 6	< 9	< 4	< 5
	MEAN	92 ± 4	-	-	-	-	-	-	-

TABLE C-VII.4 **CONCENTRATIONS OF STRONTIUM AND GAMMA EMITTERS IN AIR PARTICULATE SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION AS A RESULT OF THE NOVEMBER 2009 RELEASE**

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

STC	COLLECTION PERIOD		Sr-90	Be-7	Mn-54	Co-58	Co-60	Nb-95	Zr-95	Cs-134	Cs-137
E1-2	11/18/09 - 11/24/09	(1)		< 123	< 11	< 11	< 11	< 13	< 25	< 9	< 10
F1-3	11/18/09 - 11/24/09	(1)	< 8	127 ± 86	< 8	34 ± 12	< 9	< 10	< 16	< 8	< 8
G2-1	11/18/09 - 11/24/09	(1)	< 2	< 196	< 18	52 ± 19	36 ± 15	346 ± 38	246 ± 35	< 16	< 18
H3-1	11/18/09 - 11/24/09	(1)		120 ± 83	< 12	< 13	< 13	< 15	< 23	< 12	< 11

(1) SEE PROGRAM EXCEPTIONS SECTION FOR EXPLANATION

TABLE C-VIII.1 CONCENTRATIONS OF I-131 IN AIR IODINE SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2009

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

COLLECTION PERIOD	GROUP I		GROUP II				GROUP III
	E2-1	F1-3	A3-1	G2-1	H3-1	M2-1	Q15-1
12/31/08 - 01/07/09	< 63	< 61	< 43	< 63	< 63	< 43	< 43
01/07/09 - 01/14/09	< 29	< 22	< 64	< 29	< 29	< 64	< 64
01/14/09 - 01/21/09	< 27	< 27	< 45	< 27	< 27	< 45	< 45
01/21/09 - 01/28/09	< 25	< 40	< 47	< 41	< 41	< 47	< 47
01/28/09 - 02/04/09	< 43	< 42	< 67	< 43	< 43	< 67	< 68
02/04/09 - 02/11/09	< 54	< 52	< 51	< 32	< 53	< 51	< 51
02/11/09 - 02/18/09	< 50	< 48	< 48	< 49	< 49	< 48	< 49
02/18/09 - 02/25/09	< 32	< 31	< 41	< 32	< 18	< 32	< 41
02/25/09 - 03/04/09	< 50	< 49	< 44	< 50	< 50	< 44	< 44
03/04/09 - 03/11/09	< 15	< 14	< 20	< 15	< 20	< 8	< 20
03/11/09 - 03/18/09	< 41	< 40	< 49	< 41	< 41	< 49	< 49
03/18/09 - 03/25/09	< 39	< 38	< 40	< 38	< 39	< 40	< 32
03/25/09 - 04/01/09	< 65	< 63	< 31	< 65	< 66	< 31	< 32
04/01/09 - 04/08/09	< 66 (1)	< 29	< 34	< 29	< 63	< 65	< 64
04/08/09 - 04/16/09	(1)	< 43	< 48	< 44	< 44	< 46	< 47
04/16/09 - 04/22/09	(1)	< 52	< 63	< 67	< 67	< 68	< 65
04/22/09 - 04/29/09	< 47	< 53	< 64	< 54	< 54	< 64	< 64
04/29/09 - 05/06/09	< 37	< 45	< 61	< 46	< 46	< 62	< 62
05/06/09 - 05/13/09	< 66	< 65	< 63	< 66	< 66	< 63	< 63
05/13/09 - 05/20/09	< 66	< 64	< 59	< 35	< 65	< 64	< 58
05/20/09 - 05/27/09	< 53	< 51	< 44	< 52	< 53	< 44	< 44
05/27/09 - 06/03/09	< 36	< 35	< 38	< 36	< 20	< 39	< 39
06/03/09 - 06/10/09	< 30	< 29	< 69	< 30	< 30	< 34	< 70
06/10/09 - 06/18/09	< 8	< 8	< 15	< 8	< 8	< 9	< 15
06/18/09 - 06/24/09	< 53	< 52	< 53	< 53	< 54	< 53	< 53
06/24/09 - 07/01/09	< 65	< 63	< 65	< 64	< 66	< 65	< 35
07/01/09 - 07/07/09	< 24	< 24	< 32	< 24	< 13	< 24	< 14
07/07/09 - 07/15/09	< 59	< 58	< 59	< 59	< 67	< 67	< 68
07/15/09 - 07/22/09	< 66	< 66	< 61	< 67	< 68	< 61	< 62
07/22/09 - 07/29/09	< 38	< 38	< 15	< 38	< 38	< 23	< 17
07/29/09 - 08/05/09	< 22	< 22	< 27	< 22	< 22	< 27	< 27
08/05/09 - 08/12/09	< 42 (1)	< 41	< 44	< 43 (1)	< 43 (1)	< 44	< 45
08/12/09 - 08/19/09	< 32	< 32	< 31	< 32	< 33	< 32	< 32
08/19/09 - 08/26/09	< 33	< 33	< 34	< 21	< 34	< 34	< 35
08/26/09 - 09/02/09	< 35	< 35	< 43	< 35	< 36	< 44	< 44
09/02/09 - 09/09/09	< 53	< 53	< 54	< 54	< 30	< 53	< 54
09/09/09 - 09/16/09	< 62	< 63	< 48	< 63	< 64	< 49	< 49
09/16/09 - 09/23/09	< 39	< 39	< 37	< 39	< 39	< 37	< 38
09/23/09 - 09/30/09	< 37	< 36	< 22	< 37	< 21	< 36	< 16
09/30/09 - 10/07/09	< 52	< 52	< 66	< 52	< 52	< 66	< 67
10/07/09 - 10/14/09	< 61 (1)	< 61	< 41	< 62 (1)	< 63	< 42	< 42
10/14/09 - 10/21/09	< 42	< 41	< 19	< 45	< 45	< 45	< 46
10/21/09 - 10/28/09	< 50	< 50	< 61	< 51	< 51	< 61 (1)	< 62
10/28/09 - 11/04/09	< 64	< 35	< 69	< 64	< 64	< 69	< 70
11/04/09 - 11/11/09	< 39	< 39	< 38	< 39	< 40	< 39	< 39
11/11/09 - 11/18/09	< 17	< 23	< 59	< 23	< 23	< 59	< 59
11/18/09 - 11/24/09	< 47	< 47	< 47	< 26	< 47	< 47	< 48
11/24/09 - 12/02/09	< 35	< 35	< 50	< 35	< 36	< 50	< 50
12/02/09 - 12/09/09	< 57	< 57	< 64 (1)	< 58	< 59	< 63	< 65
12/09/09 - 12/16/09	< 48	< 48	< 64	< 49	< 27	< 64	< 65
12/16/09 - 12/22/09	< 55	< 55	< 68	< 57	< 57	< 69	< 70
12/22/09 - 12/29/09	< 60	< 60	< 63	< 60	< 63	< 63	< 64
MEAN	-	-	-	-	-	-	-

(1) SEE PROGRAM EXCEPTIONS SECTION FOR EXPLANATION

TABLE C-IX.1 CONCENTRATIONS OF I-131 IN MILK SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2009

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

	CONTROL FARM	INDICATOR FARM				
COLLECTION PERIOD	K15-3	D2-1	E2-2	F4-1	G2-1	P4-1
01/07/09	< 0.7	< 0.7	< 0.7	< 0.6	< 0.8	
02/04/09	< 0.7	< 0.6	< 0.6	< 0.5	< 0.6	
03/04/09	< 0.5	< 0.7	< 0.6	< 0.5	< 0.6	
03/18/09	< 0.5	< 0.5	< 0.9	< 0.5	< 0.6	
04/01/09	< 0.6	< 0.6	< 0.6	< 0.4	< 0.7	
04/15/09	< 0.6	< 0.6	< 0.7	< 0.4	< 0.7	
04/29/09	< 0.6	< 0.8	< 0.7	< 0.5	< 0.6	
05/13/09	< 0.6	< 0.5	< 0.5	< 0.5	< 0.6	
05/27/09	< 0.5	< 0.5	< 0.6	< 0.5	< 0.6	
06/10/09	< 0.5	< 0.5	< 0.5	< 0.5	< 0.6	
06/24/09	< 0.5	< 0.5	< 0.5	< 0.5	< 0.7	
07/08/09	< 0.6	< 0.5	< 0.6	< 0.6	< 0.6	
07/22/09	< 0.7	< 0.6	< 0.7	< 0.7	< 0.6	
08/05/09	< 0.5	< 0.5	< 0.6	< 0.5	< 0.8	
08/19/09	< 0.6	< 0.6	< 0.6	< 0.5	< 0.6	
09/02/09	< 0.6	< 0.6	< 0.8	< 0.8	< 0.6	
09/16/09	< 0.6	< 0.6	< 0.5	< 0.6	< 0.6	
09/30/09	< 0.8	< 0.6	< 0.8	< 0.4	< 0.8	
10/14/09	< 0.4	< 0.4	< 0.5	< 0.4	< 0.4	
10/28/09	< 0.8	< 0.6	< 0.6	< 0.8	< 0.6	
11/11/09	< 0.7	< 0.7	< 0.9	< 0.9	< 0.7	
11/24/09	< 0.5		< 0.7	< 0.4	< 0.4	< 0.4 (1)
12/09/09	< 0.8		< 0.7	< 0.6	< 0.7	< 0.7
MEAN	-	-	-	-	-	-

(1) SEE PROGRAM CHANGES SECTION FOR EXPLANATION

TABLE C-IX.2 CONCENTRATIONS OF STRONTIUM IN MILK SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2009

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION	CONTROL FARM		INDICATOR FARMS									
	K15-3		D2-1		E2-2		F4-1		G2-1		P4-1	
PERIOD	SR-89	SR-90	SR-89	SR-90	SR-89	SR-90	SR-89	SR-90	SR-89	SR-90	SR-89	SR-90
01/07/09 - 03/18/09	< 2.3	1.2 ± 0.4	< 2.3	0.6 ± 0.4	< 2.4	< 0.6	< 2.6	< 0.9	< 2.3	< 0.7		
04/01/09 - 06/24/09	< 1.8	0.5 ± 0.3	< 2.1	0.5 ± 0.3	< 2.6	0.8 ± 0.4	< 1.8	0.8 ± 0.3	< 2.0	< 0.4		
07/08/09 - 09/30/09	< 3.2	< 0.7	< 3.5	< 0.7	< 3.0	< 0.5	< 2.2	< 0.5	< 2.0	< 0.4		
10/14/09 - 12/09/09	< 1.7	0.7 ± 0.3	< 3.9	1.0 ± 0.4	< 2.5	< 0.7	< 2.2	< 0.6	< 2.7	0.8 ± 0.5	< 1.7 (1)	0.7 ± 0.3
MEAN	-	0.8 ± 0.7	-	0.7 ± 0.6	-	0.8 ± 0.0	-	0.8 ± 0.0	-	0.8 ± 0.0	-	0.7 ± 0.0

* THE MEAN AND 2 STANDARD DEVIATION VALUES ARE CALCULATED USING THE POSITIVE VALUES

(1) SEE PROGRAM CHANGES SECTION FOR EXPLANATION

TABLE C-IX.3 **CONCENTRATIONS OF GAMMA EMITTERS IN MILK SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2009**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

STC	COLLECTION PERIOD	K-40	Cs-134	Cs-137	Ba-140	La-140
D2-1	01/07/09	1260 ± 83	< 3	< 3	< 33	< 9
	02/04/09	1280 ± 106	< 4	< 4	< 30	< 8
	03/04/09	1090 ± 137	< 6	< 8	< 42	< 10
	03/18/09	1220 ± 94	< 4	< 4	< 33	< 11
	04/01/09	1290 ± 113	< 4	< 5	< 33	< 7
	04/15/09	1180 ± 106	< 4	< 5	< 42	< 14
	04/29/09	1270 ± 41	< 1	< 2	< 33	< 9
	05/13/09	1310 ± 39	< 1	< 1	< 41	< 12
	05/27/09	1220 ± 112	< 5	< 5	< 33	< 8
	06/10/09	1300 ± 140	< 5	< 6	< 24	< 9
	06/24/09	1280 ± 50	< 2	< 2	< 27	< 8
	07/08/09	1160 ± 101	< 3	< 4	< 37	< 10
	07/22/09	1270 ± 132	< 6	< 6	< 29	< 8
	08/05/09	1160 ± 143	< 5	< 7	< 41	< 15
	08/19/09	1270 ± 118	< 4	< 5	< 32	< 9
	09/02/09	1310 ± 110	< 5	< 5	< 32	< 9
	09/16/09	1140 ± 154	< 6	< 7	< 30	< 9
	09/30/09	1240 ± 79	< 3	< 3	< 22	< 7
	10/14/09	1270 ± 151	< 6	< 7	< 28	< 8
	10/28/09	1300 ± 96	< 4	< 5	< 28	< 7
	11/11/09	1220 ± 98	< 4	< 4	< 19	< 5
	11/24/09	(1)				
	12/09/09	(1)				
	MEAN	1240 ± 124	-	-	-	-
E2-2	01/07/09	1340 ± 80	< 3	< 3	< 34	< 11
	02/04/09	1290 ± 129	< 5	< 7	< 46	< 9
	03/04/09	1430 ± 145	< 6	< 7	< 39	< 11
	03/18/09	1340 ± 96	< 4	< 4	< 31	< 11
	04/01/09	1290 ± 149	< 6	< 7	< 44	< 12
	04/15/09	1220 ± 109	< 4	< 5	< 47	< 15
	04/29/09	1390 ± 51	< 2	< 2	< 46	< 13
	05/13/09	1370 ± 44	< 1	< 2	< 29	< 8
	05/27/09	1240 ± 134	< 5	< 6	< 37	< 11
	06/10/09	1240 ± 174	< 6	< 8	< 35	< 14
	06/24/09	1350 ± 43	< 1	< 2	< 23	< 7
	07/08/09	1210 ± 135	< 6	< 6	< 48	< 15
	07/22/09	1390 ± 117	< 4	< 5	< 26	< 8
	08/05/09	1340 ± 150	< 6	< 6	< 45	< 11
	08/19/09	1430 ± 156	< 6	< 8	< 48	< 13
	09/02/09	1420 ± 133	< 5	< 5	< 43	< 14
	09/16/09	1420 ± 120	< 5	< 5	< 21	< 8
	09/30/09	1340 ± 92	< 3	< 4	< 23	< 8
	10/14/09	1420 ± 166	< 5	< 6	< 25	< 8
	10/28/09	1270 ± 114	< 5	< 5	< 28	< 10
	11/11/09	1230 ± 120	< 4	< 5	< 21	< 7
	11/24/09	1390 ± 136	< 4	< 5	< 36	< 10
	12/09/09	1280 ± 100	< 4	< 5	< 33	< 9
	MEAN	1332 ± 147	-	-	-	-

(1) SEE PROGRAMS CHANGES SECTION FOR EXPLANATION

TABLE C-IX.3 **CONCENTRATIONS OF GAMMA EMITTERS IN MILK SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2009**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

STC	COLLECTION PERIOD	K-40	Cs-134	Cs-137	Ba-140	La-140
F4-1	01/07/09	1250 ± 81	< 3	< 3	< 37	< 10
	02/04/09	1360 ± 125	< 4	< 5	< 42	< 13
	03/04/09	1420 ± 134	< 4	< 6	< 35	< 9
	03/18/09	1360 ± 108	< 4	< 4	< 41	< 11
	04/01/09	1410 ± 147	< 5	< 5	< 40	< 13
	04/15/09	1410 ± 112	< 4	< 5	< 43	< 13
	04/29/09	1330 ± 51	< 2	< 2	< 48	< 12
	05/13/09	1330 ± 55	< 2	< 3	< 49	< 15
	05/27/09	1340 ± 126	< 5	< 4	< 31	< 10
	06/10/09	1260 ± 142	< 6	< 6	< 25	< 8
	06/24/09	1390 ± 46	< 2	< 2	< 29	< 8
	07/08/09	1370 ± 126	< 5	< 5	< 50	< 12
	07/22/09	1240 ± 122	< 4	< 4	< 21	< 6
	08/05/09	1240 ± 148	< 5	< 5	< 38	< 11
	08/19/09	1380 ± 136	< 5	< 6	< 38	< 12
	09/02/09	1410 ± 119	< 4	< 5	< 36	< 9
	09/16/09	1170 ± 117	< 5	< 6	< 24	< 7
	09/30/09	1390 ± 77	< 3	< 3	< 21	< 6
	10/14/09	1360 ± 156	< 7	< 8	< 38	< 10
	10/28/09	1340 ± 101	< 4	< 4	< 28	< 8
	11/11/09	1430 ± 117	< 5	< 6	< 25	< 7
	11/24/09	1390 ± 126	< 5	< 5	< 36	< 13
	12/09/09	1300 ± 102	< 4	< 4	< 33	< 10
	MEAN	1343 ± 138	-	-	-	-
G2-1	01/07/09	1420 ± 92	< 4	< 3	< 43	< 11
	02/04/09	1440 ± 145	< 5	< 6	< 46	< 13
	03/04/09	1280 ± 147	< 5	< 7	< 44	< 13
	03/18/09	1300 ± 121	< 3	< 4	< 36	< 10
	04/01/09	1060 ± 135	< 5	< 7	< 48	< 15
	04/15/09	1380 ± 122	< 5	< 5	< 45	< 12
	04/29/09	1190 ± 46	< 2	< 2	< 37	< 12
	05/13/09	1280 ± 43	< 2	< 2	< 37	< 11
	05/27/09	1000 ± 131	< 5	< 7	< 39	< 14
	06/10/09	966 ± 159	< 5	< 7	< 29	< 9
	06/24/09	1230 ± 43	< 2	< 2	< 27	< 8
	07/08/09	1180 ± 132	< 5	< 6	< 50	< 12
	07/22/09	1010 ± 116	< 4	< 4	< 19	< 6
	08/05/09	1160 ± 115	< 3	< 3	< 23	< 7
	08/19/09	1140 ± 126	< 6	< 6	< 36	< 14
	09/02/09	934 ± 122	< 5	< 6	< 37	< 10
	09/16/09	915 ± 137	< 6	< 6	< 31	< 8
	09/30/09	1070 ± 76	< 3	< 4	< 22	< 7
	10/14/09	993 ± 148	< 6	< 7	< 35	< 9
	10/28/09	1030 ± 82	< 4	< 4	< 25	< 7
	11/11/09	1360 ± 124	< 5	< 6	< 25	< 6
	11/24/09	1310 ± 137	< 6	< 6	< 45	< 12
	12/09/09	1050 ± 97	< 4	< 5	< 35	< 11
	MEAN	1161 ± 326	-	-	-	-

TABLE C-IX.3 CONCENTRATIONS OF GAMMA EMITTERS IN MILK SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2009

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

STC	COLLECTION PERIOD	K-40	Cs-134	Cs-137	Ba-140	La-140
K15-3	01/07/09	1340 ± 104	< 3	< 4	< 43	< 13
	02/04/09	1310 ± 133	< 5	< 6	< 44	< 11
	03/04/09	1200 ± 140	< 5	< 6	< 31	< 8
	03/18/09	1200 ± 93	< 4	< 5	< 34	< 11
	04/01/09	1280 ± 112	< 5	< 5	< 38	< 10
	04/15/09	1370 ± 122	< 4	< 5	< 47	< 15
	04/29/09	1320 ± 56	< 2	< 2	< 44	< 14
	05/13/09	1380 ± 54	< 2	< 2	< 39	< 10
	05/27/09	1360 ± 130	< 5	< 6	< 34	< 11
	06/10/09	1030 ± 166	< 6	< 9	< 30	< 14
	06/24/09	1280 ± 89	< 3	< 3	< 53	< 13
	07/08/09	1060 ± 131	< 5	< 6	< 44	< 10
	07/22/09	1430 ± 130	< 5	< 6	< 29	< 9
	08/05/09	1240 ± 89	< 4	< 4	< 26	< 9
	08/19/09	1200 ± 150	< 7	< 7	< 47	< 14
	09/02/09	1030 ± 100	< 4	< 4	< 31	< 8
	09/16/09	1380 ± 142	< 5	< 5	< 28	< 7
	09/30/09	1260 ± 73	< 3	< 3	< 20	< 6
	10/14/09	1210 ± 117	< 6	< 7	< 30	< 9
	10/28/09	1390 ± 115	< 5	< 5	< 30	< 9
	11/11/09	1250 ± 98	< 4	< 4	< 20	< 6
	11/24/09	1170 ± 121	< 4	< 5	< 38	< 11
	12/09/09	1270 ± 89	< 3	< 4	< 25	< 8
	MEAN	1259 ± 225	-	-	-	-
P4-1	01/07/09					
	02/04/09					
	03/04/09					
	03/18/09					
	04/01/09					
	04/15/09					
	04/29/09					
	05/13/09					
	05/27/09					
	06/10/09					
	06/24/09					
	07/08/09					
	07/22/09					
	08/05/09					
	08/19/09					
	09/02/09					
	09/16/09					
	09/30/09					
	10/14/09					
	10/28/09					
	11/11/09					
	11/24/09	1320 ± 129 (1)	< 6	< 7	< 44	< 13
	12/09/09	1260 ± 117	< 5	< 6	< 43	< 12
	MEAN	1290 ± 85	-	-	-	-

(1) SEE PROGRAMS CHANGES SECTION FOR EXPLANATION

TABLE C-X.1 **CONCENTRATIONS OF STRONTIUM AND GAMMA EMITTERS IN FOOD PRODUCT SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2009**

RESULTS IN UNITS OF PCI/KG WET ± 2 SIGMA

STC	COLLECTION PERIOD		SR-90	Be-7	K-40	I-131	Cs-134	Cs-137
B10-2	07/07/09	Cabbage	28 ± 3	< 194	4720 ± 451	< 56	< 17	< 19
	07/07/09	Yellow Squash Leaves	38 ± 3	332 ± 140	5650 ± 347	< 47	< 14	< 15
	07/07/09	Zucchini Leaves	38 ± 3	440 ± 154	4340 ± 353	< 47	< 14	< 16
	07/29/09	Cabbage	4 ± 2	< 95	2320 ± 185	< 55	< 9	< 10
	08/12/09	Cabbage	9 ± 2	< 77	1990 ± 151	< 40	< 7	< 8
	08/12/09	Sweet Corn		< 67	3180 ± 150	< 35	< 6	< 7
	08/12/09	Tomatoes		< 51	2390 ± 127	< 25	< 5	< 5
	08/12/09	Yellow Squash Leaves	17 ± 2	1400 ± 124	4830 ± 262	< 54	< 10	< 12
	08/12/09	Zucchini Leaves	22 ± 2	908 ± 111	3820 ± 258	< 45	< 9	< 11
	09/09/09	Broccoli Leaves	3 ± 2	< 126	2400 ± 236	< 43	< 12	< 13
	09/09/09	Cabbage	< 3	< 154	2970 ± 330	< 56	< 16	< 16
	09/09/09	Pumpkin Leaves	4 ± 1	547 ± 131	4240 ± 329	< 53	< 14	< 15
	09/09/09	Red Beets		< 57	2270 ± 156	< 25	< 5	< 6
	MEAN		18 ± 28	725 ± 870	3471 ± 2397	-	-	-

* THE MEAN AND 2 STANDARD DEVIATION VALUES ARE CALCULATED USING THE POSITIVE VALUES

TABLE C-X.1 **CONCENTRATIONS OF STRONTIUM AND GAMMA EMITTERS IN FOOD PRODUCT SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2009**

