Limerick Generating Station
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Exelon Nuclear

TS 6.9.1.7

April 20, 2012

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

Limerick Generating Station, Units 1 and 2
Facility Operating License Nos. NPF-39 and NPF-85
NRC Docket Nos. 50-352 and 50-353

Subject: 2011 Annual Radiological Environmental Operating Report

Dear Sir:
In accordance with the requirements of Section 6.9.17 of Limerick Generating Station (LGS) Unit 1 and Unit 2 Tech. Specs., and Section 6.1 of the LGS Units 1 and 2 Offsite Dose Calculation Manual (ODCM), this letter submits the 2011 Annual Radiological Environmental Operating Report No. 26. This report provides the 2011 results for the Radiological Environmental Monitoring Program (REMP) as called for in the Offsite Dose Calculation Manual.

In assessing the data collected for the REMP, we have concluded that the operation of LGS, Units 1 and 2 had no adverse impact on the environment. No plant-produced fission or activation products, with the exception of Cs-137, were found in any pathway modeled by the REMP. Cesium-137 levels detected in sediment were consistent with levels found in previous years and were attributable to LGS liquid releases. Results of the groundwater protection program are also included in this report. Positive tritium was found in 2 of 12 groundwater monitoring locations that ranged up to 1,154 pCi/L.

There are no commitments contained in this letter.

If you have any questions, please do not hesitate to contact us.

Sincerely,

F. A. Kearney
Vice President -LGS
Exelon Generation Company, LLC

Attachment: 2011 Annual Radiological Environmental Operating Report No. 27

cc: W. Dean, Administrator, Region I, USNRC (w/Attachment)
E. DiPaolo, USNRC Senior Resident Inspector, LGS (w/Attachment)
R. Ennis -Senior Project Manager-NRR, USNRC (w/Attachment)
R. Nimitz, Inspector, Region I, USNRC (w/Attachment)

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LIMERICK GENERATING STATION
ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT
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David Katz - Deputy Water Commissioner Environmental Policy and Planning City of Phila. Water Dept, ARAMark Tower 5th Flr, 1101 Market St. Phila. PA 19107-2994 (w/Attachment)
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Pennsylvania American Water 800 W. Hershey Park Dr. Hershey, PA 17033 (w/Attachment)
James Hennessey - Pottstown Water Authority 100 E. High St Pottstown, PA 19464-9525 (w/Attachment)

Docket No: 50-352
50-353

LIMERICK GENERATING STATION
UNITS 1 and 2

Annual Radiological
Environmental Operating Report

1 January Through 31 December 2011

Prepared By
Teledyne Brown Engineering
Environmental Services

Exelon SM
Nuclear
Limerick Generating Station
Sanatoga, PA 19464

April 2012

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Appendices

Figures

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I. Summary and Conclusions

In 2011, the Limerick Generating Station released to the environment through the radioactive effluent liquid and gaseous pathways approximately 187 curies of noble gas, fission and activation products and approximately 63 curies of tritium. The dose from both liquid and gaseous effluents was conservatively calculated for the Maximum Exposed Member of the Public. The results of those calculations and their comparison to the allowable limits were as follows:

Gaseous and liquid radiation doses to members of the public at the highest dose receptor							
Effluent	Applicable Organ	Estimated Dose	Age Group	Location	% of Applicable Limit	Limit	Unit
Noble Gas	Gamma - Air Dose	1.46E-02	All	Nearest Residence	7.28E-02	20	mRad
Noble Gas	Beta – Air Dose	8.73E-03	All	Nearest Residence	2.18E-02	40	mRad
Noble Gas	Total Body (Gamma)	1.39E-02	All	Nearest Residence	1.39E-02	10	mrem
Noble Gas	Skin (Beta)	2.30E-02	All	Nearest Residence	7.67E-02	30	mrem
Iodine, Particulate, Tritium & C-14	Bone	4.13E-01	Child	Cow Milk	1.38E-00	30	mrem
Liquid	Total Body	8.38E-02	Child	Phoenixville PA	1.40E-00	6	mrem
Liquid	Liver	8.38E-02	Child	Phoenixville PA	4.19E-01	20	mrem

The calculated doses, from the radiological effluents released from Limerick, were a very small percentage of the allowable limits.

This report on the Radiological Environmental Monitoring Program conducted for the Limerick Generating Station (LGS) by Exelon covers the period 1 January 2011 through 31 December 2011. During that time period, 1256 analyses were performed on 1022 samples.

On March 11, 2011 an earthquake off the Japanese islands produced a massive tsunami that caused a nuclear accident at four of the six Fukushima Daiichi reactors. In planning for the potential radioactive plume reaching the United States, Exelon Nuclear increased the sampling frequency and added additional analyses of select media from pathways that were expected to be the most sensitive to any increase in ambient radiation levels. Low level I-131 analyses and gamma spectroscopy analyses were performed on air particulates, air iodine, and milk, as appropriate.

The resulting radioactive plume was first detected in the environs of Limerick Generating Station on March 22, 2011. The final date of positive detection was April 11, 2011. The radionuclide identified was Iodine-131. Maximum activity levels found by media were 100 pCi/m^3 for air iodine. Samples collected were compared to offsite control locations to verify that these positive detections were not attributable to licensed activities. All other radionuclides analyzed for were below the minimum detectable concentration (MDC).

The radioactive half-life of I-131 is about 8 days. This short half-life allowed the

effects of this radioactive plume to subside over about 3 weeks. As of April 12, 2011 no further impacts from the Fukushima Daiichi accident was evident.

Surface and drinking water samples were analyzed for concentrations of tritium and gamma emitting nuclides. Drinking water samples were also analyzed for concentrations of total gross beta and I-131. No I-131 was detected. No fission or activation products were detected. Gross beta activities detected were consistent with those detected in previous years.

Fish (predator and bottom feeder) and sediment samples were analyzed for concentrations of gamma emitting nuclides. No fission or activation products were detected in fish.

Sediment samples collected below the discharge had Cesium-137 concentrations that were consistent to those from previous years. No other station produced fission or activation products were found in sediment. The calculated dose to a teenager's skin and whole body was 5.73E-04 mrem and 4.91E-04 mrem, respectively. This dose represents 2.86E-03% and 8.18E-03%, respectively of the 10 CFR Part 50, Appendix I dose limits.

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. No fission or activation products were detected.

High sensitivity I-131 analyses were performed on weekly air samples. All results were less than the minimum detectable concentration with the exception of eleven samples which were positive for I-131. These positive results are directly attributed to the Fukushima event in March of 2011.

Cow milk samples were analyzed for concentrations of I-131 and gamma emitting nuclides. All I-131 results were below the minimum detectable concentration. Concentrations of naturally occurring K-40 were consistent with those detected in previous years. No fission or activation products were found.

Broad leaf vegetation samples were analyzed for gamma emitting nuclides. Concentrations of naturally occurring Be-7 and K-40 were detected. Radium-226 was found in 11 of 42 samples. Radium-226 and Thorium-228 were detected in low concentration just above the MDC (minimum detectable concentration). No activation or fission products were detected.

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

Review of the gamma spectroscopy results from the surface water samples located at the Limerick intake (24S1) and downstream of the 10CFR20.2002 permitted storage area showed no evidence of offsite radionuclide transport from the 2002 permitted storage area.

A review of the TLD data for the nearest residence to the Independent Spent Fuel Storage Installation (ISFSI) indicates no direct dose was received.

A radiological groundwater protection program (RGPP) was established in 2006 as part of an Exelon Nuclear fleetwide assessment of potential groundwater intrusion from the operation of the Station. In 2011, well water samples were analyzed for tritium, Sr-90, gross alpha, gross beta, and gamma emitters. Surface water samples were analyzed for tritium, Sr-90, and gamma emitters. Most of the tritium values for well water and surface water were less than the lower limit of detection of 200 pCi/L. Precipitation water samples were also analyzed for tritium. No tritium was detected in any precipitation samples.

In assessing the data gathered for this report and comparing these results with preoperational data, it was concluded that the operation of LGS had no adverse radiological impact on the environment.

II. Introduction

The Limerick Generating Station (LGS), consisting of two 3,515 MWt boiling water reactors owned and operated by Exelon Corporation, is located adjacent to the Schuylkill River in Montgomery County, Pennsylvania. Unit No. 1 went critical on 22 December 1984. Unit No. 2 went critical on 11 August 1989. The site is located in Piedmont countryside, transversed by numerous valleys containing small tributaries that feed into the Schuylkill River. On the eastern river bank elevation rises from approximately 110 to 300 feet mean sea level (MSL). On the western river bank elevation rises to approximately 50 feet MSL to the western site boundary.

A Radiological Environmental Monitoring Program (REMP) for LGS was initiated in 1971. Review of the 1971 through 1977 REMP data resulted in the modification of the program to comply with changes in the Environmental Report Operating License Stage (EROL) and the Branch Technical Position Paper (Rev. 1, 1979). The preoperational period for most media covers the periods 1 January 1982 through 21 December 1984 and was summarized in a separate report. This report covers those analyses performed by Teledyne Brown Engineering (TBE), Mirion Technologies (Dosimetry Services Division), and Environmental Inc. (Midwest Labs) on samples collected during the period 1 January 2011 through 31 December 2011.

On 6 July 1996 a 10CFR20.2002 permit was issued to Limerick for storage of slightly contaminated soils, sediments and sludges obtained from the holding pond, cooling tower and spray pond systems. These materials will decay to background while in storage. Final disposition will be determined at Station decommissioning.

On 21 July 2008 an ISFSI pad was put into service. The ISFSI is dry cask storage, where spent nuclear fuel is stored.

A. Objective of the REMP

The objectives of the REMP are to:

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

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

B. Implementation of the Objectives

The implementation of the objectives is accomplished by:

1. Identifying significant exposure pathways.
2. Establishing baseline radiological data of media within those pathways.
3. Continuously monitoring those media before and during station operation to assess station radiological effects (if any) on man and the environment.

III. Program Description

A. Sample Collection

Samples for the LGS REMP were collected for Exelon Nuclear by Normandeau Associates, Inc. (NAI). This section describes the general collection methods used by NAI to obtain environmental samples for the LGS REMP in 2011. 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 NAI are listed in Table B-3.

Aquatic Environment

The aquatic environment was evaluated by performing radiological analyses on samples of surface water, drinking water, fish, and sediment. Two-gallon water samples were collected monthly from continuous samplers located at two surface water locations (13B1 and 24S1) and four drinking water locations (15F4, 15F7, 16C2, and 28F3). Control locations were 24S1, and 28F3. All samples were collected in new unused plastic bottles, which were rinsed at least twice with source water prior to collection. Fish samples comprising of the flesh of two groups, bottom feeder (catfish/carp/white suckers) and predator (sunfish/bass), were collected semiannually at two locations, 16C5 and 29C1 (control). Sediment samples composed of recently deposited substrate were collected at three locations semiannually, 16B2, 16C4 and 33A2 (control).

Atmospheric Environment

The atmospheric environment was evaluated by performing radiological analyses on samples of air particulate, airborne iodine, and milk. Airborne iodine and particulate samples were collected and analyzed weekly at six locations (6C1, 10S3, 11S1, 13C1, 14S1, and 22G). The control location was 22G1. 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.

Terrestrial Environment

Milk samples were collected biweekly at five locations (10F4, 18E1, 19B1, 23F1, and 25C1) from April through November, and monthly from December through March. One additional location (36E1) was sampled quarterly. Locations 36E1 and 23F1 were controls. 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.

Broad leaf vegetation was collected monthly at three locations (11S3, 13S3 and 31G1). The control location was 31G1. Eight different kinds of vegetation samples 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 were placed on and around the LGS site as follows:

A site boundary ring consisting of 16 locations (36S2, 3S1, 5S1, 7S1, 10S3, 11S1, 13S2, 14S1, 18S2, 21S2, 23S2, 25S2, 26S3, 29S1, 31S1 and 34S2) 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 LGS releases.

An intermediate distance ring consisting of 16 locations (36D1, 2E1, 4E1, 7E1, 10E1, 10F3, 13E1, 16F1, 19D1, 20F1, 24D1, 25D1, 28D2, 29E1, 31D2, and 34E1) extending to approximately 5 miles from the site designed to measure possible exposures to close-in population.

The balance of eight locations (5H1, 6C1, 9C1, 13C1, 15D1, 17B1, 20D1 and 31D1) representing control and special interests areas such as population centers, schools, etc.

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 LGS, 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.

Two TLDs – each comprised of three $CaSO_4$ thermoluminescent phosphors enclosed in plastic – were placed at each location in a PVC conduit located approximately three feet above ground level. The TLDs were exchanged quarterly and sent to Mirion Technologies for analysis.

10CFR20.2002 Permit Storage Area

In 1996 the Limerick Generating Station received NRC approval to store slightly contaminated soils, sludges and sediments on site per the requirements of 10CFR20.2002. These materials will be stored until end of the site's operating license. At that time the material will be evaluated along with the site for decommissioning. The area is approximately 1.5 acres in size and was evaluated to hold a maximum of 1.12E+06 cubic feet with no more than 7E+04 cubic feet added to the area in any single year. After each material placement on the 2002 pad, the area is graded and seeded to prevent erosion. Since all groundwater movement is to the river, the use of the REMP surface water sampling program is used as a check on potential groundwater movement from the pad.

Independent Spent Fuel Storage Installation (ISFSI)

The results from the TLD location 36S2 were used to determine the direct radiation exposure to the nearest residence from the ISFSI pad.

B. Sample Analysis

This section describes the general analytical methodologies used by TBE and Midwest Labs to analyze the environmental samples for radioactivity for the LGS REMP in 2011. The analytical procedures used by the laboratories are listed in Appendix B Table B-3.

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

1. Concentrations of beta emitters in drinking water and air particulates.
2. Concentrations of gamma emitters in surface and drinking water, air particulates, milk, fish, broad leaf vegetation and sediment.
3. Concentrations of tritium in surface and drinking water.
4. Concentrations of I-131 in air, milk, and drinking water.
5. Ambient gamma radiation levels at various site environs.

C. Data Interpretation

The radiological and direct radiation data collected prior to LGS becoming operational was used as a baseline with which these operational data were compared. For the purpose of this report, LGS was considered operational at initial criticality. In addition, data were compared to

previous years' operational data for consistency and trending. Several factors were important in the interpretation of the data:

1. Lower Limit of Detection and Minimum Detectable Concentration

   The lower limit of detection (LLD) is defined as the smallest concentration of radioactive material in a sample that would yield a net count (above background) that would be detected with only a 5% probability of falsely concluding that a blank observation represents a "real" signal. The LLD is intended as 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 are designed to achieve the required LGS detection limits for environmental sample analysis.

   The minimum detectable concentration (MDC) is defined as 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 affecting a negative number. An MDC was reported in all cases where positive activity was not detected.

   If no positive activity was detected, then gamma spectroscopy MDC results for each type of sample were grouped as follows:

   For surface and drinking water twelve nuclides, Mn-54, Co-58, Fe-59, Co-60, Zn-65, Zr-95, Nb-95, I-131, Cs-134, Cs-137, Ba-140, and La-140 were reported.

   For broad leaf vegetation eleven nuclides, Be-7, K-40, Mn-54, Co-58, Co-60, I-131, Cs-134, Cs-137, Ra-226, Th-228, and Th-232 were reported.

   For fish nine nuclides, K-40, Mn-54, Co-58, Fe-59, Co-60, Zn-65, I-131, Cs-134, and Cs-137 were reported.

   For sediment eight nuclides, Be-7, K-40, Mn-54, Co-58, Co-60, I-131, Cs-134, and Cs-137 were reported.

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

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

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

D. Program Exceptions

For 2011 the LGS REMP had a sample recovery rate in excess of 99%. Exceptions are listed below:

1. Air sample from location 22G1 for the week of 02/14/11 – 02/21/11 was not available due to equipment malfunction (IR 01240992 02).

2. Air sample from location 10S3 for the week of 05/09/11 – 05/16/11 was not available due to equipment malfunction (IR 01240992 07).

3. Air sample from location 11S2 for the week of 07/18/11 – 07/25/11 was not available due to equipment malfunction (IR 01240992 05).

4. Limited vegetation samples available at station 11S3 for the month of June and July (IR 01240992 04 and IR 01240992 06).

5. Grab samples were taken for the composite surface water sampler at location 13B1 during the following periods due to equipment malfunction, frozen sample line, and loss of power due to construction:
   01/24/11 – 02/14/11 (IR 01240992 01)
   03/07/11 – 03/14/11 (IR 01240992 03)
   08/23/11 – 08/30/11 (IR 01240992 08)
   09/06/11 – 09/13/11 (IR 01240992 12)
   09/20/11 – 09/27/11 (IR 01240992 13)
   10/11/11 – 10/18/11 (IR 01240992 14)
   11/20/11 – 12/27/11 (IR 01240992 16)

6. Grab samples were taken for the composite drinking water sampler at location 16C2 during the following periods due to equipment malfunction: 10/18/11 – 10/25/11 (IR 01240992 15)

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

1. Starting in July 2011, low level I-131 analysis was added to drinking water in order to meet the LLD of 1 pCi/L.

IV. Results and Discussion

A. Aquatic Environment

1. Surface Water

Samples were taken from a continuous sampler at two locations (13B1 and 24S1) on a monthly schedule. Of these locations only 13B1 located downstream, could be affected by Limerick's effluent releases. The following analyses were performed:

Tritium

Monthly samples from all locations were composited quarterly and analyzed for tritium activity (Table C–I.1, Appendix C). All results met the required LLD.

Gamma Spectrometry

Samples from all locations were analyzed for gamma emitting nuclides (Table C–I.2, Appendix C). All nuclides met the required LLDs.

2. Drinking Water

Monthly samples were collected from continuous water samplers at four locations (15F4, 15F7, 16C2, and 28F3). Three locations (15F4, 15F7, and 16C2) could be affected by Limerick's effluent releases. The following analyses were performed:

Gross Beta

Samples from all locations were analyzed for concentrations of total gross beta (Tables C–II.1, Appendix C). The values ranged from 2.0 to 5.6 pCi/L. Concentrations detected were consistent with those detected in previous years (Figure C–1, Appendix C).

Tritium

Monthly samples from all locations were composited quarterly and analyzed for tritium activity (Table C–II.2, Appendix C). All results met the required LLD.

Iodine-131

Samples were taken from all locations on a monthly basis starting in July and analyzed for Iodine-131 activity (Table C–II.3, Appendix C). All results met the required LLD.

Gamma Spectrometry

Samples from all locations were analyzed for gamma emitting nuclides (Table C–II.4, Appendix C). All results met the required LLDs.

3. Fish

Fish samples comprised of bottom feeder (catfish/carp/white suckers) and predator (sunfish/bass), were collected at two locations (16C5 and 29C1) in the spring and fall season. Location 16C5 could be affected by Limerick's effluent releases. The following analysis was performed:

Gamma Spectrometry

The edible portion of fish samples from both locations was analyzed for gamma emitting nuclides (Table C–III.1, Appendix C). Naturally occurring K-40 was found at all stations and ranged from 3,200 to 5,370 pCi/kg wet and was consistent with levels detected in previous years. No other gamma emitting nuclides were found. Historical levels of Cs-137 are shown in Figure C–2, Appendix C.

4. Sediment

Aquatic sediment samples were collected at three locations (16B2, 16C4 and 33A2) semiannually. Of these locations two, 16B2 and 16C4, located downstream, could be affected by Limerick's effluent releases. The following analysis was performed:

Gamma Spectrometry

Sediment samples from all three locations were analyzed for gamma emitting nuclides (Table C–IV.1, Appendix C). Nuclides detected were naturally occurring Be-7, K-40 and the fission product Cs-137.

Beryllium-7 was found at locations 16B2 and 16C4 and ranged from 1,900 to 7,160 pCi/kg dry. Potassium-40 was found at all locations and ranged from 12,700 to 19,300 pCi/kg dry. The fission product Cs-137 was found at locations 16B2 and 16C4 and ranged from 179 to 218 pCi/kg dry (Figure C–4, Appendix C).

The activity detected was consistent with those detected in the pre–operational years. Due to the control location, 33A2, not showing positive activity, the Cs-137 activity found at 16B2 and 16C4 is attributed to LGS radioactive effluent releases. The dose to a teenager's skin and whole body was conservatively calculated at 5.73E-04 mrem and 4.91E-04 mrem, respectively. This dose represents 2.86E-03% and 8.18E-03%, of the Appendix I to 10 CFR Part 50 dose limits, respectively. No other Limerick fission or activation products were found.

B. Atmospheric Environment

1. Airborne

a. Air Particulates

Continuous air particulate samples were collected from six locations on a weekly basis. The six locations were separated into three groups: Group I represents locations within the LGS site boundary (10S3, 11S1, and 14S1), Group II represents the locations at an intermediate distance from the LGS site (6C1 and 13C1), and Group III represents the control location at a remote distance from LGS (22G1). The following analyses were performed:

Gross Beta

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

Detectable gross beta activity was observed at all locations. The results from the on-site locations (Group I) ranged from 6 E–3 to 39 E–3 pCi/m^3 with a mean of 17 E–3 pCi/m^3. The results from the intermediate distance location (Group II) ranged from 7 E–3 to 33 E–3 pCi/m^3 with a mean of 17 E–3 pCi/m^3. The results from the Distant locations (Group III) ranged from 8 E–3 to 29 E–3 pCi/m^3 with a mean of 17 E–3 pCi/m^3. Comparison of the 2011 air particulate data with previous year's data indicate no effects from the operation of LGS (Figure C–4, Appendix C). In addition, a comparison of the weekly mean values for 2011 indicate no notable differences among the three groups (Figure C–5, Appendix C).

Gamma Spectrometry

Weekly samples were composited quarterly and analyzed for gamma emitting nuclides (Table C–V.3, Appendix C). Naturally occurring Be-7 due to cosmic ray activity was detected in all samples. These values ranged from 50 E–3

to 104 E–3 pCi/m^3. All other nuclides met the required LLDs. Additional sampling occurred in the weeks immediately following the Fukushima event in 2011. All nuclides met the required LLDs.

b. Airborne Iodine

Continuous air samples were collected from six locations (6C1, 10S3, 11S1, 14S1, 13C1, and 22G1) and analyzed weekly for I-131 (Table C–VI.1, Appendix C). All results met the required LLD with the exception of 11 samples which were positive for I-131. These positive results are directly attributed to the Fukushima event in March of 2011.

2. Terrestrial

a. Milk

Samples were collected from five locations (10F4, 18E1, 19B1, 23F1, and 25C1) biweekly April through November and monthly December through March. Samples from one additional location (36E1) were taken quarterly. Additional sampling occurred in the weeks immediately following the Fukushima event. The following analyses were performed:

Iodine-131

Milk samples from all locations were analyzed for concentrations of I-131 (Table C–VII.1, Appendix C). All results met the required LLD.

Gamma Spectrometry

Each milk sample was analyzed for concentrations of gamma emitting nuclides (Table C–VII.2, Appendix C).

Naturally occurring K-40 activity was found in all samples and ranged from 402 to 1,450 pCi/L. All other nuclides met the required LLDs.

b. Broad Leaf Vegetation

Eight types of broad leaf vegetation samples were collected from three locations (11S3, 13S3 and 31G1) monthly from June through September. The following analysis was performed:

Gamma Spectrometry

Each broad leaf vegetation sample was analyzed for concentrations of gamma emitting nuclides (Table C-VIII.1, Appendix C).

Cosmogenic Be-7 was found in 25 of 42 samples and ranged from 170 to 2,040 pCi/kg wet. Naturally occurring K-40 was found in all samples and ranged from 1,880 to 6,950 pCi/kg wet. All other nuclides met the required LLDs.

C. Ambient Gamma Radiation

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

Most TLD measurements were below 10 mR/standard month, with a range of 4.8 to 10.9 mR/standard month. A comparison of the Site Boundary and Intermediate Distance data to the Control Location data, indicate that the ambient gamma radiation levels from the Control Location 5H1 were consistently higher than all other locations except 13S2. Location 13S2 historically shows higher ambient gamma radiation, which is assumed due to the rock substrate. The area that this TLD is located in has been determined to emanate radon prodingy.

The historical ambient gamma radiation data from Location 5H1 were plotted along with similar data from the Site, Intermediate Distance and Outer Ring Locations (Figure C–6, Appendix C). Location 5H1 has a historical high bias, but tracked with the data from all three groups. This bias is most likely due to radon emanating from the ground.

D. 10 CFR 20.2002 Permit Storage Area

The results of the surface water aquatic monitoring program from Location 24S1 were used to determine if radioactivity from the permit storage area had made it to the Schuylkill River. The data obtained from the gamma analysis program did not detect any migration of radioactivity from the permit storage area.

E. Independent Spent Fuel Storage Installation

The result of the ambient gamma radiation level at TLD location 36S2 was used to determine the direct radiation exposure to the nearest residence from the ISFSI pad. The data, after subtracting background, shows the net direct radiation exposure to the nearest residence was zero mrem.

F. Land Use Survey

A Land Use Survey conducted in September 2011 around Limerick Generating Station (LGS) was performed by Normandeau Associates, Inc. for Exelon Nuclear to comply with Bases 3.3.2 of the Limerick's Offsite Dose Calculation Manual. The purpose of the survey was to document the nearest resident, milk producing animal and garden of greater than 500 ft^2 in each of the sixteen 22 ½ degree sectors around the site. The distance and direction of all locations from the LGS reactor buildings were positioned using Global Positioning System (GPS) technology. There were no changes required to the LGS REMP, as a result of this survey. The results of this survey are summarized below.

Distance in miles from the LGS Reactor Buildings				
Sector	Residence Feet	Garden Feet	Milk Farm Feet	Meat Animal Feet
1 N	3,109	3,335	24,775	24,775
2 NNE	2,706	9,610	-	-
3 NE	3,469	3,494	-	-
4 ENE	3,231	14,964	-	20,552
5 E	2,864	12,628	-	-
6 ESE	3,434	1,822	-	-
7 SE	5,108	1,282	-	10,927
8 SSE	5,403	6,898	-	-
9 S	4,347	6,103	22,115	12,211
10 SSW	5,063	5,320	10,390	10,390
11 SW	3,251	4,559	-	18,547
12 WSW	3,799	12,013	14,175	14,175
13 W	3,627	4,208	14,654	14,654
14 WNW	3,932	3,932	-	-
15 NW	3,619	8,169	-	-
16 NNW	5,051	7,107	-	-

G. 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 for 18 and 14 analytes, respectively (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. If the bias is greater than 30%, the results are deemed not acceptable.