RESULTS IN UNITS OF PCI/KG WET ± 2 SIGMA

STC	COLLECTION PERIOD		SR-90	Be-7	K-40	I-131	Cs-134	Cs-137
E1-2	07/29/09	Cabbage	11 ± 1	< 119	3100 ± 235	< 54	< 10	< 10
	08/12/09	Sweet Corn		< 59	3090 ± 136	< 33	< 6	< 6
	08/12/09	Tomatoes		< 43	2140 ± 118	< 21	< 4	< 5
	09/09/09	Radishes		< 111	4060 ± 257	< 50	< 11	< 11
	MEAN		11 ± 0	-	3098 ± 1568	-	-	-
H1-2	07/07/09	Cucumber Leaves	49 ± 4	614 ± 204	4200 ± 404	< 54	< 19	< 18
	07/07/09	Yellow Squash Leaves	18 ± 2	< 146	4650 ± 473	< 51	< 18	< 20
	07/07/09	Zucchini Leaves	40 ± 3	273 ± 117	5300 ± 400	< 46	< 15	< 19
	08/12/09	Cabbage	11 ± 2	< 89	3610 ± 220	< 46	< 9	< 10
	08/12/09	Neck Pumpkin Leaves	37 ± 3	770 ± 97	3350 ± 212	< 38	< 8	< 9
	08/12/09	Yellow Squash Leaves	13 ± 2	407 ± 79	4050 ± 195	< 31	< 6	< 7
	09/09/09	Cabbage	< 2	< 66	2130 ± 168	< 27	< 7	< 7
	09/09/09	Neck Pumpkin Leaves	3 ± 1	1690 ± 158	5290 ± 309	< 50	< 14	< 14
	09/09/09	Zucchini Leaves	2 ± 1	200 ± 103	4090 ± 357	< 54	< 15	< 16
	MEAN		22 ± 36	659 ± 1096	4074 ± 1981	-	-	-

* THE MEAN AND 2 STANDARD DEVIATION VALUES ARE CALCULATED USING THE POSITIVE VALUES

TABLE C-XI.1 QUARTERLY TLD RESULTS FOR THREE MILE ISLAND NUCLEAR STATION, 2009

RESULTS IN UNITS OF MILLI-ROENTGENS/STD. MONTH

STATION CODE	MEAN ± 2 S.D.	JAN - MAR	APR - JUN	JUL - SEP	OCT - DEC
A1-4	4.3 ± 0.8	3.7 ± 0.5	4.6 ± 0.4	4.4 ± 1.1	4.3 ± 0.9
A3-1	4.4 ± 1.0	3.7 ± 0.4	4.7 ± 0.3	4.7 ± 0.3	4.5 ± 0.4
A5-1	5.3 ± 0.9	4.6 ± 1.0	5.6 ± 0.8	5.5 ± 0.3	5.3 ± 0.4
A9-3	4.1 ± 0.8	3.7 ± 0.5	4.6 ± 0.4	4.0 ± 0.5	3.9 ± 0.5
B10-1	4.6 ± 0.6	4.4 ± 0.5	4.2 ± 0.5	4.8 ± 0.2	4.8 ± 0.4
B1-1	4.4 ± 0.7	3.9 ± 0.9	4.6 ± 0.3	4.4 ± 0.3	4.6 ± 0.8
B1-2	4.2 ± 0.7	3.8 ± 0.3	3.9 ± 0.5	4.4 ± 0.5	4.5 ± 0.2
B2-1	4.1 ± 0.5	3.9 ± 0.7	3.9 ± 0.4	4.2 ± 0.5	4.4 ± 0.3
B5-1	4.8 ± 0.5	4.6 ± 1.0	4.6 ± 0.9	5.0 ± 0.4	5.0 ± 0.3
C1-1	4.7 ± 0.7	4.3 ± 0.3	4.5 ± 0.8	4.9 ± 0.9	5.0 ± 0.4
C1-2	4.2 ± 0.8	4.7 ± 2.0	3.7 ± 0.4	4.0 ± 0.8	4.2 ± 0.2
C2-1	4.5 ± 0.6	4.5 ± 0.5	4.1 ± 0.2	4.8 ± 1.6	4.7 ± 0.4
C5-1	5.1 ± 0.6	5.0 ± 0.5	4.8 ± 1.2	5.4 ± 0.8	5.3 ± 0.3
C8-1	5.1 ± 0.7	4.7 ± 0.8	4.8 ± 0.5	5.5 ± 0.4	5.2 ± 0.7
D1-1	4.0 ± 0.8	3.5 ± 0.4	3.7 ± 0.3	4.2 ± 0.3	4.4 ± 0.2
D1-2	4.4 ± 0.3	4.4 ± 0.5	4.2 ± 0.8	4.5 ± 0.4	4.4 ± 0.4
D15-1	4.8 ± 0.8	4.6 ± 0.5	4.3 ± 0.3	5.2 ± 0.5	5.0 ± 0.2
D2-2	5.6 ± 0.9	5.5 ± 1.2	5.1 ± 0.6	6.2 ± 0.7	5.6 ± 0.5
D6-1	5.2 ± 0.9	4.9 ± 0.6	4.8 ± 0.3	5.8 ± 0.5	5.4 ± 0.4
E1-2	4.1 ± 0.6	3.9 ± 0.6	3.9 ± 0.5	4.5 ± 1.4	4.2 ± 0.3
E1-4	4.0 ± 0.8	3.8 ± 0.6	3.6 ± 0.7	4.2 ± 0.3	4.5 ± 0.3
E2-3	5.0 ± 0.7	4.9 ± 0.5	4.6 ± 0.5	5.4 ± 0.7	5.2 ± 0.4
E5-1	4.7 ± 1.1	4.2 ± 0.5	4.4 ± 0.5	5.4 ± 0.9	4.9 ± 0.4
E7-1	4.7 ± 0.4	4.5 ± 0.9	4.6 ± 0.5	4.9 ± 0.3	4.9 ± 0.3
F10-1	6.0 ± 1.3	5.6 ± 1.3	(1)	6.7 ± 1.2	5.6 ± 0.4
F1-1	4.5 ± 0.6	4.1 ± 0.9	4.6 ± 0.5	4.7 ± 0.8	4.7 ± 0.3
F1-2	4.4 ± 0.6	4.1 ± 0.3	4.2 ± 0.3	4.3 ± 0.6	4.8 ± 0.4
F1-4	4.1 ± 1.0	3.7 ± 0.3	3.7 ± 0.3	4.3 ± 0.4	4.7 ± 0.5
F2-1	5.3 ± 0.6	5.1 ± 0.7	5.5 ± 1.7	5.6 ± 0.6	5.0 ± 0.6
F25-1	4.9 ± 0.7	4.6 ± 0.5	5.0 ± 0.3	5.4 ± 0.9	4.7 ± 0.3
F5-1	5.1 ± 0.5	4.9 ± 0.5	5.0 ± 0.7	5.5 ± 0.5	5.1 ± 0.4
G10-1	6.6 ± 0.8	6.5 ± 0.6	6.7 ± 0.6	7.0 ± 0.7	6.1 ± 0.4
G1-2	4.6 ± 0.8	4.1 ± 0.3	4.9 ± 0.7	4.9 ± 0.7	4.4 ± 0.3
G1-3	4.0 ± 0.5	3.8 ± 0.3	3.8 ± 0.5	4.3 ± 0.7	4.0 ± 0.3
G1-5	4.2 ± 0.6	3.9 ± 0.4	4.6 ± 1.0	4.1 ± 0.4	4.0 ± 0.3
G15-1	6.1 ± 0.8	5.6 ± 0.3	6.3 ± 0.6	6.5 ± 0.6	5.8 ± 0.5
G1-6	4.4 ± 0.3	4.2 ± 0.3	4.3 ± 0.4	4.5 ± 0.6	4.4 ± 0.5
G2-4	5.6 ± 0.2	5.7 ± 0.3	5.7 ± 0.3	5.6 ± 0.4	5.5 ± 0.5
G5-1	4.5 ± 1.2	3.9 ± 1.0	4.5 ± 0.6	5.3 ± 2.0	4.2 ± 0.5
H1-1	4.8 ± 1.4	4.4 ± 0.5	4.5 ± 0.6	5.8 ± 1.7	4.4 ± 0.5
H15-1	4.8 ± 0.5	4.9 ± 0.8	4.4 ± 0.3	5.0 ± 0.7	4.9 ± 0.1
H3-1	3.7 ± 0.3	3.6 ± 0.4	3.5 ± 0.8	3.9 ± 0.3	3.6 ± 0.4
H5-1	3.4 ± 0.6	3.0 ± 0.3	3.2 ± 0.3	3.5 ± 0.4	3.7 ± 0.5
H8-1	7.3 ± 0.8	7.6 ± 0.7	6.9 ± 0.4	7.7 ± 0.7	7.1 ± 0.5
J1-1	3.9 ± 0.5	3.6 ± 0.3	3.8 ± 0.3	4.1 ± 0.4	4.1 ± 0.5
J1-3	3.8 ± 0.6	3.5 ± 0.4	3.7 ± 0.3	3.7 ± 0.5	4.2 ± 0.5

(1) SEE PROGRAMS EXCEPTIONS SECTION FOR EXPLANATION

TABLE C-XI.1 QUARTERLY TLD RESULTS FOR THREE MILE ISLAND NUCLEAR STATION, 2009

RESULTS IN UNITS OF MILLI-ROENTGENS/STD. MONTH

STATION CODE	MEAN ± 2 S.D.	JAN - MAR	APR - JUN	JUL - SEP	OCT - DEC	
J15-1	5.2 ± 0.4	5.0 ± 0.6	5.1 ± 0.5	5.5 ± 0.5	5.2 ± 0.5	
J3-1	4.4 ± 0.3	4.5 ± 0.6	4.2 ± 0.3	4.4 ± 0.6	4.5 ± 0.4	
J5-1	5.1 ± 0.3	5.0 ± 0.6	4.9 ± 0.5	5.3 ± 1.2	5.1 ± 0.4	
J7-1	5.5 ± 0.9	6.1 ± 1.7	5.7 ± 0.4	5.2 ± 0.2	5.1 ± 0.5	
K1-4	3.9 ± 0.4	3.8 ± 0.2	3.7 ± 0.2	4.2 ± 0.5	3.9 ± 0.3	
K15-1	4.6 ± 0.7	4.3 ± 0.2	4.3 ± 0.2	4.7 ± 1.0	5.0 ± 0.6	
K2-1	5.0 ± 1.0	4.9 ± 0.5	4.6 ± 0.4	5.6 ± 0.5		(1)
K3-1	3.9 ± 0.7	3.5 ± 0.4	4.2 ± 0.4	4.2 ± 0.3	3.8 ± 0.6	
K5-1	4.9 ± 0.8	4.6 ± 0.9	4.9 ± 0.3	5.4 ± 0.6	4.5 ± 0.4	
K8-1	4.6 ± 0.4	4.4 ± 0.5	4.9 ± 0.5	4.5 ± 0.3	4.5 ± 0.3	
L1-1	4.0 ± 0.8	3.8 ± 0.5	3.9 ± 0.7	4.6 ± 0.9	3.8 ± 0.3	
L1-2	3.8 ± 0.3	3.9 ± 0.3	3.6 ± 0.3	3.9 ± 0.5		(1)
L15-1	4.5 ± 0.5	4.6 ± 0.6	4.5 ± 0.4	4.6 ± 0.6	4.1 ± 0.4	
L2-1	4.5 ± 0.3	4.4 ± 0.4	4.6 ± 1.0	4.4 ± 0.1	4.7 ± 1.1	
L5-1	4.3 ± 0.4	4.1 ± 0.5	4.2 ± 0.4	4.4 ± 0.2	4.6 ± 0.7	
L8-1	4.3 ± 0.4	4.1 ± 0.1	4.4 ± 0.3	4.6 ± 0.6	4.2 ± 0.6	
M1-1	4.1 ± 1.6	3.4 ± 0.8	3.5 ± 0.3	4.2 ± 0.3	5.1 ± 0.7	
M1-2	4.9 ± 0.3	5.1 ± 0.5	4.8 ± 0.8	4.8 ± 1.1		(1)
M2-1	3.7 ± 0.3	3.5 ± 0.5	3.6 ± 0.3	3.9 ± 0.5	3.6 ± 0.3	
M5-1	4.7 ± 0.6	4.5 ± 1.4	4.3 ± 0.3	4.9 ± 0.6	4.9 ± 1.0	
M9-1	5.5 ± 0.6	5.2 ± 0.6	5.8 ± 0.9	5.7 ± 0.5	5.4 ± 1.0	
N1-1	4.6 ± 0.8	4.6 ± 0.3	4.2 ± 0.2	5.0 ± 0.7		(1)
N1-3	4.2 ± 1.1	3.8 ± 0.5	3.7 ± 0.3	4.3 ± 0.3	4.9 ± 0.8	
N15-2	5.0 ± 0.1	4.9 ± 0.3	5.0 ± 0.4	5.0 ± 0.9	5.0 ± 0.7	
N2-1	4.5 ± 1.1	4.2 ± 0.7	4.2 ± 0.4	5.3 ± 0.9	4.4 ± 0.2	
N5-1	3.9 ± 0.7	3.6 ± 0.6	4.0 ± 0.8	4.3 ± 0.3	3.5 ± 0.5	
N8-1	4.7 ± 0.4	4.5 ± 0.8	4.7 ± 0.5	4.9 ± 0.6	4.5 ± 0.4	
P1-1	4.1 ± 0.4	4.3 ± 0.3	3.9 ± 0.2	4.0 ± 0.5		(1)
P1-2	4.7 ± 3.0	3.4 ± 0.4	3.9 ± 0.6	4.5 ± 1.8	6.8 ± 1.9	
P2-1	5.3 ± 1.7	4.2 ± 0.3	5.2 ± 0.5	5.4 ± 0.8	6.3 ± 0.5	
P5-1	4.4 ± 0.7	3.9 ± 0.3	4.6 ± 0.7	4.6 ± 0.5	4.4 ± 1.2	
P8-1	3.7 ± 0.6	3.2 ± 0.5	3.9 ± 0.8	3.8 ± 1.0	3.7 ± 0.6	
Q1-1	4.6 ± 0.3	4.7 ± 0.5	4.4 ± 0.5	4.6 ± 0.4		(1)
Q1-2	3.6 ± 1.3	2.7 ± 0.4	4.0 ± 0.8	3.7 ± 0.4	4.1 ± 0.5	
Q15-1	5.0 ± 1.1	4.5 ± 0.2	5.3 ± 1.1	5.7 ± 0.9	4.6 ± 0.5	
Q2-1	3.9 ± 0.8	3.7 ± 0.3	3.6 ± 0.2	4.5 ± 0.4	3.8 ± 0.2	
Q5-1	4.1 ± 1.0	3.4 ± 0.1	4.2 ± 0.7	4.6 ± 0.6	4.1 ± 0.7	
Q9-1	4.2 ± 0.9	3.8 ± 0.6	4.3 ± 0.3	4.7 ± 0.5	3.8 ± 0.5	
R1-1	3.8 ± 0.5	3.5 ± 1.3	3.7 ± 0.6	4.0 ± 0.3	4.0 ± 0.4	
R1-2	4.0 ± 0.7	4.4 ± 0.5	3.7 ± 0.3	4.0 ± 1.1		(1)
R15-1	4.6 ± 0.5	4.3 ± 0.2	4.6 ± 0.8	4.9 ± 0.7	4.4 ± 0.3	(1)
R3-1	5.1 ± 0.9	4.7 ± 0.5	5.0 ± 0.5	5.7 ± 0.7	4.9 ± 0.4	
R5-1	4.7 ± 1.0	4.0 ± 0.4	5.1 ± 0.6	5.1 ± 0.8	4.6 ± 0.3	
R9-1	5.1 ± 0.3	4.9 ± 0.6	5.1 ± 0.5	5.2 ± 0.5	5.0 ± 0.7	

(1) SEE PROGRAMS EXCEPTIONS SECTION FOR EXPLANATION

TABLE C-XI.2 MEAN QUARTERLY TLD RESULTS FOR THE SITE BOUNDARY, INDICATOR AND CONTROL LOCATIONS FOR THREE MILE ISLAND NUCLEAR STATION, 2009

RESULTS IN UNITS OF MILLI-ROENTGENS/MONTH ± 2 STANDARD DEVIATIONS OF THE STATION DATA

COLLECTION PERIOD	SITE BOUNDARY ± 2 S.D.	INDICATOR	CONTROL
JAN-MAR	3.8 ± 0.8	4.4 ± 1.5	4.9 ± 1.3
APR-JUN	3.9 ± 0.7	4.5 ± 1.3	5.0 ± 1.6
JUL-SEP	4.3 ± 0.9	4.9 ± 1.5	5.4 ± 1.5
OCT-DEC	4.5 ± 1.3	4.7 ± 1.4	5.0 ± 1.2

TABLE C-XI.3 SUMMARY OF THE AMBIENT DOSIMETRY PROGRAM FOR THREE MILE ISLAND NUCLEAR STATION, 2009

RESULTS IN UNITS OF MILLI-ROENTGEN/STD. MONTH

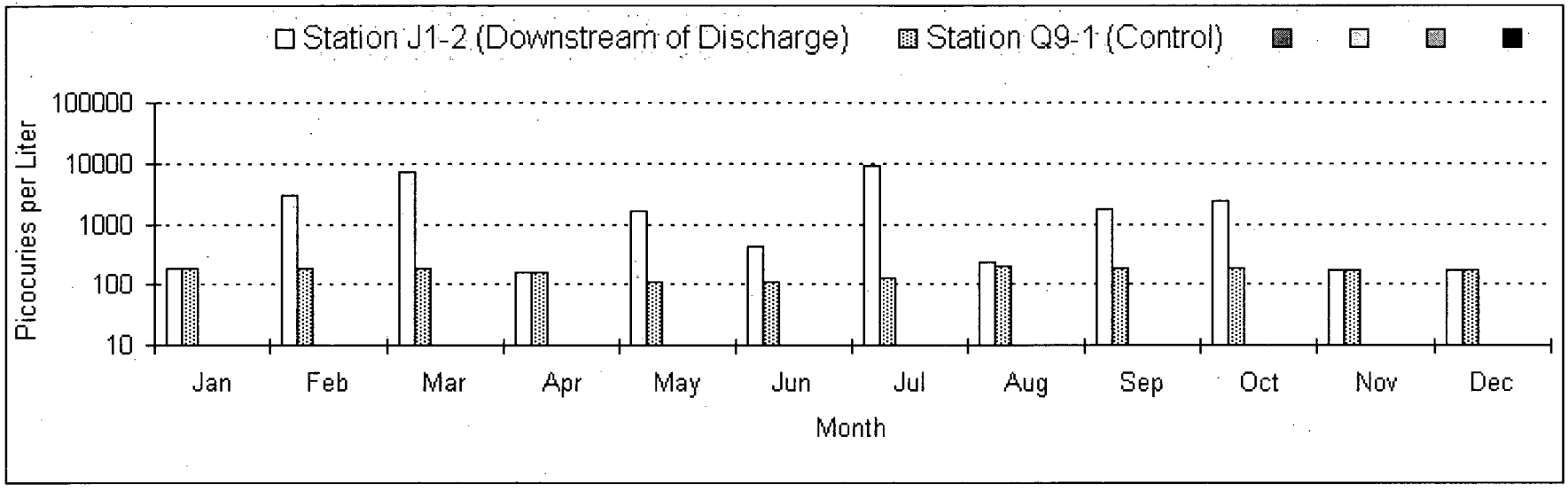
LOCATION	SAMPLES ANALYZED	PERIOD MINIMUM	PERIOD MAXIMUM	PERIOD MEAN ± 2 S.D.	PRE-OP MEAN ± 2 S.D.
SITE BOUNDARY	76	2.7	6.8	4.1 ± 1.1	4.8 ± 1.5
INDICATOR	232	3.0	7.7	4.6 ± 1.5	5.2 ± 1.5
CONTROL	44	4.1	7.0	5.1 ± 1.4	5.8 ± 1.7

SITE BOUNDARY STATIONS - A1-4, B1-2, C1-2, D1-1, E1-4, F1-2, F1-4, G1-3, G1-5, G1-6, H1-1, J1-3, K1-4, L1-1, M1-1, N1-3, P1-2, Q1-2, R1-1

INDICATOR STATIONS - A3-1, A5-1, A9-3, B1-1, B10-1, B2-1, B5-1, C1-1, C2-1, C5-1, C8-1, D1-2, D2-2, D6-1, E1-2, E2-3, E5-1, E7-1, F1-1, F10-1, F2-1, F5-1, G1-2, G2-4, G5-1, H3-1, H5-1, H8-1, J1-1, J3-1, J5-1, J7-1, K2-1, K3-1, K5-1, K8-1, L1-2, L2-1, L5-1, L8-1, M1-2, M2-1, M5-1, M9-1, N1-1, N2-1, N5-1, N8-1, P1-1, P2-1, P5-1, P8-1, Q1-1, Q2-1, Q5-1, Q9-1, R1-2, R3-1, R5-1, R9-1

CONTROL STATIONS - D15-1, F25-1, G10-1, G15-1, H15-1, J15-1, K15-1, L15-1, N15-2, Q15-1, R15-1

FIGURE C-1
Monthly Tritium Concentrations in Surface Water and Effluent Water
Three Mile Island Nuclear Station, 2009



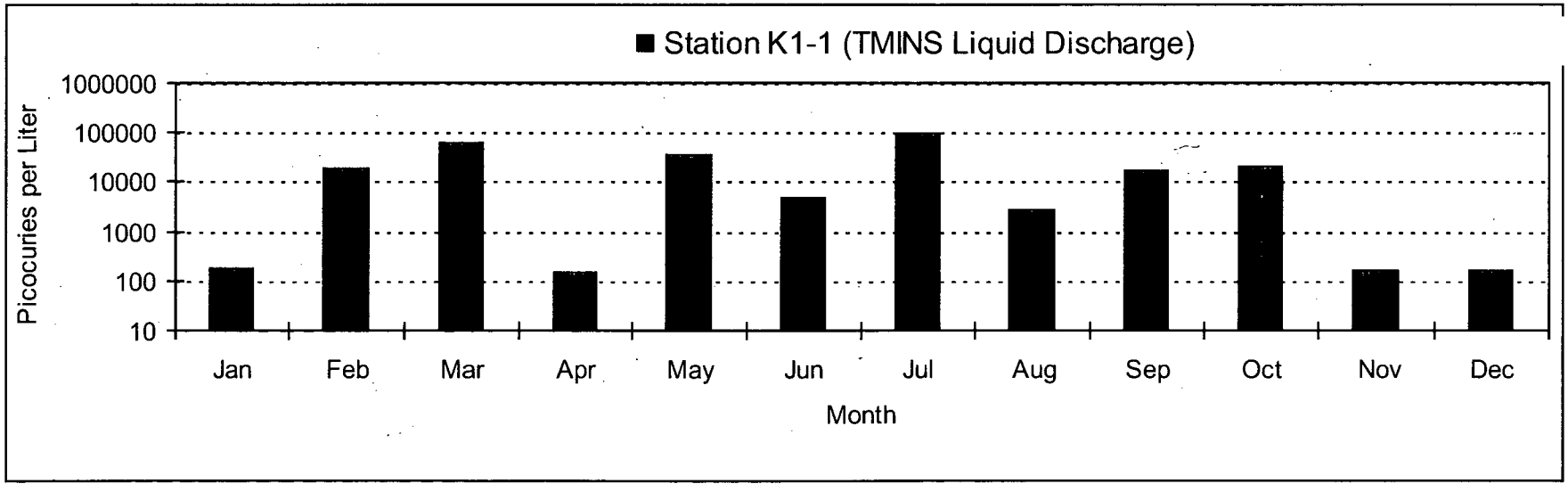


FIGURE C-2
Mean Quarterly Tritium Concentrations in Surface Water
Three Mile Island Nuclear Station, 1974 - 2009