For the primary laboratory, 14 out of 18 analytes met the specified acceptance criteria. Four analytes (one sample each of Cr-51, Sr-89 and Sr-90 and two Gross Alpha samples) did not meet the specified acceptance criteria for the following reason:

1. Teledyne Brown Engineering's Analytics March 2011 Cr-51 in milk result of 398 pCi/L was higher than the known value of 298 pCi/L, resulting in a found to known ratio of 1.34. NCR 11-13 was initiated to investigate this failure. There was a slightly high bias in all the gamma activities. The June gamma results in milk did not show a high bias. No further action was required.
2. Teledyne Brown Engineering's ERA May 2011 Gross Alpha in water result of 64.1 pCi/L was higher than the known value of 50.1 pCi/L, which exceeded the upper control limit of 62.9 pCi/L. NCR 11-08 was initiated to investigate this failure. The solids on the

planchet exceeded 100 mg, which was beyond the range of the efficiency curve.

3. Teledyne Brown Engineering's MAPEP March 2011 Gross Alpha in air particulate result of 0.101 Bq/sample was lower than the known value of 0.659 Bq/sample, which exceeded the lower control limit of 0.198 Bq/sample. NCR 11-11 was initiated to investigate this failure. The air particulate filter was counted on the wrong side.
4. Teledyne Brown Engineering's ERA November 2011 Sr-89 in water result of 81.0 pCi/L was higher than the known value of 69.7 pCi/L, which exceeded the upper control limit of 77.9 pCi/L. NCR 11-16 was initiated to investigate this failure. The TBE reported value to known ratio of 1.16 fell within the acceptable range of ± 20%, which TBE considers acceptable.
5. Teledyne Brown Engineering's MAPEP March 2011 Sr-90 in soil, air particulate and vegetation were non-reports that were evaluated as failed. NCR 11-11 was initiated to investigate these failures. MAPEP evaluated the non-reports as failed due to not reporting a previously reported analyte.

For the secondary laboratory, Environmental, Inc., 12 out of 14 analytes met the specified acceptance criteria. Two analytes (one sample of Cs-134 and two Sr-90 samples) did not meet the specified acceptance criteria for the following reason:

1. Environmental Inc.'s ERA October 2011 Cs-134 in water result of 38.8 pCi/L was higher than the known value of 33.4 pCi/L, which exceeded the upper control limit of 36.7 pCi/L. The sample was reanalyzed. The reanalyzed result of 32.9 was acceptable.
2. Environmental Inc.'s MAPEP February 2011 Sr-90 in air particulate result of 1.89 Bq/sample was higher than the known value of 1.36 Bq/sample, which exceeded the upper control limit of 1.77 Bq/sample. No errors were found in the calculation or procedure. The reanalyzed result of 1.73 Bq/sample was acceptable.
3. Environmental Inc.'s MAPEP August 2011 Sr-90 in soil result of 219.4 Bq/kg, less than the known value of 320 Bq/kg, was below the lower control limit of 224 Bq/kg. The sample was reanalyzed in triplicate through a strontium column. The reanalyzed result of 304.2 Bq/kg was acceptable.

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. ERRATA

A. Correction to 2010 AREOR

In the 2010 AREOR Table A-1 some nuclides were not captured in the report due to formatting. Nuclides included Cs-137, Ba-140, La-140. A corrected table is included in Appendix G of this report.

VI. References

A. Environmental Report Operating License Stage, Limerick Generating Station, Units 1 and 2, Volumes 1–5 Philadelphia Electric Company.

B. NUREG-1302 Offsite Dose Calculation Manual Guidance: Standard Radiological Effluent Controls for Boiling Water Reactors

C. Branch Technical Position Paper, Regulatory Guide 4.8, Revision 1, November 1979.

D. Pre-operational Radiological Environmental Monitoring Program Report, Limerick Generating Station Units 1 and 2, 1 January 1982 through 21 December 1984, Teledyne Isotopes and Radiation Management Corporation.

APPENDIX A

RADIOLOGICAL ENVIRONMENTAL MONITORING REPORT SUMMARY

TABLE A-1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY FOR THE LIMERICK GENERATING STATION, 2011

Name of Facility: LIMERICK GENERATING STATION **DOCKET NUMBER:** 50-352 & 50-353
Location of Facility: MONTGOMERY COUNTY PA **REPORTING PERIOD:** 2011

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	MEAN (M) (F) RANGE	LOCATION WITH HIGHEST ANNUAL MEAN (M) STATION # NAME DISTANCE AND DIRECTION	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
SURFACE WATER (PCI/LITER)	H-3	8	200	<LLD	<LLD	-		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
	NB-95		15	<LLD	<LLD	-		0

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

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SURFACE WATER (PCI/LITER)	ZR-95		30	<LLD	<LLD	-		0
	I-131		15	<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	48	4	3.9 (20/36) (2.2/5.1)	3.9 (4/12) (2.0/5.6)	4 (4/12) (3.7/4.5)	16C2 INDICATOR CITIZENS HOME WATER COMPANY 2.66 MILES SSE OF SITE	0

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DRINKING WATER (PCI/LITER)	H-3	16	200	<LLD	<LLD	-		0
	I-131	24	1	<LLD	<LLD	-		0
	GAMMA	48						
	MN-54		15	<LLD	<LLD	-		0
	CO-58		15	<LLD	<LLD	-		0
	FE-59		30	<LLD	<LLD	-		0
	CO-60		15	<LLD	<LLD	-		0
	ZN-65		30	<LLD	<LLD	-		0

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DRINKING WATER (PCI/LITER)	NB-95		15	<LLD	<LLD	-		0
	ZR-95		30	<LLD	<LLD	-		0
	I-131		15	<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

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BOTTOM FEEDER (PCI/KG WET)	GAMMA	4						
	K-40		NA	4455 (2/2) (3540/5370)	3625 (2/2) (3460/3790)	4455 (2/2) (3540/5370)	16C5 INDICATOR VINCENT POOL 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
	I-131		NA	<LLD	<LLD	-		0

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BOTTOM FEEDER (PCI/KG WET)	CS-134		130	<LLD	<LLD	-		0
	CS-137		150	<LLD	<LLD	-		0
PREDATOR (PCI/KG WET)	GAMMA	4						
	K-40		NA	3400 (2/2) (3300/3500)	3230 (2/2) (3200/3260)	3400 (2/2) (3300/3500)	16C5 INDICATOR VINCENT POOL 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

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PREDATOR (PCI/KG WET)	ZN-65		260	<LLD	<LLD	-		0
	I-131		NA	<LLD	<LLD	-		0
	CS-134		130	<LLD	<LLD	-		0
	CS-137		150	<LLD	<LLD	-		0
SEDIMENT (PCI/KG DRY)	GAMMA	6						
	BE-7		NA	3618 (4/4) (1900/7160)	<LLD	4580 (2/2) (2000/7160)	16B2 INDICATOR LINFIELD BRIDGE 1.35 MILES SSE OF SITE	0
	K-40		NA	16175 (4/4) (13000/19300)	13650 (2/2) (12700/14600)	16200 (2/2) (15000/17400)	16B2 INDICATOR LINFIELD BRIDGE 1.35 MILES SSE OF SITE	0
	MN-54		NA	<LLD	<LLD	-		0

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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	MEAN (M) (F) RANGE	LOCATION WITH HIGHEST ANNUAL MEAN (M) STATION # NAME DISTANCE AND DIRECTION	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
SEDIMENT (PCI/KG DRY)	CO-58		NA	<LLD	<LLD	-		0
	CO-60		NA	<LLD	<LLD	-		0
	I-131		NA	<LLD	<LLD	-		0
	CS-134		150	<LLD	<LLD	-		0
	CS-137		180	196 (3/4) (179/218)	<LLD	199 (2/2) (179/218)	16B2 INDICATOR LINFIELD BRIDGE 1.35 MILES SSE OF SITE	0
AIR PARTICULATE (E-3 PCI/CU.METER)	GR-B	310	10	17 (251/259) (6/39)	17 (49/51) (8/29)	18 (52/52) (7/39)	14S1 INDICATOR LONGVIEW ROAD 0.63 MILES SSE OF SITE	0

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AIR PARTICULATE (E-3 PCI/CU.METER)	GAMMA	24						
	BE-7		NA	75 (20/20) (50/104)	76 (4/4) (60/83)	86 (4/4) (70/104)	6C1 INDICATOR 11305 FEET NE OF SITE	0
	MN-54		NA	<LLD	<LLD	-		0
	CO-58		NA	<LLD	<LLD	-		0
	CO-60		NA	<LLD	<LLD	-		0
	CS-134		50	<LLD	<LLD	-		0
	CS-137		60	<LLD	<LLD	-		0

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AIR IODINE (E-3 PCI/CU.METER)	GAMMA I-131	310	70	63 (10/259) (24/100)	59 (1/51)	85 (2/52) (70/100)	13C1 INDICATOR KING ROAD 2.84 MILES SE OF SITE	0
MILK (PCI/LITER)	I-131	114	1	<LLD	<LLD	-		0
MILK (PCI/LITER)	GAMMA K-40	114	NA	1173 (88/88) (402/1450)	1222 (26/26) (1030/1430)	1277 (22/22) (1130/1450)	19B1 INDICATOR 1.95 MILES SSW OF SITE	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

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FRACTION OF DETECTABLE MEASUREMENTS AT SPECIFIED LOCATIONS IS INDICATED IN PARENTHESIS (F)

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VEGETATION (PCI/KG WET)	GAMMA	42						
	BE-7		NA	471 (13/27) (219/1020)	836 (12/15) (170/2040)	836 (12/15) (170/2040)	31G1 CONTROL	0
	K-40		NA	4405 (27/27) (1880/6870)	4827 (15/15) (2930/6950)	4827 (15/15) (2930/6950)	31G1 CONTROL	0
	MN-54		NA	<LLD	<LLD	-		0
	CO-58		NA	<LLD	<LLD	-		0
	CO-60		NA	<LLD	<LLD	-		0
	I-131		60	<LLD	<LLD	-		0
	CS-134		60	<LLD	<LLD	-		0

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Name of Facility: LIMERICK GENERATING STATION				DOCKET NUMBER:			50-352 & 50-353	
Location of Facility: MONTGOMERY COUNTY PA				REPORTING PERIOD:		2011		
				INDICATOR LOCATIONS	CONTROL LOCATION		LOCATION WITH HIGHEST ANNUAL MEAN (M)	
MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPES OF ANALYSIS PERFORMED	NUMBER OF ANALYSIS PERFORMED	REQUIRED LOWER LIMIT OF DETECTION (LLD)	MEAN (M) (F) RANGE	MEAN (M) (F) RANGE	MEAN (M) (F) RANGE	STATION # NAME DISTANCE AND DIRECTION	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
VEGETATION (PCI/KG WET)	CS-137		80	<LLD	<LLD	-		0
	RA-226		NA	1621 (10/27) (764/3200)	266 (1/15)	1701 (9/15) (764/3200)	13S3 INDICATOR VINCENT DAM 0.24 MILES SE OF SITE	0
	TH-228		NA	43 (6/27) (18/68)	60 (4/15) (24/125)	60 (4/15) (24/125)	31G1 CONTROL	0
	TH-232		NA	<LLD	<LLD	-		0
DIRECT RADIATION (MILLI-ROENTGEN/STD.MO.)	TLD-QUARTERLY	160	NA	7.1 (156/156) (4.8/10.9)	8.4 (4/4) (7.7/9.1)	9.9 (4/4) (8.8/10.9)	13S2 INDICATOR 500 KV SUBSTATION 0.41 MILES SE	0

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FRACTION OF DETECTABLE MEASUREMENTS AT SPECIFIED LOCATIONS IS INDICATED IN PARENTHESIS (F)

APPENDIX B

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

TABLE B-1: Location Designation and Identification System for the Limerick Generating Station

XXYZ - General code for identification of locations, where:

XX - Angular Sector of Sampling Location. The compass is divided into 36 sectors of 10 degrees each with center at Limerick's Units 1 and 2 off-gas vents. Sector 36 is centered due North, and others are numbered in a clockwise direction.

Y - Radial Zone of Sampling Location (in this report, the radial distance from the Limerick vent for all regional stations).

S : on-site location
A : 0-5,280 feet off-site
B : 5,280-10,560 feet off-site
C : 10,560-15,840 feet off-site
D : 15,840-21,120 feet off-site
E : 21,120-26,400 feet off-site
F : 26,400-52,800 feet off-site
G : 52,800-105,600 feet off-site
H : 105,600-528,000 feet off-site

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, Limerick Generating Station, 2011

Location	Location Description	Distance & Direction From Site
A.	Surface Water	
13B1	Vincent Dam	9,225 feet SE
24S1	Limerick Intake (control)	1,058 feet SW
B.	Drinking (Potable) Water	
15F4	Philadelphia Suburban Water Company	45,514 feet SE
15F7	Phoenixville Water Works	33,400 feet SSE
16C2	Citizens Home Water Company	14,034 feet SSE
28F3	Pottstown Water Authority (control)	30,811 feet WNW
C.	Milk - bi-weekly / monthly	
10F4		34,848 feet ESE
18E1		22,229 feet S
19B1		10,317 feet SSW
23F1	Control	26,505 feet SW
25C1		14,224 feet WSW
D.	Milk - quarterly	
36E1	Control	24,816 feet N
E.	Air Particulates / Air Iodine	
10S3	Keen Road	2,648 feet E
11S1	LGS Information Center	2,017 feet ESE
11S2	LGS Information Center (quality control)	2,017 feet ESE
13C1	King Road	14,980 feet SE
14S1	Longview Road	3,319 feet SSE
22G1	Manor Substation (control)	93,619 feet SW
6C1	Pottstown Landing Field	11,305 feet NE
F.	Fish	
16C5	Vincent Pool	Downstream of Discharge
29C1	Pottstown Vicinity (control)	Upstream of Intake
G.	Sediment	
16B2	Linfield Bridge	7,128 feet SSE
16C4	Vincent Dam	11,510 feet SSE
33A2	Upstream of Intake (control)	4,435 feet NNW
H.	Broad Leaf Vegetation	
11S3	LGS Information Center	1,848 feet ESE
13S3	LGS 500 KV Yard	1,267 feet SE
31G1	Prout's Jollyview Farm (control)	71,808 feet NW

TABLE B-2: Radiological Environmental Monitoring Program - Sampling Locations, Distance and Direction, Limerick Generating Station, 2011

Location	Location Description	Distance & Direction From Site
I. Environmental Dosimetry - TLD		
Site Boundary		
36S2	Evergreen & Sanatoga Road	3,183 feet N
3S1	Sanatoga Road	2,301 feet NNE
5S1	Possum Hollow Road	2,350 feet NE
7S1	LGS Training Center	3,099 feet ENE
10S3	Keen Road	2,648 feet E
11S1	LGS Information Center	2,017 feet ESE
13S2	500 KV Substation	2,149 feet SE
14S1	Longview Road	3,319 feet SSE
18S2	Rail Line along Longview Road	1,390 feet S
21S2	Near Intake Building	977 feet SSW
23S2	Transmission Tower	2,793 feet SW
25S2	Sector Site Boundary	2,445 feet WSW
26S3	Met. Tower #2	2,088 feet W
29S1	Sector Site Boundary	2,886 feet WNW
31S1	Sector Site Boundary	1,395 feet NW
34S2	Met. Tower #1	3,071 feet NNW
Intermediate Distance		
36D1	Siren Tower No. 147	18,527 feet N
2E1	Laughing Waters GSC	25,112 feet NNE
4E1	Neiffer Road	25,221 feet NE
7E1	Pheasant Road	22,489 feet ENE
10E1	Royersford Road	20,826 feet E
10F3	Trappe Substation	29,442 feet ESE
13E1	Vaughn Substation	22,772 feet SE
16F1	Pikeland Substation	26,608 feet SSE
19D1	Snowden Substation	18,439 feet S
20F1	Sheeder Substation	27,648 feet SSW
24D1	Porters Mill Substation	20,972 feet SW
25D1	Hoffecker & Keim Streets	21,044 feet WSW
28D2	W. Cedarville Road	20,231 feet W
29E1	Prince Street	26,110 feet WNW
31D2	Poplar Substation	20,446 feet NW
34E1	Varnell Road	24,243 feet NNW
Control and Special Interest		
5H1	Birch Substation (control)	130,742 feet NE
6C1	Pottstown Landing Field	11,305 feet NE
9C1	Reed Road	11,377 feet E
13C1	King Road	14,980 feet SE
15D1	Spring City Substation	16,877 feet SE
17B1	Linfield Substation	8,462 feet S
20D1	Ellis Woods Road	16,157 feet SSW
31D1	Lincoln Substation	15,853 feet WNW

TABLE B-3: Radiological Environmental Monitoring Program – Summary of Sample Collection and Analytical Methods, Limerick Generating Station, 2011

Sample Medium	Analysis	Sampling Method	Collection Procedure Number	Sample Size	Analytical Procedure Number
Surface Water	Gamma Spectroscopy	Monthly composite from a continuous water compositor.	RMC-ER5 Collection of water samples for radiological analysis (Limerick Generating Station)	2 gallon	TBE, TBE-2007 Gamma emitting radioisotope analysis Env. Inc., GS-01 Determination of gamma emitters by gamma spectroscopy
Surface Water	Tritium	Quarterly composite from a continuous water compositor.	RMC-ER5 Collection of water samples for radiological analysis (Limerick Generating Station)	500 ml	TBE, TBE-2011 Tritium analysis in drinking water by liquid scintillation Env. Inc., T-02 Determination of tritium in water (direct method)
Drinking Water	Gross Beta	Monthly composite from a continuous water compositor.	RMC-ER5 Collection of water samples for radiological analysis (Limerick Generating 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) Env. Inc., W(SS)-02 Determination of gross alpha and/or gross beta in water (suspended solids)
Drinking Water	I-131	Monthly composite from a continuous water compositor.	RMC-ER10 Collection of water samples for radiological analysis (Limerick Generating Station)	2 gallon	TBE, TBE-2012 Radioiodine in various matrices Env. Inc., I-131-01 Determination of I-131 in water by an ion exchange
Drinking Water	Gamma Spectroscopy	Monthly composite from a continuous water compositor.	RMC-ER5 Collection of water samples for radiological analysis (Limerick Generating Station)	2 gallon	TBE, TBE-2007 Gamma emitting radioisotope analysis Env. Inc., GS-01 Determination of gamma emitters by gamma spectroscopy
Drinking Water	Tritium	Quarterly composite from a continuous water compositor.	RMC-ER5 Collection of water samples for radiological analysis (Limerick Generating Station)	500 ml	TBE, TBE-2011 Tritium analysis in drinking water 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	RMC-ER6 Collection of fish samples for radiological analysis (Limerick Generating Station)	1000 grams (wet)	TBE-2007 Gamma emitting radioisotope analysis Env. Inc., GS-01 Determination of gamma emitters by gamma spectroscopy
Sediment	Gamma Spectroscopy	Semi-annual grab samples	RMC-ER7 Collection of sediment samples for radiological analysis (Limerick Generating 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	RMC-ER8 Collection of air particulate and air iodine samples for radiological analysis (Limerick Generating 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

TABLE B-3: Radiological Environmental Monitoring Program – Summary of Sample Collection and Analytical Methods, Limerick Generating Station, 2011

Sample Medium	Analysis	Sampling Method	Collection Procedure Number	Sample Size	Analytical Procedure Number
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	RMC-ER8 Collection of air particulate and air iodine samples for radiological analysis (Limerick Generating 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	RMC-ER10 Collection of milk samples for radiological analysis (Limerick Generating 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	Gamma Spectroscopy	Bi-weekly grab sample when cows are on pasture. Monthly all other times	RMC-ER10 Collection of milk samples for radiological analysis (Limerick Generating Station)	2 gallon	TBE, TBE-2007 Gamma emitting radioisotope analysis Env. Inc., GS-01 Determination of gamma emitters by gamma spectroscopy
TLD	Thermoluminescence Dosimetry	Quarterly TLDs comprised of two Panasonic 814 (containing 3 each $CaSO_4$ elements)	RMC-ER9 Collection of TLD samples for radiological analysis (Limerick Generating Station)	2 dosimeters	Mirion Technologies

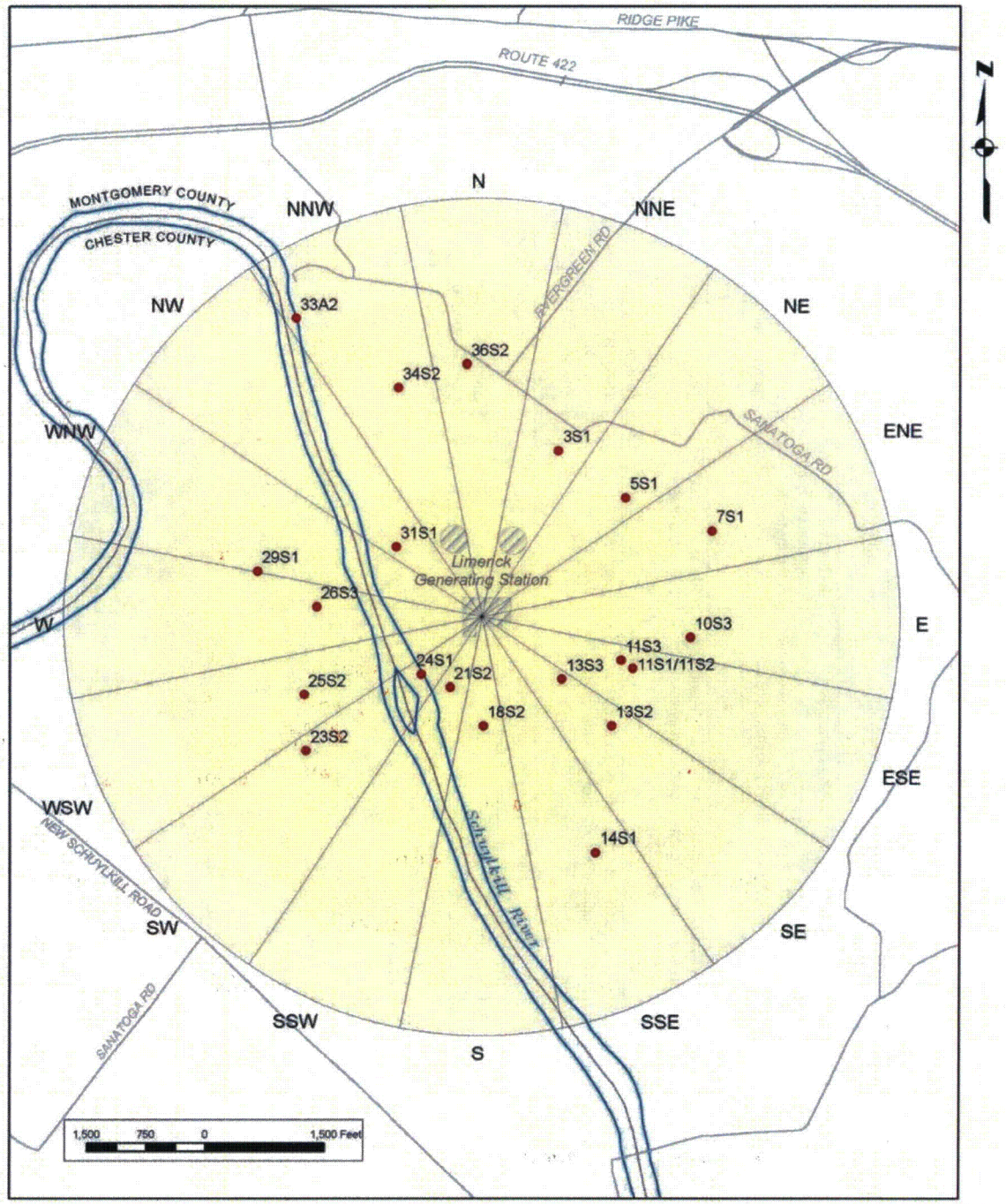


Figure B-1
Environmental Sampling Locations Within 5,280 Feet
of the Limerick Generating Station, 2011