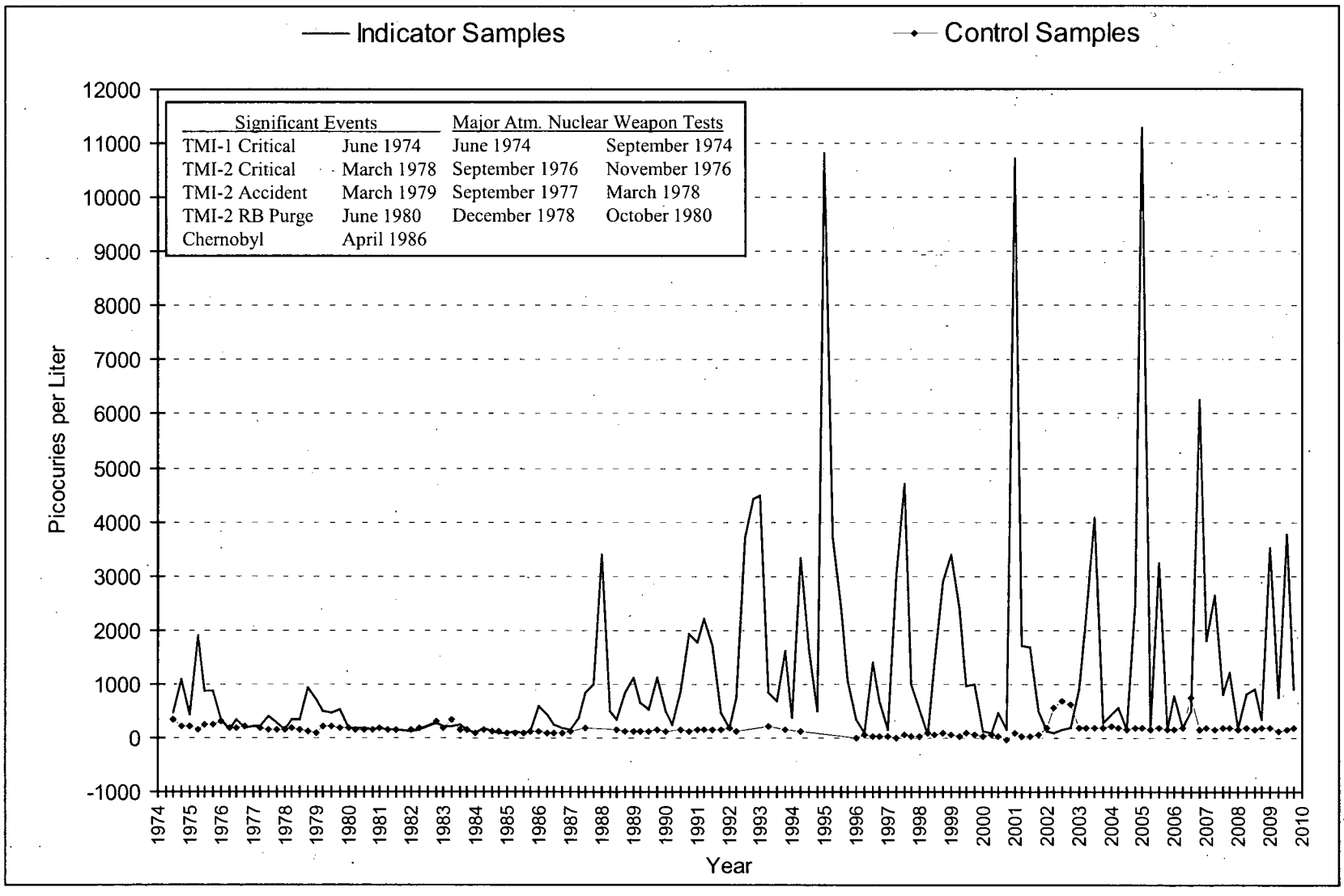


FIGURE C-3
Mean Monthly Gross Beta Concentrations in Drinking Water
Three Mile Island Nuclear Station, 2009

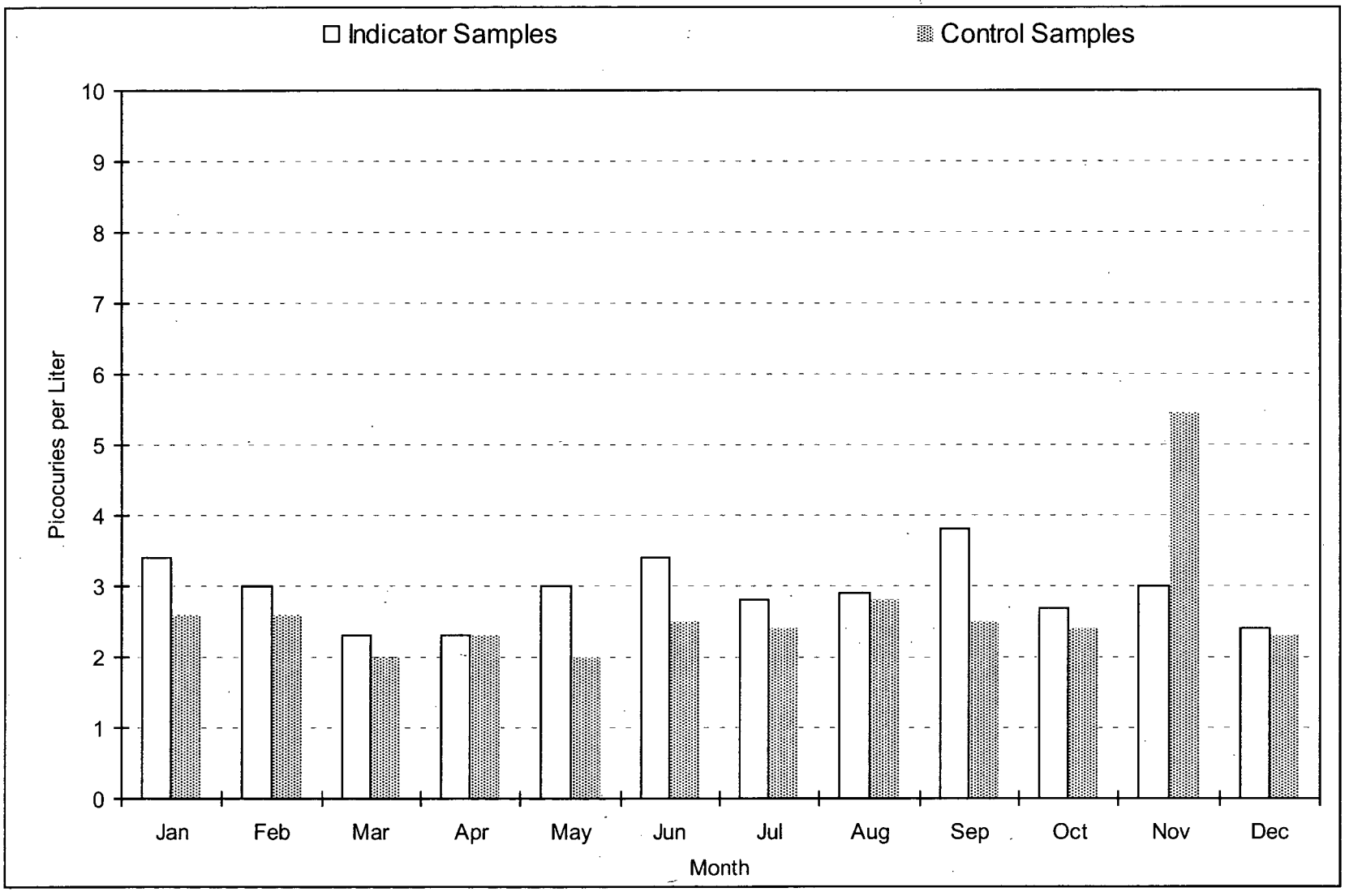
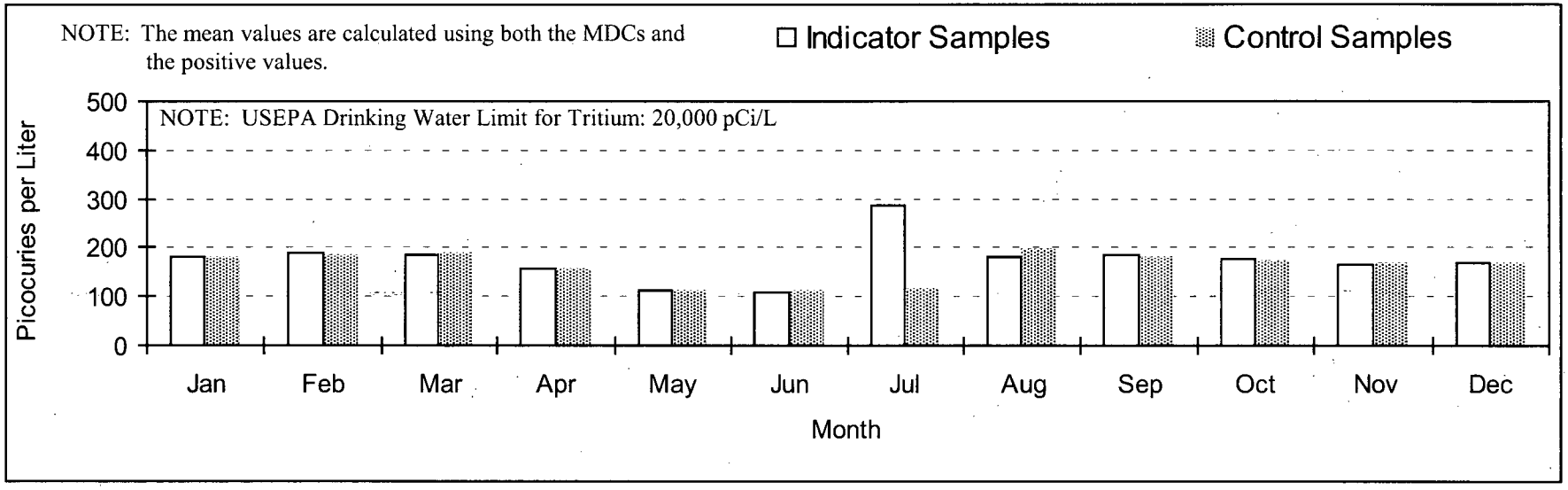


FIGURE C-4

Mean Monthly Tritium Concentrations in Drinking Water and Effluent Water

Three Mile Island Nuclear Station, 2009



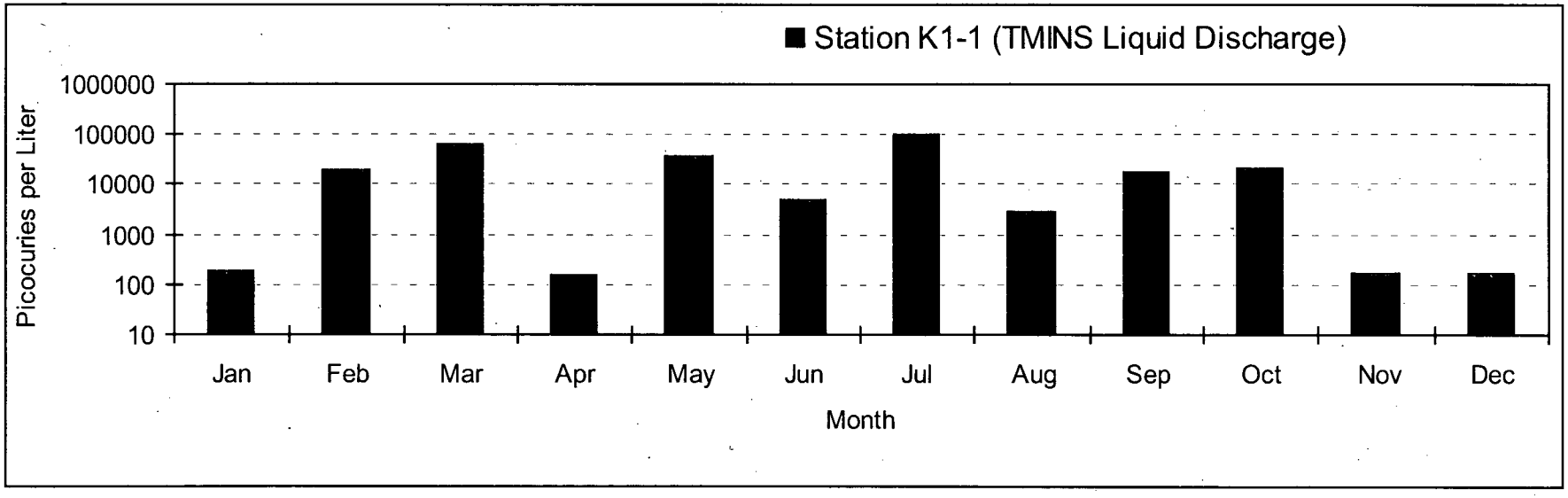


FIGURE C-5
Mean Cesium-137 Concentrations in Aquatic Sediments
Three Mile Island Nuclear Station, 1984 - 2009

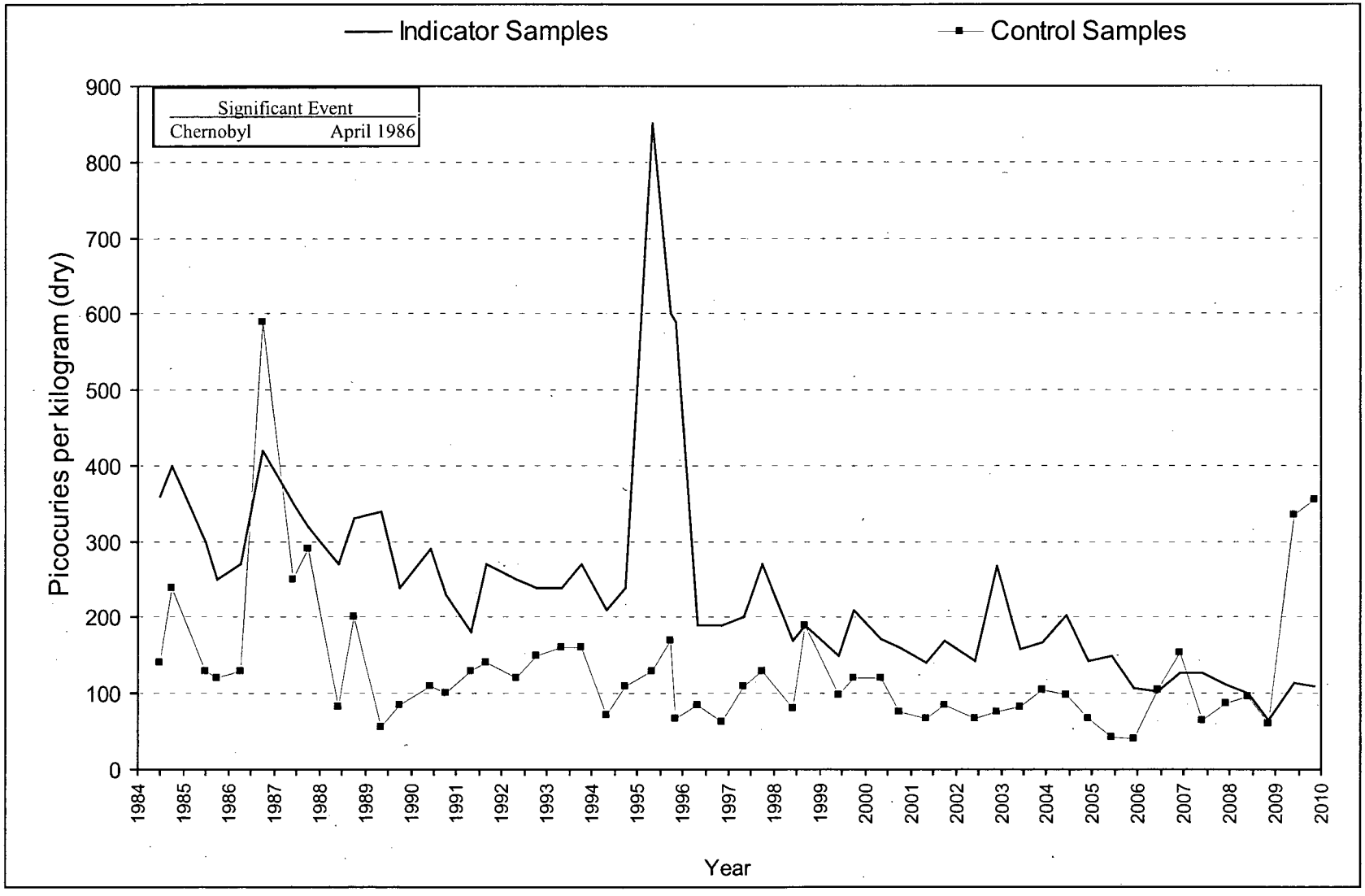


FIGURE C-6

Mean Quarterly Gross Beta Concentrations in Air Particulates

Three Mile Island Nuclear Station, 1972 - 2009

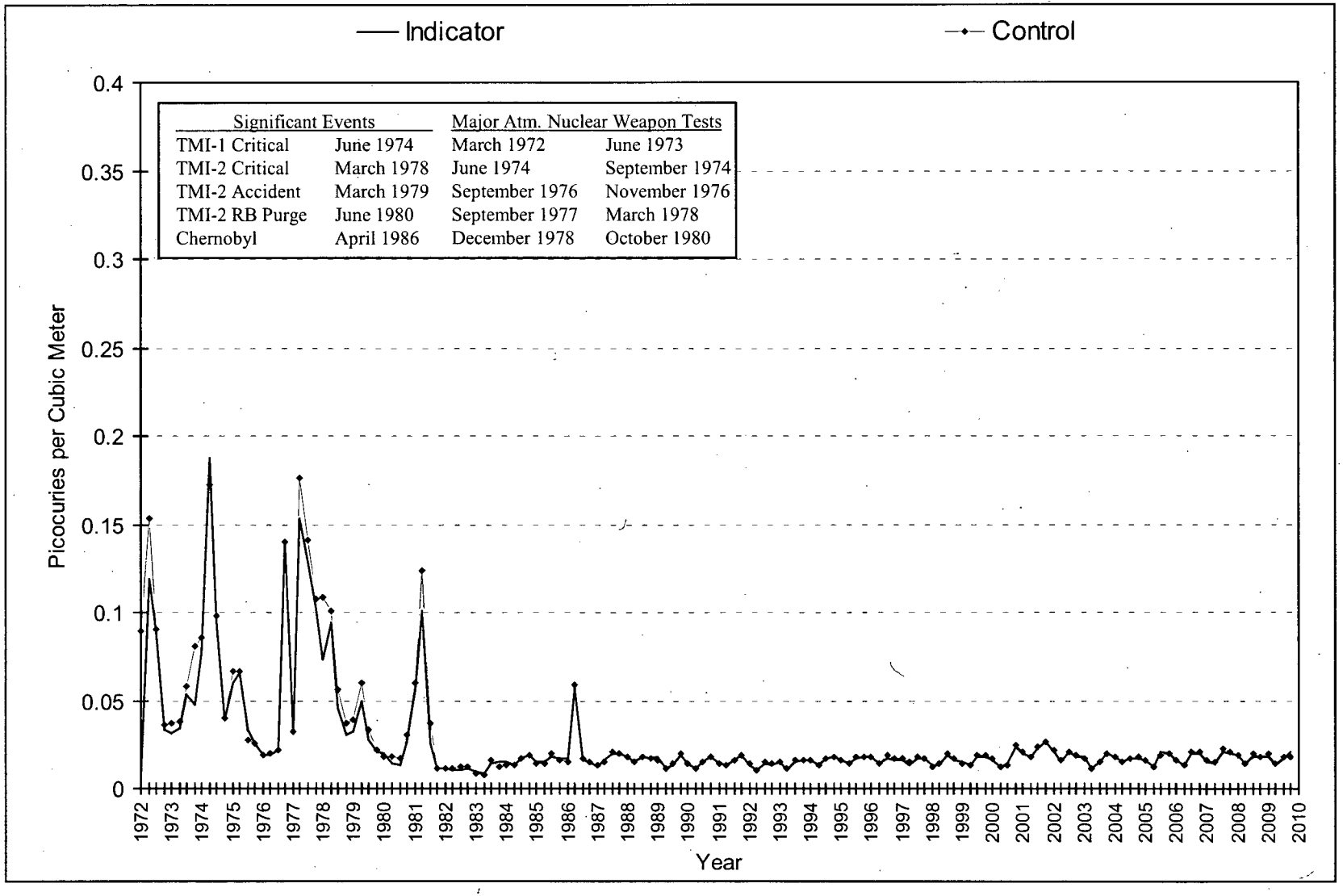
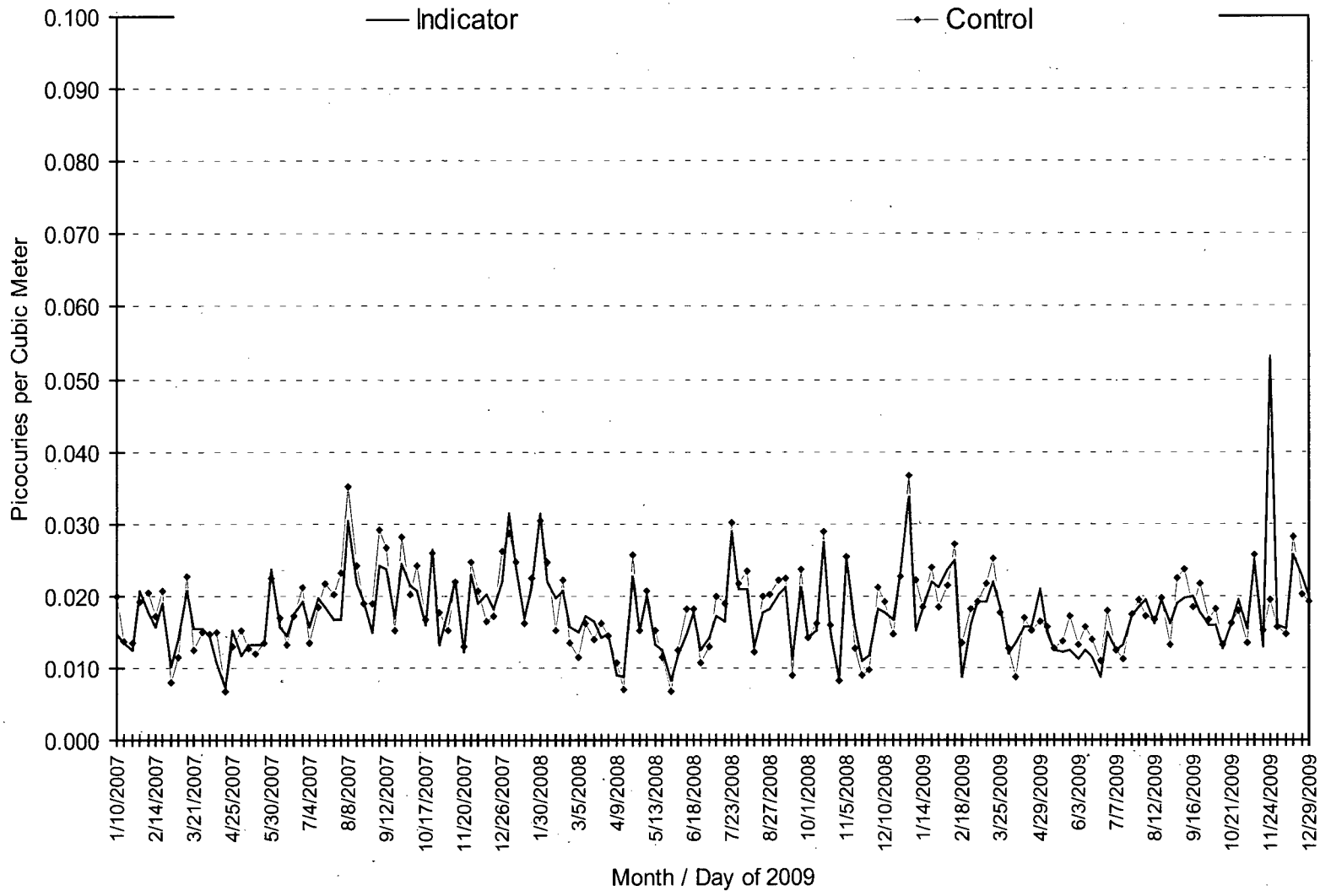