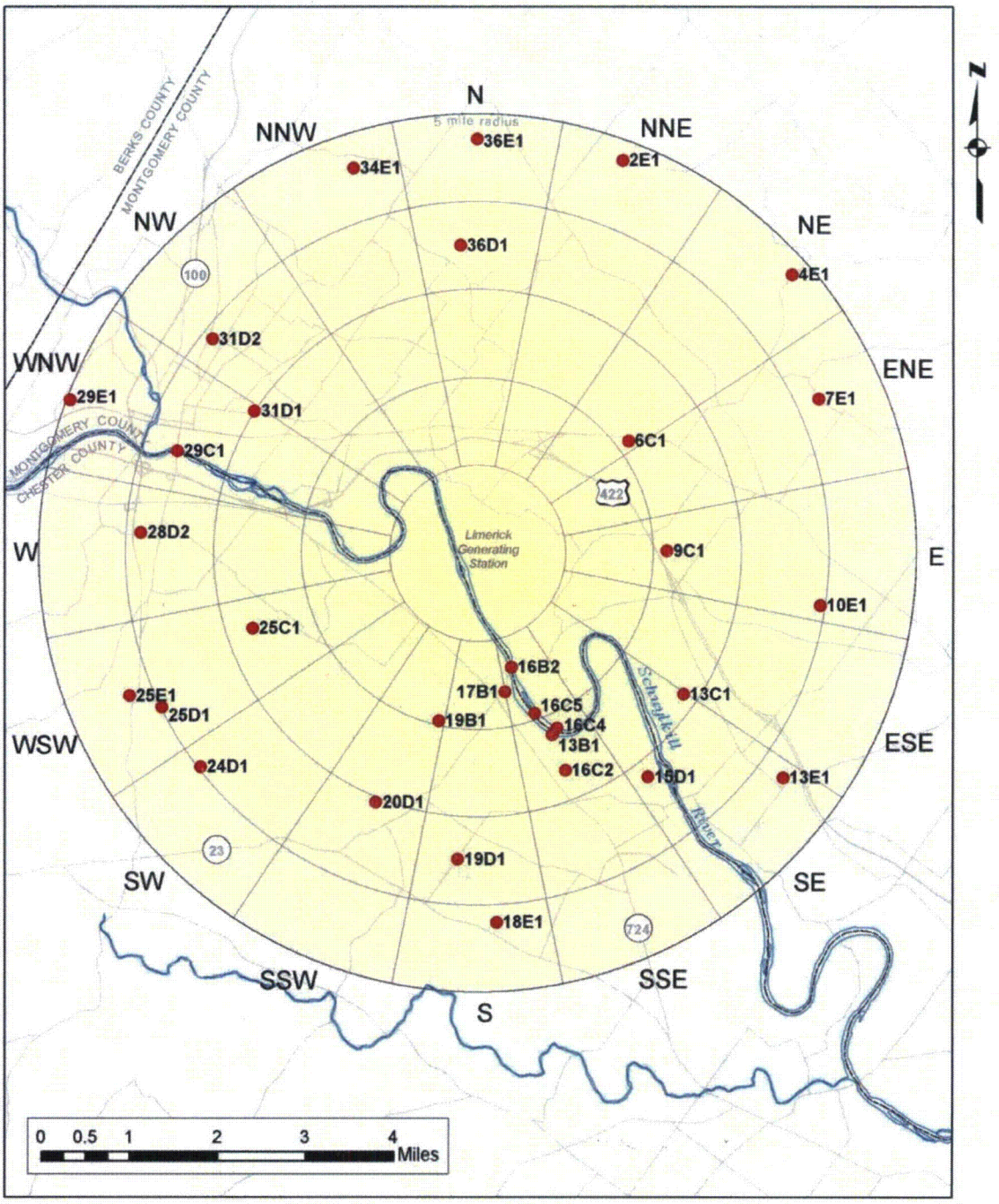


Figure B-2
Environmental Sampling Locations Between 5,280 and 26,400 Feet
from the Limerick Generating Station, 2011

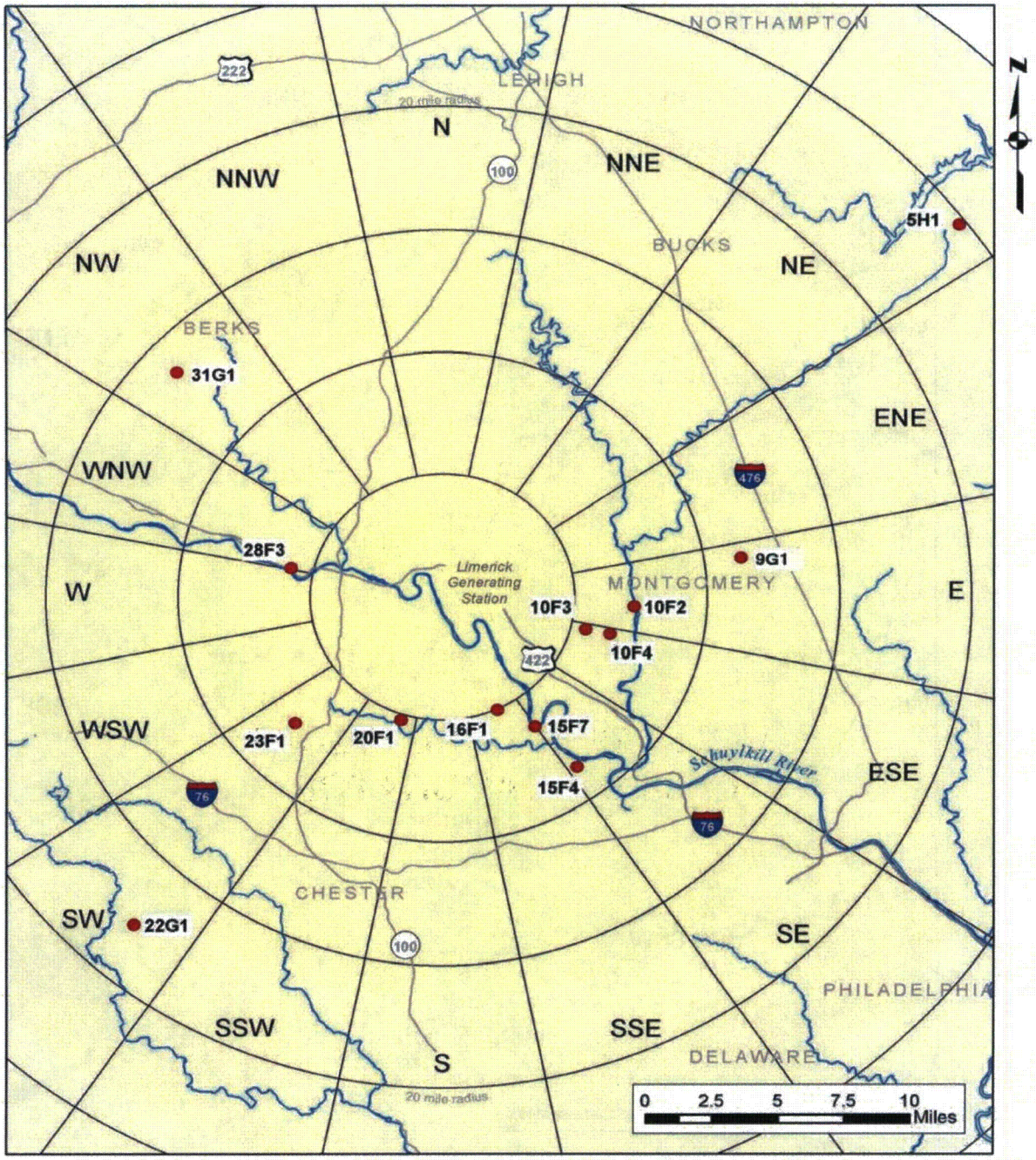


Figure B-3
Environmental Sampling Locations Greater than 26,400 Feet
from the Limerick Generating Station, 2011

APPENDIX C

DATA TABLES AND FIGURES
PRIMARY LABORATORY

TABLE C-I.1 **CONCENTRATIONS OF TRITIUM IN SURFACE WATER SAMPLES COLLECTED IN THE VICINITY OF LIMERICK GENERATING STATION, 2011**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	13B1	24S1
12/27/10 - 03/29/11	< 162 (1)	< 167
03/29/11 - 06/27/11	< 178	< 173
06/27/11 - 09/27/11	< 187 (1)	< 188
09/27/11 - 12/27/11	< 173 (1)	< 175
MEAN	-	-

(1) SEE PROGRAM EXCEPTIONS SECTION FOR EXPLANATION

TABLE C-I.2 **CONCENTRATIONS OF GAMMA EMITTERS IN SURFACE WATER SAMPLES COLLECTED IN THE VICINITY OF LIMERICK GENERATING STATION, 2011**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION PERIOD	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	I-131	Cs-134	Cs-137	Ba-140	La-140
13B1	12/27/10 - 01/31/11	< 5	< 5	< 12	< 5	< 10	< 5	< 11	< 9	< 5	< 6	< 24	< 7
	01/31/11 - 03/01/11	< 4	< 5	< 11	< 4	< 10	< 6	< 9	< 15	< 5	< 5	< 31	< 9
	03/01/11 - 03/29/11	< 4	< 4	< 8	< 3	< 7	< 4	< 7	< 14	< 3	< 3	< 28	< 8
	03/29/11 - 05/03/11	< 1	< 1	< 3	< 1	< 2	< 1	< 2	< 12	< 1	< 1	< 16	< 5
	05/03/11 - 05/31/11	< 1	< 1	< 3	< 1	< 2	< 1	< 2	< 14	< 1	< 1	< 19	< 5
	05/31/11 - 06/27/11	< 6	< 5	< 13	< 7	< 15	< 6	< 11	< 13	< 8	< 6	< 32	< 10
	06/27/11 - 08/02/11	< 6	< 7	< 12	< 6	< 10	< 8	< 11	< 9	< 7	< 8	< 24	< 8
	08/02/11 - 08/29/11	< 5	< 4	< 10	< 6	< 7	< 5	< 8	< 9	< 5	< 4	< 21	< 8
	08/29/11 - 09/27/11	< 5	< 6	< 13	< 5	< 12	< 6	< 11	< 11	< 5	< 5	< 28	< 8
	09/27/11 - 11/01/11	< 5	< 5	< 10	< 5	< 8	< 6	< 9	< 10	< 5	< 5	< 21	< 7
	11/01/11 - 11/28/11	< 5	< 5	< 10	< 6	< 10	< 6	< 10	< 9	< 5	< 6	< 26	< 8
	11/28/11 - 12/27/11	< 4	< 5	< 11	< 5	< 10	< 6	< 9	< 9	< 5	< 5	< 28	< 8
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-
24S1	12/27/10 - 01/31/11	< 5	< 5	< 9	< 5	< 10	< 5	< 9	< 10	< 5	< 6	< 26	< 8
	01/31/11 - 03/01/11	< 4	< 4	< 9	< 5	< 8	< 5	< 9	< 14	< 4	< 4	< 28	< 8
	03/01/11 - 03/29/11	< 4	< 4	< 9	< 4	< 7	< 4	< 7	< 15	< 4	< 4	< 30	< 9
	03/29/11 - 05/03/11	< 1	< 1	< 2	< 1	< 1	< 1	< 2	< 10	< 1	< 1	< 14	< 4
	05/03/11 - 05/31/11	< 1	< 2	< 4	< 1	< 3	< 2	< 3	< 14	< 1	< 1	< 21	< 7
	05/31/11 - 06/27/11	< 6	< 6	< 13	< 7	< 15	< 7	< 12	< 13	< 7	< 6	< 35	< 12
	06/27/11 - 08/02/11	< 7	< 8	< 15	< 8	< 17	< 8	< 12	< 9	< 6	< 8	< 28	< 8
	08/02/11 - 08/29/11	< 4	< 5	< 8	< 4	< 7	< 5	< 7	< 9	< 3	< 5	< 23	< 9
	08/29/11 - 09/27/11	< 2	< 2	< 3	< 2	< 3	< 2	< 3	< 3	< 2	< 2	< 8	< 3
	09/27/11 - 11/01/11	< 5	< 4	< 10	< 6	< 12	< 6	< 8	< 9	< 4	< 5	< 22	< 8
	11/01/11 - 11/29/11	< 4	< 3	< 6	< 4	< 6	< 4	< 6	< 6	< 4	< 4	< 16	< 4
	11/29/11 - 12/27/11	< 6	< 4	< 13	< 5	< 13	< 8	< 12	< 12	< 6	< 6	< 32	< 6
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-

TABLE C-II.1 **CONCENTRATIONS OF GROSS BETA IN DRINKING WATER SAMPLES COLLECTED IN THE VICINITY OF LIMERICK GENERATING STATION, 2011**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	15F4	15F7	16C2	28F3
12/27/10 - 01/31/11	4.0 ± 2.5	< 3.9	3.7 ± 1.8	< 3.2
01/31/11 - 03/01/11	3.8 ± 1.9	3.7 ± 1.7	3.7 ± 1.9	< 2.3
03/01/11 - 03/29/11	< 3.4	< 3.2	< 3.7	< 3.3
03/29/11 - 05/03/11	< 3.5	< 3.5	< 3.9	< 3.5
05/03/11 - 05/31/11	3.9 ± 2.2	< 3.1	< 3.2	< 3.5
05/31/11 - 06/27/11	< 3.4	3.4 ± 2.2	< 3.5	< 3.4
06/27/11 - 08/02/11	5.1 ± 1.8	5.1 ± 1.8	4.5 ± 1.9	3.5 ± 1.7
08/02/11 - 08/29/11	4.3 ± 2.2	3.3 ± 2.1	< 3.6	< 3.3
08/29/11 - 09/27/11	4.4 ± 2.0	4.9 ± 1.9	< 3.0	4.6 ± 2.0
09/27/11 - 11/01/11	3.3 ± 1.5	< 2.3	< 2.5	< 2.3
11/01/11 - 11/28/11	3.3 ± 2.0	4.1 ± 2.1	4.2 ± 2.2	5.6 ± 2.2
11/29/11 - 12/27/11	2.4 ± 1.0	2.2 ± 1.0	< 1.7	2.0 ± 1.0
MEAN	3.8 ± 1.6	3.8 ± 2.0	4.0 ± 0.8	3.9 ± 3.1

TABLE C-II.2 **CONCENTRATIONS OF TRITIUM IN DRINKING WATER SAMPLES COLLECTED IN THE VICINITY OF LIMERICK GENERATING STATION, 2011**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	15F4	15F7	16C2	28F3
12/27/10 - 03/29/11	< 185	< 183	< 162	< 163
03/29/11 - 06/27/11	< 173	< 176	< 178	< 175
06/27/11 - 09/27/11	< 186	< 186	< 186	< 187
09/27/11 - 12/27/11	< 177	< 181	< 175	< 176
MEAN	-	-	-	-

TABLE C-II.3 **CONCENTRATIONS OF I-131 IN DRINKING WATER SAMPLES COLLECTED IN THE VICINITY OF LIMERICK GENERATING STATION, 2011**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	15F4	15F7	16C2	28F3
06/27/11 - 08/02/11 (1)	< 0.8	< 0.7	< 0.8	< 0.8
08/02/11 - 08/29/11	< 0.6	< 0.6	< 0.6	< 0.6
08/29/11 - 09/27/11	< 0.5	< 0.5	< 0.6	< 0.5
09/27/11 - 11/01/11	< 0.8	< 0.6	< 0.6	< 0.6
11/01/11 - 11/28/11	< 0.6	< 0.6	< 0.6	< 0.7
11/29/11 - 12/27/11	< 0.4	< 0.4	< 0.5	< 0.4
MEAN	-	-	-	-

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

TABLE C-II.4 **CONCENTRATIONS OF GAMMA EMITTERS IN DRINKING WATER SAMPLES COLLECTED IN THE VICINITY OF LIMERICK GENERATING STATION, 2011**

RESULTS IN UNITS OF PCI/LITER ± SIGMA

SITE	COLLECTION PERIOD	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	I-131	Cs-134	Cs-137	Ba-140	La-140
15F4	12/27/10 - 01/31/11	< 5	< 5	< 12	< 5	< 10	< 5	< 8	< 9	< 4	< 5	< 27	< 8
	01/31/11 - 03/01/11	< 4	< 4	< 9	< 3	< 9	< 4	< 8	< 12	< 4	< 3	< 29	< 9
	03/01/11 - 03/29/11	< 3	< 3	< 6	< 2	< 4	< 3	< 5	< 11	< 2	< 3	< 22	< 7
	03/29/11 - 05/03/11	< 1	< 1	< 3	< 1	< 2	< 1	< 2	< 12	< 1	< 1	< 17	< 6
	05/03/11 - 05/31/11	< 1	< 1	< 3	< 1	< 2	< 1	< 2	< 12	< 1	< 1	< 17	< 5
	05/31/11 - 06/27/11	< 6	< 7	< 13	< 7	< 14	< 8	< 13	< 13	< 6	< 6	< 39	< 13
	06/27/11 - 08/02/11	< 4	< 6	< 15	< 7	< 14	< 6	< 11	< 8	< 6	< 7	< 26	< 7
	08/02/11 - 08/29/11	< 6	< 6	< 11	< 6	< 10	< 6	< 9	< 11	< 5	< 6	< 27	< 8
	08/29/11 - 09/27/11	< 4	< 3	< 7	< 4	< 7	< 4	< 6	< 7	< 3	< 3	< 18	< 6
	09/27/11 - 11/01/11	< 5	< 5	< 11	< 5	< 10	< 6	< 8	< 10	< 4	< 5	< 25	< 8
	11/01/11 - 11/29/11	< 4	< 4	< 7	< 4	< 8	< 5	< 7	< 7	< 4	< 4	< 19	< 5
	11/29/11 - 12/27/11	< 5	< 5	< 11	< 4	< 9	< 5	< 8	< 8	< 5	< 5	< 26	< 8
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-
15F7	12/27/10 - 01/31/11	< 3	< 3	< 8	< 3	< 6	< 3	< 6	< 7	< 3	< 4	< 17	< 5
	01/31/11 - 03/01/11	< 5	< 5	< 11	< 5	< 10	< 5	< 8	< 14	< 5	< 5	< 32	< 7
	03/01/11 - 03/29/11	< 2	< 3	< 6	< 3	< 5	< 3	< 5	< 10	< 2	< 2	< 21	< 7
	03/29/11 - 05/03/11	< 1	< 1	< 2	< 1	< 2	< 1	< 2	< 12	< 1	< 1	< 15	< 5
	05/03/11 - 05/31/11	< 1	< 2	< 4	< 1	< 3	< 2	< 3	< 14	< 1	< 1	< 22	< 7
	05/31/11 - 06/27/11	< 5	< 5	< 11	< 5	< 8	< 5	< 11	< 12	< 5	< 5	< 29	< 10
	06/27/11 - 08/02/11	< 6	< 5	< 9	< 7	< 13	< 7	< 12	< 8	< 7	< 6	< 24	< 13
	08/02/11 - 08/29/11	< 6	< 5	< 11	< 5	< 8	< 5	< 10	< 10	< 4	< 6	< 26	< 10
	08/29/11 - 09/27/11	< 2	< 2	< 4	< 2	< 4	< 2	< 4	< 4	< 2	< 2	< 11	< 3
	09/27/11 - 11/01/11	< 6	< 5	< 12	< 6	< 10	< 6	< 9	< 10	< 5	< 6	< 25	< 8
	11/01/11 - 11/29/11	< 4	< 5	< 9	< 5	< 10	< 5	< 7	< 8	< 5	< 4	< 22	< 8
	11/29/11 - 12/27/11	< 6	< 6	< 11	< 5	< 7	< 6	< 10	< 11	< 6	< 6	< 30	< 12
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-

TABLE C-II.4 **CONCENTRATIONS OF GAMMA EMITTERS IN DRINKING WATER SAMPLES COLLECTED IN THE VICINITY OF LIMERICK GENERATING STATION, 2011**

RESULTS IN UNITS OF PCI/LITER ± SIGMA

SITE	COLLECTION PERIOD	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	I-131	Cs-134	Cs-137	Ba-140	La-140
16C2	12/27/10 - 01/31/11	< 2	< 3	< 6	< 3	< 6	< 3	< 5	< 7	< 3	< 3	< 15	< 5
	01/31/11 - 03/01/11	< 4	< 5	< 10	< 5	< 10	< 5	< 7	< 14	< 4	< 5	< 30	< 8
	03/01/11 - 03/29/11	< 3	< 3	< 8	< 4	< 7	< 4	< 6	< 13	< 3	< 3	< 29	< 10
	03/29/11 - 05/03/11	< 1	< 2	< 3	< 1	< 3	< 2	< 3	< 15	< 1	< 1	< 19	< 5
	05/03/11 - 05/31/11	< 1	< 1	< 3	< 1	< 2	< 2	< 3	< 14	< 1	< 1	< 18	< 5
	05/31/11 - 06/27/11	< 6	< 5	< 14	< 6	< 11	< 7	< 13	< 14	< 7	< 6	< 36	< 14
	06/27/11 - 08/02/11	< 7	< 8	< 14	< 5	< 13	< 7	< 12	< 8	< 7	< 7	< 24	< 9
	08/02/11 - 08/29/11	< 4	< 5	< 13	< 5	< 9	< 5	< 9	< 9	< 4	< 4	< 23	< 9
	08/29/11 - 09/27/11	< 5	< 6	< 10	< 5	< 11	< 7	< 10	< 10	< 5	< 6	< 26	< 7
	09/27/11 - 11/01/11	< 6	< 6	< 11	< 7	< 14	< 8	< 11	< 12	< 5	< 6	< 32	< 11
	11/01/11 - 11/28/11	< 6	< 7	< 10	< 6	< 14	< 6	< 11	< 9	< 5	< 5	< 27	< 9
	11/28/11 - 12/27/11	< 4	< 6	< 13	< 4	< 11	< 5	< 8	< 12	< 6	< 6	< 26	< 8
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-
28F3	12/27/10 - 01/31/11	< 5	< 6	< 11	< 5	< 11	< 6	< 9	< 11	< 5	< 5	< 30	< 9
	01/31/11 - 03/01/11	< 4	< 5	< 10	< 4	< 8	< 6	< 7	< 14	< 4	< 5	< 26	< 10
	03/01/11 - 03/29/11	< 4	< 4	< 9	< 4	< 7	< 5	< 7	< 15	< 4	< 4	< 32	< 9
	03/29/11 - 05/03/11	< 1	< 1	< 3	< 1	< 2	< 1	< 2	< 12	< 1	< 1	< 17	< 4
	05/03/11 - 05/31/11	< 1	< 2	< 4	< 1	< 3	< 2	< 3	< 14	< 1	< 2	< 24	< 5
	05/31/11 - 06/27/11	< 5	< 6	< 15	< 7	< 13	< 8	< 12	< 10	< 6	< 7	< 29	< 13
	06/27/11 - 08/02/11	< 5	< 6	< 12	< 5	< 11	< 6	< 10	< 7	< 6	< 6	< 25	< 6
	08/02/11 - 08/29/11	< 6	< 7	< 12	< 6	< 13	< 6	< 9	< 11	< 6	< 6	< 28	< 10
	08/29/11 - 09/27/11	< 6	< 7	< 14	< 6	< 15	< 8	< 10	< 10	< 7	< 8	< 36	< 12
	09/27/11 - 11/01/11	< 7	< 8	< 16	< 7	< 16	< 10	< 13	< 12	< 7	< 7	< 38	< 13
	11/01/11 - 11/28/11	< 4	< 5	< 9	< 6	< 10	< 5	< 8	< 8	< 4	< 5	< 20	< 8
	11/28/11 - 12/27/11	< 7	< 7	< 9	< 5	< 12	< 5	< 11	< 10	< 5	< 6	< 30	< 6
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-

TABLE C-III.1 CONCENTRATIONS OF GAMMA EMMITTERS IN PREDATOR AND BOTTOM FEEDER (FISH) SAMPLES COLLECTED IN THE VICINITY OF LIMERICK GENERATING STATION, 2011

RESULTS IN UNITS OF PCI/KG WET ± 2 SIGMA

SITE	COLLECTION PERIOD	K-40	Mn-54	Co-58	Fe-59	Co-60	Zn-65	I-131	Cs-134	Cs-137
16C5	PREDATOR									
	05/09/11	3500 ± 832	< 19	< 34	< 53	< 30	< 53	< 156	< 28	< 30
	10/25/11	3300 ± 986	< 59	< 65	< 141	< 78	< 99	< 125	< 63	< 71
	MEAN	3400 ± 283	-	-	-	-	-	-	-	-
16C5	BOTTOM FEEDER									
	05/09/11	3540 ± 600	< 21	< 25	< 54	< 14	< 38	< 131	< 24	< 16
	10/25/11	5370 ± 1240	< 83	< 80	< 215	< 65	< 172	< 196	< 79	< 82
	MEAN	4455 ± 2588	-	-	-	-	-	-	-	-
29C1	PREDATOR									
	05/12/11	3200 ± 798	< 46	< 62	< 129	< 54	< 120	< 909	< 64	< 50
	10/24/11	3260 ± 1040	< 49	< 77	< 167	< 57	< 132	< 177	< 70	< 67
	MEAN	3230 ± 85	-	-	-	-	-	-	-	-
29C1	BOTTOM FEEDER									
	05/12/11	3460 ± 810	< 59	< 88	< 217	< 61	< 117	< 828	< 61	< 51
	10/24/11	3790 ± 1050	< 67	< 46	< 139	< 65	< 131	< 151	< 54	< 63
	MEAN	3625 ± 467	-	-	-	-	-	-	-	-

TABLE C-IV.1 CONCENTRATIONS OF GAMMA EMITTERS IN SEDIMENT SAMPLES COLLECTED IN THE VICINITY OF LIMERICK GENERATING STATION, 2011

RESULTS IN UNITS OF PCI/KG DRY ± 2 SIGMA

SITE	COLLECTION PERIOD	Be-7	K-40	Mn-54	Co-58	Co-60	I-131	Cs-134	Cs-137
16B2	06/06/11	7160 ± 1330	15000 ± 1790	< 51	< 68	< 48	< 655	< 40	179 ± 93
	12/13/11	2000 ± 1040	17400 ± 2040	< 102	< 119	< 115	< 755	< 93	218 ± 104
	MEAN	4580 ± 7297	16200 ± 3394	-	-	-	-	-	199 ± 55
16C4	06/06/11	3410 ± 1720	19300 ± 2860	< 118	< 142	< 128	< 1470	< 92	< 173
	12/13/11	1900 ± 1140	13000 ± 2130	< 115	< 115	< 108	< 771	< 113	191 ± 101
	MEAN	2655 ± 2135	16150 ± 8910	-	-	-	-	-	-
33A2	06/06/11	< 862	12700 ± 1650	< 102	< 91	< 97	< 778	< 89	< 107
	12/13/11	< 798	14600 ± 1560	< 63	< 86	< 78	< 409	< 67	< 78
	MEAN	-	13650 ± 2687	-	-	-	-	-	-

TABLE C-V.1 CONCENTRATIONS OF GROSS BETA IN AIR PARTICULATE SAMPLES COLLECTED IN THE VICINITY OF LIMERICK GENERATING STATION, 2011