FIGURE C-7
Mean Weekly Gross Beta Concentrations in Air Particulates
Three Mile Island Nuclear Station, 2009



The high value on 11/24/2009 was caused by an airborne release on 11/21/2009

FIGURE C-8
Mean Quarterly Strontium-90 Concentrations in Cow Milk
Three Mile Island Nuclear Station, 1979 - 2009

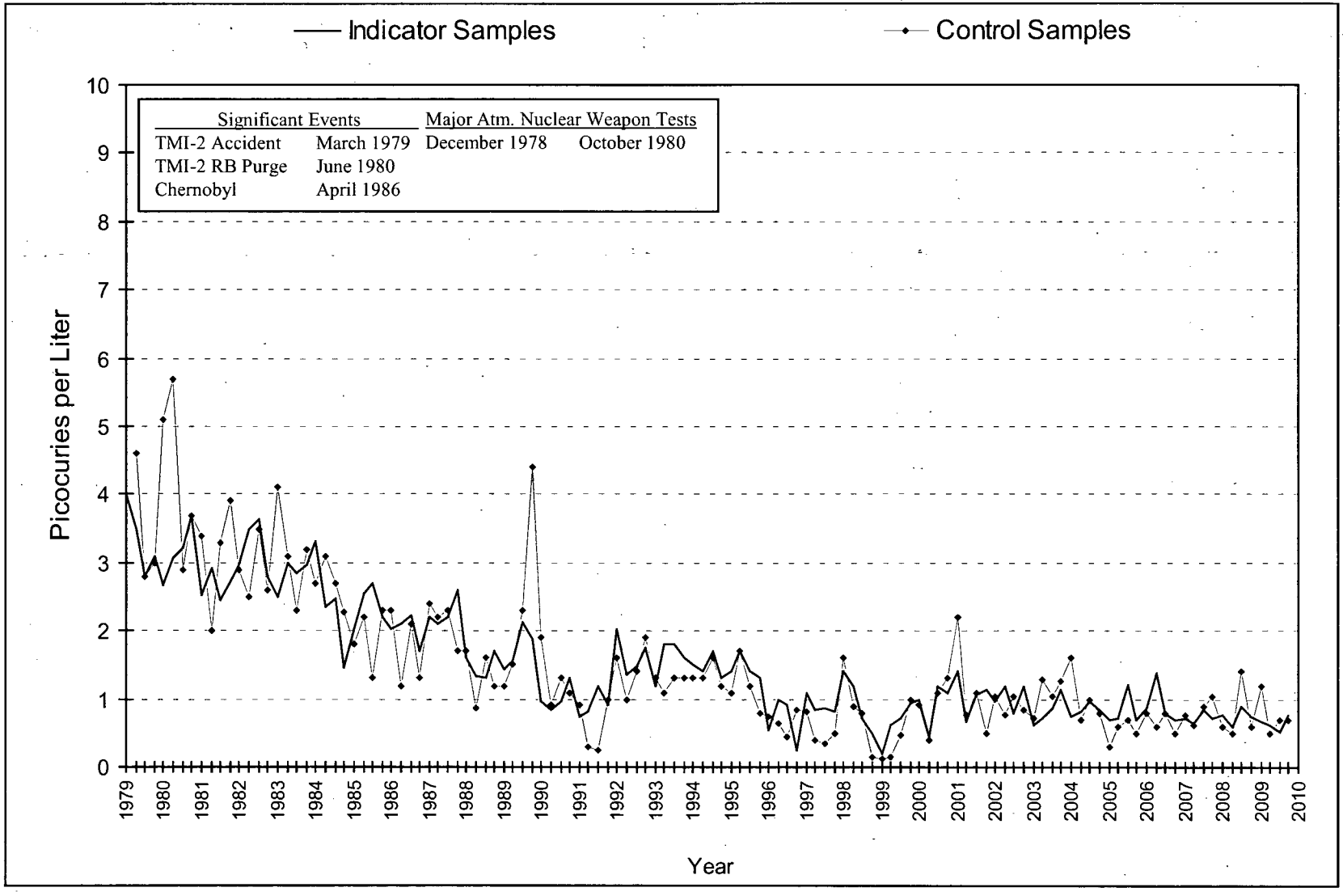
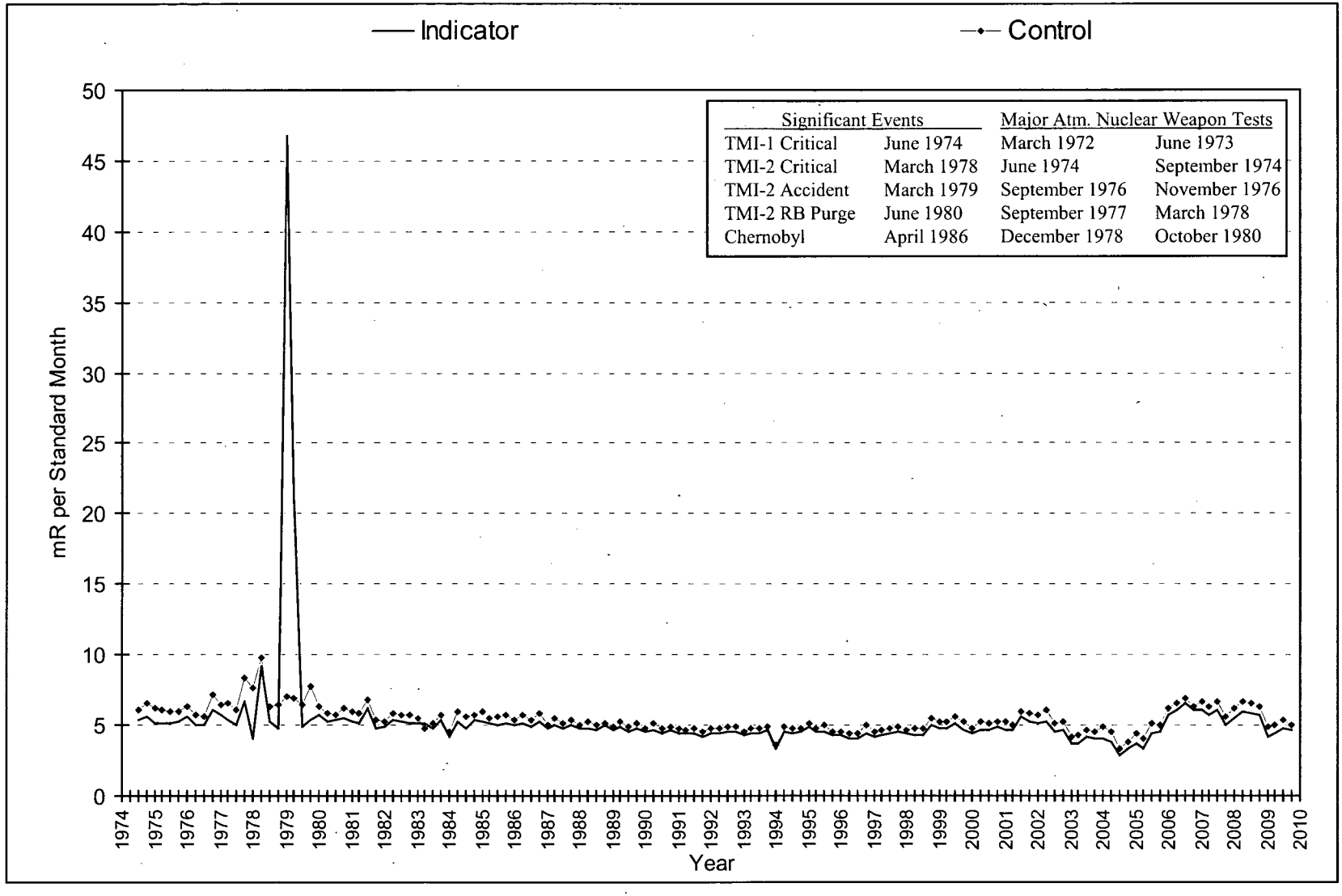


FIGURE C-9
Mean Quarterly Gamma Exposure Rates
Three Mile Island Nuclear Station, 1974 - 2009



Significant Events		Major Atm. Nuclear Weapon Tests	
TMI-1 Critical	June 1974	March 1972	June 1973
TMI-2 Critical	March 1978	June 1974	September 1974
TMI-2 Accident	March 1979	September 1976	November 1976
TMI-2 RB Purge	June 1980	September 1977	March 1978
Chernobyl	April 1986	December 1978	October 1980

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APPENDIX D

DATA TABLES AND FIGURES
COMPARISON LABORATORY

The following section contains data and figures illustrating the analyses performed by the quality control laboratory, Environmental Inc. (Env). Duplicate samples were obtained from several locations and media and split between the primary laboratory, Teledyne Brown Engineering (TBE) and Environmental Inc. (Env). Comparison of the results for most media were within expected ranges.

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TABLE D-I.1 **CONCENTRATIONS OF GROSS BETA IN DRINKING WATER SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2009**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	Q9-1Q
12/30/08 - 02/03/09	< 1.8
02/03/09 - 03/03/09	1.9 ± 1.0
03/03/09 - 03/31/09	< 0.9
03/31/09 - 04/28/09	< 0.9
04/28/09 - 06/02/09	0.9 ± 0.5
06/02/09 - 06/30/09	< 1.2
06/30/09 - 07/28/09	< 0.8
07/28/09 - 08/31/09	< 0.6
08/31/09 - 09/29/09	1.6 ± 0.7
09/29/09 - 11/03/09	< 1.2
11/03/09 - 12/01/09	< 0.9
12/01/09 - 12/28/09	0.8 ± 0.4
MEAN	1.0 ± 0.7

TABLE D-I.2 **CONCENTRATIONS OF TRITIUM IN DRINKING WATER SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2009**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	Q9-1Q
12/30/08 - 02/03/09	< 157
02/03/09 - 03/03/09	< 151
03/03/09 - 03/31/09	< 158
03/31/09 - 04/28/09	< 167
04/28/09 - 06/02/09	< 154
06/02/09 - 06/30/09	< 148
06/30/09 - 07/28/09	< 169
07/28/09 - 08/31/09	< 142
08/31/09 - 09/29/09	< 147
09/29/09 - 11/03/09	< 155
11/03/09 - 12/01/09	< 150
12/01/09 - 12/28/09	< 152
MEAN	-

TABLE D-I.3 **CONCENTRATIONS OF IODINE-131 IN DRINKING WATER SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2009**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	Q9-1Q
12/30/08 - 02/03/09	< 0.3
02/03/09 - 03/03/09	< 0.5
03/03/09 - 03/31/09	< 0.4
03/31/09 - 04/28/09	< 0.3
04/28/09 - 06/02/09	< 0.3
06/02/09 - 06/30/09	< 0.3
06/30/09 - 07/28/09	< 0.4
07/28/09 - 08/31/09	< 0.2
08/31/09 - 09/29/09	< 0.3
09/29/09 - 11/03/09	< 0.3
11/03/09 - 12/01/09	< 0.1
12/01/09 - 12/28/09	< 0.3
MEAN	-

* THE MEAN AND 2 STANDARD DEVIATION VALUES ARE CALCULATED USING THE POSITIVE VALUES

TABLE D-I.4 CONCENTRATIONS OF GAMMA EMITTERS IN DRINKING WATER SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2009

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

STC	COLLECTION PERIOD	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Zr-95	Nb-95	Cs-134	Cs-137	Ba-140	La-140
Q9-1Q	12/30/08 - 02/03/09	< 5.0	< 3.2	< 9.2	< 5.4	< 5.5	< 10.7	< 3.8	< 4.4	< 4.8	< 15	< 4.0
	02/03/09 - 03/03/09	< 1.9	< 2.4	< 3.8	< 1.1	< 5.4	< 4.5	< 1.9	< 2.0	< 2.3	< 11	< 2.5
	03/03/09 - 03/31/09	< 2.4	< 2.8	< 6.9	< 2.8	< 3.7	< 5.2	< 2.5	< 2.6	< 1.9	< 11	< 2.4
	03/31/09 - 04/28/09	< 1.9	< 2.0	< 4.1	< 1.2	< 3.8	< 3.3	< 2.4	< 3.6	< 1.8	< 11	< 1.6
	04/28/09 - 06/02/09	< 2.2	< 2.0	< 7.6	< 2.0	< 2.9	< 4.4	< 3.0	< 2.6	< 2.9	< 8.2	< 3.5
	06/02/09 - 06/30/09	< 2.4	< 3.1	< 4.6	< 2.0	< 5.2	< 4.9	< 2.4	< 3.0	< 3.0	< 15	< 2.3
	06/30/09 - 07/28/09	< 2.8	< 2.8	< 9.0	< 1.8	< 4.1	< 3.2	< 1.5	< 2.7	< 2.2	< 16	< 5.2
	07/28/09 - 08/31/09	< 3.6	< 1.5	< 6.8	< 2.2	< 3.5	< 7.3	< 2.1	< 4.0	< 2.0	< 11	< 1.4
	08/31/09 - 09/29/09	< 1.9	< 1.9	< 6.0	< 1.9	< 2.5	< 4.7	< 3.0	< 4.1	< 1.6	< 17	< 3.8
	09/29/09 - 11/03/09	< 4.1	< 2.1	< 5.4	< 2.7	< 6.4	< 7.5	< 4.2	< 3.6	< 4.5	< 20	< 4.5
	11/03/09 - 12/01/09	< 2.8	< 3.1	< 2.2	< 2.3	< 4.7	< 3.6	< 2.1	< 3.4	< 2.4	< 16	< 1.9
	12/01/09 - 12/28/09	< 2.2	< 2.2	< 3.8	< 1.9	< 3.0	< 3.1	< 2.6	< 3.4	< 2.3	< 16	< 2.3

TABLE D-II.1 **CONCENTRATIONS OF STRONTIUM AND GAMMA EMITTERS IN FISH SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2009**

RESULTS IN UNITS OF PCI/KG WET ± 2 SIGMA

STC	COLLECTION PERIOD	Sr-89	Sr-90	K-40	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Cs-134	Cs-137
INDP	10/22/09	< 0.6	< 0.4	3302 ± 3302	< 7	< 14	< 35	< 13	< 13	< 11	< 8

TABLE D-III.1 CONCENTRATIONS OF GAMMA EMITTERS IN SEDIMENT SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2009

RESULTS IN UNITS OF PCI/KG WET ± 2 SIGMA

STC	COLLECTION PERIOD	K-40	Cs-134	Cs-137
J2-1	11/23/09	16607 ± 1169	52 ± 29	110 ± 43

TABLE D-IV.1 CONCENTRATIONS OF GAMMA EMITTERS AND STRONTIUM IN FOOD PRODUCT SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2009

RESULTS IN UNITS OF PCI/KG WET ± 2 SIGMA

STC	COLLECTION PERIOD	K-40	I-131	Cs-134	Cs-137	Sr-89	Sr-90
H1-2Q	07/07/09	4641 ± 393	< 12	< 13	< 14	< 20	< 2
B10-2Q	07/29/09	1684 ± 216	< 10	< 10	< 9	< 10	< 1
MEAN		3163 ± 4182	-	-	-	-	-

TABLE D-V.1 CONCENTRATIONS OF GROSS BETA IN AIR PARTICULATE AND I-131 IN AIR IODINE SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2009

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

COLLECTION PERIOD	E1-2Q GROSS BETA	E1-2Q I-131
12/31/08 - 01/07/09	26 ± 4	< 17
01/07/09 - 01/14/09	26 ± 4	< 10
01/14/09 - 01/21/09	32 ± 4	< 16
01/21/09 - 01/28/09	25 ± 4	< 17
01/28/09 - 02/04/09	29 ± 4	< 11
02/04/09 - 02/11/09	31 ± 4	< 19
02/11/09 - 02/18/09	18 ± 4	< 10
02/18/09 - 02/25/09	27 ± 4	< 11
02/25/09 - 03/04/09	26 ± 4	< 17
03/04/09 - 03/11/09	24 ± 4	< 14
03/11/09 - 03/18/09	35 ± 4	< 16
03/18/09 - 03/25/09	26 ± 4	< 20
03/25/09 - 04/01/09	14 ± 4	< 14
04/01/09 - 04/08/09	13 ± 4	< 10
04/08/09 - 04/16/09	(1)	(1)
04/16/09 - 04/22/09	(1)	(1)
04/22/09 - 04/29/09	26 ± 4	< 12
04/29/09 - 05/06/09	21 ± 4	< 17
05/06/09 - 05/13/09	15 ± 4	< 10
05/13/09 - 05/20/09	22 ± 4	< 22
05/20/09 - 05/27/09	23 ± 4	< 16
05/27/09 - 06/03/09	14 ± 4	< 2
06/03/09 - 06/10/09	18 ± 4	< 13
06/10/09 - 06/18/09	15 ± 3	< 15
06/18/09 - 06/24/09	12 ± 4	< 14
06/24/09 - 07/01/09	20 ± 4	< 15
07/01/09 - 07/07/09	21 ± 4	< 27
07/07/09 - 07/15/09	20 ± 3	< 14
07/15/09 - 07/22/09	23 ± 4	< 18
07/22/09 - 07/29/09	22 ± 4	< 10
07/29/09 - 08/05/09	29 ± 4	< 13
08/05/09 - 08/12/09	25 ± 4	< 13
08/12/09 - 08/19/09	33 ± 4	< 9
08/19/09 - 08/26/09	20 ± 4	< 11
08/26/09 - 09/02/09	25 ± 4	< 13
09/02/09 - 09/09/09	31 ± 4	< 14
09/09/09 - 09/16/09	23 ± 4	< 16
09/16/09 - 09/23/09	27 ± 4	< 10
09/23/09 - 09/30/09	18 ± 4	< 19
09/30/09 - 10/07/09	17 ± 4	< 12
10/07/09 - 10/14/09	16 ± 4	< 12
10/14/09 - 10/21/09	20 ± 4	< 10
10/21/09 - 10/28/09	20 ± 4	< 16
10/28/09 - 11/04/09	16 ± 4	< 16
11/04/09 - 11/11/09	35 ± 4	< 9
11/11/09 - 11/18/09	18 ± 4	< 10
11/18/09 - 11/24/09	27 ± 5	< 12
11/24/09 - 12/02/09	14 ± 3	< 8
12/02/09 - 12/09/09	20 ± 4	< 13
12/09/09 - 12/16/09	30 ± 4	< 14
12/16/09 - 12/22/09	32 ± 5	< 17
12/22/09 - 12/29/09	15 ± 4	< 12
MEAN	23 ± 12	-

(1) NO SAMPLE DUE TO AC POWER PROBLEMS

TABLE D-V.2 CONCENTRATIONS OF GAMMA EMITTERS IN AIR PARTICULATE SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2009

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

STC	COLLECTION PERIOD	Be-7	Cs-134	Cs-137
E1-2Q	12/31/08 - 04/01/09	72 ± 13	< 1.1	< 0.8
	04/01/09 - 07/01/09	100 ± 18	< 0.7	< 0.8
	07/01/09 - 09/30/09	97 ± 20	< 0.5	< 0.5
	09/30/09 - 12/29/09	73 ± 13	< 0.9	< 0.5
	MEAN	86 ± 30	-	-

TABLE D-VI.1 CONCENTRATIONS OF I-131 BY CHEMICAL SEPARATION, GAMMA EMITTERS, AND STRONTIUM IN MILK SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2009

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

STC	COLLECTION PERIOD	I-131	K-40	Cs-134	Cs-137	Ba-140	La-140	Sr-89	Sr-90
G2-1Q	01/07/09	< 0.3	1351 ± 122	< 3.6	< 2.9	< 17	< 2.3		
	02/04/09	< 0.4	1537 ± 120	< 4.6	< 3.7	< 15	< 2.5		
	03/04/09	< 0.3	1331 ± 106	< 2.8	< 4.1	< 12	< 3.9		
	03/18/09	< 0.4	1267 ± 107	< 3.8	< 3.9	< 13	< 1.4	< 0.6	0.8 ± 0.3
	04/01/09	< 0.4	1061 ± 104	< 3.3	< 3.3	< 14	< 3.1		
	04/15/09	< 0.4	1335 ± 114	< 2.2	< 3.7	< 12	< 1.2		
	04/29/09	< 0.1	1296 ± 109	< 4.0	< 3.4	< 10	< 2.5		
	05/13/09	< 0.4	1263 ± 112	< 4.7	< 4.0	< 17	< 2.4		
	05/27/09	< 0.2	1095 ± 117	< 5.3	< 2.0	< 24	< 5.0		
	06/10/09	< 0.3	1101 ± 105	< 2.2	< 2.9	< 12	< 1.9		
	06/24/09	< 0.3	1369 ± 108	< 3.4	< 3.5	< 12	< 4.4	< 0.6	0.6 ± 0.3
	07/08/09	< 0.3	1097 ± 111	< 3.5	< 3.6	< 10	< 3.6		
	07/22/09	< 0.3	1061 ± 115	< 5.0	< 4.8	< 16	< 1.9		
	08/05/09	< 0.3	1302 ± 113	< 3.7	< 2.8	< 13	< 2.2		
	08/19/09	< 0.3	1381 ± 118	< 3.9	< 3.6	< 17	< 2.4		
	09/02/09	< 0.3	990 ± 106	< 3.9	< 3.3	< 18	< 5.3		
	09/16/09	< 0.3	892 ± 96	< 5.1	< 4.7	< 15	< 5.5		
	09/30/09	< 0.2	1174 ± 107	< 4.2	< 3.2	< 21	< 3.8	< 0.9	< 0.4
	10/14/09	< 0.3	1350 ± 110	< 3.9	< 3.7	< 20	< 3.1		
	10/28/09	< 0.2	1173 ± 128	< 2.9	< 4.7	< 17	< 3.8		
	11/11/09	< 0.3	1414 ± 109	< 3.1	< 3.6	< 16	< 3.2		
	11/24/09	< 0.4	1352 ± 113	< 4.2	< 3.5	< 15	< 3.2		
	12/09/09	< 0.3	1228 ± 103	< 3.2	< 3.5	< 21	< 3.0	< 0.8	0.6 ± 0.4
	MEAN		1236 ± 312	-	-	-	-	-	0.7 ± 0.2

* THE MEAN AND 2 STANDARD DEVIATION VALUES ARE CALCULATED USING THE POSITIVE VALUES

FIGURE D-1
MONTHLY GROSS BETA CONCENTRATIONS IN DRINKING WATER SAMPLES COLLECTED FROM TMINS LOCATION Q9-1Q, 2009

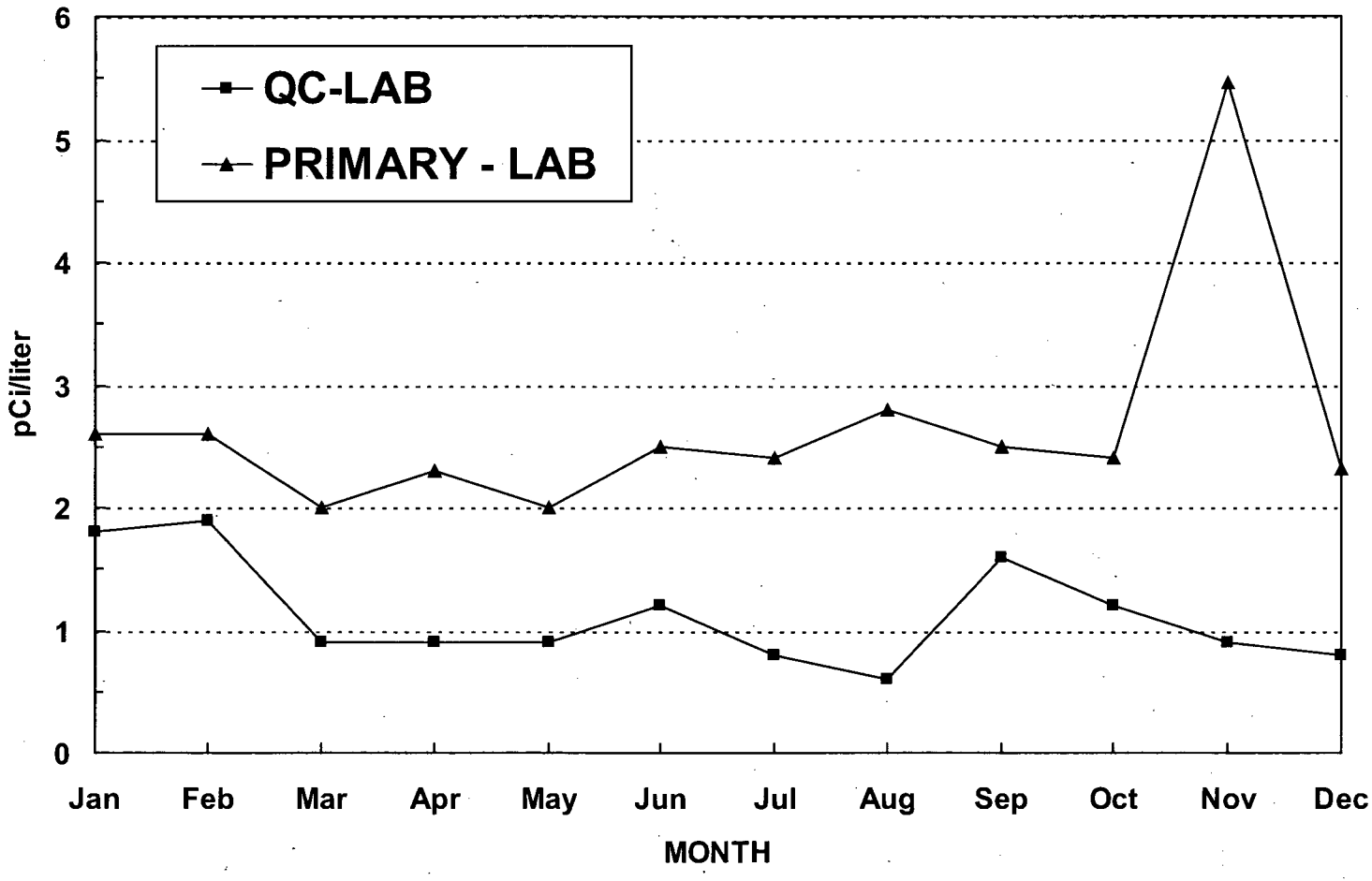
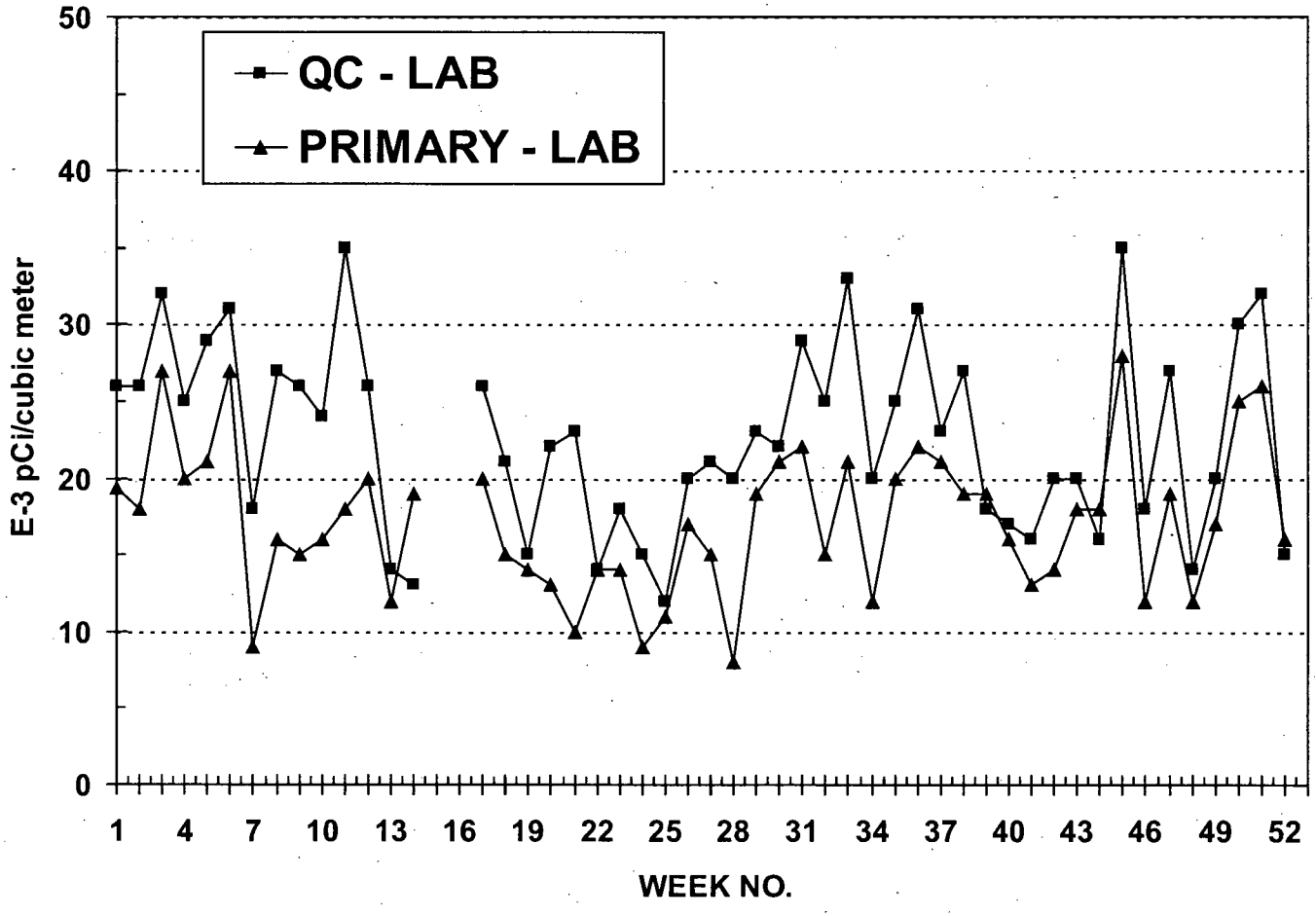


FIGURE D-2
WEEKLY GROSS BETA CONCENTRATIONS IN AIR PARTICULATE SAMPLES COLLECTED FROM TMINS LOCATION E1-2Q, 2009



APPENDIX E

INTER-LABORATORY COMPARISON PROGRAM

TABLE E-1 **ANALYTICS ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM**
TELEDYNE BROWN ENGINEERING, 2009
(PAGE 1 OF 3)

Month/Year	Identification Number	Matrix	Nuclide	Units	Reported Value (a)	Known Value (b)	Ratio (c) TBE/Analytics	Evaluation (d)
March 2009	E6533-396	Milk	Sr-89	pCi/L	102	97.7	1.04	A
			Sr-90	pCi/L	14.9	15.6	0.96	A
	E6534-396	Milk	I-131	pCi/L	66.7	79.3	0.84	A
			Ce-141	pCi/L	87.5	94.9	0.92	A
			Cr-51	pCi/L	275	305	0.90	A
			Cs-134	pCi/L	82.0	93.7	0.88	A
			Cs-137	pCi/L	111	111	1.00	A
			Co-58	pCi/L	114	119	0.96	A
			Mn-54	pCi/L	136	128	1.06	A
			Fe-59	pCi/L	112	99.9	1.12	A
			Zn-65	pCi/L	160	156	1.03	A
			Co-60	pCi/L	142	142	1.00	A
	E6536-396	AP	Ce-141	pCi	120	115	1.04	A
			Cr-51	pCi	385	371	1.04	A
			Cs-134	pCi	113	114	0.99	A
			Cs-137	pCi	149	135	1.10	A
			Co-58	pCi	153	145	1.06	A
			Mn-54	pCi	155	155	1.00	A
			Fe-59	pCi	118	121	0.98	A
			Zn-65	pCi	195	189	1.03	A
			Co-60	pCi	190	173	1.10	A
	E6535-396	Charcoal	I-131	pCi	82.8	79.4	1.04	A
June 2009	E6742-396	Milk	Sr-89	pCi/L	107	112	0.96	A
			Sr-90	pCi/L	19.0	16.7	1.14	A
	E6743-396	Milk	I-131	pCi/L	98.1	102.0	0.96	A
			Ce-141	pCi/L	260	284	0.92	A
			Cr-51	pCi/L	389	400	0.97	A
			Cs-134	pCi/L	144.0	166	0.87	A
			Cs-137	pCi/L	185	192	0.96	A
			Co-58	pCi/L	86.9	91.9	0.95	A
			Mn-54	pCi/L	133	137	0.97	A
			Fe-59	pCi/L	126	122	1.03	A
			Zn-65	pCi/L	173	175	0.99	A
			Co-60	pCi/L	298	312	0.96	A
	E6745-396	AP	Ce-141	pCi	186	163	1.14	A
			Cr-51	pCi	262	231	1.13	A
			Cs-134	pCi	101	95	1.06	A
			Cs-137	pCi	135	111	1.22	W
			Co-58	pCi	61	53	1.16	A
			Mn-54	pCi	83.1	79	1.05	A
			Fe-59	pCi	84	70	1.19	A
			Zn-65	pCi	137	101	1.36	N (1)
			Co-60	pCi	202	180	1.12	A
	E6744-396	Charcoal	I-131	pCi	92.2	95.8	0.96	A

TABLE E-1 **ANALYTICS ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM**
TELEDYNE BROWN ENGINEERING, 2009
(PAGE 2 OF 3)

Month/Year	Identification Number	Matrix	Nuclide	Units	Reported Value (a)	Known Value (b)	Ratio (c) TBE/Analytics	Evaluation (d)
September 2009	E6897-396	Milk	Sr-89	pCi/L	113	107	1.06	A
			Sr-90	pCi/L	17.4	18.8	0.93	A
	E6898-396	Milk	I-131	pCi/L	89.2	98.6	0.90	A
			Ce-141	pCi/L	249	275	0.91	A
			Cr-51	pCi/L	213	221	0.96	A
			Cs-134	pCi/L	104.0	123	0.85	A
			Cs-137	pCi/L	172	185	0.93	A
			Co-58	pCi/L	96.3	99.4	0.97	A
			Mn-54	pCi/L	201	206	0.98	A
			Fe-59	pCi/L	154	147	1.05	A
			Zn-65	pCi/L	213	204	1.04	A
			Co-60	pCi/L	154	160	0.96	A
	E6900-396	AP	Ce-141	pCi	181	161	1.12	A
			Cr-51	pCi	145	130	1.12	A
			Cs-134	pCi	71.8	72	0.99	A
			Cs-137	pCi	115	109	1.06	A
			Co-58	pCi	62	58	1.06	A
			Mn-54	pCi	129	121	1.07	A
			Fe-59	pCi	97	98	0.98	A
			Zn-65	pCi	110	120	0.92	A
			Co-60	pCi	98.7	94.1	1.05	A
	E6899-396	Charcoal	I-131	pCi	89.5	92.3	0.97	A
December 2009	E6946-396	Milk	Sr-89	pCi/L	131	131	1.00	A
			Sr-90	pCi/L	19.3	17.9	1.08	A
	E6947-396	Milk	I-131	pCi/L	79.2	87.3	0.91	A
			Ce-141	pCi/L	193	202	0.96	A
			Cr-51	pCi/L	512	548	0.93	A
			Cs-134	pCi/L	222	253	0.88	A
			Cs-137	pCi/L	163	179	0.91	A
			Co-58	pCi/L	200	211	0.95	A
			Mn-54	pCi/L	178	178	1.00	A
			Fe-59	pCi/L	176	178	0.99	A
			Zn-65	pCi/L	326	345	0.94	A
			Co-60	pCi/L	240	256	0.94	A
	E6949-396	AP	Ce-141	pCi	103	103	1.00	A
			Cr-51	pCi	290	280	1.04	A
			Cs-134	pCi	116	129	0.90	A
			Cs-137	pCi	93.4	91.5	1.02	A
			Co-58	pCi	111	108	1.03	A
			Mn-54	pCi	81.0	90.8	0.89	A
			Fe-59	pCi	106	90.8	1.17	A
			Zn-65	pCi	155	176	0.88	A
			Co-60	pCi	135	131	1.03	A

TABLE E-1 **ANALYTICS ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM**
TELEDYNE BROWN ENGINEERING, 2009
(PAGE 3 OF 3)

Month/Year	Identification Number	Matrix	Nuclide	Units	Reported Value (a)	Known Value (b)	Ratio (c) TBE/Analytics	Evaluation (d)
December 2009	E6948-396	Charcoal	I-131	pCi	93.3	93.9	0.99	A

(1) Detector 7 appears to have a slightly high bias. Detector 7 was removed from service until it can be recalibrated. NCR 09-23

(a) Teledyne Brown Engineering reported result.

(b) The Analytics known value is equal to 100% of the parameter present in the standard as determined by gravimetric and/or volumetric measurements made during standard preparation.

(c) Ratio of Teledyne Brown Engineering to Analytics results.

(d) Analytics evaluation based on TBE internal QC limits: A= Acceptable. Reported result falls within ratio limits of 0.80-1.20. W-Acceptable with warning. Reported result falls within 0.70-0.80 or 1.20-1.30. N = Not Acceptable. Reported result falls outside the ratio limits of < 0.70 and > 1.30.

TABLE E-2 **ERA ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM**
TELEDYNE BROWN ENGINEERING, 2009
(PAGE 1 OF 1)

Month/Year	Identification Number	Media	Nuclide	Units	Reported Value (a)	Known Value (b)	Control Limits	Evaluation (c)
April 2009	RAD 77	Water	Sr-89	pCi/L	57.4	48.3	37.8 - 55.7	N (1)
			Sr-90	pCi/L	30.6	31.4	22.9 - 36.4	A
			Ba-133	pCi/L	55.2	52.7	43.4 - 58.3	A
			Cs-134	pCi/L	65.8	72.9	59.5 - 80.2	A
			Cs-137	pCi/L	157	168	151 - 187	A
			Co-60	pCi/L	86.4	88.9	80.0 - 100	A
			Zn-65	pCi/L	85.5	84.4	76.0 - 101	A
			Gr-A	pCi/L	47.7	54.2	28.3 - 67.7	A
			Gr-B	pCi/L	45.2	43.5	29.1 - 50.8	A
			I-131	pCi/L	25.2	26.1	21.7 - 30.8	A
			H-3	pCi/L	19733	20300	17800 - 22300	A
October 2009	RAD 79	Water	Sr-89	pCi/L	64.75	62.2	50.2 - 70.1	A
			Sr-90	pCi/L	30.30	30.7	22.4 - 35.6	A
			Ba-133	pCi/L	97.9	92.9	78.3 - 102	A
			Cs-134	pCi/L	76.8	79.4	65.0 - 87.3	A
			Cs-137	pCi/L	59.9	54.6	49.1 - 62.9	A
			Co-60	pCi/L	121	117	105 - 131	A
			Zn-65	pCi/L	115	99.5	89.6 - 119	A
			Gr-A	pCi/L	19.6	23.2	11.6 - 31.1	A
			Gr-B	pCi/L	28.5	26.0	16.2 - 33.9	A
			I-131	pCi/L	22.1	22.2	18.4 - 26.5	A
			H-3	pCi/L	16133	16400	14300 - 18000	A

(1) Calculation did not allow for Y-90 ingrowth on the Sr-89 mount. NCR 09-14

(a) Teledyne Brown Engineering reported result.

(b) The ERA known value is equal to 100% of the parameter present in the standard as determined by gravimetric and/or volumetric measurements made during standard preparation.

(c) ERA evaluation: A=acceptable. Reported result falls within the Warning Limits. NA=not acceptable. Reported result falls outside of the Control Limits. CE=check for Error. Reported result falls within the Control Limits and outside of the Warning Limit.

TABLE E-3 DOE'S MIXED ANALYTE PERFORMANCE EVALUATION PROGRAM (MAPEP)
TELEDYNE BROWN ENGINEERING, 2009
(PAGE 1 OF 2)

Month/Year	Identification Number	Media	Nuclide	Units	Reported Value (a)	Known Value (b)	Acceptance Range	Evaluation (c)
March 2009	09-MaW20	Water	Cs-134	Bq/L	18.8	22.5	18.5 - 29.3	A
			Cs-137	Bq/L	0.0601		(1)	A
			Co-57	Bq/L	17.0	18.9	13.2 - 24.6	A
			Co-60	Bq/L	16.1	17.21	12.05 - 22.37	A
			H-3	Bq/L	332	330.9	231.6 - 430.2	A
			Mn-54	Bq/L	13.8	14.7	10.26 - 19.06	A
			Sr-90	Bq/L	6.88	7.21	5.05- 9.37	A
			Zn-65	Bq/L	13.2	13.6	9.5 - 17.7	A
	09-GrW20	Water	Gr-A	Bq/L	0.529	0.635	>0.0 - 1.270	A
			Gr-B	Bq/L	1.87	1.27	0.64 - 1.91	A
	09-MaS20	Soil	Cs-134	Bq/kg	433	467	327 - 607	A
			Cs-137	Bq/kg	649	605	424 - 787	A
			Co-57	Bq/kg	-0.120		(1)	A
			Co-60	Bq/kg	3.91	4.113	(2)	A
			Mn-54	Bq/kg	339	307	215 - 399	A
			K-40	Bq/kg	644	570	399 - 741	A
			Sr-90	Bq/kg	245	257	180 - 334	A
			Zn-65	Bq/kg	272	242	169 - 315	A
	09-RdF20	AP	Cs-134	Bq/sample	2.77	2.93	2.05 - 3.81	A
			Cs-137	Bq/sample	1.41	1.52	1.06 - 1.98	A
			Co-57	Bq/sample	1.24	1.30	0.91 - 1.69	A
			Co-60	Bq/sample	1.33	1.22	0.85 - 1.59	A
			Mn-54	Bq/sample	2.42	2.2709	1.5898 - 2.9522	A
			Sr-90	Bq/sample	0.713	0.64	0.448 - 0.832	A
			Zn-65	Bq/sample	1.30	1.36	0.95 - 1.77	A
	09-GrF20	AP	Gr-A	Bq/sample	0.188	0.348	>0.0 - 0.696	A
			Gr-B	Bq/sample	0.313	0.279	0.140 - 0.419	A
March 2009	09-RdV20	Vegetation	Cs-134	Bq/sample	3.48	3.40	2.38 - 4.42	A
			Cs-137	Bq/sample	1.15	0.93	0.65 - 1.21	W
			Co-57	Bq/sample	3.12	2.36	1.65 - 3.07	N (3)
			Co-60	Bq/sample	-0.0105		(1)	A
			Mn-54	Bq/sample	2.98	2.3	1.61 - 2.99	W
			K-40	Bq/sample	64.1		(4)	
			Sr-90	Bq/sample	1.09	1.260	0.882 - 1.638	A
			Zn-65	Bq/sample	1.73	1.3540	0.948 - 1.760	W
September 2009	09-MaW21	Water	Cs-134	Bq/L	26.5	32.2	22.5 - 41.9	A
			Cs-137	Bq/L	37.2	41.2	28.8 - 53.6	A
			Co-57	Bq/L	32.2	36.6	25.6 - 47.6	A
			Co-60	Bq/L	14.0	15.40	10.8 - 20.0	A
			H-3	Bq/L	705	634.1	443.9 - 824.3	A
			Mn-54	Bq/L	-0.1015		(1)	A
			Sr-90	Bq/L	13.9	12.99	9.09- 16.89	A
			Zn-65	Bq/L	26.2	26.9	18.8 - 35.0	A
	09-GrW21	Water	Gr-A	Bq/L	1.27	1.047	>0.0 - 2.094	A
			Gr-B	Bq/L	9.70	7.53	3.77 - 11.30	A

TABLE E-3 **DOE'S MIXED ANALYTE PERFORMANCE EVALUATION PROGRAM (MAPEP)**
TELEDYNE BROWN ENGINEERING, 2009
(PAGE 2 OF 2)

Month/Year	Identification Number	Media	Nuclide	Units	Reported Value (a)	Known Value (b)	Acceptance Range	Evaluation (c)
September 2009	09-MaS21	Soil	Am-241	Bq/kg	74.7	89.8	62.9 - 116.7	A
			Cs-134	Bq/kg	0.554		(1)	A
			Cs-137	Bq/kg	706	669	468 - 870	A
			Co-57	Bq/kg	606	586	410 - 762	A
			Co-60	Bq/kg	350	327.000	229 - 425	A
			Mn-54	Bq/kg	876	796	557 - 1035	A
			K-40	Bq/kg	425	375	263 - 488	A
			Sr-90	Bq/kg	505	455	319 - 592	A
			Zn-65	Bq/kg	1370	1178	825 - 1531	A
	09-RdF21	AP	Cs-134	Bq/sample	-0.02		(1)	A
			Cs-137	Bq/sample	1.4	1.4	0.98 - 1.82	A
			Co-57	Bq/sample	5.98	6.48	4.54 - 8.42	A
			Co-60	Bq/sample	1.01	1.03	0.72 - 1.34	A
			Mn-54	Bq/sample	5.16	5.49	3.84 - 7.14	A
			Sr-90	Bq/sample	0.925	0.0835	0.585 - 1.086	A
			Zn-65	Bq/sample	4.39	3.93	2.75 - 5.11	A
	09-GrF21	AP	Gr-A	Bq/sample	0.357	0.659	>0.0 - 1.318	A
			Gr-B	Bq/sample	1.403	1.320	0.66 - 1.98	A
	09-RdV21	Vegetation	Cs-134	Bq/sample	-0.0027		(1)	A
			Cs-137	Bq/sample	2.36	2.43	1.70 - 3.16	A
			Co-60	Bq/sample	2.58	2.57	1.80 - 3.34	A
			Mn-54	Bq/sample	8.36	7.9	5.5 - 10.3	A
			K-40	Bq/sample	57.8		(4)	
			Sr-90	Bq/sample	1.73	1.78	1.25 - 2.31	A
			Zn-65	Bq/sample	-0.59		(1)	A

(1) False positive test.
(2) Sensativity evaluation.
(3) Homogeniety problem. MAPEP requires using entire sample but due to geometry limitations we can only use part of the sample. NCR 09-13
(4) Not evaluated by MAPEP.
(a) Teledyne Brown Engineering reported result.
(b) The MAPEP known value is equal to 100% of the parameter present in the standard as determined by gravimetric and/or volumetric measurements made during standard preparation.
(c) DOE/MAPEP evaluation: A=acceptable, W=acceptable with warning, N=not acceptable.