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

COLLECTION	GROUP I			GROUP II		GROUP III
PERIOD	10S3	11S1	14S1	6C1	13C1	22G1
01/03/11 - 01/10/11	32 ± 6	34 ± 6	30 ± 6	29 ± 6	33 ± 6	28 ± 6
01/10/11 - 01/17/11	12 ± 5	13 ± 5	17 ± 6	12 ± 5	< 7	14 ± 5
01/17/11 - 01/24/11	24 ± 6	21 ± 5	17 ± 5	25 ± 6	18 ± 5	19 ± 5
01/24/11 - 01/31/11	20 ± 6	18 ± 5	19 ± 6	20 ± 6	20 ± 6	17 ± 5
01/31/11 - 02/07/11	12 ± 5	8 ± 5	14 ± 5	13 ± 5	10 ± 5	11 ± 5
02/07/11 - 02/14/11	18 ± 5	19 ± 5	18 ± 5	22 ± 6	15 ± 5	17 ± 5
02/14/11 - 02/21/11	15 ± 5	14 ± 5	15 ± 5	14 ± 5	17 ± 5	(1)
02/21/11 - 02/28/11	14 ± 5	8 ± 5	12 ± 5	16 ± 5	14 ± 5	16 ± 6
02/28/11 - 03/07/11	10 ± 5	14 ± 5	15 ± 5	13 ± 5	14 ± 5	11 ± 5
03/07/11 - 03/14/11	11 ± 5	11 ± 6	16 ± 6	14 ± 6	10 ± 5	12 ± 6
03/14/11 - 03/22/11	11 ± 4	11 ± 4	13 ± 5	11 ± 5	12 ± 4	13 ± 5
03/22/11 - 03/28/11	22 ± 7	23 ± 7	38 ± 8	32 ± 8	19 ± 7	28 ± 8
03/28/11 - 04/04/11	23 ± 6	29 ± 6	39 ± 7	25 ± 6	30 ± 6	25 ± 6
04/04/11 - 04/11/11	19 ± 5	18 ± 5	22 ± 5	21 ± 5	23 ± 5	24 ± 5
04/11/11 - 04/18/11	12 ± 5	10 ± 5	15 ± 5	9 ± 5	13 ± 5	13 ± 5
04/18/11 - 04/25/11	14 ± 5	14 ± 5	14 ± 5	23 ± 6	18 ± 6	15 ± 6
04/25/11 - 05/02/11	8 ± 5	< 7	8 ± 5	9 ± 5	9 ± 5	8 ± 5
05/02/11 - 05/09/11	15 ± 5	9 ± 4	13 ± 5	12 ± 5	16 ± 5	10 ± 5
05/09/11 - 05/16/11	(1)	6 ± 4	9 ± 4	8 ± 4	7 ± 4	< 6
05/16/11 - 05/23/11	14 ± 5	8 ± 4	9 ± 4	13 ± 4	10 ± 4	11 ± 4
05/23/11 - 05/31/11	18 ± 5	20 ± 5	22 ± 5	17 ± 5	22 ± 5	15 ± 4
05/31/11 - 06/06/11	19 ± 6	19 ± 6	18 ± 6	17 ± 5	14 ± 5	22 ± 6
06/06/11 - 06/13/11	21 ± 5	20 ± 5	21 ± 5	26 ± 6	22 ± 5	22 ± 5
06/13/11 - 06/20/11	12 ± 5	8 ± 5	14 ± 5	14 ± 5	12 ± 5	11 ± 5
06/20/11 - 06/27/11	12 ± 5	15 ± 5	15 ± 5	12 ± 5	11 ± 5	16 ± 5
06/27/11 - 07/05/11	14 ± 5	10 ± 5	16 ± 5	17 ± 5	11 ± 5	16 ± 5
07/05/11 - 07/11/11	15 ± 5	22 ± 6	24 ± 6	24 ± 6	20 ± 6	24 ± 6
07/11/11 - 07/18/11	13 ± 5	16 ± 5	21 ± 5	15 ± 5	9 ± 4	16 ± 5
07/18/11 - 07/25/11	19 ± 6	26 ± 6	22 ± 6	27 ± 6	17 ± 6	27 ± 6
07/25/11 - 08/01/11	17 ± 5	21 ± 5	24 ± 6	19 ± 5	20 ± 8	18 ± 5
08/01/11 - 08/08/11	17 ± 5	18 ± 5	18 ± 5	17 ± 5	23 ± 7	14 ± 5
08/08/11 - 08/15/11	12 ± 5	13 ± 5	15 ± 5	14 ± 5	9 ± 5	13 ± 5
08/15/11 - 08/22/11	17 ± 5	16 ± 5	18 ± 5	18 ± 5	16 ± 5	16 ± 5
08/22/11 - 08/29/11	10 ± 5	16 ± 5	11 ± 5	9 ± 5	10 ± 5	18 ± 6
08/29/11 - 09/05/11	26 ± 6	27 ± 6	28 ± 6	20 ± 5	24 ± 6	26 ± 6
09/05/11 - 09/12/11	9 ± 5	7 ± 5	7 ± 5	< 7	< 8	10 ± 5
09/12/11 - 09/19/11	21 ± 5	17 ± 5	23 ± 5	18 ± 5	18 ± 5	22 ± 5
09/19/11 - 09/26/11	19 ± 6	15 ± 6	15 ± 6	9 ± 5	10 ± 6	13 ± 5
09/26/11 - 10/03/11	< 6	10 ± 5	8 ± 5	8 ± 5	8 ± 5	8 ± 5
10/03/11 - 10/11/11	25 ± 5	25 ± 5	33 ± 5	24 ± 5	28 ± 5	28 ± 5
10/11/11 - 10/17/11	< 9	< 9	11 ± 6	12 ± 6	< 9	< 9
10/17/11 - 10/24/11	12 ± 5	12 ± 5	14 ± 5	12 ± 5	11 ± 5	17 ± 5
10/24/11 - 10/31/11	20 ± 5	14 ± 5	20 ± 5	17 ± 5	20 ± 6	21 ± 5
10/31/11 - 11/07/11	18 ± 6	15 ± 6	18 ± 6	18 ± 6	11 ± 5	16 ± 6
11/07/11 - 11/14/11	28 ± 6	27 ± 6	29 ± 6	29 ± 6	24 ± 6	29 ± 6
11/14/11 - 11/21/11	21 ± 6	19 ± 6	17 ± 6	19 ± 6	20 ± 6	23 ± 6
11/21/11 - 11/28/11	11 ± 5	12 ± 5	21 ± 6	18 ± 6	12 ± 6	19 ± 6
11/28/11 - 12/05/11	16 ± 5	16 ± 6	14 ± 6	15 ± 6	16 ± 6	13 ± 5
12/05/11 - 12/12/11	16 ± 5	13 ± 5	16 ± 5	17 ± 5	10 ± 5	15 ± 5
12/12/11 - 12/19/11	31 ± 6	27 ± 6	36 ± 6	27 ± 6	22 ± 5	24 ± 5
12/19/11 - 12/27/11	19 ± 5	14 ± 5	18 ± 5	18 ± 5	13 ± 5	16 ± 5
12/27/11 - 01/03/12	17 ± 5	18 ± 5	16 ± 5	13 ± 5	12 ± 5	17 ± 5
MEAN	17 ± 11	16 ± 13	18 ± 15	17 ± 12	16 ± 12	17 ± 11

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

(1) SEE PROGRAM EXCEPTIONS SECTION FOR EXPLANATION

TABLE C-V.2 **MONTHLY AND YEARLY MEAN VALUES OF GROSS BETA CONCENTRATIONS IN AIR PARTICULATE SAMPLES COLLECTED IN THE VICINITY OF LIMERICK GENERATING STATION, 2011**

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

GROUP I - ON-SITE LOCATIONS				GROUP II - INTERMEDIATE DISTANCE LOCATIONS				GROUP III - CONTROL LOCATIONS			
COLLECTION PERIOD	MIN	MAX	MEAN ± 2SD	COLLECTION PERIOD	MIN	MAX	MEAN ± 2SD	COLLECTION PERIOD	MIN	MAX	MEAN ± 2SD
01/03/11 - 01/31/11	12	34	21 ± 14	01/03/11 - 01/31/11	12	33	22 ± 14	01/03/11 - 01/31/11	14	28	20 ± 12
01/31/11 - 02/28/11	8	19	14 ± 7	01/31/11 - 02/28/11	10	22	15 ± 7	01/31/11 - 02/28/11	11	17	15 ± 6
02/28/11 - 03/28/11	10	38	16 ± 16	02/28/11 - 03/28/11	10	32	16 ± 14	02/28/11 - 03/28/11	11	28	16 ± 16
03/28/11 - 05/02/11	8	39	17 ± 17	03/28/11 - 05/02/11	9	30	18 ± 15	03/28/11 - 05/02/11	8	25	17 ± 14
05/02/11 - 05/31/11	6	22	13 ± 11	05/02/11 - 05/31/11	7	22	13 ± 10	05/02/11 - 05/31/11	10	15	12 ± 6
05/31/11 - 06/27/11	8	21	16 ± 8	05/31/11 - 06/27/11	11	26	16 ± 11	05/31/11 - 06/27/11	11	22	18 ± 10
06/27/11 - 08/01/11	10	26	19 ± 9	06/27/11 - 08/01/11	9	27	18 ± 11	06/27/11 - 08/01/11	16	27	20 ± 10
08/01/11 - 08/29/11	10	18	15 ± 6	08/01/11 - 08/29/11	9	23	14 ± 10	08/01/11 - 08/29/11	13	18	15 ± 4
08/29/11 - 10/03/11	7	28	17 ± 15	08/29/11 - 10/03/11	8	24	14 ± 12	08/29/11 - 10/03/11	8	26	16 ± 15
10/03/11 - 10/31/11	11	33	19 ± 15	10/03/11 - 10/31/11	11	28	18 ± 13	10/03/11 - 10/31/11	17	28	22 ± 11
10/31/11 - 11/28/11	11	29	20 ± 12	10/31/11 - 11/28/11	11	29	19 ± 12	10/31/11 - 11/28/11	16	29	22 ± 11
11/28/11 - 01/03/12	13	36	19 ± 13	11/28/11 - 01/03/12	10	27	16 ± 10	11/28/11 - 01/03/12	13	24	17 ± 9
01/03/11 - 01/03/12	6	39	17 ± 13	01/03/11 - 01/03/12	7	33	17 ± 12	01/03/11 - 01/03/12	8	29	17 ± 11

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

TABLE C-V.3 **CONCENTRATIONS OF GAMMA EMITTERS IN AIR PARTICULATE SAMPLES COLLECTED IN THE VICINITY OF LIMERICK GENERATING STATION, 2011**

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

SITE	COLLECTION PERIOD	Be-7	Mn-54	Co-58	Co-60	Cs-134	Cs-137
10S3	01/03 - 03/28/11	76 ± 27	< 3	< 4	< 3	< 2	< 3
	03/28 - 06/27/11	96 ± 45	< 4	< 6	< 4	< 4	< 4
	06/27 - 10/03/11	50 ± 38	< 3	< 5	< 3	< 3	< 3
	10/03 - 01/03/12	60 ± 15	< 2	< 2	< 2	< 2	< 2
	MEAN	71 ± 39	-	-	-	-	-
11S1	01/03 - 03/28/11	89 ± 27	< 3	< 3	< 2	< 2	< 3
	03/28 - 06/27/11	79 ± 26	< 3	< 4	< 2	< 2	< 2
	06/27 - 10/03/11	65 ± 31	< 4	< 4	< 4	< 4	< 3
	10/03 - 01/03/12	66 ± 13	< 2	< 2	< 2	< 2	< 2
	MEAN	75 ± 23	-	-	-	-	-
13C1	01/03 - 03/28/11	55 ± 26	< 3	< 4	< 4	< 3	< 3
	03/28 - 06/27/11	86 ± 26	< 3	< 3	< 3	< 3	< 3
	06/27 - 10/03/11	68 ± 23	< 3	< 4	< 3	< 3	< 1
	10/03 - 01/03/12	62 ± 22	< 3	< 2	< 3	< 2	< 3
	MEAN	68 ± 27	-	-	-	-	-
14S1	01/03 - 03/28/11	72 ± 25	< 2	< 4	< 2	< 3	< 2
	03/28 - 06/27/11	74 ± 34	< 2	< 3	< 3	< 2	< 3
	06/27 - 10/03/11	69 ± 29	< 4	< 4	< 4	< 4	< 3
	10/03 - 01/03/12	82 ± 22	< 2	< 3	< 3	< 3	< 3
	MEAN	74 ± 11	-	-	-	-	-
22G1	01/03 - 03/28/11	80 ± 22	< 2	< 3	< 3	< 3	< 2
	03/07 - 03/14/11	**< 329**	**< 30**	**< 34**	**< 30**	**< 37**	**< 29**
	03/14 - 03/22/11	**< 243**	**< 20**	**< 22**	**< 31**	**< 28**	**< 25**
	03/22 - 03/28/11	**< 226**	**< 28**	**< 24**	**< 33**	**< 34**	**< 32**
	03/28 - 04/04/11	**< 280**	**< 38**	**< 33**	**< 31**	**< 45**	**< 35**
	03/28 - 06/27/11	80 ± 35	< 3	< 5	< 2	< 2	< 2
	04/04 - 04/11/11	**< 293**	**< 39**	**< 29**	**< 37**	**< 31**	**< 31**
	06/27 - 10/03/11	83 ± 33	< 3	< 6	< 3	< 3	< 3
	10/03 - 01/03/12	60 ± 22	< 3	< 3	< 4	< 3	< 3
	MEAN	76 ± 22	-	-	-	-	-
6C1	01/03 - 03/28/11	104 ± 34	< 3	< 4	< 3	< 3	< 4
	03/28 - 06/27/11	88 ± 26	< 3	< 3	< 3	< 2	< 3
	06/27 - 10/03/11	70 ± 26	< 2	< 3	< 2	< 2	< 2
	10/03 - 01/03/12	81 ± 14	< 1	< 2	< 2	< 2	< 2
	MEAN	86 ± 29	-	-	-	-	-

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

BOLDED VALUES INDICATE ADDITIONAL SAMPLING DUE TO THE FUKUSHIMA EVENT

TABLE C-VI.1 CONCENTRATIONS OF I-131 IN AIR IODINE SAMPLES COLLECTED IN THE VICINITY OF LIMERICK GENERATING STATION, 2011

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

COLLECTION	GROUP I			GROUP II		GROUP III
PERIOD	10S3	11S1	14S1	6C1	13C1	22G1
01/03/11 - 01/10/11	< 21	< 38	< 50	< 39	< 38	< 51
01/10/11 - 01/17/11	< 51	< 52	< 62	< 52	< 61	< 63
01/17/11 - 01/24/11	< 27	< 27	< 29	< 27	< 28	< 29
01/24/11 - 01/31/11	< 39	< 39	< 60	< 40	< 59	< 60
01/31/11 - 02/07/11	< 22	< 22	< 36	< 22	< 12	< 37
02/07/11 - 02/14/11	< 20	< 21	< 30	< 21	< 30	< 30
02/14/11 - 02/21/11	< 64	< 66	< 22	< 64	< 51	(1)
02/21/11 - 02/28/11	< 59	< 59	< 49	< 60	< 48	< 59
02/28/11 - 03/07/11	< 42	< 58	< 58	< 43	< 58	< 25
03/07/11 - 03/14/11	< 50	< 50	< 51	< 50	< 50	< 67
03/14/11 - 03/22/11	< 23	< 25	< 25	< 28	< 20	< 25
03/22/11 - 03/28/11	63 ± 29	89 ± 30	< 33	< 53	100 ± 22	< 55
03/28/11 - 04/04/11	76 ± 30	70 ± 18	70 ± 17	24 ± 18	70 ± 23	59 ± 20
04/04/11 - 04/11/11	41 ± 24	< 30	28 ± 18	< 36	< 34	< 39
04/11/11 - 04/18/11	< 31	< 27	< 37	< 38	< 41	< 26
04/18/11 - 04/25/11	< 34	< 35	< 36	< 35	< 35	< 36
04/25/11 - 05/02/11	< 58	< 58	< 66	< 59	< 66	< 66
05/02/11 - 05/09/11	< 48	< 48	< 51	< 48	< 50	< 52
05/09/11 - 05/16/11	(1)	< 60	< 50	< 60	< 49	< 50
05/16/11 - 05/23/11	< 35	< 31	< 45	< 30	< 44	< 45
05/23/11 - 05/31/11	< 32	< 32	< 39	< 33	< 38	< 38
05/31/11 - 06/06/11	< 69	< 69	< 52	< 69	< 51	< 53
06/06/11 - 06/13/11	< 52	< 52	< 46	< 53	< 45	< 46
06/13/11 - 06/20/11	< 34	< 34	< 32	< 34	< 32	< 33
06/20/11 - 06/27/11	< 26	< 62	< 54	< 61	< 62	< 52
06/27/11 - 07/05/11	< 26	< 26	< 37	< 26	< 38	< 37
07/05/11 - 07/11/11	< 36	< 37	< 56	< 37	< 57	< 55
07/11/11 - 07/18/11	< 23	< 24	< 25	< 23	< 25	< 24
07/18/11 - 07/25/11	< 53	< 54	< 51	< 54	< 29	< 50
07/25/11 - 08/01/11	< 54	< 56	< 36	< 55	< 54	< 35
08/01/11 - 08/08/11	< 18	< 18	< 14	< 18	< 19	< 14
08/08/11 - 08/15/11	< 37	< 38	< 61	< 38	< 61	< 58
08/15/11 - 08/22/11	< 58	< 59	< 62	< 58	< 63	< 33
08/22/11 - 08/29/11	< 29	< 30	< 28	< 30	< 28	< 31
08/29/11 - 09/05/11	< 37	< 38	< 49	< 21	< 50	< 48
09/05/11 - 09/12/11	< 48	< 49	< 51	< 49	< 61	< 50
09/12/11 - 09/19/11	< 19	< 45	< 39	< 45	< 46	< 39
09/19/11 - 09/26/11	< 39	< 40	< 33	< 40	< 33	< 32
09/26/11 - 10/03/11	< 25	< 25	< 29	< 25	< 30	< 28
10/03/11 - 10/11/11	< 20	< 20	< 31	< 20	< 31	< 30
10/11/11 - 10/17/11	< 42	< 42	< 59	< 42	< 24	< 58
10/17/11 - 10/24/11	< 37	< 37	< 11	< 37	< 11	< 6
10/24/11 - 10/31/11	< 38	< 39	< 49	< 40	< 50	< 47
10/31/11 - 11/07/11	< 47	< 48	< 53	< 48	< 53	< 52
11/07/11 - 11/14/11	< 16	< 16	< 22	< 16	< 23	< 22
11/14/11 - 11/21/11	< 47	< 48	< 68	< 48	< 69	< 66
11/21/11 - 11/28/11	< 42	< 42	< 38	< 18	< 43	< 37
11/28/11 - 12/05/11	< 44	< 45	< 30	< 45	< 31	< 30
12/05/11 - 12/12/11	< 20	< 36	< 40	< 36	< 37	< 39
12/12/11 - 12/19/11	< 39	< 40	< 40	< 40	< 40	< 39
12/19/11 - 12/27/11	< 31	< 32	< 30	< 32	< 32	< 29
12/27/11 - 01/03/12	< 23	< 23	< 41	< 23	< 41	< 40
MEAN	60 ± 36	79 ± 27	49 ± 59	-	85 ± 41	-

(1) SEE PROGRAM EXCEPTIONS SECTION FOR EXPLANATION

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

TABLE C-VII.1 CONCENTRATIONS OF I-131 IN MILK SAMPLES COLLECTED IN THE VICINITY OF LIMERICK GENERATING STATION, 2011

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

	CONTROL FARM		INDICATOR FARM			
COLLECTION DATE	23F1	36E1	10F4	18E1	19B1	25C1
01/11/11	< 0.4	< 0.5	< 0.6	< 0.5	< 0.5	< 0.6
02/16/11	< 0.4		< 0.5	< 0.6	< 0.4	< 0.9
03/15/11	< 0.5		< 0.7	< 0.6	< 0.8	< 0.7
03/23/11	**< 0.3**					
03/30/11	**< 0.4**					
04/05/11	< 0.6	< 0.9	< 0.8	< 0.7	< 0.5	< 0.8
04/13/11	**< 0.2**					
04/19/11	< 0.4		< 0.6	< 0.4	< 0.4	< 0.7
04/25/11	**< 0.6**					
05/04/11	< 0.6		< 0.4	< 0.5	< 0.6	< 0.6
05/17/11	< 0.3		< 0.4	< 0.4	< 0.3	< 0.4
05/31/11	< 0.5		< 0.6	< 0.4	< 0.4	< 0.5
06/14/11	< 0.7		< 0.8	< 0.6	< 0.8	< 0.9
06/28/11	< 0.5		< 0.5	< 0.5	< 0.9	< 0.7
07/12/11	< 0.7	< 0.7	< 0.8	< 0.8	< 0.9	< 0.9
07/26/11	< 0.6		< 1.0	< 0.7	< 0.9	< 0.8
08/09/11	< 0.5		< 0.7	< 0.6	< 0.7	< 0.8
08/23/11	< 0.6		< 0.6	< 0.5	< 0.7	< 0.8
09/06/11	< 0.5		< 0.6	< 0.5	< 0.6	< 0.7
09/20/11	< 0.5		< 0.7	< 0.6	< 0.6	< 0.6
10/04/11	< 0.5	< 0.7	< 0.9	< 0.7	< 0.6	< 0.8
10/18/11	< 0.5		< 0.7	< 0.7	< 0.7	< 0.7
11/01/11	< 0.6		< 0.7	< 0.6	< 0.7	< 0.8
11/15/11	< 0.8		< 0.6	< 0.7	< 0.6	< 0.8
11/29/11	< 0.6		< 0.5	< 0.6	< 0.7	< 0.6
12/13/11	< 0.5		< 0.6	< 0.6	< 0.7	< 0.6
MEAN	-	-	-	-	-	-

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

BOLDED VALUES INDICATE ADDITIONAL SAMPLING DUE TO THE FUKUSHIMA EVENT

TABLE C-VII.2 CONCENTRATIONS OF GAMMA EMITTERS IN MILK SAMPLES COLLECTED IN THE VICINITY OF LIMERICK GENERATING STATION, 2011

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION PERIOD	K-40	Cs-134	Cs-137	Ba-140	La-140
10F4	01/11/11	1420 ± 125	< 5	< 6	< 36	< 11
	02/15/11	1290 ± 168	< 7	< 8	< 56	< 14
	03/15/11	1340 ± 160	< 7	< 7	< 51	< 15
	04/05/11	1390 ± 134	< 5	< 5	< 49	< 10
	04/19/11	1260 ± 138	< 5	< 6	< 48	< 13
	05/04/11	1290 ± 119	< 5	< 4	< 32	< 11
	05/17/11	1340 ± 123	< 4	< 5	< 32	< 9
	05/31/11	1200 ± 120	< 5	< 5	< 55	< 12
	06/14/11	1210 ± 155	< 5	< 5	< 31	< 13
	06/28/11	788 ± 104	< 5	< 6	< 43	< 12
	07/12/11	709 ± 170	< 7	< 10	< 35	< 12
	07/26/11	404 ± 138	< 7	< 8	< 39	< 13
	08/09/11	402 ± 114	< 7	< 7	< 35	< 10
	08/23/11	639 ± 137	< 7	< 7	< 32	< 7
	09/06/11	1140 ± 136	< 5	< 5	< 25	< 7
	09/20/11	669 ± 119	< 6	< 6	< 34	< 10
	10/04/11	734 ± 152	< 8	< 7	< 48	< 9
	10/18/11	482 ± 127	< 8	< 7	< 33	< 14
	11/01/11	1230 ± 144	< 5	< 6	< 33	< 8
	11/15/11	1030 ± 242	< 9	< 10	< 32	< 12
	11/29/11	1340 ± 178	< 7	< 7	< 29	< 13
	12/13/11	1040 ± 182	< 8	< 9	< 42	< 13
	MEAN	1016 ± 688	-	-	-	-
18E1	01/11/11	1100 ± 97	< 4	< 5	< 25	< 8
	02/15/11	1180 ± 143	< 6	< 7	< 42	< 13
	03/15/11	1270 ± 141	< 6	< 7	< 55	< 15
	04/05/11	1190 ± 129	< 4	< 5	< 43	< 15
	04/19/11	1040 ± 122	< 5	< 5	< 44	< 10
	05/03/11	924 ± 132	< 5	< 6	< 46	< 11
	05/17/11	1190 ± 126	< 5	< 5	< 40	< 10
	05/31/11	1110 ± 119	< 6	< 5	< 50	< 14
	06/14/11	1220 ± 169	< 6	< 6	< 50	< 14
	06/28/11	1270 ± 141	< 6	< 6	< 44	< 15
	07/12/11	1210 ± 197	< 8	< 9	< 39	< 13
	07/26/11	1180 ± 170	< 8	< 8	< 37	< 8
	08/09/11	923 ± 123	< 5	< 6	< 24	< 6
	08/23/11	924 ± 144	< 6	< 7	< 26	< 7
	09/06/11	1060 ± 165	< 6	< 5	< 32	< 11
	09/20/11	1040 ± 141	< 5	< 5	< 27	< 7
	10/04/11	1140 ± 160	< 11	< 11	< 50	< 10
	10/18/11	1100 ± 151	< 6	< 8	< 31	< 12
	11/01/11	1310 ± 171	< 8	< 7	< 42	< 9
	11/15/11	1280 ± 56	< 2	< 2	< 37	< 10
	11/29/11	1140 ± 155	< 7	< 7	< 32	< 10
	12/13/11	1220 ± 154	< 6	< 6	< 31	< 11
	MEAN	1137 ± 231	-	-	-	-

TABLE C-VII.2 CONCENTRATIONS OF GAMMA EMITTERS IN MILK SAMPLES COLLECTED IN THE VICINITY OF LIMERICK GENERATING STATION, 2011

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION PERIOD	K-40	Cs-134	Cs-137	Ba-140	La-140
19B1	01/11/11	1180 ± 124	< 5	< 6	< 34	< 9
	02/15/11	1340 ± 143	< 5	< 6	< 35	< 8
	03/15/11	1270 ± 149	< 7	< 6	< 54	< 15
	04/05/11	1220 ± 120	< 4	< 4	< 39	< 12
	04/19/11	1360 ± 129	< 5	< 6	< 41	< 12
	05/03/11	1220 ± 142	< 5	< 6	< 43	< 15
	05/17/11	1220 ± 137	< 6	< 6	< 41	< 13
	05/31/11	1210 ± 98	< 4	< 4	< 40	< 15
	06/14/11	1130 ± 148	< 6	< 6	< 46	< 8
	06/28/11	1310 ± 159	< 6	< 7	< 50	< 12
	07/12/11	1330 ± 178	< 9	< 8	< 38	< 7
	07/26/11	1250 ± 173	< 5	< 7	< 29	< 5
	08/09/11	1350 ± 148	< 6	< 6	< 30	< 7
	08/23/11	1350 ± 176	< 7	< 6	< 36	< 9
	09/06/11	1380 ± 129	< 5	< 7	< 30	< 7
	09/20/11	1260 ± 126	< 5	< 6	< 31	< 7
	10/04/11	1210 ± 176	< 7	< 9	< 37	< 12
	10/18/11	1450 ± 174	< 8	< 8	< 37	< 10
	11/01/11	1150 ± 185	< 5	< 8	< 33	< 13
	11/15/11	1300 ± 162	< 6	< 7	< 32	< 8
	11/29/11	1300 ± 127	< 5	< 6	< 30	< 8
	12/13/11	1310 ± 150	< 6	< 7	< 37	< 9
	MEAN	1277 ± 160	-	-	-	-
25C1	01/11/11	1270 ± 104	< 4	< 4	< 25	< 5
	02/15/11	1280 ± 144	< 5	< 7	< 42	< 12
	03/15/11	1340 ± 130	< 5	< 5	< 49	< 13
	04/05/11	1300 ± 134	< 3	< 5	< 42	< 12
	04/19/11	1250 ± 116	< 4	< 5	< 35	< 10
	05/03/11	1320 ± 148	< 6	< 6	< 41	< 13
	05/17/11	1280 ± 154	< 6	< 7	< 48	< 13
	05/31/11	1220 ± 129	< 5	< 6	< 60	< 13
	06/14/11	1250 ± 144	< 5	< 8	< 43	< 12
	06/28/11	1290 ± 124	< 4	< 5	< 39	< 13
	07/12/11	1300 ± 179	< 7	< 7	< 35	< 11
	07/26/11	1270 ± 127	< 5	< 5	< 24	< 6
	08/09/11	1260 ± 126	< 6	< 6	< 29	< 9
	08/23/11	1130 ± 176	< 7	< 7	< 31	< 13
	09/06/11	1430 ± 177	< 6	< 6	< 30	< 10
	09/20/11	1410 ± 144	< 5	< 5	< 32	< 12
	10/04/11	1270 ± 196	< 6	< 8	< 41	< 14
	10/18/11	1100 ± 141	< 7	< 7	< 36	< 9
	11/01/11	1230 ± 168	< 8	< 7	< 39	< 12
	11/15/11	1220 ± 176	< 7	< 8	< 42	< 14
	11/29/11	1180 ± 126	< 5	< 5	< 23	< 4
	12/13/11	1180 ± 151	< 7	< 7	< 30	< 11
	MEAN	1263 ± 155	-	-	-	-

TABLE C-VII.2 CONCENTRATIONS OF GAMMA EMITTERS IN MILK SAMPLES COLLECTED IN THE VICINITY OF LIMERICK GENERATING STATION, 2011

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION PERIOD	K-40	Cs-134	Cs-137	Ba-140	La-140
23F1	01/11/11	1300 ± 126	< 5	< 6	< 32	< 8
	02/16/11	1170 ± 131	< 5	< 7	< 51	< 12
	03/15/11	1160 ± 100	< 5	< 5	< 37	< 14
	03/23/11	**1270 ± 116**	**< 5**	**< 6**	**< 49**	**< 14**
	03/30/11	**1310 ± 213**	**< 8**	**< 12**	**< 33**	**< 10**
	04/05/11	1320 ± 135	< 3	< 4	< 42	< 9
	04/13/11	**1120 ± 53**	**< 1**	**< 1**	**< 19**	**< 4**
	04/19/11	1210 ± 120	< 5	< 5	< 39	< 13
	04/25/11	**1120 ± 149**	**< 5**	**< 6**	**< 44**	**< 13**
	05/03/11	1120 ± 126	< 6	< 6	< 37	< 9
	05/17/11	1170 ± 128	< 5	< 6	< 44	< 11
	05/31/11	1210 ± 74	< 3	< 3	< 31	< 9
	06/14/11	1340 ± 125	< 5	< 6	< 39	< 13
	06/28/11	1260 ± 145	< 6	< 7	< 48	< 14
	07/12/11	1160 ± 174	< 7	< 8	< 32	< 11
	07/26/11	1240 ± 129	< 5	< 6	< 25	< 7
	08/09/11	1180 ± 166	< 6	< 6	< 29	< 10
	08/23/11	1200 ± 139	< 6	< 6	< 31	< 9
	09/06/11	1290 ± 166	< 7	< 9	< 38	< 14
	09/20/11	1280 ± 141	< 5	< 6	< 31	< 9
	10/04/11	1360 ± 176	< 10	< 11	< 52	< 11
	10/18/11	1080 ± 146	< 7	< 8	< 37	< 13
	11/01/11	1320 ± 198	< 6	< 7	< 45	< 9
	11/15/11	1330 ± 186	< 7	< 8	< 39	< 12
	11/29/11	1430 ± 167	< 6	< 7	< 31	< 9
	12/13/11	1250 ± 150	< 7	< 8	< 31	< 12
	MEAN	1238 ± 176	-	-	-	-
36E1	01/11/11	1030 ± 162	< 4	< 6	< 23	< 7
	04/05/11	1170 ± 96	< 4	< 5	< 43	< 14
	07/12/11	1110 ± 173	< 7	< 7	< 41	< 11
	10/04/11	1070 ± 149	< 9	< 9	< 38	< 10
	MEAN	1095 ± 119	-	-	-	-

BOLDED VALUES INDICATE ADDITIONAL SAMPLING DUE TO THE FUKUSHIMA EVENT

TABLE C-VIII.1 **CONCENTRATIONS OF GAMMA EMITTERS IN BROAD LEAFY VEGETATION SAMPLES COLLECTED IN THE VICINITY OF LIMERICK GENERATING STATION, 2011**

RESULTS IN UNITS OF PCI/KG WET ± 2 SIGMA

SITE	COLLECTION PERIOD		Be-7	K-40	Mn-54	Co-58	Co-60	I-131	Cs-134	Cs-137	Ra-226	Th-228	Th-232
11S3	06/28/11	Cabbage	- (1)	-	-	-	-	-	-	-	-	-	-
	06/28/11	Collards	- (1)	-	-	-	-	-	-	-	-	-	-
	06/28/11	Kale	- (1)	-	-	-	-	-	-	-	-	-	-
	07/25/11	Cabbage	< 226 (1)	5750 ± 561	< 18	< 25	< 21	< 47	< 21	< 25	< 554	< 41	< 90
	07/25/11	Kale	< 213 (1)	6340 ± 516	< 20	< 27	< 29	< 53	< 23	< 25	< 595	< 40	< 103
	07/25/11	Swiss Chard	< 266 (1)	6870 ± 628	< 28	< 29	< 32	< 58	< 28	< 34	< 620	< 50	< 117
	08/18/11	Cabbage	< 67	2490 ± 273	< 6	< 8	< 7	< 12	< 7	< 7	845 ± 263	18 ± 14	< 42
	08/18/11	Collards	< 193	3530 ± 414	< 17	< 21	< 21	< 35	< 21	< 22	< 494	< 36	< 88
	08/18/11	Kale	< 219	3210 ± 489	< 24	< 24	< 29	< 29	< 21	< 24	< 482	< 39	< 102
	09/19/11	Collards	478 ± 180	3520 ± 456	< 22	< 21	< 26	< 43	< 20	< 23	< 433	41 ± 28	< 96
	09/19/11	Kale	595 ± 226	3460 ± 609	< 27	< 33	< 32	< 54	< 22	< 26	< 568	< 42	< 105
	09/19/11	Swiss Chard	1020 ± 224	4460 ± 440	< 18	< 20	< 25	< 43	< 17	< 20	< 473	56 ± 32	< 82
	10/12/11	Cabbage	406 ± 230	3240 ± 608	< 29	< 28	< 35	< 47	< 26	< 31	< 634	< 60	< 126
	10/12/11	Collards	384 ± 273	3640 ± 692	< 37	< 34	< 44	< 54	< 31	< 33	< 765	< 53	< 148
	10/12/11	Kale	< 212	2300 ± 428	< 27	< 25	< 33	< 46	< 24	< 25	< 542	43 ± 31	< 105
	MEAN		577 ± 522	4068 ± 2965	-	-	-	-	-	-	-	39 ± 31	-
13S3	06/28/11	Cabbage	< 123	4880 ± 318	< 12	< 15	< 14	< 53	< 12	< 13	1830 ± 385	< 22	< 56
	06/28/11	Collards	< 149	4950 ± 392	< 15	< 16	< 20	< 58	< 15	< 16	1430 ± 403	< 27	< 64
	06/28/11	Kale	< 99	5820 ± 277	< 9	< 11	< 11	< 58	< 9	< 10	1350 ± 291	31 ± 17	< 40
	07/25/11	Cabbage	< 208	5690 ± 521	< 22	< 21	< 30	< 51	< 25	< 24	2590 ± 651	< 42	< 110
	07/25/11	Collards	< 245	6330 ± 571	< 24	< 26	< 28	< 56	< 23	< 22	3200 ± 750	< 43	< 100
	07/25/11	Kale	< 239	6730 ± 668	< 24	< 31	< 34	< 51	< 25	< 22	764 ± 573	< 53	< 110
	08/18/11	Cabbage	< 113	1880 ± 367	< 17	< 14	< 18	< 23	< 12	< 15	< 361	< 29	< 60
	08/18/11	Collards	219 ± 124	3290 ± 358	< 14	< 13	< 18	< 28	< 15	< 17	< 357	< 26	< 76
	08/18/11	Kale	230 ± 196	3620 ± 408	< 20	< 18	< 22	< 30	< 17	< 18	< 449	< 40	< 90
	09/19/11	Collards	533 ± 176	3740 ± 502	< 24	< 20	< 24	< 47	< 20	< 23	1460 ± 718	< 43	< 99
	09/19/11	Kale	344 ± 200	4540 ± 705	< 26	< 27	< 25	< 49	< 24	< 26	< 629	< 46	< 92
	09/19/11	Swiss Chard	746 ± 242	5770 ± 549	< 20	< 21	< 25	< 43	< 19	< 22	1760 ± 520	< 45	< 96
	10/12/11	Collards	428 ± 309	4200 ± 683	< 31	< 32	< 44	< 48	< 29	< 35	978 ± 761	< 60	< 136
	10/12/11	Kale	265 ± 221	4520 ± 552	< 24	< 20	< 27	< 41	< 22	< 24	< 541	68 ± 51	< 94
	10/12/11	Swiss Chard	476 ± 228	4170 ± 585	< 23	< 24	< 23	< 36	< 25	< 21	< 704	< 51	< 120
	MEAN		405 ± 360	4675 ± 2556	-	-	-	-	-	-	1707 ± 1535	49 ± 52	-

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

TABLE C-VIII.1 **CONCENTRATIONS OF GAMMA EMITTERS IN BROAD LEAFY VEGETATION SAMPLES COLLECTED IN THE VICINITY OF LIMERICK GENERATING STATION, 2011**

RESULTS IN UNITS OF PCI/KG WET ± 2 SIGMA

SITE	COLLECTION PERIOD		Be-7	K-40	Mn-54	Co-58	Co-60	I-131	Cs-134	Cs-137	Ra-226	Th-228	Th-232
31G1	06/28/11	Cabbage	170 ± 97	5060 ± 229	< 9	< 10	< 10	< 50	< 8	< 9	266 ± 180	24 ± 14	< 37
	06/28/11	Kale	192 ± 99	5730 ± 289	< 12	< 13	< 15	< 59	< 10	< 12	< 228	39 ± 17	< 49
	06/28/11	Lettuce	328 ± 91	6950 ± 253	< 9	< 9	< 12	< 32	< 8	< 9	< 171	< 14	< 39
	07/25/11	Broccoli Leaves	245 ± 171	6940 ± 520	< 18	< 18	< 20	< 40	< 17	< 17	< 462	< 33	< 80
	07/25/11	Cabbage	< 207	5640 ± 580	< 27	< 29	< 36	< 46	< 22	< 23	< 394	< 38	< 97
	07/25/11	Kale	< 178	2930 ± 337	< 16	< 18	< 19	< 36	< 16	< 19	< 415	< 37	< 65
	08/18/11	Cabbage	< 111	3630 ± 481	< 13	< 13	< 12	< 18	< 11	< 14	< 287	< 24	< 65
	08/18/11	Kale	632 ± 241	3080 ± 695	< 30	< 28	< 34	< 34	< 23	< 30	< 541	< 52	< 100
	08/18/11	Squash Leaves	2040 ± 294	5480 ± 592	< 23	< 22	< 31	< 31	< 19	< 19	< 469	< 46	< 101
	09/19/11	Broccoli Leaves	1270 ± 264	4900 ± 622	< 23	< 22	< 29	< 59	< 23	< 24	< 569	< 48	< 110
	09/19/11	Cabbage	350 ± 244	3490 ± 469	< 19	< 16	< 22	< 48	< 19	< 23	< 451	53 ± 38	< 81
	09/19/11	Kale	2030 ± 345	6680 ± 740	< 25	< 26	< 28	< 52	< 25	< 25	< 541	125 ± 40	< 122
	10/12/11	Broccoli Leaves	1410 ± 444	3810 ± 485	< 25	< 27	< 22	< 46	< 30	< 27	< 719	< 56	< 109
	10/12/11	Cabbage	674 ± 309	4530 ± 646	< 31	< 25	< 37	< 55	< 24	< 29	< 664	< 47	< 111
	10/12/11	Cauliflower Leaves	695 ± 166	3550 ± 394	< 18	< 16	< 27	< 30	< 19	< 17	< 392	< 34	< 81
	MEAN		836 ± 1373	4827 ± 2777	-	-	-	-	-	-	-	60 ± 90	-

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

TABLE C-IX.1 QUARTERLY TLD RESULTS FOR LIMERICK GENERATING STATION, 2011

RESULTS IN UNITS OF MILLI-ROENTGEN/STD. MONTH ± 2 STANDARD DEVIATIONS

STATION CODE	MEAN ± 2 S.D.	JAN - MAR	APR - JUN	JUL - SEP	OCT - DEC
2E1	7.3 ± 1.2	7.0 ± 0.7	6.6 ± 0.9	7.9 ± 0.6	7.6 ± 0.9
3S1	7.2 ± 1.3	7.0 ± 0.5	6.5 ± 0.7	7.2 ± 0.6	8.1 ± 0.7
4E1	5.9 ± 1.1	6.1 ± 0.6	5.3 ± 0.7	6.5 ± 1.4	5.6 ± 0.9
5H1	8.4 ± 1.1	8.4 ± 0.6	7.7 ± 0.8	8.4 ± 0.8	9.1 ± 0.7
5S1	8.0 ± 1.5	7.6 ± 0.6	7.2 ± 0.6	8.2 ± 0.5	8.9 ± 0.9
6C1	7.1 ± 0.8	7.2 ± 0.7	6.5 ± 0.3	7.3 ± 0.2	7.4 ± 0.6
7E1	7.3 ± 1.2	7.2 ± 1.1	6.6 ± 0.2	8.1 ± 1.2	7.4 ± 0.7
7S1	7.5 ± 1.6	7.1 ± 0.6	6.7 ± 0.5	7.7 ± 0.6	8.5 ± 0.5
9C1	7.0 ± 1.1	7.5 ± 1.0	6.2 ± 0.7	7.2 ± 0.4	7.0 ± 1.6
10E1	7.3 ± 1.2	7.6 ± 0.5	6.5 ± 0.5	7.9 ± 1.2	7.2 ± 0.6
10F3	7.3 ± 0.7	7.4 ± 0.6	6.8 ± 0.4	7.6 ± 0.5	7.4 ± 0.7
10S3	7.5 ± 1.5	7.0 ± 0.3	6.7 ± 0.5	7.8 ± 0.7	8.4 ± 0.4
11S1	8.5 ± 1.7	8.2 ± 0.4	7.4 ± 0.4	9.2 ± 1.8	9.2 ± 0.7
13C1	5.4 ± 0.8	5.7 ± 0.6	4.8 ± 0.5	5.6 ± 0.7	5.6 ± 0.5
13E1	7.1 ± 1.2	7.8 ± 0.9	6.4 ± 0.4	7.0 ± 0.4	7.2 ± 0.9
13S2	9.9 ± 1.7	9.9 ± 1.4	8.8 ± 0.6	10.1 ± 0.6	10.9 ± 0.8
14S1	6.7 ± 1.1	6.8 ± 0.5	6.1 ± 0.5	7.4 ± 1.3	6.4 ± 0.5
15D1	7.4 ± 0.7	7.3 ± 0.7	6.9 ± 0.3	7.4 ± 0.7	7.8 ± 0.6
16F1	7.2 ± 0.6	7.3 ± 0.8	6.8 ± 0.4	7.5 ± 0.9	7.0 ± 1.1
17B1	7.0 ± 0.8	7.2 ± 0.4	6.4 ± 0.7	7.0 ± 0.6	7.2 ± 0.8
18S2	7.7 ± 1.0	7.8 ± 0.9	7.0 ± 0.5	7.9 ± 0.4	8.1 ± 0.7
19D1	6.7 ± 0.8	6.6 ± 0.3	6.1 ± 0.6	6.9 ± 0.3	7.0 ± 1.0
20D1	6.5 ± 0.9	7.0 ± 0.3	5.9 ± 0.5	6.6 ± 0.5	6.6 ± 0.5
20F1	7.0 ± 0.9	7.1 ± 0.9	6.4 ± 0.5	6.9 ± 0.6	7.5 ± 0.9
21S2	6.6 ± 1.0	6.7 ± 0.6	6.0 ± 0.3	6.6 ± 1.4	7.2 ± 0.6
23S2	6.6 ± 1.0	6.8 ± 0.3	5.9 ± 0.6	6.8 ± 0.6	7.0 ± 0.7
24D1	6.2 ± 1.1	6.5 ± 0.6	5.4 ± 0.4	6.5 ± 0.8	6.5 ± 0.8
25D1	6.1 ± 0.8	6.3 ± 1.2	5.5 ± 0.3	6.0 ± 0.6	6.4 ± 0.5
25S2	6.3 ± 1.1	5.9 ± 0.5	5.7 ± 0.3	6.7 ± 0.3	6.7 ± 0.5
26S3	6.5 ± 1.2	6.2 ± 0.5	5.8 ± 0.4	6.7 ± 1.0	7.2 ± 0.7
28D2	6.6 ± 0.5	6.7 ± 0.8	6.2 ± 0.4	6.6 ± 0.8	6.8 ± 1.1
29E1	6.8 ± 1.2	7.1 ± 0.7	6.1 ± 0.5	6.5 ± 0.7	7.4 ± 1.1
29S1	6.5 ± 0.8	6.9 ± 0.7	5.9 ± 0.5	6.6 ± 0.7	6.6 ± 0.6
31D1	8.2 ± 1.1	8.5 ± 0.3	7.4 ± 0.4	8.4 ± 0.4	8.6 ± 0.7
31D2	7.3 ± 1.1	7.2 ± 0.7	6.6 ± 0.5	7.5 ± 0.5	7.9 ± 0.8
31S1	7.3 ± 1.0	7.4 ± 0.4	6.7 ± 0.6	7.9 ± 1.0	7.0 ± 0.8
34E1	7.0 ± 0.8	7.3 ± 0.4	6.4 ± 0.5	7.0 ± 0.6	7.3 ± 0.5
34S2	7.2 ± 0.8	7.0 ± 0.3	6.9 ± 0.8	7.2 ± 0.8	7.8 ± 0.7
36D1	6.6 ± 0.5	6.3 ± 1.4	6.8 ± 1.7	6.7 ± 0.6	6.4 ± 0.8
36S2	7.4 ± 1.1	7.1 ± 1.1	6.9 ± 0.6	7.4 ± 0.4	8.2 ± 1.3

TABLE C-IX.2 **MEAN QUARTERLY TLD RESULTS FOR THE SITE BOUNDARY, INTERMEDIATE AND CONTROL LOCATIONS FOR LIMERICK GENERATING STATION, 2011**

RESULTS IN UNITS OF MILLI-ROENTGEN/STD. MONTH ± 2 STANDARD DEVIATIONS OF THE STATION DATA

COLLECTION PERIOD	SITE BOUNDARY ± 2 S.D.	INTERMEDIATE	CONTROL
JAN-MAR	7.2 ± 1.8	7.0 ± 1.2	8.4 ± 0.0
APR-JUN	6.6 ± 1.6	6.3 ± 1.2	7.7 ± 0.0
JUL-SEP	7.6 ± 1.9	7.1 ± 1.3	8.4 ± 0.0
OCT-DEC	7.9 ± 2.3	7.1 ± 1.4	9.1 ± 0.0

TABLE C-IX.3 **SUMMARY OF THE AMBIENT DOSIMETRY PROGRAM FOR LIMERICK GENERATING STATION, 2011**

RESULTS IN UNITS OF MILLI-ROENTGEN/STD. MONTH

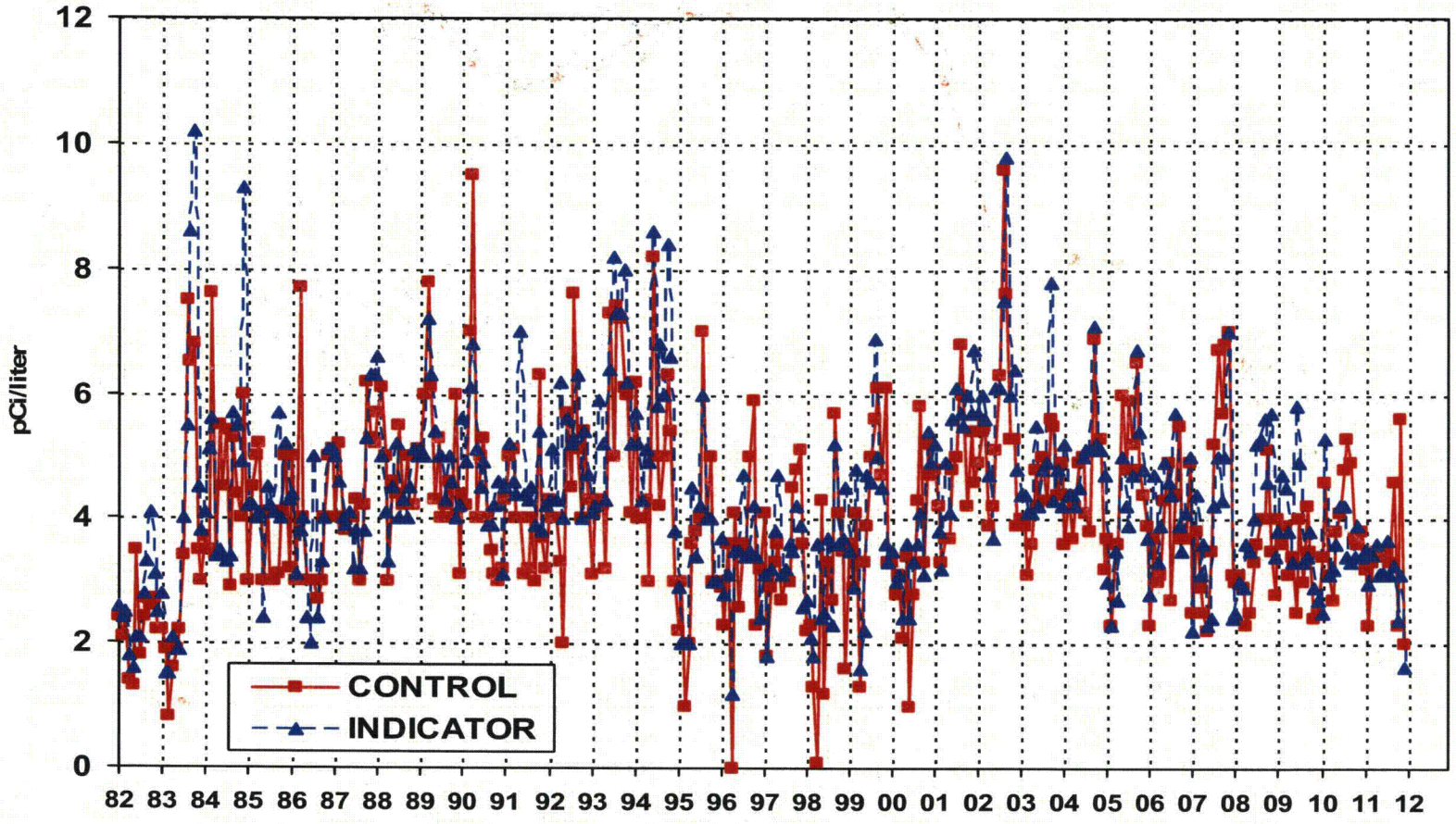
LOCATION	SAMPLES ANALYZED	PERIOD MINIMUM	PERIOD MAXIMUM	PERIOD MEAN ± 2 S.D.
SITE BOUNDARY	64	5.7	10.9	7.3 ± 2.1
MIDDLE	92	4.8	8.6	6.9 ± 1.4
CONTROL	4	7.7	9.1	8.4 ± 1.1

SITE BOUNDARY STATIONS - 10S3, 11S1, 13S2, 14S1, 18S2, 21S2, 23S2, 25S2, 26S3, 29S1, 31S1, 34S2, 36S2, 3S1, 5S1, 7S1

MIDDLE STATIONS - 10E1, 10F3, 13C1, 13E1, 15D1, 16F1, 17B1, 19D1, 20D1, 20F1, 24D1, 25D1, 28D2, 29E1, 2E1, 31D1, 31D2, 34E1, 36D1, 4E1, 6C1, 7E1, 9C1