TABLE E-4 **ERA (a) STATISTICAL SUMMARY PROFICIENCY TESTING PROGRAM ENVIRONMENTAL, INC., 2009**

Lab Code	Date	Analysis	Concentration (pCi/L) Laboratory Result[b]	ERA Result[c]	Control Limits	Acceptance
STW-1181	04/06/09	Sr-89	41.0 ± 5.8	48.3	37.8 - 55.7	Pass
STW-1181	04/06/09	Sr-90	32.4 ± 2.4	31.4	22.9 - 36.4	Pass
STW-1182	04/06/09	Ba-133	44.6 ± 3.1	52.7	43.4 - 58.3	Pass
STW-1182	04/06/09	Co-60	81.0 ± 3.1	88.9	80.0 - 100.0	Pass
STW-1182	04/06/09	Cs-134	65.6 ± 5.2	72.9	59.5 - 80.2	Pass
STW-1182 [d]	04/06/09	Cs-137	147.7 ± 5.3	168.0	151.0 - 187.0	Fail
STW-1182	04/06/09	Zn-65	79.8 ± 7.5	84.4	76.0 - 101.0	Pass
STW-1183	04/06/09	Gr. Alpha	47.6 ± 2.1	54.2	28.3 - 67.7	Pass
STW-1183	04/06/09	Gr. Beta	38.5 ± 1.3	43.5	29.1 - 50.8	Pass
STW-1184	04/06/09	I-131	24.4 ± 2.5	26.1	21.7 - 30.8	Pass
STW-1186 [e]	04/06/09	H-3	22819.0 ± 453.0	20300.0	17800.0 - 22300.0	Fail
STW-1193	10/05/09	Sr-89	53.0 ± 6.0	62.2	50.2 - 70.1	Pass
STW-1193	10/05/09	Sr-90	31.1 ± 2.2	30.7	22.4 - 35.6	Pass
STW-1194	10/05/09	Ba-133	82.5 ± 3.5	92.9	78.3 - 102.0	Pass
STW-1194	10/05/09	Co-60	116.8 ± 3.3	117.0	105.0 - 131.0	Pass
STW-1194	10/05/09	Cs-134	78.8 ± 5.7	78.8	65.0 - 87.3	Pass
STW-1194	10/05/09	Cs-137	54.2 ± 3.7	54.6	49.1 - 62.9	Pass
STW-1194	10/05/09	Zn-65	102.5 ± 6.2	99.5	89.6 - 119.0	Pass
STW-1195	10/05/09	Gr. Alpha	20.3 ± 2.0	23.2	11.6 - 31.1	Pass
STW-1195	10/05/09	Gr. Beta	23.7 ± 1.4	26.0	16.2 - 33.9	Pass
STW-1196	10/05/09	I-131	22.4 ± 1.4	22.2	18.4 - 26.5	Pass
STW-1198	10/05/09	H-3	17228.0 ± 694.0	16400.0	14300.0 - 18000.0	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 Assc (ERA).*

[b] *Unless otherwise indicated, the laboratory result is given as the mean ± standard deviation for three determinations.*

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

[d] *All gamma -emitters showed a low bias. A large plastic burr found on the base of the Marinelli kept the beaker from sitting directly on the detector. Result of recount in a different beaker, Cs-137, 155.33 ± 14.55 pCi/L.*

[e] *Samples were recounted and also reanalyzed. A recount of the original vials averaged 23,009 pCi/L. Reanalysis results were acceptable, 19,170 pCi/L.*

TABLE E-5 DOE'S MIXED ANALYTE PERFORMANCE EVALUATION PROGRAM (MAPEP)[a]
ENVIRONMENTAL, INC., 2009
(Page 1 of 2)

			Concentration [b]			
Lab Code [c]	Date	Analysis	Laboratory result	Known Activity	Control Limits [d]	Acceptance
STW-1170	01/01/09	Co-57	19.60 ± 0.40	18.90	13.20 - 24.60	Pass
STW-1170	01/01/09	Co-60	16.60 ± 0.30	17.21	12.05 - 22.37	Pass
STW-1170	01/01/09	Cs-134	20.40 ± 0.50	22.50	15.80 - 29.30	Pass
STW-1170 [e]	01/01/09	Cs-137	0.10 ± 0.20	0.00	0.00 - 1.00	Pass
STW-1170	01/01/09	H-3	359.90 ± 33.90	330.90	231.60 - 430.20	Pass
STW-1170	01/01/09	Mn-54	15.00 ± 0.40	14.66	10.26 - 19.06	Pass
STW-1170	01/01/09	Sr-90	7.87 ± 1.39	7.21	5.05 - 9.37	Pass
STW-1170	01/01/09	Zn-65	14.00 ± 0.70	13.60	9.50 - 17.70	Pass
STW-1171	01/01/09	Gr. Alpha	0.56 ± 0.06	0.64	0.00 - 1.27	Pass
STW-1171	01/01/09	Gr. Beta	1.29 ± 0.05	1.27	0.64 - 1.91	Pass
STSO-1172 [e]	01/01/09	Co-57	0.00 ± 0.00	0.00	0.00 - 1.00	Pass
STSO-1172	01/01/09	Cs-134	458.60 ± 7.40	467.00	327.00 - 607.00	Pass
STSO-1172	01/01/09	Cs-137	652.30 ± 3.50	605.00	424.00 - 787.00	Pass
STSO-1172	01/01/09	K-40	636.40 ± 9.50	570.00	360.40 - 669.40	Pass
STSO-1172	01/01/09	Mn-54	346.40 ± 3.10	307.00	215.00 - 399.00	Pass
STSO-1172	01/01/09	Sr-90	180.60 ± 12.10	257.00	180.00 - 334.00	Pass
STSO-1172	01/01/09	Zn-65	268.30 ± 4.00	242.00	169.00 - 315.00	Pass
STVE-1173	01/01/09	Co-57	2.75 ± 0.11	2.36	1.65 - 3.07	Pass
STVE-1173 [e]	01/01/09	Co-60	0.06 ± 0.09	0.00	0.00 - 1.00	Pass
STVE-1173	01/01/09	Cs-134	3.49 ± 0.22	3.40	2.38 - 4.42	Pass
STVE-1173	01/01/09	Cs-137	1.01 ± 0.11	0.93	0.65 - 1.21	Pass
STVE-1173	01/01/09	Mn-54	2.52 ± 0.14	2.30	1.61 - 2.99	Pass
STVE-1173	01/01/09	Zn-65	1.52 ± 0.18	1.35	0.95 - 1.76	Pass
STAP-1174	01/01/09	Co-57	1.25 ± 0.05	1.30	0.91 - 1.69	Pass
STAP-1174	01/01/09	Co-60	1.17 ± 0.06	1.22	0.85 - 1.59	Pass
STAP-1174	01/01/09	Cs-134	2.67 ± 0.14	2.93	2.05 - 3.81	Pass
STAP-1174	01/01/09	Cs-137	1.53 ± 0.08	1.52	1.06 - 1.98	Pass
STAP-1174	01/01/09	Mn-54	2.34 ± 0.09	2.27	1.59 - 2.95	Pass
STAP-1174 [f]	01/01/09	Sr-90	0.93 ± 0.14	0.64	0.45 - 0.83	Fail
STAP-1174	01/01/09	Zn-65	1.44 ± 0.14	1.36	0.95 - 1.77	Pass
STAP-1175	01/01/09	Gr. Alpha	0.22 ± 0.03	0.35	0.00 - 0.70	Pass
STAP-1175	01/01/09	Gr. Beta	0.36 ± 0.04	0.28	0.14 - 0.42	Pass
STW-1192	07/01/09	Co-57	37.20 ± 1.50	36.60	25.60 - 47.60	Pass
STW-1192	07/01/09	Co-60	15.10 ± 0.90	15.40	10.80 - 20.00	Pass
STW-1192	07/01/09	Cs-134	30.30 ± 2.10	32.20	22.50 - 41.90	Pass
STW-1192	07/01/09	Cs-137	41.90 ± 1.80	41.20	28.80 - 53.60	Pass
STW-1192	07/01/09	H-3	680.30 ± 33.60	634.10	443.90 - 824.30	Pass
STW-1192 [e]	07/01/09	Mn-54	0.01 ± 0.26	0.00	0.00 - 1.00	Pass
STW-1192	07/01/09	Sr-90	12.90 ± 1.70	12.99	9.09 - 16.89	Pass
STW-1192	07/01/09	Zn-65	28.50 ± 2.40	26.90	18.80 - 35.00	Pass

TABLE E-5 DOE'S MIXED ANALYTE PERFORMANCE EVALUATION PROGRAM (MAPEP)[a]
ENVIRONMENTAL, INC., 2009
(Page 2 of 2)

			Concentration [b]			
Lab Code [c]	Date	Analysis	Laboratory result	Known Activity	Control Limits [d]	Acceptance
STW-1191	07/01/09	Gr. Alpha	0.88 ± 0.07	1.05	0.00 - 2.09	Pass
STW-1191	07/01/09	Gr. Beta	7.29 ± 0.10	7.53	3.77 - 11.30	Pass
STSO-1188	07/01/09	Co-57	674.60 ± 9.00	586.00	410.00 - 762.00	Pass
STSO-1188	07/01/09	Co-60	356.40 ± 6.30	327.00	229.00 - 425.00	Pass
STSO-1188	07/01/09	Cs-134	0.20 ± 1.90	0.00	0.00 - 1.00	Pass
STSO-1188	07/01/09	Cs-137	767.50 ± 12.00	669.00	468.00 - 870.00	Pass
STSO-1188	07/01/09	K-40	433.00 ± 37.20	375.00	263.00 - 488.00	Pass
STSO-1188	07/01/09	Mn-54	931.60 ± 14.10	796.00	557.00 - 1035.00	Pass
STSO-1188 [g]	07/01/09	Sr-90	310.50 ± 12.20	455.00	319.00 - 592.00	Fail
STSO-1188	07/01/09	Zn-65	1433.90 ± 25.20	1178.00	825.00 - 1531.00	Pass
STVE-1190	07/01/09	Co-57	8.90 ± 0.60	8.00	5.60 - 10.40	Pass
STVE-1190	07/01/09	Co-60	2.50 ± 0.36	2.57	1.80 - 3.34	Pass
STVE-1190	07/01/09	Cs-134	0.01 ± 0.11	0.00	0.00 - 0.10	Pass
STVE-1190	07/01/09	Cs-137	2.42 ± 0.16	2.43	1.70 - 3.16	Pass
STVE-1190	07/01/09	Mn-54	8.35 ± 0.70	7.90	5.50 - 10.30	Pass
STVE-1190	07/01/09	Zn-65	0.01 ± 0.26	0.00	0.00 - 0.10	Pass
STAP-1189	07/01/09	Gr. Alpha	0.33 ± 0.04	0.66	0.00 - 1.32	Pass
STAP-1189	07/01/09	Gr. Beta	1.57 ± 0.07	1.32	0.66 - 1.98	Pass
STAP-1190	07/01/09	Co-57	6.78 ± 0.27	6.48	4.54 - 8.42	Pass
STAP-1190	07/01/09	Co-60	1.06 ± 0.18	1.03	0.72 - 1.34	Pass
STAP-1190	07/01/09	Cs-134	0.01 ± 0.06	0.00	0.01 - 0.05	Pass
STAP-1190	07/01/09	Cs-137	1.49 ± 0.27	1.40	0.98 - 1.82	Pass
STAP-1190	07/01/09	Mn-54	6.00 ± 0.45	5.49	3.84 - 7.14	Pass
STAP-1190	07/01/09	Sr-90	0.79 ± 0.13	0.84	0.59 - 1.09	Pass
STAP-1190	07/01/09	Zn-65	4.55 ± 0.66	3.93	2.75 - 5.11	Pass

[a] *Results obtained by Environmental, Inc., Midwest Laboratory as a participant in the Department of Energy's Mixed Analyte Performance Evaluation Program, Idaho Operations office, Idaho Falls, Idaho*
[b] *Results are reported in units of Bq/kg (soil), Bq/L (water) or Bq/total sample (filters, vegetation).*
[c] *Laboratory codes as follows: STW (water), STAP (air filter), STSO (soil), STVE (vegetation).*
[d] *MAPEP results are presented as the known values and expected laboratory precision (1 sigma, 1 determination) and control limits as defined by the MAPEP.*
[e] *Included in the testing series as a "false positive".*
[f] *No reason was determined for the initial high results. The analysis was repeated; result of reanalysis; 0.54 ± 0.12 Bq/filter.*
[g] *Incomplete separation of strontium from calcium could result in a higher recovery percentage and consequently lower reported activity. The analysis was repeated; result of reanalysis 363.3 ± 28.6 Bq/kg.*

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APPENDIX F

ANNUAL RADIOLOGICAL GROUNDWATER PROTECTION PROGRAM REPORT (ARGPPR)

Docket No: 50-289
50-320

THREE MILE ISLAND NUCLEAR STATION
UNITS 1 and 2

Annual Radiological
Groundwater Protection Program Report (ARGPPR)

1 January Through 31 December 2009

Prepared By

Teledyne Brown Engineering
Environmental Services

Exelon SM
Nuclear

Three Mile Island Nuclear Station
Middletown, PA 17057

April 2010

Table Of Contents

I. Summary and Conclusions 1

II. Introduction 3
- A. Objectives of the RGPP 3
- B. Implementation of the Objectives 4
- C. Program Description 4
- D. Characteristics of Tritium (H-3) 5

III. Program Description 6
- A. Sample Analysis 6
- B. Data Interpretation 6

IV. Results and Discussion 7
- A. Groundwater Results 7
- B. Surface Water Results 8
- D. Leaks, Spills, and Releases 9
- E. Actions Taken 9

Appendices

Appendix A Location Designation

Tables

Table A-1: Radiological Groundwater Protection Program - Sampling Locations, Distance and Direction, Three Mile Island Nuclear Station, 2009

Figures

Figure A-1: Sampling Locations Near the Site Boundary of the Three Mile Island Nuclear Station, 2009

Appendix B Data Tables

Tables

Table B-I.1 Concentrations of Tritium and Strontium in Well Water Samples Collected as Part of the Radiological Groundwater Protection Program, Three Mile Island Nuclear Station, 2009.

Table B-I.2 Concentrations of Gamma Emitters in Well Water Samples Collected in the Vicinity of Three Mile Island Nuclear Station, 2009.

Table B-II.1 Concentrations of Tritium and Strontium in Surface Water Samples Collected as Part of the Radiological Groundwater Protection Program, Three Mile Island Nuclear Station, 2009.

Table B-II.2 Concentrations of Gamma Emitters in Surface Water Samples Collected in the Vicinity of Three Mile Island Nuclear Station, 2009.

Appendix C Data Tables

Tables

Table C-I.1 Concentrations of Tritium and Strontium in Well Water Split Samples Collected as Part of the Radiological Groundwater Protection Program, Three Mile Island Nuclear Station, 2009.

Table C-I.2 Concentrations of Gamma Emitters in Well Water Split Samples Collected as Part of the Radiological Groundwater Protection Program, Three Mile Island Nuclear Station, 2009.

I. Summary and Conclusions

In 2006, Exelon instituted a comprehensive program to evaluate the impact of station operations on groundwater and surface water in the vicinity of Three Mile Island Nuclear Station. At Three Mile Island Nuclear, 31 new permanent groundwater monitoring wells were installed in 2006. The results of the special investigations for all TMI wells are included in this report. This report covers groundwater and surface water samples, collected from the environment, both on and off station property in 2009. During that time period, 517 analyses were performed on 368 samples from 67 locations.

In assessing all the data gathered for this report, it was concluded that the operation of Three Mile Island Nuclear Station had no adverse radiological impact on the environment, and there were no known active releases at the end of 2009 into the groundwater at Three Mile Island Nuclear Station.

Gamma-emitting radionuclides associated with licensed plant operations were not detected at concentrations greater than their respective Lower Limits of Detection (LLDs) as specified in the Offsite Dose Calculation Manual (ODCM) in any of the groundwater or surface water samples. In the case of tritium, Exelon specified that its laboratories achieve a lower limit of detection 10 times lower than that required by federal regulation.

Strontium-89/90 was not detected at a concentration greater than the LLD of 2.0 picoCuries per liter (pCi/L) in the groundwater samples tested.

Tritium was not detected in any groundwater or surface water samples at concentrations greater than the United States Environmental Protection Agency (USEPA) drinking water standard (and the Nuclear Regulatory Commission Reporting Limit) of 20,000 pCi/L. Low levels of tritium were detected at concentrations greater than the LLD of 200 pCi/L in 41 of 64 groundwater monitoring locations. The groundwater tritium concentrations ranged from 154 ± 102 pCi/L to 8,510 ± 904 pCi/L. Tritium that was detected in groundwater at the Station is believed to be the result of historical releases, the recapture of gaseous tritium releases via rainwater and/or background from external sources greater than 200 pCi/L.

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II. Introduction

The Three Mile Island Nuclear Station (TMINS) established a revised and more comprehensive groundwater monitoring program in 2006 as part of an Exelon Nuclear fleetwide assessment.

Conestoga Rovers & Associates (CRA) performed the initial assessment. CRA prepared a Hydrogeologic Investigation Report (HIR) for Exelon to determine whether groundwater at and near TMINS has been adversely impacted by any releases of radionuclides. The CRA report documents the results of the May 2006 Hydrogeologic Investigation Work Plan. CRA assessed groundwater quality at the Station in locations designated as Areas for Further Evaluation. The results and conclusions of this Phase 1 study were made available to state and federal regulators as well as the public on an Exelon web site in station specific reports.

As a result of the Phase 1 study, the Radiological Groundwater Protection Program (RGPP) was revised to a long term monitoring program. This report covers those analyses performed by Teledyne Brown Engineering (TBE) and Environmental Inc. (Midwest Labs) on well water and surface water samples collected in 2009. All wells that were established were located in the owner controlled areas of the site. No offsite wells were established because the groundwater movement is to the Susquehanna River.

This report covers those analyses performed by Teledyne Brown Engineering (TBE) and Environmental Inc. (Midwest Labs) on samples collected in 2009.

A. Objective of the RGPP

The long-term objectives of the RGPP are as follows:

1. Identify suitable locations to monitor and evaluate potential impacts from station operations before significant radiological impact to the environment and potential drinking water sources.

2. Understand the local hydrogeologic regime in the vicinity of the station and maintain up-to-date knowledge of flow patterns on the surface and shallow subsurface.

3. Perform routine water sampling and radiological analysis of water from selected locations.

4. Notify stakeholders in a timely manner for new leaks, spills, or other detections with potential radiological significance.

5. Regularly assess analytical results to identify adverse trends.

6. Take necessary corrective actions to protect groundwater resources.

B. Implementation of the Objectives

The objectives identified have been implemented at Three Mile Island Nuclear Station as discussed below:

1. Three Mile Island Nuclear Station continues to sample and monitor the groundwater at the station in accordance with station procedures. Sample frequencies and locations are adjusted based on monitoring results and investigations.

2. The Three Mile Island Nuclear Station reports describe the local hydrogeologic regime. Periodically, the flow patterns on the surface and shallow subsurface are updated based on ongoing measurements.

3. Three Mile Island Nuclear Station will continue to perform routine sampling and radiological analysis of water from selected locations.

4. Three Mile Island Nuclear Station has implemented new procedures to identify and report new leaks, spills, or other detections with potential radiological significance in a timely manner.

5. Three Mile Island Nuclear Station staff and consulting hydrogeologist assess analytical results on an ongoing basis to identify adverse trends.

C. Program Description

1. Sample Collection

Sample locations can be found in Table A-1 and Figures A-1 and A-2, Appendix A.

<u>Groundwater and Surface Water</u>

Samples of water are collected, managed, transported and analyzed in accordance with approved procedures. Both groundwater and surface water are collected. Sample locations, sample collection frequencies and analytical frequencies are controlled in accordance with approved station procedures. Contractor and/or station personnel are trained in the collection,

preservation management, and shipment of samples, as well as in documentation of sampling events. For split samples, collectors will periodically collect samples that are sent to Midwest Labs to confirm that TBE is producing comparable data. Analytical laboratories are subject to internal quality assurance programs, industry cross-check programs, as well as nuclear industry audits. Station personnel review and evaluate all analytical data deliverables as data are received.

Analytical data results are reviewed by both station personnel and an independent hydrogeologist for adverse trends or changes to hydrogeologic conditions.

D. Characteristics of Tritium (H-3)

Tritium (chemical symbol H-3) is a radioactive isotope of hydrogen. The most common form of tritium is tritium oxide, which is also called "tritiated water." Tritiated water behaves chemically and physically like non-tritiated water in the subsurface, and therefore tritiated water will travel at the same velocity as the average groundwater velocity.

Tritium is created in the environment from naturally occurring processes both cosmic and subterranean, as well as from anthropogenic (i.e., man-made) sources. Tritium is produced naturally in the upper atmosphere when cosmic rays strike air molecules. This “cosmogenic” tritium combines with oxygen to form tritiated water, which will then enter the hydrologic cycle. Below ground, “lithogenic” tritium is produced by the bombardment of natural lithium present in crystalline rocks by neutrons produced by the radioactive decay of naturally abundant uranium and thorium. Lithogenic production of tritium is usually negligible compared to other sources due to the limited abundance of lithium in rock. The lithogenic tritium is introduced directly to groundwater.

A major anthropogenic source of tritium and strontium-90 comes from the former atmospheric testing of thermonuclear weapons. Levels of tritium in precipitation increased significantly during the 1950s and early 1960s, and later with additional testing, resulting in the release of significant amounts of tritium to the atmosphere. The Canadian heavy water nuclear power reactors, other commercial power reactors, nuclear research and weapons production continue to influence tritium concentrations in the environment.

The chemical properties of tritium are essentially those of ordinary hydrogen. Tritium can be taken into the body by drinking water, breathing air, eating food, or absorption through skin. Once tritium enters the body,

it disperses quickly and is uniformly distributed throughout the body. Tritium is excreted primarily through urine with a clearance rate characterized by an effective biological half-life of about 14 days. Within one month or so after ingestion, all tritium is essentially cleared. Organically bound tritium (tritium that is incorporated in organic compounds) can remain in the body for a longer period.

Tritium has a half-life of approximately 12.3 years. It decays spontaneously to helium-3 (He-3). This radioactive decay releases a beta particle (low-energy electron). The radioactive decay of tritium is the source of the health risk from exposure to tritium. Tritium is one of the least dangerous radionuclides, because it emits very weak radiation and leaves the body relatively quickly. Since tritium is almost always found as water, it goes directly into soft tissues and organs. The associated dose to these tissues is generally uniform and is dependent on the water content of the specific tissue.

III. Program Description

A. Sample Analysis

This section describes the general analytical methodologies used by TBE and Midwest Labs to analyze the environmental samples for radioactivity for the Three Mile Island Nuclear Station RGPP in 2009.

In order to achieve the stated objectives, the current program includes the following analyses:

1. Concentrations of gamma emitters in groundwater and surface water.

2. Concentrations of strontium in groundwater and surface water.

3. Concentrations of tritium in groundwater and surface water.

B. Data Interpretation

1. <u>Lower Limit of Detection and Minimum Detectable Concentration</u>

   The lower limit of detection (LLD) is specified by federal regulation as a minimum sensitivity value that must be achieved routinely by the analytical parameter.

2. Laboratory Measurements Uncertainty

The estimated uncertainty in measurement of tritium in environmental samples is frequently on the order of 50% of the measurement value.

Statistically, the exact value of a measurement is expressed as a range with a stated level of confidence. The convention is to report results with a 95% level of confidence. The uncertainty comes from calibration standards, sample volume or weight measurements, sampling uncertainty and other factors. Exelon reports the uncertainty of a measurement created by statistical process (counting error)

Analytical uncertainties are reported at the 95% confidence level in this report for reporting consistency with the AREOR.

Gamma spectroscopy results for each type of sample were grouped as follows:

For groundwater and surface water 11 nuclides, Mn-54, Co-58, Fe-59, Co-60, Zn-65, Nb-95, Zr-95, Cs-134, Cs-137, Ba-140 and La-140 were reported.

The radio-analytical laboratory is counting tritium results to an LLD of 200 pCi/L. Typically, the lowest positive measurement will be reported within a range of 40 – 240 pCi/L or 140 ± 100 pCi/L. Clearly, these sample results cannot be distinguished as different from background at this concentration.

IV. Results and Discussion

A. Groundwater Results

Samples were collected from on and off-site wells throughout the year in accordance with the station radiological groundwater protection program. Analytical results and anomalies are discussed below.

Tritium

Samples from 64 locations were analyzed for tritium activity (Table B–I.1, Appendix B). Tritium values ranged from the detection limit to 8,510 pCi/l. One of the locations was offsite drinking water wells

with no detectable concentration of tritium.

Tritium Split Samples

Tritium values ranged from detection limit to 6,054 (Table C–1.1, Appendix C).

Strontium

Strontium-90 was not detected above the required detection limit of 2.0 pCi/liter. (Table B–I.1, Appendix B)

Strontium Split Samples

Strontium-90 was not detected above the required detection limit of 2.0 pCi/liter (Table C–1.1, Appendix C).

Gamma Emitters

Potassium-40 was detected in one of 66 samples. The concentration was 74 pCi/liter. No other gamma emitting nuclides were detected (Table B–I.2, Appendix B).

Gamma Emitters Split Samples

Potassium-40 was detected in six of 8 samples. The concentration ranged from 74 to 163 pCi/liter. No other gamma emitting nuclides were detected (Table C–I.2, Appendix C).

B. Surface Water Results

Samples were collected from surface water locations throughout the year in accordance with the station radiological groundwater protection program. Analytical results and anomalies are discussed below.

Tritium

Tritium was not detected above the required detection limit of 200 pCi/liter. (Table B-II.1, Appendix B).

Strontium

Strontium-90 was not detected above the required detection limit of 2.0 pCi/liter. (Table B–II.1, Appendix B).

Gamma Emitters

No gamma emitting nuclides were detected. (Table B–II.2, Appendix B).

C. Leaks, Spills, and Releases

No new active leaks were identified at the TMI in 2009. TMI continues to monitor tritium plumes from previous years and reports the dose to the public in the AREOR. No spills were determined to be reportable under voluntary reporting requirements for the NEI Groundwater Protection Initiative (GPI) as implemented in Exelon's Reportability procedure LS-AA-1120, RAD 1.34.

D. Actions Taken

1. Compensatory Actions

TMI continues to monitor groundwater radioactivity as part of natural monitored attenuation of historical leaks.

APPENDIX A

LOCATION DESIGNATION

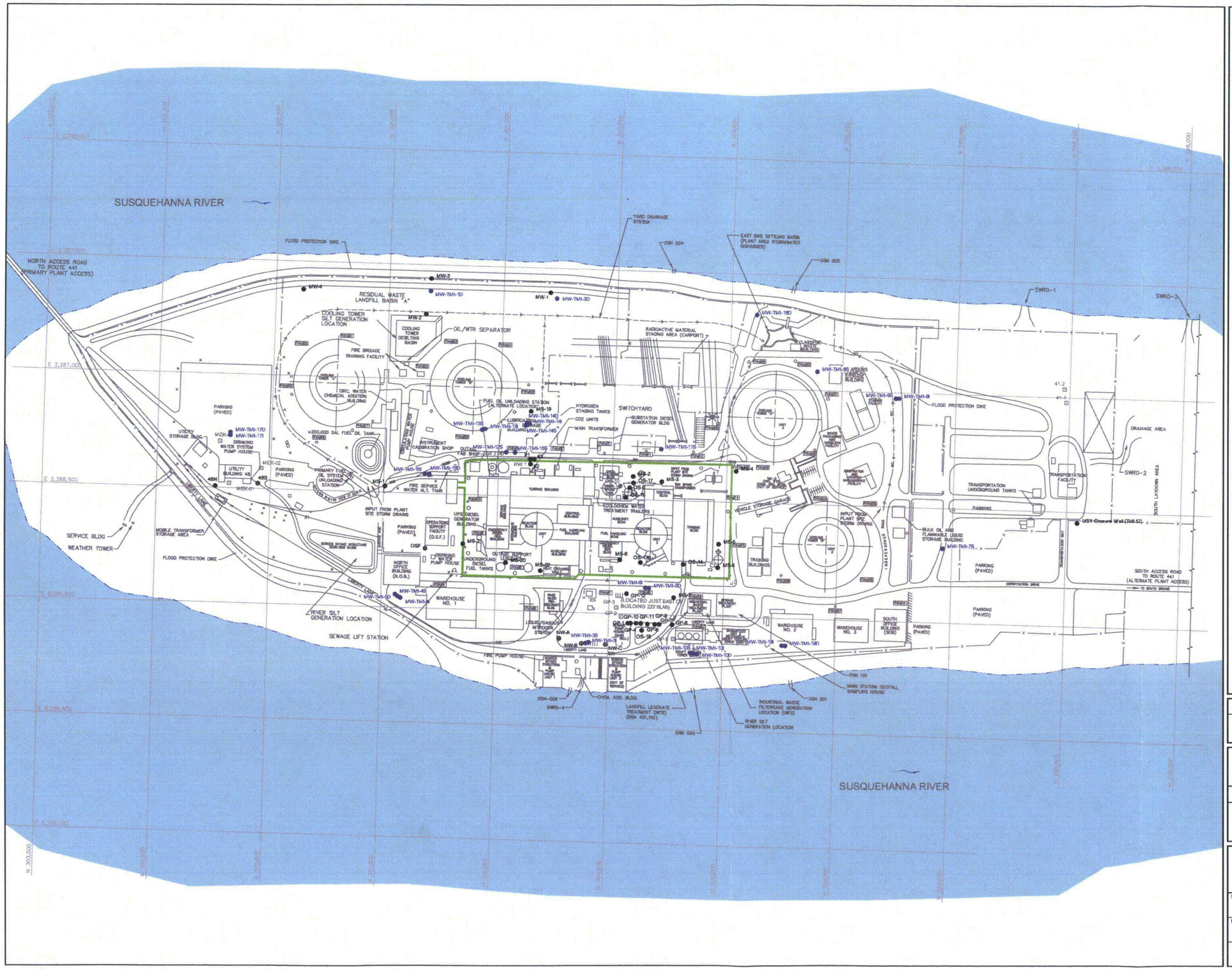
TABLE A-1: **Radiological Groundwater Protection Program - Sampling Locations and Distance, Three Mile Island Nuclear Station, 2009**

Site	Site Type
#3	Monitoring Well
48N	Monitoring Well
48S	Production Potable Well
E1-2	Monitoring Well, Offsite
GP-12	Monitoring Well
GP-6	Monitoring Well
GP-8	Monitoring Well
GP-9	Monitoring Well
J1-3	Precipitation
MS-1	Monitoring Well, Precipitation
MS-19	Monitoring Well, Precipitation
MS-2	Monitoring Well, Precipitation
MS-20	Monitoring Well, Precipitation
MS-21	Monitoring Well
MS-22	Monitoring Well
MS-3	Monitoring Well
MS-4	Monitoring Well
MS-5	Monitoring Well
MS-6	Monitoring Well
MS-7	Monitoring Well
MS-8	Monitoring Well
MW-1	Monitoring Well
MW-2	Monitoring Well
MW-3	Monitoring Well
MW-4	Monitoring Well
N2-1	Monitoring Well, Offsite
NW-A	Production Well
NW-B	Production Well, Precipitation
NW-C	Production Well
NW-CW	Clearwell
OS-13B	Monitoring Well
OS-14	Monitoring Well
OS-16	Monitoring Well
OS-17	Monitoring Well
OS-18	Monitoring Well
OSF	Production Potable Well
RW-1	Monitoring Well
RW-2	Monitoring Well
SW-E-1	Surface Water
SW-E-2	Surface Water
SW-E-3	Surface Water
MW-TMI-9S*	Monitoring Well
MW-TMI-10D	Monitoring Well
MW-TMI-10I	Monitoring Well
MW-TMI-10S	Monitoring Well
MW-TMI-11S*	Monitoring Well
MW-TMI-12S	Monitoring Well
MW-TMI-13I	Monitoring Well
MW-TMI-13S	Monitoring Well
MW-TMI-14D	Monitoring Well
MW-TMI-14I	Monitoring Well
MW-TMI-14S	Monitoring Well
MW-TMI-16D	Monitoring Well
MW-TMI-16I	Monitoring Well

* NO WATER PRESENT TO SAMPLE

TABLE A-1: **Radiological Groundwater Protection Program - Sampling Locations and Distance, Three Mile Island Nuclear Station, 2009**

Site	Site Type
MW-TMI-17D	Monitoring Well
MW-TMI-17I	Monitoring Well
MW-TMI-18D	Monitoring Well
MW-TMI-19D	Monitoring Well
MW-TMI-19I	Monitoring Well
MW-TMI-1D	Monitoring Well
MW-TMI-2D	Monitoring Well
MW-TMI-3I	Monitoring Well
MW-TMI-4I	Monitoring Well
MW-TMI-4S	Monitoring Well
MW-TMI-5D	Monitoring Well
MW-TMI-6D	Monitoring Well
MW-TMI-6I	Monitoring Well
MW-TMI-7S	Monitoring Well
MW-TMI-8S	Monitoring Well
MW-TMI-9I	Monitoring Well
TRAINING CENTER	Monitoring Well



0 100 200ft

LEGEND

- EDGE OF WATER
- FENCE LINE
- SITE GRID
- RAILROAD
- SURFACE WATER FLOW DIRECTION
- SUPPLY WELL LOCATION
- RECOVERY WELL LOCATION
- ABANDONED MONITORING WELL LOCATION
- ABANDONED TEST WELL LOCATION
- EXISTING MONITORING WELL LOCATION
- CRA MONITORING WELL LOCATION
- PROTECTED AREA

NOTES:

1). CLOSED TMI CONSTRUCTION LANDFILL
- SOUTH TMI AREA PVC PIE "DITCH WELLS".

2). OS-15 LOCATED IN THE SOUTH END OF THE ISLAND, OFF-MAP. WELLS OS-11 AND OS-12 WERE NEVER COMPLETED, SUBSEQUENTLY THEY ARE NOT SHOWN ON THIS FIGURE.

DRAFT

PRIVILEGED AND CONFIDENTIAL
ATTORNEY-CLIENT COMMUNICATION
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SCALE VERIFICATION

THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY.

EXELON GENERATION COMPANY, LLC

FLEETWIDE ASSESSMENT

GROUNDWATER MONITORING WELL LOCATIONS
THREE MILE ISLAND GENERATING STATION
MIDDLETOWN, PENNSYLVANIA

Exelon. CRA CONESTOGA-ROVERS & ASSOCIATES

Source Reference:

Project Manager:	Reviewed By:	Date:	
S. QUIGLEY	M. KELLY	AUGUST 2006	
Scale: AS SHOWN	Project N #: 45136-29	Report N #: 021	Drawing N #: figure 4.2

45136-29(021)GN-WA028 AUG 11/2006

APPENDIX B

DATA TABLES

TABLE B-I.1 **CONCENTRATIONS OF TRITIUM AND STRONTIUM IN WELL WATER SAMPLES COLLECTED AS PART OF THE RADIOLOGICAL GROUNDWATER PROTECTION PROGRAM - THREE MILE ISLAND NUCLEAR STATION, 2009**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE		COLLECTION DATE	H-3	SR-90
#3		05/13/09	< 167	
#3		10/15/09	< 142	< 0.5
48N		05/14/09	< 147	
48N		10/15/09	< 182	< 0.5
48S	ORIGINAL	03/18/09	268 ± 130	
48S	RERUN	03/18/09	< 173	
48S	ORIGINAL	05/18/09	213 ± 113	
48S	RERUN	05/18/09	255 ± 133	
48S		08/11/09	< 184	
48S		10/16/09	< 185	< 0.5
48S		10/16/09	< 175	< 0.5
GP-6		05/15/09	154 ± 102	
GP-9		05/14/09	184 ± 105	
MS-1		01/13/09	246 ± 117	
MS-1		02/17/09	250 ± 126	
MS-1		03/17/09	< 179	
MS-1		04/22/09	233 ± 121	
MS-1		04/29/09	< 179	
MS-1		05/13/09	< 161	
MS-1		10/14/09	< 158	< 0.5
MS-19		05/15/09	< 141	
MS-19		10/15/09	< 182	< 0.5
MS-2		05/12/09	< 169	
MS-2		05/12/09	< 167	
MS-2		10/14/09	415 ± 121	< 0.9
MS-2		10/14/09	437 ± 128	< 0.5
MS-20		04/22/09	357 ± 127	
MS-20		05/07/09	352 ± 115	
MS-20		05/12/09	483 ± 128	
MS-20		05/19/09	427 ± 114	
MS-20		05/19/09	388 ± 112	
MS-20		06/18/09	622 ± 128	
MS-20		07/16/09	692 ± 133	
MS-20		08/12/09	575 ± 135	
MS-20		09/10/09	404 ± 149	
MS-20		10/15/09	597 ± 133	< 0.7
MS-21		05/12/09	748 ± 143	
MS-21		05/12/09	781 ± 144	
MS-22		03/18/09	798 ± 165	
MS-22		05/14/09	1680 ± 216	
MS-22		08/10/09	608 ± 134	
MS-3		05/12/09	476 ± 140	
MS-3		10/14/09	192 ± 104	< 0.5
MS-4		05/13/09	216 ± 122	
MS-4		10/20/09	166 ± 103	< 0.4
MS-5		05/12/09	< 170	
MS-5		10/14/09	< 140	< 0.8
MS-6		05/12/09	< 171	
MS-6		10/14/09	200 ± 104	< 0.5
MS-6		10/14/09	< 171	< 0.5
MS-7		05/12/09	< 145	

TABLE B-I.1 **CONCENTRATIONS OF TRITIUM AND STRONTIUM IN WELL WATER SAMPLES COLLECTED AS PART OF THE RADIOLOGICAL GROUNDWATER PROTECTION PROGRAM - THREE MILE ISLAND NUCLEAR STATION, 2009**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE		COLLECTION DATE	H-3	SR-90
MS-7		10/14/09	< 196	< 0.9
MS-8		05/12/09	380 ± 125	
MS-8		10/14/09	< 178	< 0.5
MW-1		05/12/09	< 167	
MW-1		10/20/09	< 178	< 0.7
MW-1		10/20/09	< 173	< 0.5
MW-2		05/12/09	< 173	
MW-2		05/12/09	< 172	
MW-2		10/20/09	< 182	< 0.6
MW-3		05/12/09	< 167	
MW-3		10/20/09	< 179	< 0.6
MW-4		05/12/09	< 167	
MW-4		10/20/09	< 186	< 0.7
MW-TMI-10D		05/12/09	290 ± 115	
MW-TMI-10D		10/14/09	302 ± 114	< 0.7
MW-TMI-10I		03/17/09	2070 ± 280	
MW-TMI-10I		05/15/09	2510 ± 291	
MW-TMI-10I		08/11/09	1780 ± 241	
MW-TMI-10I		08/11/09	1950 ± 259	
MW-TMI-10I		10/14/09	1170 ± 179	< 1.0
MW-TMI-10I		10/14/09	1300 ± 191	< 0.7
MW-TMI-10S		03/17/09	4710 ± 541	
MW-TMI-10S		05/15/09	4430 ± 477	
MW-TMI-10S		05/15/09	4820 ± 518	
MW-TMI-10S		08/11/09	8510 ± 904	
MW-TMI-10S		10/15/09	4560 ± 507	< 0.9
MW-TMI-12S		01/13/09	< 174	
MW-TMI-12S		01/20/09	< 175	
MW-TMI-12S		01/27/09	< 185	
MW-TMI-12S		02/03/09	285 ± 115	
MW-TMI-12S		02/10/09	< 186	
MW-TMI-12S		02/17/09	501 ± 135	
MW-TMI-12S	ORIGINAL	03/18/09	3020 ± 363	
MW-TMI-12S	RERUN	03/18/09	3240 ± 398	
MW-TMI-12S	ORIGINAL	04/16/09	6010 ± 657	
MW-TMI-12S	RERUN	04/16/09	6880 ± 759	
MW-TMI-12S		04/22/09	5210 ± 582	
MW-TMI-12S		04/22/09	5130 ± 574	
MW-TMI-12S		04/29/09	838 ± 158	
MW-TMI-12S		05/07/09	481 ± 121	
MW-TMI-12S		05/13/09	< 162	
MW-TMI-12S		05/19/09	308 ± 109	
MW-TMI-12S		06/18/09	332 ± 114	
MW-TMI-12S		07/16/09	215 ± 110	
MW-TMI-12S		08/12/09	< 184	
MW-TMI-12S		09/10/09	< 187	
MW-TMI-12S		10/20/09	< 147	< 0.8
MW-TMI-12S		11/19/09	< 178	
MW-TMI-13I		01/13/09	2370 ± 300	
MW-TMI-13I		01/20/09	1850 ± 245	
MW-TMI-13I		02/03/09	2050 ± 252	

TABLE B-I.1 **CONCENTRATIONS OF TRITIUM AND STRONTIUM IN WELL WATER SAMPLES COLLECTED AS PART OF THE RADIOLOGICAL GROUNDWATER PROTECTION PROGRAM - THREE MILE ISLAND NUCLEAR STATION, 2009**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION DATE	H-3	SR-90
MW-TMI-13I	02/17/09	1950 ± 264	
MW-TMI-13I	03/17/09	1500 ± 218	
MW-TMI-13I	03/17/09	1450 ± 208	
MW-TMI-13I	04/16/09	1520 ± 219	
MW-TMI-13I	04/29/09	1380 ± 209	
MW-TMI-13I	05/07/09	1390 ± 186	
MW-TMI-13I	05/13/09	1460 ± 205	
MW-TMI-13I	05/19/09	1710 ± 224	
MW-TMI-13I	06/18/09	1460 ± 200	
MW-TMI-13I	07/16/09	984 ± 154	
MW-TMI-13I	07/16/09	1310 ± 186	
MW-TMI-13I	08/11/09	991 ± 168	
MW-TMI-13I	09/10/09	1050 ± 168	
MW-TMI-13I	10/22/09	828 ± 150	< 0.9
MW-TMI-13I	11/19/09	841 ± 152	
MW-TMI-13I	11/19/09	775 ± 148	
MW-TMI-13S	01/13/09	405 ± 125	
MW-TMI-13S	01/20/09	247 ± 122	
MW-TMI-13S	02/03/09	376 ± 119	
MW-TMI-13S	02/17/09	366 ± 125	
MW-TMI-13S	03/17/09	577 ± 145	
MW-TMI-13S	04/16/09	< 176	
MW-TMI-13S	04/16/09	< 181	
MW-TMI-13S	04/29/09	< 191	
MW-TMI-13S	05/07/09	< 147	
MW-TMI-13S	05/13/09	< 162	
MW-TMI-13S	05/19/09	< 153	
MW-TMI-13S	06/18/09	< 160	
MW-TMI-13S	07/16/09	174 ± 110	
MW-TMI-13S	08/11/09	< 179	
MW-TMI-13S	09/10/09	< 178	
MW-TMI-13S	10/22/09	157 ± 99	< 0.8
MW-TMI-13S	11/19/09	< 180	
MW-TMI-14D	01/13/09	1150 ± 183	
MW-TMI-14D	01/27/09	1160 ± 192	
MW-TMI-14D	02/10/09	973 ± 167	
MW-TMI-14D	02/17/09	1260 ± 203	
MW-TMI-14D	03/18/09	900 ± 164	
MW-TMI-14D	04/16/09	1230 ± 196	
MW-TMI-14D	04/22/09	1190 ± 193	
MW-TMI-14D	04/29/09	906 ± 163	
MW-TMI-14D	05/07/09	798 ± 138	
MW-TMI-14D	05/07/09	1140 ± 164	
MW-TMI-14D	05/13/09	876 ± 153	
MW-TMI-14D	05/19/09	1050 ± 162	
MW-TMI-14D	06/18/09	1080 ± 164	
MW-TMI-14D	07/16/09	1020 ± 161	
MW-TMI-14D	08/11/09	723 ± 142	
MW-TMI-14D	09/10/09	814 ± 150	
MW-TMI-14D	09/10/09	753 ± 144	
MW-TMI-14D	10/15/09	616 ± 145	< 0.7

TABLE B-I.1 **CONCENTRATIONS OF TRITIUM AND STRONTIUM IN WELL WATER SAMPLES COLLECTED AS PART OF THE RADIOLOGICAL GROUNDWATER PROTECTION PROGRAM - THREE MILE ISLAND NUCLEAR STATION, 2009**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE		COLLECTION DATE	H-3	SR-90
MW-TMI-14D		11/19/09	702 ± 141	
MW-TMI-14I		01/13/09	266 ± 114	
MW-TMI-14I		01/27/09	259 ± 125	
MW-TMI-14I		02/10/09	< 179	
MW-TMI-14I		02/17/09	< 179	
MW-TMI-14I		02/17/09	248 ± 125	
MW-TMI-14I		03/18/09	< 183	
MW-TMI-14I		04/16/09	< 180	
MW-TMI-14I		04/22/09	256 ± 120	
MW-TMI-14I		04/29/09	252 ± 120	
MW-TMI-14I		04/29/09	214 ± 118	
MW-TMI-14I		05/07/09	237 ± 107	
MW-TMI-14I		05/13/09	177 ± 106	
MW-TMI-14I		05/19/09	228 ± 106	
MW-TMI-14I		06/18/09	269 ± 108	
MW-TMI-14I		07/16/09	264 ± 115	
MW-TMI-14I		08/11/09	< 179	
MW-TMI-14I		09/10/09	248 ± 122	
MW-TMI-14I		10/15/09	< 182	< 0.8
MW-TMI-14I		11/19/09	< 177	
MW-TMI-14S		01/13/09	< 173	
MW-TMI-14S		01/27/09	232 ± 121	
MW-TMI-14S		02/10/09	208 ± 126	
MW-TMI-14S		02/17/09	307 ± 127	
MW-TMI-14S		03/18/09	232 ± 130	
MW-TMI-14S		04/16/09	< 175	
MW-TMI-14S		04/22/09	< 181	
MW-TMI-14S		04/29/09	426 ± 128	
MW-TMI-14S		05/07/09	< 149	
MW-TMI-14S		05/13/09	< 159	
MW-TMI-14S		05/19/09	< 154	
MW-TMI-14S		06/18/09	< 157	
MW-TMI-14S		07/16/09	235 ± 112	
MW-TMI-14S		08/11/09	< 182	
MW-TMI-14S		09/10/09	< 182	
MW-TMI-14S		10/15/09	< 183	< 0.5
MW-TMI-14S		11/19/09	< 177	
MW-TMI-16D		01/13/09	1810 ± 246	
MW-TMI-16D		01/20/09	1630 ± 224	
MW-TMI-16D		01/27/09	1710 ± 245	
MW-TMI-16D		02/03/09	1500 ± 201	
MW-TMI-16D		02/10/09	1180 ± 188	
MW-TMI-16D		02/17/09	1320 ± 207	
MW-TMI-16D		03/18/09	955 ± 170	
MW-TMI-16D	ORIGINAL	04/16/09	1550 ± 227	
MW-TMI-16D	RERUN	04/16/09	1580 ± 243	
MW-TMI-16D		04/22/09	1580 ± 229	
MW-TMI-16D		04/29/09	1700 ± 240	
MW-TMI-16D		05/07/09	1010 ± 151	
MW-TMI-16D		05/13/09	987 ± 161	
MW-TMI-16D		05/13/09	1090 ± 171	