CONTROL STATIONS - 5H1

FIGURE C-1
MEAN MONTHLY TOTAL GROSS BETA CONCENTRATIONS IN DRINKING WATER SAMPLES COLLECTED IN THE VICINITY OF LGS, 1982 - 2011

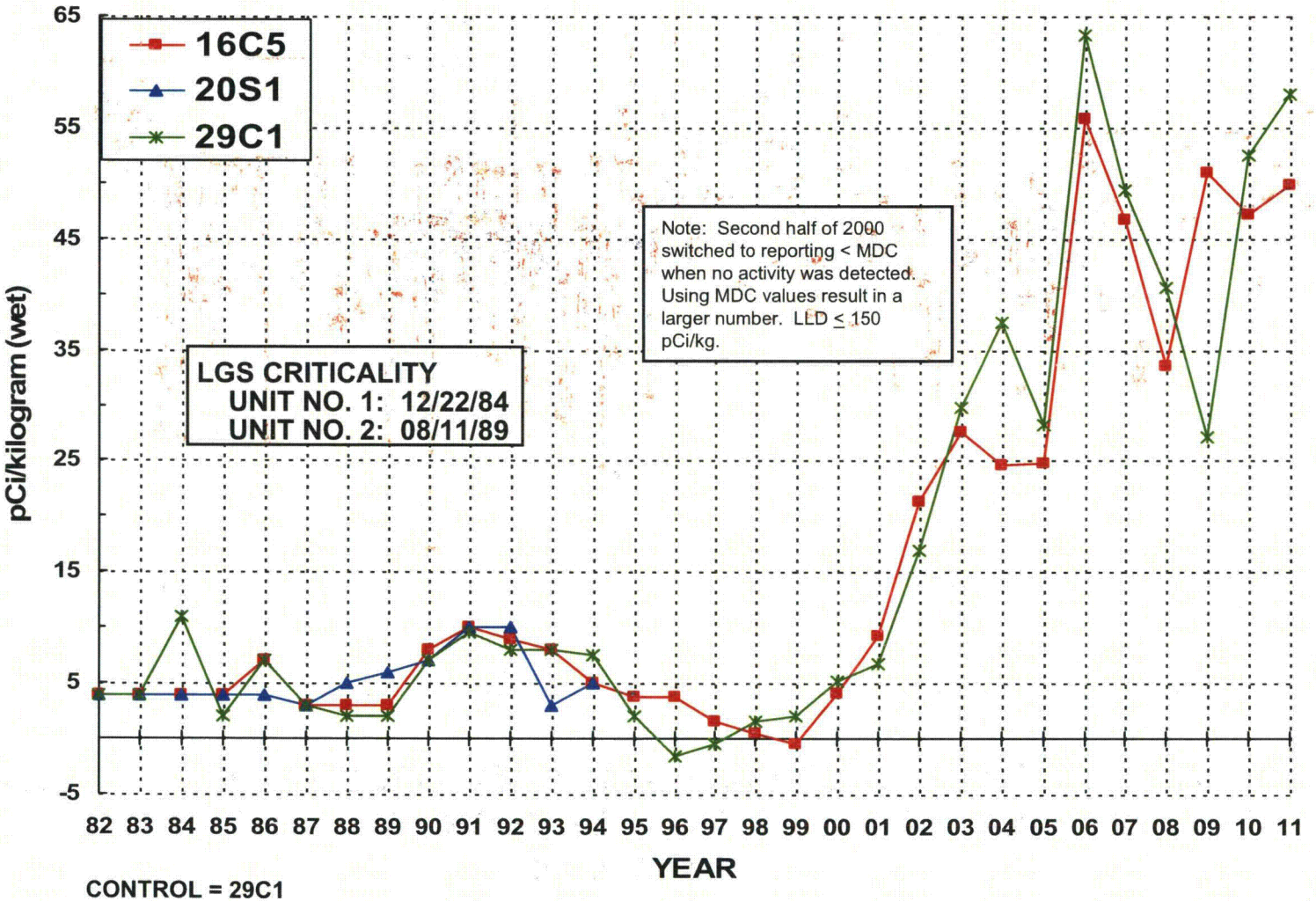


Note: 2005 analysis changed from Insoluble & Soluble to Total Gross Beta

LGS CRITICALITY
UNIT NO. 1: 12/22/84
UNIT NO. 2: 08/11/89

LGS CHANGED TO TOTAL GROSS BETA AT THE BEGINNING OF 2005. PREVIOUS DATA INCLUDED SUMMATION OF LESS THAN VALUES.

FIGURE C-2
MEAN ANNUAL CS-137 CONCENTRATIONS IN FISH SAMPLES COLLECTED IN THE VICINITY OF LGS, 1982 - 2011



CONTROL = 29C1

Station 20S1 discontinued in 1995

FIGURE C-3
CONCENTRATIONS OF CS-137 IN SEDIMENT SAMPLES COLLECTED IN THE VICINITY OF LGS, 1982 – 2011

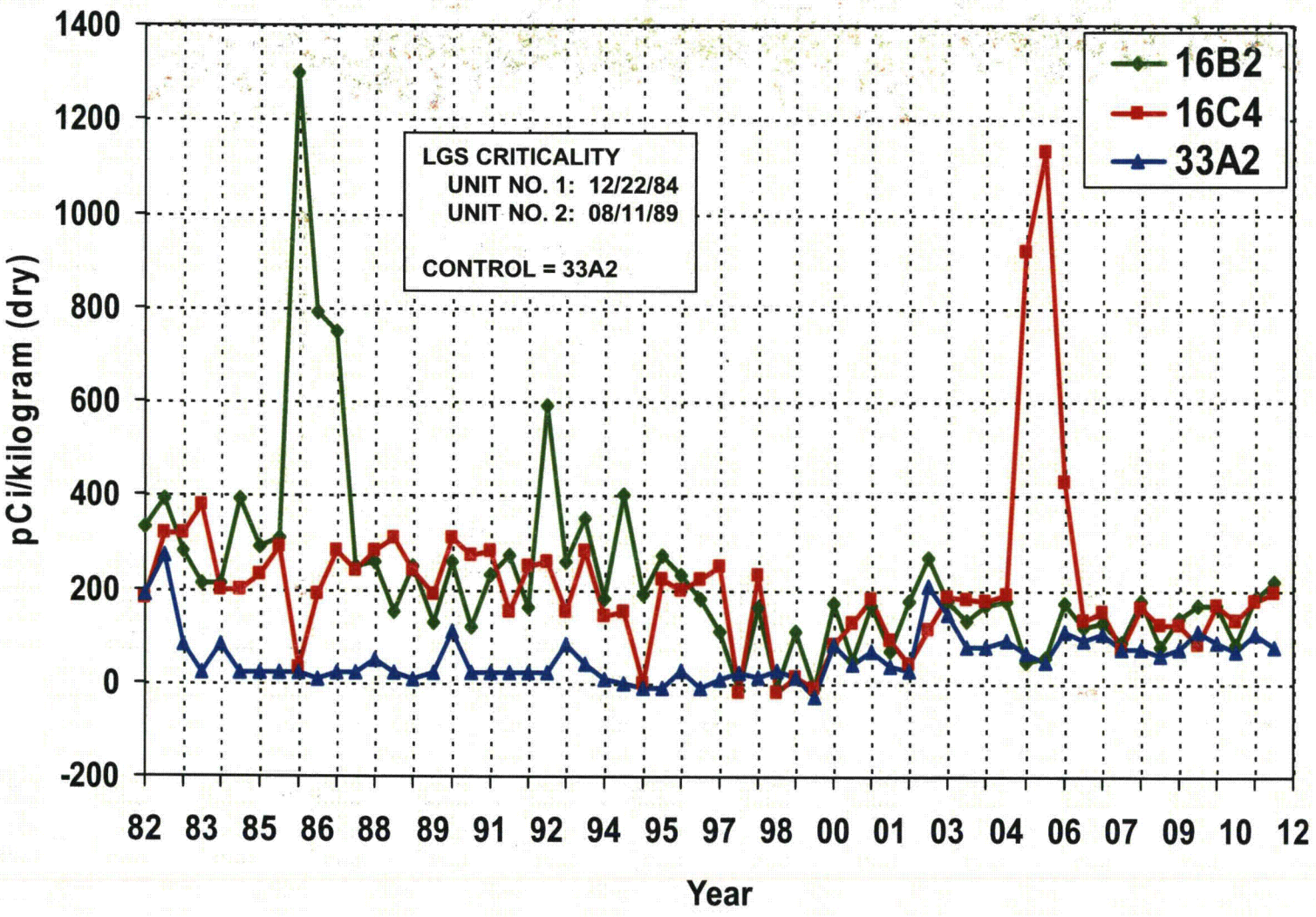


FIGURE C-4
MEAN MONTHLY GROSS BETA CONCENTRATIONS IN AIR PARTICULATE SAMPLES COLLECTED IN THE VICINITY OF LGS, 1982 – 2011

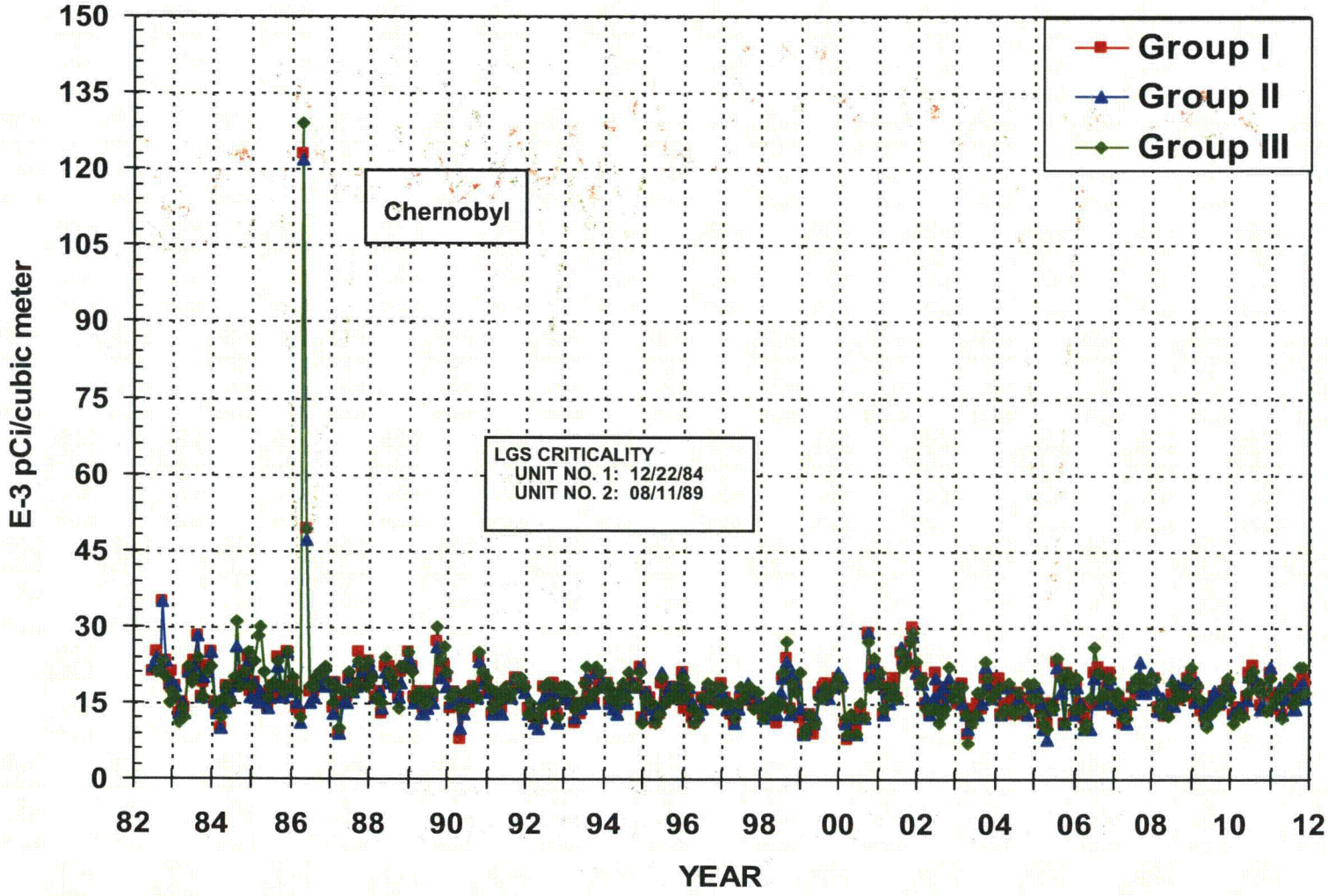


FIGURE C-5
MEAN WEEKLY GROSS BETA CONCENTRATIONS IN AIR PARTICULATE SAMPLES COLLECTED IN THE VICINITY OF LGS, 2011

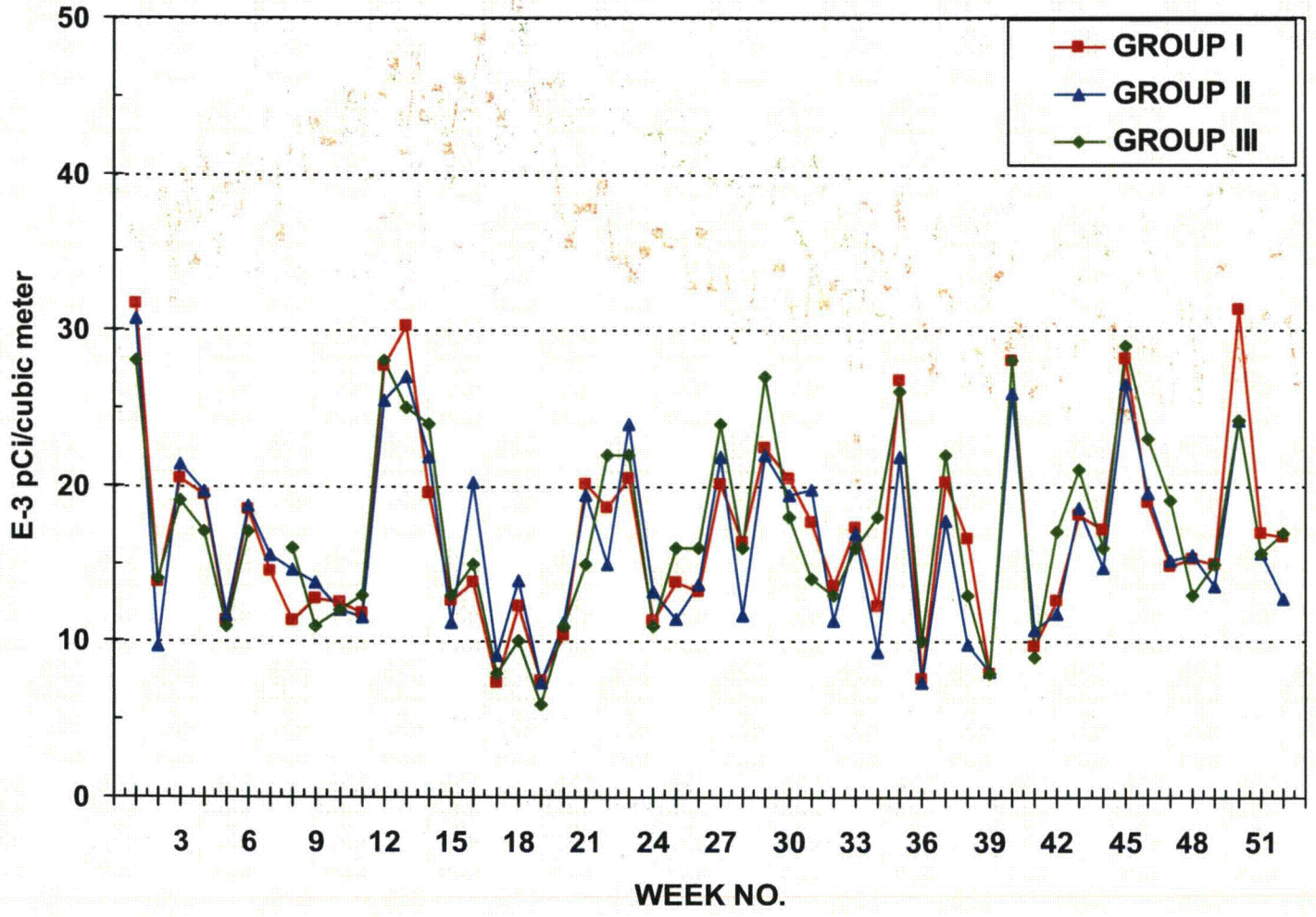
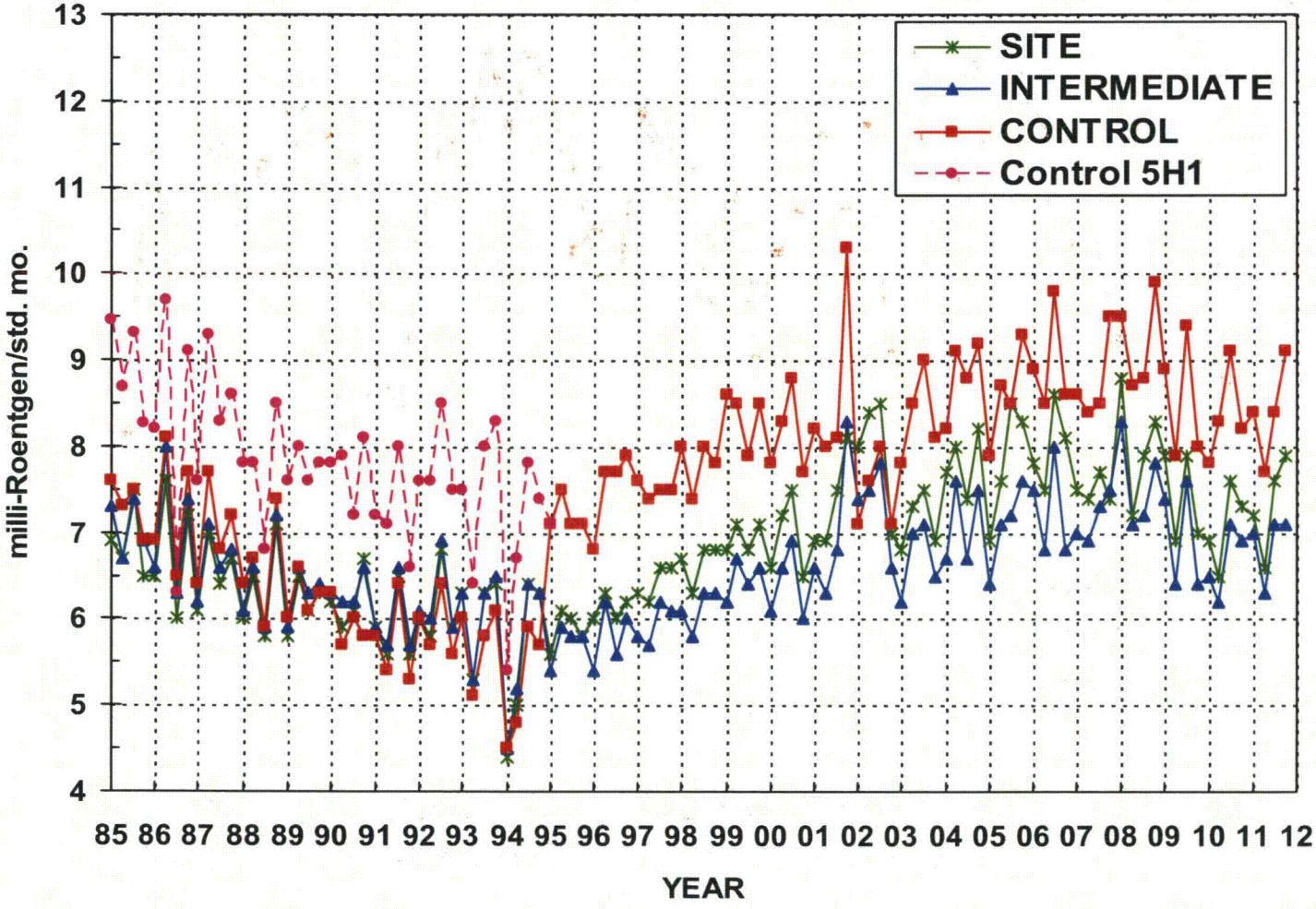


FIGURE C-6
MEAN QUARTERLY AMBIENT GAMMA RADIATION LEVELS (TLD) IN THE VICINITY OF LGS, 1985 – 2011

NOTE: Control Station 5H1 became the only distant location beginning in 1995



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APPENDIX D

DATA TABLES AND FIGURES
COMPARISON LABORATORY

TABLE D-I.1 CONCENTRATIONS OF TOTAL GROSS BETA IN DRINKING WATER SAMPLES COLLECTED IN THE VICINITY OF LIMERICK GENERATING STATION, 2011

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	16C2
12/27/10 - 01/31/11	1.8 ± 0.5
01/31/11 - 03/01/11	3.0 ± 0.9
03/01/11 - 03/29/11	< 1.8
03/29/11 - 05/03/11	1.3 ± 0.8
05/03/11 - 05/31/11	1.2 ± 0.6
05/31/11 - 06/27/11	0.9 ± 0.5
06/27/11 - 08/02/11	< 2.0
08/02/11 - 08/29/11	2.1 ± 1.1
08/29/11 - 09/27/11	3.0 ± 0.8
09/27/11 - 11/01/11	1.1 ± 0.5
11/01/11 - 11/28/11	< 0.9
11/29/11 - 12/27/11	< 0.9
MEAN	1.8 ± 0.8

TABLE D-I.2 CONCENTRATIONS OF TRITIUM IN DRINKING WATER SAMPLES COLLECTED IN THE VICINITY OF LIMERICK GENERATING STATION, 2011

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	16C2
12/27/10 - 03/29/11	< 146
03/29/11 - 06/27/11	< 149
06/27/11 - 09/27/11	< 149
09/27/11 - 12/27/11	< 151
MEAN	-

TABLE D-I.3 **CONCENTRATIONS OF GAMMA EMITTERS IN DRINKING WATER SAMPLES COLLECTED IN THE VICINITY OF LIMERICK GENERATING STATION, 2011**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION PERIOD	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Zr-95	Nb-95	I-131	Cs-134	Cs-137	Ba-140	La-140
16C2	12/27/10 - 01/31/11	< 4	< 2	< 5	< 3	< 5	< 3	< 3	< 5	< 2	< 2	< 13	< 2
	01/31/11 - 03/01/11	< 3	< 1	< 3	< 2	< 4	< 3	< 3	< 4	< 3	< 3	< 9	< 2
	03/01/11 - 03/29/11	< 2	< 2	< 2	< 2	< 6	< 4	< 2	< 4	< 3	< 3	< 9	< 2
	03/29/11 - 05/03/11	< 3	< 2	< 5	< 2	< 5	< 4	< 3	< 10	< 3	< 3	< 22	< 5
	05/03/11 - 05/31/11	< 3	< 2	< 5	< 2	< 5	< 5	< 2	< 4	< 3	< 2	< 12	< 2
	05/31/11 - 06/27/11	< 2	< 2	< 5	< 2	< 4	< 4	< 3	< 6	< 3	< 3	< 13	< 2
	06/27/11 - 08/02/11	< 2	< 2	< 6	< 1	< 3	< 2	< 2	< 8	< 2	< 1	< 14	< 3
	08/02/11 - 08/29/11	< 2	< 2	< 3	< 1	< 5	< 2	< 2	< 2	< 3	< 3	< 10	< 2
	08/29/11 - 09/27/11	< 3	< 2	< 5	< 2	< 3	< 4	< 2	< 3	< 2	< 3	< 14	< 3
	09/27/11 - 11/01/11	< 4	< 2	< 5	< 2	< 3	< 5	< 3	< 5	< 2	< 3	< 16	< 3
	11/01/11 - 11/29/11	< 5	< 5	< 11	< 5	< 5	< 6	< 7	< 7	< 4	< 3	< 23	< 6
	11/29/11 - 12/27/11	< 3	< 2	< 5	< 1	< 4	< 4	< 3	< 3	< 3	< 3	< 9	< 2
	MEAN	-	-	-	-	-		-	-	-	-	-	-

TABLE D-II.1 CONCENTRATIONS OF GROSS BETA IN AIR PARTICULATE SAMPLES COLLECTED IN THE VICINITY OF LIMERICK GENERATING STATION, 2011

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

COLLECTION PERIOD	11S2
01/03/11 - 01/10/11	42 ± 5
01/10/11 - 01/17/11	21 ± 4
01/17/11 - 01/24/11	25 ± 4
01/24/11 - 01/31/11	29 ± 4
01/31/11 - 02/07/11	20 ± 4
02/07/11 - 02/14/11	22 ± 4
02/14/11 - 02/21/11	21 ± 4
02/21/11 - 02/28/11	18 ± 4
02/28/11 - 03/07/11	17 ± 4
03/07/11 - 03/14/11	15 ± 4
03/14/11 - 03/22/11	17 ± 3
03/22/11 - 03/28/11	37 ± 5
03/28/11 - 04/04/11	40 ± 5
04/04/11 - 04/11/11	22 ± 4
04/11/11 - 04/18/11	16 ± 4
04/18/11 - 04/25/11	14 ± 4
04/25/11 - 05/02/11	17 ± 4
05/02/11 - 05/09/11	13 ± 4
05/09/11 - 05/16/11	11 ± 3
05/16/11 - 05/23/11	9 ± 3
05/23/11 - 05/31/11	20 ± 4
05/31/11 - 06/06/11	19 ± 5
06/06/11 - 06/13/11	29 ± 4
06/13/11 - 06/20/11	23 ± 4
06/20/11 - 06/27/11	18 ± 4
06/27/11 - 07/05/11	24 ± 4
07/05/11 - 07/11/11	30 ± 5
07/11/11 - 07/18/11	12 ± 5
07/18/11 - 07/25/11	(1)
07/25/11 - 08/01/11	26 ± 5
08/01/11 - 08/08/11	25 ± 4
08/08/11 - 08/15/11	23 ± 4
08/15/11 - 08/22/11	23 ± 4
08/22/11 - 08/29/11	12 ± 4
08/29/11 - 09/05/11	26 ± 4
09/05/11 - 09/12/11	12 ± 4
09/12/11 - 09/19/11	30 ± 4
09/19/11 - 09/26/11	14 ± 4
09/26/11 - 10/03/11	10 ± 3
10/03/11 - 10/11/11	35 ± 4
10/11/11 - 10/17/11	18 ± 4
10/17/11 - 10/24/11	18 ± 4
10/24/11 - 10/31/11	24 ± 4
10/31/11 - 11/07/11	25 ± 4
11/07/11 - 11/14/11	32 ± 5
11/14/11 - 11/21/11	25 ± 4
11/21/11 - 11/28/11	25 ± 4
11/28/11 - 12/05/11	21 ± 4
12/05/11 - 12/12/11	23 ± 4
12/12/11 - 12/19/11	42 ± 5
12/19/11 - 12/27/11	26 ± 4
12/27/11 - 01/03/12	17 ± 4
MEAN	22 ± 16

(1) SEE PROGRAM EXCEPTIONS SECTION FOR EXPLANATION

TABLE D-II.2 CONCENTRATIONS OF GAMMA EMITTERS IN AIR PARTICULATE SAMPLES COLLECTED IN THE VICINITY OF LIMERICK GENERATING STATION, 2011

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

SITE	COLLECTION PERIOD	Be-7	Mn-54	Co-58	Co-60	Cs-134	Cs-137
11S2	01/03/11 - 03/28/11	85 ± 15	< 0.7	< 0.8	< 1.1	< 1.1	< 1.2
	03/28/11 - 06/27/11	81 ± 16	< 0.4	< 0.7	< 0.5	< 0.9	< 0.8
	06/27/11 - 10/03/11	67 ± 13	< 0.6	< 0.8	< 0.8	< 0.5	< 0.5
	10/03/11 - 01/03/12	63 ± 13	< 0.5	< 1.0	< 0.6	< 1.0	< 0.5
	MEAN	74 ± 21	-	-	-	-	-

TABLE D-III.1 CONCENTRATIONS OF I-131 BY CHEMICAL SEPARATION AND GAMMA EMITTERS IN MILK SAMPLES COLLECTED IN THE VICINITY OF LIMERICK GENERATING STATION, 2011

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION PERIOD	I-131	K-40	Cs-134	Cs-137	Ba-140	La-140
19B1	01/11/11	< 0.16	1228 ± 110	< 3.0	< 2.8	< 12.7	< 2.0
	04/05/11	< 0.5	1301 ± 105	< 3.1	< 1.7	< 20.6	< 3.4
	07/12/11	< 0.36	1346 ± 103	< 3.0	< 2.1	< 22.1	< 3.7
	10/04/11	< 0.2	1452 ± 118	< 2.1	< 3.3	< 18.4	< 2.3
	MEAN	-	1332 ± 188	-	-	-	-
10F4	01/11/11	< 0.15	1462 ± 109	< 2.6	< 2.9	< 14.9	< 1.9
	04/05/11	< 0.2	1383 ± 119	< 3.6	< 3.5	< 13.6	< 2.2
	07/12/11	< 0.27	834 ± 92	< 3.7	< 3.6	< 20.4	< 3.3
	10/04/11	< 0.14	654 ± 82	< 2.1	< 3.4	< 13.9	< 4.0
	MEAN	-	1083 ± 800	-	-	-	-
25C1	01/11/11	< 0.18	1264 ± 107	< 3.4	< 3.6	< 15.9	< 1.8
	04/05/11	< 0.26	1366 ± 108	< 2.7	< 3.6	< 27	< 4
	07/12/11	< 0.17	1478 ± 112	< 2.5	< 2.8	< 21.7	< 3.4
	10/04/11	< 0.36	1348 ± 104	< 2.1	< 2.7	< 17.8	< 2.9
	MEAN	-	1364 ± 176	-	-	-	-

FIGURE D-1
COMPARISON OF MONTHLY TOTAL GROSS BETA CONCENTRATIONS IN DRINKING WATER SAMPLES SPLIT BETWEEN ENV AND TBE, 2011

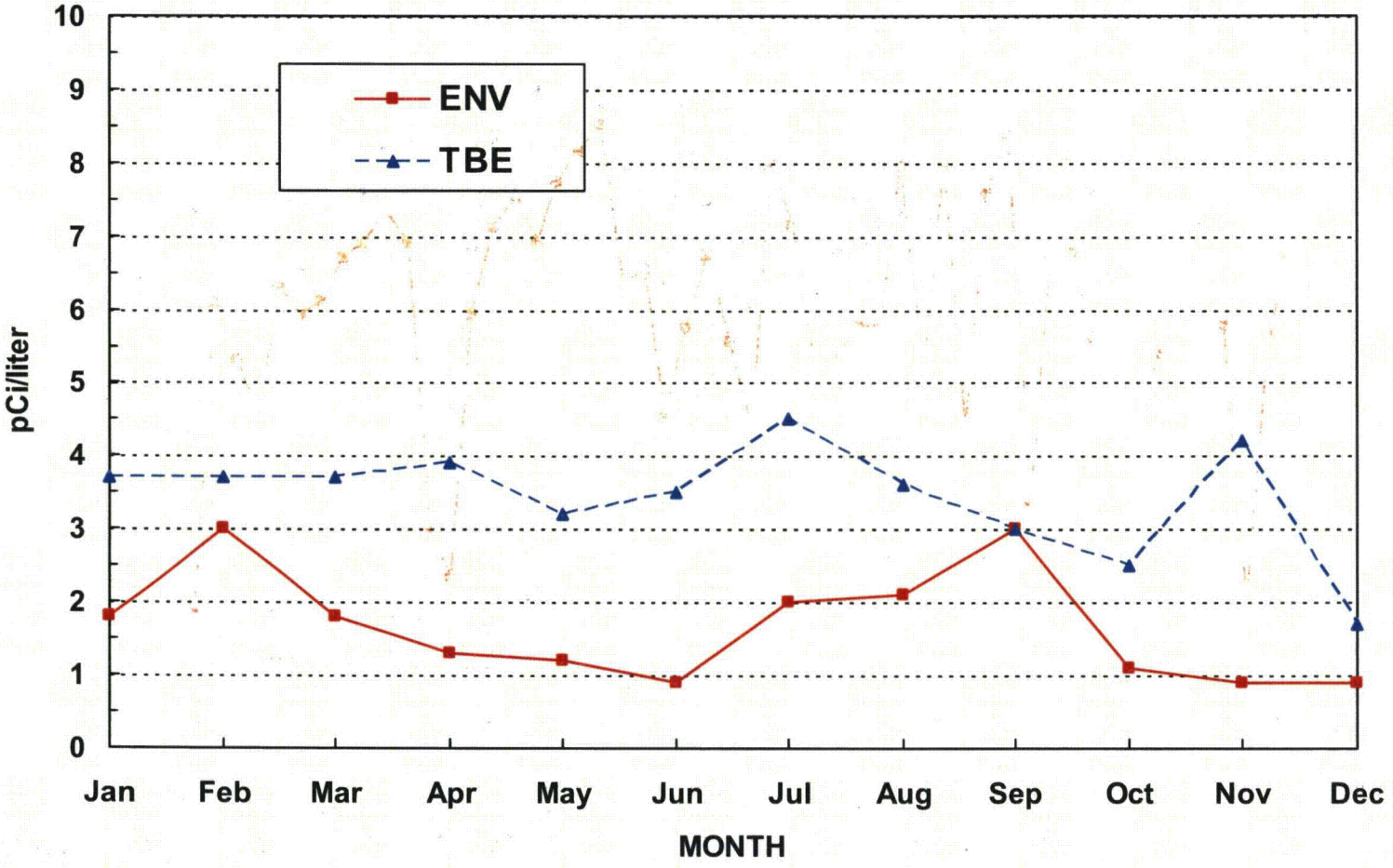
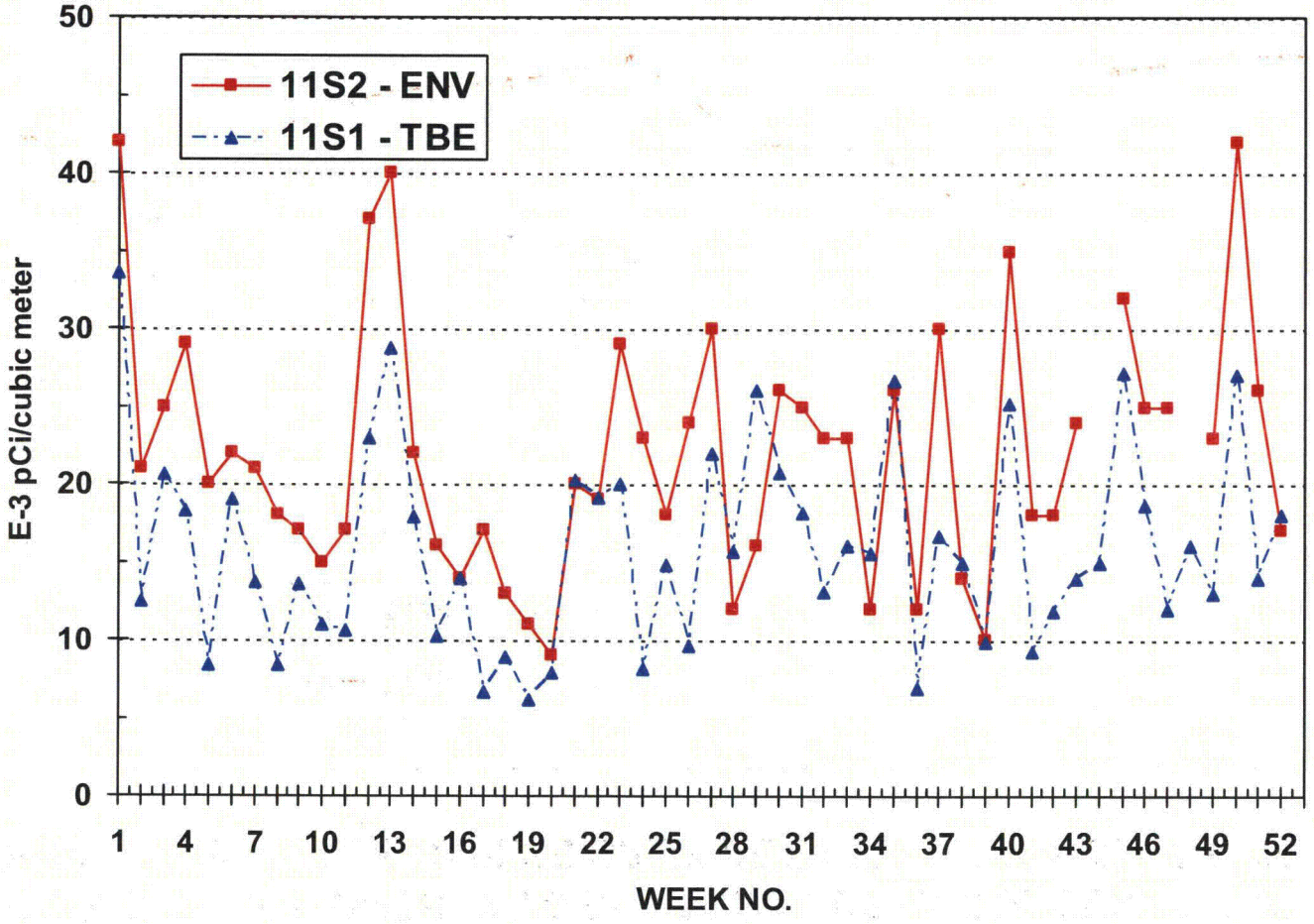


FIGURE D-2
COMPARISON OF WEEKLY GROSS BETA CONCENTRATIONS IN AIR PARTICULATE SAMPLES COLLECTED FROM LGS COLLOCATED LOCATIONS 11S1 AND 11S2, 2011



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APPENDIX E

INTER-LABORATORY COMPARISON PROGRAM

TABLE E-1 **ANALYTICS ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM**
TELEDYNE BROWN ENGINEERING, 2011
(PAGE 1 OF 3)

Month/Year	Identification Number	Matrix	Nuclide	Units	Reported Value (a)	Known Value (b)	Ratio (c) TBE/Analytics	Evaluation (d)
March 2011	E7460-396	Milk	Sr-89	pCi/L	98.8	97.4	1.01	A
			Sr-90	pCi/L	15.2	15.8	0.96	A
	E7461-396	Milk	I-131	pCi/L	92.9	96.9	0.96	A
			Ce-141	pCi/L	not provided by Analytics for this study			
			Cr-51	pCi/L	398	298	1.34	N (1)
			Cs-134	pCi/L	130	130	1.00	A
			Cs-137	pCi/L	232	205	1.13	A
			Co-58	pCi/L	121	113	1.07	A
			Mn-54	pCi/L	289	266	1.09	A
			Fe-59	pCi/L	201	175	1.15	A
			Zn-65	pCi/L	287	261	1.10	A
			Co-60	pCi/L	186	172	1.08	A
	E7463-396	AP	Ce-141	pCi	not provided by Analytics for this study			
			Cr-51	pCi	243	215	1.13	A
			Cs-134	pCi	85.0	94.2	0.90	A
			Cs-137	pCi	168	148	1.14	A
			Co-58	pCi	89.2	81.8	1.09	A
			Mn-54	pCi	171	192	0.89	A
			Fe-59	pCi	129	126	1.02	A
			Zn-65	pCi	159	189	0.84	A
			Co-60	pCi	132	124	1.06	A
	E7462-396	Charcoal	I-131	pCi	96.5	96.3	1.00	A
June 2011	E7851-396	Milk	Sr-89	pCi/L	96.7	103	0.94	A
			Sr-90	pCi/L	13.8	15.6	0.88	A
	E7852-396	Milk	I-131	pCi/L	110	103.0	1.07	A
			Ce-141	pCi/L	68.1	79.9	0.85	A
			Cr-51	pCi/L	186	206	0.90	A
			Cs-134	pCi/L	164	190	0.86	A
			Cs-137	pCi/L	140	138	1.01	A
			Co-58	pCi/L	141	152	0.93	A
			Mn-54	pCi/L	136	138	0.99	A
			Fe-59	pCi/L	128	123	1.04	A
			Zn-65	pCi/L	263	261	1.01	A
			Co-60	pCi/L	189	195	0.97	A
	E7854-396	AP	Ce-141	pCi	49.9	42.9	1.16	A
			Cr-51	pCi	95.6	110	0.87	A
			Cs-134	pCi	104	102	1.02	A
			Cs-137	pCi	83.8	74.0	1.13	A
			Co-58	pCi	90.7	81.3	1.12	A
			Mn-54	pCi	74.5	73.9	1.01	A
			Fe-59	pCi	62.0	66.1	0.94	A
			Zn-65	pCi	140	140	1.00	A
			Co-60	pCi	119	104	1.14	A
	E7853-396	Charcoal	I-131	pCi	76.2	86.1	0.89	A

TABLE E-1 ANALYTICS ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM
TELEDYNE BROWN ENGINEERING, 2011
(PAGE 2 OF 3)

Month/Year	Identification Number	Matrix	Nuclide	Units	Reported Value (a)	Known Value (b)	Ratio (c) TBE/Analytics	Evaluation (d)
September 2011	E8070-396	Milk	Sr-89	pCi/L	102	90.8	1.12	A
			Sr-90	pCi/L	13.2	14.7	0.90	A
	E8071-396	Milk	I-131	pCi/L	74.2	89.2	0.83	A
			Ce-141	pCi/L	66.9	66.7	1.00	A
			Cr-51	pCi/L	249	226	1.10	A
			Cs-134	pCi/L	116	128	0.91	A
			Cs-137	pCi/L	106	114	0.93	A
			Co-58	pCi/L	95.4	97.5	0.98	A
			Mn-54	pCi/L	147	151	0.97	A
			Fe-59	pCi/L	53.1	54.8	0.97	A
			Zn-65	pCi/L	175	180	0.97	A
			Co-60	pCi/L	150	157	0.96	A
	E8073-396	AP	Ce-141	pCi	66.6	67.5	0.99	A
			Cr-51	pCi	263	229	1.15	A
			Cs-134	pCi	139	130	1.07	A
			Cs-137	pCi	110	115	0.96	A
			Co-58	pCi	108	98.6	1.10	A
			Mn-54	pCi	152	153	0.99	A
			Fe-59	pCi	57.5	55.5	1.04	A
			Zn-65	pCi	190	183	1.04	A
			Co-60	pCi	156	159	0.98	A
	E8072-396	Charcoal	I-131	pCi	77.6	80.6	0.96	A
December, 2011	E8230-396	Milk	Sr-89	pCi/L	93.3	93.1	1.00	A
			Sr-90	pCi/L	12.7	15.4	0.82	A
	E8231-396	Milk	I-131	pCi/L	82.5	90.2	0.91	A
			Ce-141	pCi/L	not provided by Analytics for this study			
			Cr-51	pCi/L	465	566	0.82	A
			Cs-134	pCi/L	142	171	0.83	A
			Cs-137	pCi/L	185	210	0.88	A
			Co-58	pCi/L	177	221	0.80	A
			Mn-54	pCi/L	208	241	0.86	A
			Fe-59	pCi/L	164	183	0.90	A
			Zn-65	pCi/L	259	291	0.89	A
			Co-60	pCi/L	224	270	0.83	A
	E8233-396	AP	Ce-141	pCi	not provided by Analytics for this study			
			Cr-51	pCi	344	368	0.93	A
			Cs-134	pCi	105	111	0.95	A
			Cs-137	pCi	129	137	0.94	A
			Co-58	pCi	145	144	1.01	A
			Mn-54	pCi	137	157	0.87	A
			Fe-59	pCi	119	119	1.00	A
			Zn-65	pCi	145	190	0.76	W
			Co-60	pCi	168	176	0.95	A

TABLE E-1 **ANALYTICS ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM**
TELEDYNE BROWN ENGINEERING, 2011
(PAGE 3 OF 3)

Month/Year	Identification Number	Matrix	Nuclide	Units	Reported Value (a)	Known Value (b)	Ratio (c) TBE/Analytics	Evaluation (d)
December 2011	E8232-396	Charcoal	I-131	pCi	100	89.5	1.12	A

(1) Sample appears to be biased high. Corrective Action evaluated after the 2nd Quarter Analytics PE sample; no action required. NCR 11-13

(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, 2011
(PAGE 1 OF 1)

Month/Year	Identification Number	Media	Nuclide	Units	Reported Value (a)	Known Value (b)	Control Limits	Evaluation (c)
May 2011	RAD-85	Water	Sr-89	pCi/L	59.8	63.2	51.1 - 71.2	A
			Sr-90	pCi/L	42.5	42.5	31.3 - 48.8	A
			Ba-133	pCi/L	73.3	75.3	63.0 - 82.8	A
			Cs-134	pCi/L	64.9	72.9	59.5 - 80.2	A
			Cs-137	pCi/L	74.6	77.0	69.3 - 87.4	A
			Co-60	pCi/L	87.8	88.8	79.9 - 100	A
			Zn-65	pCi/L	103	98.9	89.0 - 118	A
			Gr-A	pCi/L	64.1	50.1	26.1 - 62.9	N (1)
			Gr-B	pCi/L	51.8	49.8	33.8 - 56.9	A
			I-131	pCi/L	27.4	27.5	22.9 - 32.3	A
			U-Nat	pCi/L	38.5	39.8	32.2 - 44.4	A
			H-3	pCi/L	10057	10200	8870 - 11200	A
	MRAD-14	Filter	Gr-A	pCi/filter	79.7	74.3	38.5 - 112	A
November 2011	RAD-87	Water	Sr-89	pCi/L	81.0	69.7	56.9 - 77.9	N (2)
			Sr-90	pCi/L	35.5	41.4	30.2 - 47.2	A
			Ba-133	pCi/L	90.7	96.9	81.8 - 106	A
			Cs-134	pCi/L	36.6	33.4	26.3 - 36.7	A
			Cs-137	pCi/L	44.7	44.3	39.4 - 51.7	A
			Co-60	pCi/L	118.7	119	107 - 133	A
			Zn-65	pCi/L	80.2	76.8	68.9 - 92.5	A
			Gr-A	pCi/L	34.2	53.2	27.8 - 66.6	A
			Gr-B	pCi/L	39.3	45.9	30.9 - 53.1	A
			I-131	pCi/L	22.9	27.5	22.9 - 32.3	A
			U-Nat	pCi/L	46.8	48.6	39.4 - 54.0	A
			H-3	pCi/L	15733	17400	15200 - 19100	A
	MRAD-15	Filter	Gr-A	pCi/filter	44.6	58.4	30.3 - 87.8	A

(1) The solids on the planchet exceeded 100 mg, which was beyond the range of the efficiency curve. NCR 11-08

(2) Sr-89 TBE to known ratio of 1.16 fell within acceptable range of ± 20%. No action required. NCR 11-16

(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, 2011
(PAGE 1 OF 2)

Month/Year	Identification Number	Media	Nuclide	Units	Reported Value (a)	Known Value (b)	Acceptance Range	Evaluation (c)
March 2011	11-MaW24	Water	Cs-134	Bq/L	19.1	21.5	15.1 - 28.0	A
			Cs-137	Bq/L	29.0	29.4	20.6 - 38.2	A
			Co-57	Bq/L	0.139		(1)	A
			Co-60	Bq/L	23.9	24.6	17.2 - 32.0	A
			H-3	Bq/L	265	243	170 - 316	A
			Mn-54	Bq/L	31.8	31.6	22.1 - 41.1	A
			K-40	Bq/L	94.8	91	64 - 118	A
			Sr-90	Bq/L	9.64	8.72	6.10 - 11.34	A
			Zn-65	Bq/L	-0.142		(1)	A
	11-GrW24	Water	Gr-A	Bq/L	0.767	1.136	0.341 - 1.931	A
			Gr-B	Bq/L	3.43	2.96	1.48 - 4.44	A
	11-MaS24	Soil	Cs-134	Bq/kg	612	680	476 - 884	A
			Cs-137	Bq/kg	772	758	531 - 985	A
			Co-57	Bq/kg	910	927	649 - 1205	A
			Co-60	Bq/kg	500	482	337 - 627	A
			Mn-54	Bq/kg	0.607		(1)	A
			K-40	Bq/kg	569	540	378 - 702	A
			Sr-90	Bq/kg	NR	160	112 - 208	N (2)
			Zn-65	Bq/kg	1497	1359	951 - 1767	A
	11-RdF24	AP	Cs-134	Bq/sample	3.26	3.49	2.44 - 4.54	A
			Cs-137	Bq/sample	2.36	2.28	1.60 - 2.96	A
			Co-57	Bq/sample	3.30	3.33	2.33 - 4.33	A
			Co-60	Bq/sample	0.0765		(1)	A
			Mn-54	Bq/sample	2.84	2.64	1.85 - 3.43	A
			Sr-90	Bq/sample	NR	1.36	0.95 - 1.77	N (2)
			Zn-65	Bq/sample	3.30	3.18	2.23 - 4.13	A
	11-GrF24	AP	Gr-A	Bq/sample	0.101	0.659	0.198 - 1.120	N (3)
			Gr-B	Bq/sample	1.23	1.323	0.662 - 1.985	A
	11-RdV24	Vegetation	Cs-134	Bq/sample	4.97	5.50	3.85 - 7.15	A
			Cs-137	Bq/sample	0.0356		(1)	A
			Co-57	Bq/sample	10.8	9.94	6.96 - 12.92	A
			Co-60	Bq/sample	4.89	4.91	3.44 - 6.38	A
			Mn-54	Bq/sample	6.42	6.40	4.48 - 8.32	A
			Sr-90	Bq/sample	NR	2.46	1.72 - 3.20	N (2)
			Zn-65	Bq/sample	3.07	2.99	2.09 - 3.89	A
September 2011	11-MaW25	Water	Cs-134	Bq/L	16.0	19.1	13.4 - 24.8	A
			Cs-137	Bq/L	0.0043		(1)	A
			Co-57	Bq/L	33.1	36.6	25.6 - 47.6	A
			Co-60	Bq/L	26.9	29.3	20.5 - 38.1	A
			H-3	Bq/L	1011	1014	710 - 1318	A
			Mn-54	Bq/L	23.2	25.0	17.5 - 32.5	A
			K-40	Bq/L	147	156	109 - 203	A
			Sr-90	Bq/L	15.8	14.2	9.9 - 18.5	A
			Zn-65	Bq/L	27.3	28.5	20.0 - 37.1	A

TABLE E-3 DOE'S MIXED ANALYTE PERFORMANCE EVALUATION PROGRAM (MAPEP)
TELEDYNE BROWN ENGINEERING, 2011
(PAGE 2 OF 2)

Month/Year	Identification Number	Media	Nuclide	Units	Reported Value (a)	Known Value (b)	Acceptance Range	Evaluation (c)
September 2011	11-GrW25	Water	Gr-A	Bq/L	0.894	0.866	0.260 - 1.472	A
			Gr-B	Bq/L	5.87	4.81	2.41 - 7.22	A
	11-MaS25	Soil	Cs-134	Bq/kg	-0.213		(1)	A
			Cs-137	Bq/kg	1110	979	685 - 1273	A
			Co-57	Bq/kg	1290	1180	826 - 1534	A
			Co-60	Bq/kg	731	644	451 - 837	A
			Mn-54	Bq/kg	987	848	594 - 1102	A
			K-40	Bq/kg	753	625	438 - 813	W
			Sr-90	Bq/kg	276	320	224 - 416	A
			Zn-65	Bq/kg	1870	1560	1092 - 2028	A
September 2011	11-RdF25	AP	Cs-134	Bq/sample	-0.043		(1)	A
			Cs-137	Bq/sample	3.09	2.60	1.82 - 3.38	A
			Co-57	Bq/sample	5.36	5.09	3.56 - 6.62	A
			Co-60	Bq/sample	3.41	3.20	2.24 - 4.16	A
			Mn-54	Bq/sample	0.067		(1)	A
			Sr-90	Bq/sample	1.84	1.67	1.17 - 2.17	A
			Zn-65	Bq/sample	5.17	4.11	2.88 - 5.34	W
	11-GrF25	AP	Gr-A	Bq/sample	0.0058		(1)	A
			Gr-B	Bq/sample	-0.01		(1)	A
	11-RdV25	Vegetation	Cs-134	Bq/sample	0.0081		(1)	A
			Cs-137	Bq/sample	4.94	4.71	3.30 - 6.12	A
			Co-57	Bq/sample	0.0639		(1)	A
			Co-60	Bq/sample	3.36	3.38	2.37 - 4.39	A
			Mn-54	Bq/sample	5.89	5.71	4.00 - 7.42	A
			Sr-90	Bq/sample	1.31	1.26	0.88 - 1.64	A
			Zn-65	Bq/sample	6.54	6.39	4.47 - 8.31	A

(1) False positive test.