TABLE B-I.1 **CONCENTRATIONS OF TRITIUM AND STRONTIUM IN WELL WATER SAMPLES COLLECTED AS PART OF THE RADIOLOGICAL GROUNDWATER PROTECTION PROGRAM - THREE MILE ISLAND NUCLEAR STATION, 2009**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION DATE	H-3	SR-90
MW-TMI-16D	05/19/09	1050 ± 162	
MW-TMI-16D	06/18/09	1560 ± 209	
MW-TMI-16D	07/16/09	1220 ± 178	
MW-TMI-16D	08/12/09	1230 ± 192	
MW-TMI-16D	09/10/09	773 ± 147	
MW-TMI-16D	10/14/09	693 ± 150	< 0.8
MW-TMI-16I	01/13/09	563 ± 132	
MW-TMI-16I	01/20/09	586 ± 142	
MW-TMI-16I	01/20/09	542 ± 139	
MW-TMI-16I	01/27/09	513 ± 137	
MW-TMI-16I	02/03/09	457 ± 123	
MW-TMI-16I	02/10/09	< 190	
MW-TMI-16I	02/17/09	280 ± 123	
MW-TMI-16I	03/18/09	218 ± 128	
MW-TMI-16I	04/16/09	< 184	
MW-TMI-16I	04/22/09	332 ± 123	
MW-TMI-16I	04/29/09	433 ± 129	
MW-TMI-16I	05/07/09	654 ± 132	
MW-TMI-16I	05/13/09	606 ± 129	
MW-TMI-16I	05/19/09	542 ± 118	
MW-TMI-16I	06/18/09	856 ± 146	
MW-TMI-16I	07/16/09	625 ± 129	
MW-TMI-16I	08/12/09	660 ± 135	
MW-TMI-16I	08/12/09	623 ± 138	
MW-TMI-16I	09/10/09	682 ± 140	
MW-TMI-16I	10/14/09	474 ± 137	< 0.5
MW-TMI-17D	05/14/09	< 139	
MW-TMI-17D	10/15/09	< 135	< 0.6
MW-TMI-17I	05/14/09	181 ± 101	
MW-TMI-17I	10/15/09	< 142	< 0.9
MW-TMI-18D	05/14/09	< 168	
MW-TMI-18D	10/15/09	171 ± 107	< 0.9
MW-TMI-19D	05/14/09	< 166	
MW-TMI-19D	10/15/09	< 131	< 0.6
MW-TMI-19I	05/14/09	< 168	
MW-TMI-19I	10/14/09	< 151	< 0.8
MW-TMI-19I	10/14/09	< 170	< 1.0
MW-TMI-1D	05/12/09	556 ± 132	
MW-TMI-1D	10/20/09	286 ± 115	< 0.5
MW-TMI-2D	03/17/09	439 ± 142	
MW-TMI-2D	05/15/09	356 ± 136	
MW-TMI-2D	08/11/09	393 ± 127	
MW-TMI-2D	10/20/09	390 ± 124	< 0.6
MW-TMI-3I	05/12/09	293 ± 115	
MW-TMI-3I	10/14/09	< 151	< 0.7
MW-TMI-4I	05/12/09	< 142	
MW-TMI-4I	05/12/09	< 165	
MW-TMI-4I	10/14/09	< 144	< 0.7
MW-TMI-4S	05/12/09	< 137	
MW-TMI-4S	10/14/09	< 145	< 0.7
MW-TMI-4S	11/19/09	< 165	

TABLE B-I.1 **CONCENTRATIONS OF TRITIUM AND STRONTIUM IN WELL WATER SAMPLES COLLECTED AS PART OF THE RADIOLOGICAL GROUNDWATER PROTECTION PROGRAM - THREE MILE ISLAND NUCLEAR STATION, 2009**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION DATE	H-3	SR-90
MW-TMI-5D	05/12/09	< 189	
MW-TMI-5D	10/14/09	< 153	< 0.7
MW-TMI-6D	05/12/09	247 ± 110	
MW-TMI-6D	05/12/09	233 ± 108	
MW-TMI-6D	10/14/09	< 192	< 0.7
MW-TMI-6D	10/14/09	< 172	< 0.6
MW-TMI-6I	05/12/09	210 ± 107	
MW-TMI-6I	10/14/09	< 186	< 0.7
MW-TMI-7S	05/14/09	< 165	
MW-TMI-7S	10/20/09	< 146	< 0.7
MW-TMI-8S	05/14/09	< 166	
MW-TMI-8S	10/15/09	< 144	< 0.4
MW-TMI-9I	05/15/09	< 144	
MW-TMI-9I	10/22/09	< 184	< 0.6
N2-1	05/13/09	< 147	
N2-1	10/14/09	< 173	< 0.9
NW-A	05/16/09	1080 ± 161	
NW-A	10/18/09	934 ± 159	< 0.7
NW-B	05/16/09	905 ± 147	
NW-B	10/18/09	675 ± 137	< 0.7
NW-C	05/16/09	1910 ± 238	
NW-C	10/18/09	3210 ± 375	< 0.7
NW-CW	05/16/09	943 ± 151	
NW-CW	10/18/09	915 ± 156	< 0.7
OS-13B	05/12/09	294 ± 120	
OS-14	05/12/09	< 171	
OS-14	10/14/09	< 139	< 0.7
OS-16	05/13/09	176 ± 114	
OS-16	10/14/09	183 ± 100	< 0.7
OS-17	05/13/09	< 173	
OS-17	10/14/09	173 ± 105	< 0.7
OS-18	03/17/09	849 ± 165	
OS-18	03/17/09	815 ± 164	
OS-18	04/16/09	957 ± 171	
OS-18	05/12/09	200 ± 104	
OS-18	08/10/09	1120 ± 179	
OS-18	08/10/09	1030 ± 167	
OS-18	10/20/09	191 ± 108	< 0.7
OSF	03/18/09	349 ± 135	
OSF	03/18/09	440 ± 135	
OSF	05/18/09	827 ± 145	
OSF	08/11/09	559 ± 134	
OSF	10/16/09	596 ± 135	< 0.9
RW-1	04/22/09	< 180	
RW-1	05/07/09	< 149	
RW-1	05/13/09	< 171	
RW-1	05/19/09	< 154	
RW-1	09/10/09	< 191	
RW-1	10/15/09	< 145	< 0.5
RW-2	01/13/09	651 ± 140	
RW-2	01/13/09	836 ± 157	

TABLE B-I.1 **CONCENTRATIONS OF TRITIUM AND STRONTIUM IN WELL WATER SAMPLES COLLECTED AS PART OF THE RADIOLOGICAL GROUNDWATER PROTECTION PROGRAM - THREE MILE ISLAND NUCLEAR STATION, 2009**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE		COLLECTION DATE	H-3	SR-90
RW-2		01/20/09	618 ± 139	
RW-2		01/27/09	663 ± 149	
RW-2		02/03/09	438 ± 121	
RW-2		02/10/09	260 ± 128	
RW-2		02/17/09	327 ± 128	
RW-2	ORIGINAL	03/18/09	2360 ± 301	
RW-2	RERUN	03/18/09	2170 ± 281	
RW-2		04/16/09	2250 ± 294	
RW-2		04/22/09	1720 ± 241	
RW-2		04/29/09	730 ± 149	
RW-2		05/07/09	320 ± 115	
RW-2		05/13/09	212 ± 108	
RW-2		05/19/09	240 ± 106	
RW-2		06/18/09	299 ± 112	
RW-2		06/18/09	353 ± 116	
RW-2		07/16/09	284 ± 114	
RW-2		08/12/09	251 ± 120	
RW-2		09/10/09	< 191	
RW-2		10/20/09	< 144	< 0.6
RW-2		11/19/09	< 158	
TRAINING CENTER		05/18/09	< 165	
TRAINING CENTER		10/16/09	< 173	< 0.9

TABLE B-I.2 **CONCENTRATIONS OF GAMMA EMITTERS IN WELL WATER SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2009**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

STC	COLLECTION PERIOD	Be-7	K-40	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	Cs-134	Cs-137	Ba-140	La-140
#3	10/15/09	< 29	< 45	< 3	< 3	< 6	< 3	< 7	< 3	< 6	< 3	< 3	< 22	< 7
48N	10/15/09	< 19	< 41	< 2	< 2	< 5	< 2	< 4	< 2	< 4	< 2	< 2	< 19	< 6
48S	10/16/09	< 15	< 15	< 1	< 2	< 4	< 2	< 3	< 2	< 3	< 1	< 2	< 13	< 4
48S	10/16/09	< 18	< 15	< 2	< 2	< 4	< 2	< 3	< 2	< 3	< 2	< 2	< 18	< 5
MS-1	10/14/09	< 18	< 15	< 2	< 2	< 4	< 2	< 3	< 2	< 3	< 2	< 2	< 18	< 5
MS-19	10/15/09	< 19	< 32	< 2	< 2	< 5	< 2	< 4	< 2	< 4	< 2	< 2	< 16	< 6
MS-2	10/14/09	< 39	< 74	< 4	< 4	< 10	< 4	< 8	< 4	< 8	< 4	< 4	< 29	< 9
MS-2	10/14/09	< 20	< 59	< 2	< 2	< 5	< 2	< 4	< 2	< 4	< 2	< 2	< 18	< 6
MS-20	10/15/09	< 31	< 30	< 3	< 4	< 8	< 4	< 6	< 4	< 7	< 3	< 4	< 25	< 7
MS-3	10/14/09	< 30	< 60	< 3	< 3	< 7	< 3	< 7	< 4	< 6	< 3	< 3	< 19	< 7
MS-4	10/20/09	< 35	< 31	< 4	< 4	< 8	< 6	< 10	< 4	< 7	< 4	< 4	< 21	< 6
MS-5	10/14/09	< 33	< 77	< 4	< 4	< 8	< 3	< 7	< 4	< 7	< 3	< 4	< 25	< 7
MS-6	10/14/09	< 37	< 73	< 4	< 3	< 9	< 3	< 7	< 4	< 6	< 3	< 3	< 24	< 9
MS-6	10/14/09	< 19	< 16	< 2	< 2	< 4	< 2	< 4	< 2	< 4	< 2	< 2	< 20	< 5
MS-7	10/14/09	< 22	< 31	< 2	< 2	< 5	< 2	< 4	< 3	< 4	< 2	< 2	< 19	< 5
MS-8	10/14/09	< 28	< 33	< 3	< 3	< 7	< 3	< 6	< 4	< 5	< 3	< 3	< 23	< 7
MW-1	10/20/09	< 13	< 13	< 1	< 2	< 3	< 1	< 3	< 2	< 3	< 1	< 1	< 10	< 3
MW-1	10/20/09	< 12	< 12	< 1	< 1	< 3	< 1	< 3	< 1	< 3	< 1	< 1	< 9	< 3
MW-2	10/20/09	< 17	< 33	< 2	< 2	< 4	< 2	< 3	< 2	< 3	< 1	< 2	< 12	< 3
MW-3	10/20/09	< 13	< 31	< 1	< 1	< 3	< 1	< 3	< 2	< 2	< 1	< 1	< 10	< 3
MW-4	10/20/09	< 14	< 12	< 1	< 1	< 3	< 1	< 3	< 2	< 3	< 1	< 2	< 10	< 3
MW-TMI-10D	10/14/09	< 31	< 41	< 4	< 4	< 8	< 6	< 7	< 4	< 8	< 3	< 4	< 27	< 9
MW-TMI-10I	10/14/09	< 22	< 39	< 2	< 2	< 5	< 2	< 4	< 2	< 4	< 2	< 2	< 23	< 7
MW-TMI-10I	10/14/09	< 20	< 16	< 2	< 2	< 5	< 2	< 4	< 2	< 4	< 2	< 2	< 20	< 6
MW-TMI-10S	10/15/09	< 10	< 15	< 1	< 1	< 2	< 1	< 2	< 1	< 2	< 1	< 1	< 10	< 3
MW-TMI-12S	04/29/09	< 41	< 110	< 5	< 5	< 10	< 5	< 11	< 6	< 8	< 5	< 6	< 22	< 9
MW-TMI-12S	10/20/09	< 37	< 80	< 4	< 4	< 9	< 4	< 8	< 4	< 7	< 4	< 4	< 21	< 7
MW-TMI-13I	10/22/09	< 15	< 29	< 2	< 2	< 4	< 2	< 3	< 2	< 3	< 1	< 2	< 12	< 4
MW-TMI-13S	10/22/09	< 35	< 79	< 4	< 4	< 9	< 4	< 8	< 5	< 7	< 3	< 4	< 20	< 9
MW-TMI-14D	10/15/09	< 18	< 29	< 2	< 2	< 4	< 2	< 4	< 2	< 3	< 2	< 2	< 15	< 5
MW-TMI-14I	10/15/09	< 21	< 43	< 2	< 2	< 5	< 2	< 4	< 2	< 4	< 2	< 2	< 18	< 6
MW-TMI-14S	10/15/09	< 13	< 22	< 1	< 1	< 3	< 1	< 3	< 2	< 3	< 1	< 1	< 12	< 3
MW-TMI-16D	10/14/09	< 17	< 33	< 2	< 2	< 4	< 2	< 4	< 2	< 3	< 2	< 2	< 17	< 5
MW-TMI-16I	10/14/09	< 12	< 10	< 1	< 1	< 3	< 1	< 2	< 1	< 2	< 1	< 1	< 12	< 3
MW-TMI-17D	10/15/09	< 41	< 91	< 4	< 5	< 10	< 4	< 9	< 4	< 8	< 4	< 5	< 28	< 11

TABLE B-I.2 **CONCENTRATIONS OF GAMMA EMITTERS IN WELL WATER SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2009**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

STC	COLLECTION PERIOD	Be-7	K-40	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	Cs-134	Cs-137	Ba-140	La-140
MW-TMI-17I	10/15/09	< 39	< 32	< 4	< 4	< 8	< 3	< 7	< 4	< 8	< 4	< 4	< 28	< 9
MW-TMI-18D	10/15/09	< 36	< 35	< 4	< 4	< 8	< 4	< 7	< 4	< 6	< 4	< 4	< 29	< 8
MW-TMI-19D	10/15/09	< 34	< 34	< 4	< 4	< 9	< 3	< 8	< 5	< 8	< 3	< 4	< 29	< 9
MW-TMI-19I	10/14/09	< 30	< 34	< 3	< 4	< 7	< 4	< 7	< 4	< 6	< 3	< 4	< 23	< 9
MW-TMI-19I	10/14/09	< 20	< 18	< 2	< 2	< 5	< 2	< 4	< 2	< 4	< 2	< 2	< 20	< 7
MW-TMI-1D	10/20/09	< 22	< 19	< 2	< 2	< 5	< 2	< 4	< 2	< 4	< 2	< 2	< 16	< 5
MW-TMI-2D	10/20/09	< 13	< 13	< 1	< 2	< 3	< 1	< 3	< 2	< 3	< 1	< 1	< 11	< 3
MW-TMI-3I	10/14/09	< 32	< 34	< 3	< 3	< 6	< 3	< 6	< 4	< 5	< 3	< 3	< 25	< 6
MW-TMI-4I	10/14/09	< 39	< 74	< 4	< 4	< 9	< 5	< 9	< 4	< 7	< 3	< 4	< 31	< 9
MW-TMI-4S	10/14/09	< 36	< 76	< 4	< 4	< 8	< 4	< 7	< 4	< 6	< 3	< 4	< 28	< 9
MW-TMI-5D	10/14/09	< 41	< 47	< 3	< 4	< 9	< 2	< 9	< 4	< 8	< 4	< 4	< 32	< 11
MW-TMI-6D	10/14/09	< 26	< 23	< 3	< 3	< 6	< 2	< 5	< 3	< 6	< 2	< 3	< 23	< 7
MW-TMI-6D	10/14/09	< 18	< 16	< 2	< 2	< 4	< 2	< 4	< 2	< 3	< 2	< 2	< 19	< 7
MW-TMI-6I	10/14/09	< 23	< 21	< 2	< 3	< 5	< 2	< 4	< 3	< 4	< 2	< 2	< 22	< 7
MW-TMI-7S	10/20/09	< 33	< 37	< 4	< 4	< 7	< 4	< 7	< 5	< 7	< 3	< 4	< 22	< 6
MW-TMI-8S	10/15/09	< 35	< 29	< 3	< 4	< 7	< 3	< 7	< 4	< 6	< 3	< 4	< 25	< 8
MW-TMI-9I	10/22/09	< 37	< 43	< 4	< 5	< 10	< 5	< 9	< 6	< 8	< 5	< 5	< 20	< 7
N2-1	10/14/09	< 15	< 29	< 1	< 2	< 4	< 1	< 3	< 2	< 3	< 1	< 1	< 16	< 5
NW-A	10/18/09	< 32	< 47	< 3	< 4	< 8	< 3	< 8	< 4	< 6	< 4	< 3	< 29	< 10
NW-B	10/18/09	< 20	< 18	< 2	< 2	< 5	< 2	< 4	< 2	< 4	< 2	< 2	< 18	< 5
NW-C	10/18/09	< 24	< 20	< 2	< 2	< 5	< 2	< 4	< 3	< 4	< 2	< 2	< 19	< 6
NW-CW	10/18/09	< 22	< 21	< 2	< 2	< 6	< 2	< 4	< 3	< 4	< 2	< 2	< 20	< 7
OS-14	10/14/09	< 31	< 29	< 3	< 3	< 6	< 3	< 6	< 3	< 5	< 3	< 3	< 19	< 6
OS-16	10/14/09	< 36	< 89	< 4	< 4	< 8	< 4	< 7	< 4	< 7	< 4	< 4	< 28	< 9
OS-17	10/14/09	< 45	< 44	< 4	< 5	< 11	< 4	< 9	< 5	< 8	< 4	< 4	< 30	< 9
OS-18	10/20/09	< 41	< 77	< 4	< 5	< 10	< 4	< 9	< 4	< 7	< 5	< 5	< 23	< 8
OSF	10/16/09	< 15	< 13	< 1	< 2	< 3	< 1	< 3	< 2	< 3	< 1	< 1	< 15	< 4
RW-1	10/15/09	< 43	< 38	< 4	< 5	< 10	< 4	< 8	< 5	< 8	< 4	< 5	< 30	< 10
RW-2	04/29/09	< 47	< 52	< 5	< 5	< 8	< 6	< 14	< 7	< 8	< 5	< 6	< 24	< 8
RW-2	10/20/09	< 31	78 ± 49	< 4	< 3	< 7	< 4	< 8	< 4	< 7	< 3	< 5	< 22	< 7
TRAINING CENTER	10/16/09	< 13	< 24	< 1	< 1	< 3	< 1	< 2	< 1	< 2	< 1	< 1	< 13	< 4

TABLE B-II.1 CONCENTRATIONS OF TRITIUM AND STRONTIUM IN SURFACE WATER SAMPLES COLLECTED AS PART OF THE RADIOLOGICAL GROUNDWATER PROTECTION PROGRAM - THREE MILE ISLAND NUCLEAR STATION, 2009

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION DATE	H-3	SR-90
SW-E-1	03/17/09	< 192	
SW-E-1	05/18/09	< 164	
SW-E-1	08/11/09	< 175	
SW-E-1	10/16/09	< 153	< 0.9
SW-E-2	03/17/09	< 176	
SW-E-2	05/18/09	< 162	
SW-E-2	08/11/09	< 183	
SW-E-2	10/16/09	< 154	< 0.7
SW-E-3	03/17/09	< 194	
SW-E-3	05/18/09	< 162	
SW-E-3	08/11/09	< 178	
SW-E-3	10/16/09	< 156	< 0.7

TABLE B-II.2 **CONCENTRATIONS OF GAMMA EMITTERS IN SURFACE WATER SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2009**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

STC	COLLECTION PERIOD	Be-7	K-40	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	Cs-134	Cs-137	Ba-140	La-140
TM-SW-E-1	10/16/09	< 34	< 66	< 3	< 4	< 8	< 3	< 7	< 4	< 6	< 3	< 3	< 24	< 8
TM-SW-E-2	10/16/09	< 29	< 29	< 3	< 3	< 7	< 3	< 6	< 4	< 6	< 3	< 4	< 23	< 8
TM-SW-E-3	10/16/09	< 34	< 32	< 4	< 4	< 8	< 4	< 7	< 4	< 6	< 3	< 4	< 26	< 9

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APPENDIX C

DATA TABLES

TABLE C-I.1 **CONCENTRATIONS OF TRITIUM AND STRONTIUM IN WELL WATER SPLIT SAMPLES COLLECTED AS PART OF THE RADIOLOGICAL GROUNDWATER PROTECTION PROGRAM, THREE MILE ISLAND NUCLEAR STATION, 2009**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE		COLLECTION DATE	H-3	SR-90
48S		10/16/09	< 155	< 0.5
MS-2		05/12/09	< 158	
MS-2		10/14/09	325 ± 97	< 0.6
MS-20		05/19/09	446 ± 100	
MS-21		05/12/09	737 ± 114	
MS-6	ORIGINAL	10/14/09	< 155	< 0.5
MS-6	DUPLICATE	10/14/09	< 155	< 0.5
MW-1		10/20/09	< 155	< 0.8
MW-2		05/12/09	< 163	
MW-TMI-10I		08/11/09	1891 ± 146	
MW-TMI-10I		10/14/09	1373 ± 134	< 0.5
MW-TMI-10S		05/15/09	5737 ± 237	
MW-TMI-12S		04/22/09	6054 ± 244	
MW-TMI-13I		03/17/09	2201 ± 162	
MW-TMI-13I	ORIGINAL	07/16/09	1362 ± 127	
MW-TMI-13I	DUPLICATE	07/16/09	1312 ± 125	
MW-TMI-13I		11/18/09	1004 ± 119	
MW-TMI-13S		04/16/09	174 ± 87	
MW-TMI-14D		05/07/09	1113 ± 134	
MW-TMI-14D		09/10/09	937 ± 116	
MW-TMI-14I	ORIGINAL	02/17/09	173 ± 84	
MW-TMI-14I	DUPLICATE	02/17/09	223 ± 86	
MW-TMI-14I		04/29/09	271 ± 113	
MW-TMI-16D		05/13/09	1221 ± 130	
MW-TMI-16I		01/20/09	614 ± 101	
MW-TMI-16I		08/12/09	693 ± 107	
MW-TMI-19I		10/14/09	< 155	< 0.8
MW-TMI-4I		05/12/09	< 158	
MW-TMI-6D		05/12/09	265 ± 94	
MW-TMI-6D		10/14/09	196 ± 91	< 0.6
OS-18		03/17/09	909 ± 122	
OS-18		08/10/09	1097 ± 122	
RW-2		01/13/09	726 ± 101	
RW-2		06/18/09	229 ± 89	

TABLE C-I.2

CONCENTRATIONS OF GAMMA EMITTERS IN WELL WATER SPLIT SAMPLES COLLECTED AS PART OF THE RADIOLOGICAL GROUNDWATER PROTECTION PROGRAM, THREE MILE ISLAND NUCLEAR STATION, 2009

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

STC	COLLECTION PERIOD		Be-7	K-40	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	Cs-134	Cs-137	Ba-140	La-140
MS-2	10/14/09		< 27	110 ± 31	< 2	< 3	< 2	< 1	< 5	< 3	< 5	< 3	< 3	< 26	< 5
MW-TMI-19I	10/14/09		< 36	< 61	< 3	< 3	< 4	< 3	< 2	< 2	< 2	< 3	< 2	< 28	< 3
MW-TMI-6D	10/14/09		< 32	74 ± 30	< 2	< 3	< 4	< 2	< 5	< 3	< 4	< 3	< 3	< 26	< 3
48S	10/16/09		< 30	163 ± 60	< 3	< 4	< 8	< 3	< 5	< 5	< 7	< 4	< 4	< 31	< 5
MS-6	10/14/09	ORIGINAL	< 21	95 ± 31	< 2	< 3	< 4	< 3	< 4	< 2	< 6	< 3	< 3	< 14	< 3
MS-6	10/14/09	DUPLICATE	< 30	< 62	< 3	< 2	< 8	< 3	< 4	< 4	< 5	< 4	< 3	< 20	< 4
MW-TMI-10I	10/14/09		< 18	89 ± 32	< 3	< 4	< 6	< 2	< 6	< 2	< 7	< 2	< 2	< 15	< 3
MW-1	10/20/09		< 18	135 ± 35	< 2	< 3	< 3	< 3	< 5	< 3	< 5	< 3	< 3	< 21	< 2