(2) Evaluated as failed due to not reporting a previously reported analyte. NCR 11-11

(3) The filter for Gross Alpha was counted on the wrong side. Recounted on the correct side resulted in acceptable results. NCR 11-11

(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.

TABLE E-4 ERA (a) STATISTICAL SUMMARY PROFICIENCY TESTING PROGRAM[a] ENVIRONMENTAL, INC., 2011

Lab Code	Date	Concentration (pCi/L)				
		Analysis	Laboratory Result [b]	ERA Result [c]	Control Limits	Acceptance
STW-1243	04/04/11	Sr-89	68.2 ± 5.8	63.2	51.1 - 71.2	Pass
STW-1243	04/04/11	Sr-90	44.3 ± 2.4	42.5	31.3 - 48.8	Pass
STW-1244	04/04/11	Ba-133	69.8 ± 3.9	75.3	63.0 - 82.8	Pass
STW-1244	04/04/11	Co-60	87.9 ± 3.8	88.8	79.9 - 100.0	Pass
STW-1244	04/04/11	Cs-134	69.5 ± 3.7	72.9	59.5 - 80.2	Pass
STW-1244	04/04/11	Cs-137	77.9 ± 5.3	77.0	69.3 - 87.4	Pass
STW-1244	04/04/11	Zn-65	105.2 ± 8.4	98.9	89.0 - 118.0	Pass
STW-1245	04/04/11	Gr. Alpha	41.5 ± 2.3	50.1	26.1 - 62.9	Pass
STW-1245	04/04/11	Gr. Beta	48.9 ± 1.8	49.8	33.8 - 56.9	Pass
STW-1246	04/04/11	I-131	26.6 ± 1.7	27.5	22.9 - 32.3	Pass
STW-1248	04/04/11	H-3	10322 ± 285	10200.0	8870 - 11200	Pass
STW-1256	10/07/11	Sr-89	68.7 ± 6.0	69.7	56.9 - 77.9	Pass
STW-1256	10/07/11	Sr-90	36.9 ± 2.4	41.1	30.2 - 47.2	Pass
STW-1257	10/07/11	Ba-133	88.2 ± 7.8	96.9	81.8 - 106.0	Pass
STW-1257	10/07/11	Co-60	116.5 ± 7.1	119.0	107.0 - 133.0	Pass
STW-1257 [d]	10/07/11	Cs-134	38.8 ± 8.0	33.4	26.3 - 36.7	Fail
STW-1257	10/07/11	Cs-137	45.6 ± 7.3	44.3	39.4 - 51.7	Pass
STW-1257	10/07/11	Zn-65	84.9 ± 15.4	76.8	68.9 - 92.5	Pass
STW-1258	10/07/11	Gr. Alpha	35.7 ± 3.8	53.2	27.8 - 66.6	Pass
STW-1258	10/07/11	Gr. Beta	36.1 ± 3.3	45.9	30.9 - 53.1	Pass
STW-1259	10/07/11	I-131	25.0 ± 1.1	27.5	22.9 - 32.3	Pass
STW-1261	10/07/11	H-3	17435 ± 382	17400	15200 - 19100	Pass

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

[b] 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] The sample was reanalyzed. Result of reanalysis was acceptable, 32.9 ± 7.4 pCi/L.

TABLE E-5 DOE'S MIXED ANALYTE PERFORMANCE EVALUATION PROGRAM (MAPEP)[a]
ENVIRONMENTAL, INC., 2011
(Page 1 of 2)

			Concentration [b]			
Lab Code [c]	Date	Analysis	Laboratory result	Activity	Limits [d]	Acceptance
STW-1237	02/01/11	Co-57	< 0.2	0.00	-	Pass
STW-1237	02/01/11	Co-60	24.10 ± 0.40	24.60	17.20 - 32.00	Pass
STW-1237	02/01/11	Cs-134	19.80 ± 0.40	21.50	15.10 - 28.00	Pass
STW-1237	02/01/11	Cs-137	29.40 ± 0.50	29.40	20.60 - 38.20	Pass
STW-1237	02/01/11	H-3	238.90 ± 8.80	243.00	170.00 - 316.00	Pass
STW-1237	02/01/11	K-40	95.40 ± 3.10	91.00	64.00 - 118.00	Pass
STW-1237	02/01/11	Mn-54	32.50 ± 0.60	31.60	22.10 - 41.10	Pass
STW-1237	02/01/11	Sr-90	8.70 ± 0.70	8.72	6.10 - 11.34	Pass
STW-1237	02/01/11	Zn-65	< 0.5	0.00	-	Pass
STW-1238	02/01/11	Gr. Alpha	0.82 ± 0.07	1.14	0.34 - 1.93	Pass
STW-1238	02/01/11	Gr. Beta	2.82 ± 0.07	2.96	1.48 - 4.44	Pass
STVE-1239	02/01/11	Co-57	11.27 ± 0.21	9.94	6.96 - 12.92	Pass
STVE-1239	02/01/11	Co-60	4.95 ± 0.16	4.91	3.44 - 6.38	Pass
STVE-1239	02/01/11	Cs-134	5.18 ± 0.19	5.50	3.85 - 7.15	Pass
STVE-1239	02/01/11	Cs-137	< 0.09	0.00	-	Pass
STVE-1239	02/01/11	Mn-54	6.91 ± 0.25	6.40	4.48 - 8.32	Pass
STVE-1239	02/01/11	Zn-65	3.10 ± 0.32	2.99	2.09 - 3.89	Pass
STSO-1240	02/01/11	Co-57	984.10 ± 4.10	927.00	649.00 - 1205.00	Pass
STSO-1240	02/01/11	Co-60	540.70 ± 3.00	482.00	337.00 - 627.00	Pass
STSO-1240	02/01/11	Cs-134	726.70 ± 5.92	680.00	476.00 - 884.00	Pass
STSO-1240	02/01/11	Cs-137	883.10 ± 4.70	758.00	531.00 - 985.00	Pass
STSO-1240	02/01/11	K-40	622.70 ± 16.70	540.00	378.00 - 702.00	Pass
STSO-1240	02/01/11	Mn-54	-0.30 ± 1.00	0.00	-	Pass
STSO-1240	02/01/11	Zn-65	1671.00 ± 13.10	1359.00	951.00 - 1767.00	Pass
STAP-1241	02/01/11	Co-57	3.48 ± 0.06	3.33	2.33 - 4.33	Pass
STAP-1241	02/01/11	Co-60	0.00 ± 0.02	0.00	-0.10 - 0.10	Pass
STAP-1241	02/01/11	Cs-134	3.44 ± 0.27	3.49	2.44 - 4.54	Pass
STAP-1241	02/01/11	Cs-137	2.46 ± 0.27	2.28	1.60 - 2.96	Pass
STAP-1241	02/01/11	Gr. Alpha	0.39 ± 0.05	0.66	0.20 - 1.12	Pass
STAP-1241	02/01/11	Gr. Beta	1.54 ± 0.07	1.32	0.66 - 1.99	Pass
STAP-1241	02/01/11	Mn-54	2.90 ± 0.10	2.64	1.85 - 3.43	Pass
STAP-1241 e	02/01/11	Sr-90	1.89 ± 0.15	1.36	0.95 - 1.77	Fail
STAP-1241	02/01/11	Zn-65	3.80 ± 0.18	3.18	2.23 - 4.13	Pass
STVE-1250	08/01/11	Co-57	0.01 ± 0.02	0.00	-	Pass
STVE-1250	08/01/11	Co-60	3.57 ± 0.13	3.38	2.37 - 4.39	Pass
STVE-1250	08/01/11	Cs-134	-0.02 ± 0.04	0.00	-0.10 - 0.10	Pass
STVE-1250	08/01/11	Cs-137	5.28 ± 0.20	4.71	3.30 - 6.12	Pass
STVE-1250	08/01/11	Mn-54	6.48 ± 0.22	5.71	4.00 - 7.42	Pass
STVE-1250	08/01/11	Zn-65	7.35 ± 0.34	6.39	4.47 - 8.31	Pass

TABLE E-5 DOE'S MIXED ANALYTE PERFORMANCE EVALUATION PROGRAM (MAPEP)[a] ENVIRONMENTAL, INC., 2011

			Concentration [b]			
Lab Code [c]	Date	Analysis	Laboratory result	Known Activity	Control Limits [d]	Acceptance
STSO-1251	08/01/11	Co-57	1333.90 ± 4.20	1180.00	826.00 - 1534.00	Pass
STSO-1251	08/01/11	Co-60	701.30 ± 3.40	644.00	451.00 - 837.00	Pass
STSO-1251	08/01/11	Cs-134	0.71 ± 1.05	0.00	-	Pass
STSO-1251	08/01/11	Cs-137	1106.00 ± 5.60	979.00	685.00 - 1273.00	Pass
STSO-1251	08/01/11	K-40	749.20 ± 19.00	625.00	438.00 - 813.00	Pass
STSO-1251	08/01/11	Mn-54	984.30 ± 5.40	848.00	594.00 - 1102.00	Pass
STSO-1251 f	08/01/11	Sr-90	219.40 ± 16.70	320.00	224.00 - 416.00	Fail
STSO-1251	08/01/11	Zn-65	1639.90 ± 11.40	1560.00	1092.00 - 2028.00	Pass
STAP-1252	08/01/11	Co-57	5.06 ± 0.08	5.09	3.56 - 6.62	Pass
STAP-1252	08/01/11	Co-60	3.13 ± 0.09	3.20	2.24 - 4.16	Pass
STAP-1252	08/01/11	Cs-134	0.01 ± 0.03	0.00	-0.10 - 0.10	Pass
STAP-1252	08/01/11	Cs-137	2.61 ± 0.09	2.60	1.82 - 3.38	Pass
STAP-1252	08/01/11	Mn-54	0.01 ± 0.03	0.00	-0.10 - 0.10	Pass
STAP-1252	08/01/11	Sr-90	1.65 ± 0.16	1.67	1.17 - 2.17	Pass
STAP-1252	08/01/11	Zn-65	4.46 ± 0.23	4.11	2.88 - 5.34	Pass
STW-1254	08/01/11	Co-57	37.20 ± 0.50	36.60	25.60 - 47.60	Pass
STW-1254	08/01/11	Co-60	28.80 ± 0.40	29.30	20.50 - 38.10	Pass
STW-1254	08/01/11	Cs-134	18.00 ± 0.60	19.10	13.40 - 24.80	Pass
STW-1254	08/01/11	Cs-137	0.06 ± 0.13	0.00	-	Pass
STW-1254	08/01/11	H-3	1039.90 ± 17.90	1014.00	710.00 - 1318.00	Pass
STW-1254	08/01/11	K-40	161.40 ± 4.10	156.00	109.00 - 203.00	Pass
STW-1254	08/01/11	Mn-54	25.70 ± 0.50	25.00	17.50 - 32.50	Pass
STW-1254	08/01/11	Sr-90	15.60 ± 1.80	14.20	9.90 - 18.50	Pass
STW-1254	08/01/11	Zn-65	30.20 ± 0.90	28.50	20.00 - 37.10	Pass
STW-1255	08/01/11	Gr. Alpha	0.72 ± 0.12	0.87	0.26 - 1.47	Pass
STW-1255	08/01/11	Gr. Beta	4.71 ± 0.15	4.81	2.41 - 7.22	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. A known value of "zero" indicates an analysis was included in the testing series as a "false positive". MAPEP does not provide control limits.

[e] No errors found in calculation or procedure, results of reanalysis; 1.73 Bq/filter.

[f] The analyses were repeated through a strontium column; mean result of triplicate analyses, 304.2 Bq/kg.

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APPENDIX F

ANNUAL RADIOLOGICAL GROUNDWATER PROTECTION PROGRAM REPORT (ARGPPR)

Docket No: 50 – 352
50 – 353

LIMERICK GENERATING STATION
UNITS 1 and 2

Annual Radiological
Groundwater Protection Program Report

1 January Through 31 December 2011

Prepared By

Teledyne Brown Engineering
Environmental Services

Exelon SM
Nuclear

Limerick Generating Station
Sanatoga, PA 19464

April 2012

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Appendices

I. Summary and Conclusions

This report on the Radiological Groundwater Protection Program (RGPP) conducted for the Limerick Generating Station (LGS) by Exelon Nuclear, covers the period 01 January 2011 through 31 December 2011. During that time period, 384 analyses were performed on 132 samples from 12 groundwater, 7 surface water, and 4 precipitation water locations collected from the environment, both on and off station property in 2011.

There were no spills that could affect the ground water monitoring program in 2011.

Tritium was not detected in any of the groundwater, surface water, or precipitation 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 two of the 12 groundwater monitoring locations and one of seven surface water locations. The tritium concentrations ranged from 177 to 1,154 pCi/L for groundwater and 236 to 1607 pCi/L for surface water.

Strontium-90 was not detected and met the required LLD groundwater and surface water samples.

Gross Alpha and Gross Beta analyses in the dissolved and suspended fractions performed on groundwater water samples throughout 2011. Gross Alpha (dissolved) was detected at 5 of 12 groundwater locations. The concentrations ranged from 1.2 to 2.7 pCi/L. Gross Alpha (suspended) was detected at 4 of 12 groundwater locations. The concentrations ranged from 1.3 to 82.8 pCi/L. Gross Beta (dissolved) was detected at 12 of 12 groundwater water locations. The concentrations ranged from 2.0 to 31.2 pCi/L. Gross Beta (suspended) was detected at 8 of 12 groundwater locations. The concentrations ranged from 1.6 to 407 pCi/L.

Naturally occurring K-40 was detected in one sample. All other gamma-emitting radionuclides associated with licensed plant operations met the required LLDs.

Tritium in precipitation samples associated with the recapture of Limerick gaseous tritium releases met the LLD.

Hard-To-Detect analyses were not performed in 2011.

Although no drinking water pathway is available from groundwater, the dose via the drinking water pathway was calculated at 0.07 mrem to a child (total body), which was 1.14% of the 10 CFR 50, Appendix I dose limit.

In assessing all the data gathered for this report, it was concluded that the operation of Limerick Generating Station had no adverse radiological impact on the environment offsite of LGS.

II. Introduction

The Limerick Generating Station (LGS), consisting of two 3,515 MWt boiling water reactors owned and operated by Exelon Corporation, is located adjacent to the Schuylkill River in Montgomery County, Pennsylvania. Unit No. 1 went critical on 22 December 1984. Unit No. 2 went critical on 11 August 1989. The site is located in Piedmont countryside, transversed by numerous valleys containing small tributaries that feed into the Schuylkill River. On the eastern river bank elevation rises from approximately 110 to 300 feet mean sea level (MSL). On the western river bank elevation rises to approximately 50 feet MSL to the western boundary.

This report covers those analyses performed by Teledyne Brown Engineering (TBE) on samples collected in 2011.

In 2006, Exelon instituted a comprehensive program to evaluate the impact of station operations on groundwater and surface water in the vicinity of Limerick Generating Station. This evaluation involved numerous station personnel and contractor support personnel.

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. Report new leaks, spills, or other detections with potential radiological significance to stakeholders in a timely manner.

5. Regularly assess analytical results to identify adverse trends.

6. Take necessary corrective actions to protect groundwater resources.

B. Implementation of the Objectives

The objectives identified have been implemented at Limerick Generating Station as discussed below:

1. Exelon and its consultant identified locations as described in the 2006 Phase 1 study. The Phase 1 study results and conclusions were made available to state and federal regulators in station specific reports.

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

3. Limerick Generating Station will continue to perform routine sampling and radiological analysis of water from selected locations.

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

5. Limerick Generating Station staff and consulting hydrogeologist assess analytical results on an ongoing basis to identify adverse trends.

C. Program Description

Samples for the ongoing ground water monitoring program were collected for Exelon Nuclear by Normandeau Associates, Inc. (NAI). This section describes the general collection methods used to obtain environmental samples for the LGS RGPP in 2011. Sample locations can be found in Table A–1, Appendix A.

1. Sample Collection

<u>Groundwater, Surface Water, and Precipitation Water</u>

Samples of groundwater, surface water, and precipitation water were collected, managed, transported and analyzed in accordance with approved procedures following EPA methods. Sample locations, sample collection frequencies and analytical frequencies were controlled in accordance with approved station procedures.

Contractor and/or station personnel were trained in the collection, preservation management, and shipment of samples, as well as in documentation of sampling events. Analytical laboratories were subject to internal quality assurance programs, industry cross-check programs, as well as nuclear industry audits. Station personnel reviewed and evaluated all analytical data deliverables as data was received.

Both station personnel and an independent hydrogeologist reviewed analytical data results for adverse trends or changes to hydrogeologic conditions.

D. Characteristics of Tritium (H-3)

Tritium (chemical symbol H-3) is a radioactive isotope of hydrogen. The most common form of tritium is tritium oxide, which is also called "tritiated water." The chemical properties of tritium are essentially those of ordinary hydrogen.

Tritiated water behaves the same as ordinary water in both the environment and the body. Tritium can be taken into the body by drinking water, breathing air, eating food, or absorption through skin. Once tritium enters the body, it disperses quickly and is uniformly distributed throughout the body. Tritium is excreted primarily through urine with a clearance rate characterized by an effective biological half-life of about 14 days. Within one month or so after ingestion, essentially all tritium is cleared. Organically bound tritium (tritium that is incorporated in organic compounds) can remain in the body for a longer period.

Tritium is produced naturally in the upper atmosphere when cosmic rays strike air molecules. Tritium is also produced during nuclear weapons explosions, as a by-product in reactors producing electricity, and in special production reactors, where the isotopes lithium-7 and/or boron-10 are activated to produce tritium. Tritiated water, like normal water, is colorless and odorless. Tritiated water behaves chemically and physically like non-tritiated water in the subsurface, and therefore tritiated water will travel at the same velocity as the average groundwater velocity.

Tritium has a half-life of approximately 12.3 years. It decays spontaneously to helium-3 (He-3). This radioactive decay releases a beta particle (low-energy electron). The radioactive decay of tritium is the source of the health risk from exposure to tritium. Tritium is one of the

least dangerous radionuclides because it emits very weak radiation and leaves the body relatively quickly. Since tritium is almost always found as water, it goes directly into soft tissues and organs. The associated dose to these tissues is generally uniform and is dependent on the water content of the specific tissue.

III. Program Description

A. Sample Analysis

This section describes the general analytical methodologies used by TBE to analyze the environmental samples for radioactivity for the Limerick Generating Station RGPP in 2011.

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

1. Concentrations of tritium in groundwater, surface water, and precipitation water.
2. Concentrations of Gross Alpha, Dissolved and Suspended and Gross Beta, Dissolved and Suspended in groundwater.
3. Concentrations of gamma emitters in groundwater and surface water.
4. Concentrations of strontium-90 in groundwater and surface water.

B. Data Interpretation

The radiological data collected prior to Limerick Generating Station becoming operational were used as a baseline with which these operational data were compared. For the purpose of this report, Limerick Generating Station was considered operational at initial criticality. Several factors were important in the interpretation of the data:

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

   The lower limit of detection (LLD) is defined as the smallest concentration of radioactive material in a sample that would yield a net count (above background) that would be detected with only a 5% probability of falsely concluding that a blank observation represents a "real" signal. The LLD is intended as a before the fact

estimate of a system (including instrumentation, procedure and sample type) and not as an after the fact criterion for the presence of activity. All analyses are designed to achieve the required LGS 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. 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) as well as all sources of error (Total Propagated Uncertainty or TPU). Each result has two values calculated. Exelon reports the TPU by following the result with plus or minus ± the estimated sample standard deviation, as TPU, that is obtained by propagating all sources of analytical uncertainty in measurements.

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

C. Background Analysis

A pre-operational radiological environmental monitoring program (pre-operational REMP) was conducted to establish background radioactivity levels prior to operation of the Station. The environmental media sampled and analyzed during the pre-operational REMP were atmospheric radiation, fall-out, domestic water, surface water, aquatic life, and foodstuffs. The results of the monitoring were detailed in the report entitled, Pre-operational Radiological Environmental Monitoring Program Report, Limerick Generating Station Units 1 and 2, 1 January 1982 through 21 December 1984, Teledyne Isotopes and Radiation Management Corporation.

The pre-operational REMP contained analytical results from samples collected from both surface water and groundwater.

Monthly surface water sampling began in 1982, and the samples were analyzed for tritium as well as other radioactive analytes. During the preoperational program tritium was detected at a maximum concentration of 420 pCi/L, indicating that these preoperational results were from nuclear weapons testing and was radioactively decaying as predicted. Gamma isotopic results from the preoperational program were all less than or at the minimum detectable concentration (MDC) level.

1. Background Concentrations of Tritium

The purpose of the following discussion is to summarize background measurements of tritium in various media performed by others. Additional detail may be found by consulting references.

a. Tritium Production

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

A major anthropogenic source of tritium and 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.

b. Precipitation Data

Precipitation samples are routinely collected at stations around the world for the analysis of tritium and other radionuclides. Two publicly available databases that provide tritium concentrations in precipitation are Global Network of Isotopes in Precipitation (GNIP) and USEPA's RadNet database. GNIP provides tritium precipitation concentration data for samples collected world wide since 1960. RadNet provides tritium precipitation concentration data for samples collected at stations through out the U.S. Based on GNIP data for sample stations located in the U.S., tritium concentrations peaked around 1963. This peak, which approached 10,000 pCi/L for some stations, coincided with the atmospheric testing of thermonuclear weapons. Tritium concentrations in surface water showed a sharp decline up until 1975 followed by a gradual decline since that time. Tritium concentrations have typically been below 100 pCi/L since approximately 1980. Tritium concentrations in wells may still be above the 200 pCi/L detection limit from the external causes described above. Water from previous years was naturally captured in groundwater. As a result, some well water sources today are affected by the surface water from the 1960s that contained elevated tritium activity.

c. Surface Water Data

Tritium concentrations are routinely measured in the Schuylkill and Delaware Rivers. Pennsylvania surface water data are typically less than 100 pCi/L.

The USEPA RadNet surface water data typically has a reported 'Combined Standard Uncertainty' of 35 to 50 pCi/L. According to USEPA, this corresponds to a ± 70 to 100 pCi/L 95% confidence bound on each given measurement. Therefore, the typical background data provided may be subject to measurement uncertainty of approximately ± 70 to 100 pCi/L.

The radioanalytical laboratory is counting tritium results to an Exelon specified LLD of 200 pCi/L. Typically, the lowest positive measurement will be reported within a range of 40 –

240 pCi/L or 140 ± 100 pCi/L. At this concentration, these sample results cannot be distinguished as different from background.

IV. Results and Discussion

Gamma spectroscopy results for groundwater and surface water sample were reported for fourteen nuclides (Be-7, K-40, Mn-54, Co-58, Fe-59, Co-60, Zn-65, Nb-95, Zr-95, I-131, Cs-134, Cs-137, Ba-140 and La-140).

A. Groundwater Results

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

Tritium

Samples from twelve locations were analyzed for tritium activity (Table B–I.1, Appendix B). Tritium values ranged from non detectable to 1,154 pCi/L. Well MW-LR-9 had the highest value of 1,154 pCi/L. The activity in this well is from a 2009 leak to ground. Although no drinking water pathway is available from groundwater, the theoretical dose via the drinking water pathway was calculated at 0.07 mrem to a child (total body), which represents 1.14% of the 10 CFR 50, Appendix I dose limit of 6 mrem.

Strontium

All Sr-90 analyses met the required LLD (Table B–I.1, Appendix B).

Gross Alpha and Gross Beta (dissolved and suspended)

Gross Alpha and Gross Beta analyses in the dissolved and suspended fractions were performed on groundwater throughout the sampling year. Gross Alpha (dissolved) was detected at 5 of 12 groundwater locations. The concentrations ranged from 1.2 to 2.7 pCi/L. Gross Alpha (suspended) was detected at 4 of 12 groundwater locations. The concentrations ranged from 1.3 to 82.8 pCi/L. Gross Beta (dissolved) was detected at 12 of 12 groundwater water locations. The concentrations ranged from 2.0 to 31.2 pCi/L. Gross Beta (suspended) was detected at 8 of 12 groundwater locations. The concentrations ranged from 1.6 to 407

pCi/L (Table B-I.1, Appendix B).

Gamma Emitters

Potassium-40 was detected at one of 12 groundwater locations at a concentration of 81 pCi/L. All other gamma emitting nuclides met their respective LLDs (Table B-I.2, Appendix B).

Hard-To-Detect

Hard-To-Detect analyses were performed in 2011.

B. Surface Water Results

In accordance with the Station's radiological groundwater protection program surface water samples were collected from streams that transverses the site, as well as, from other water bodies that could influence the tritium concentration at Limerick. Analytical results and anomalies are discussed below.

Tritium

Samples from seven locations were analyzed for tritium activity. Tritium activity was detected in station SW-LR-8. The concentrations ranged from 236 to 1,607 pCi/Liter (Table B-II.1, Appendix B).

Strontium

All Sr-90 analyses met the required LLD (Table B–II.1, Appendix B).

Gross Alpha and Gross Beta (dissolved and suspended)

Gross Alpha and Gross Beta analyses were not performed on any surface water samples in 2011.

Gamma Emitters

All gamma emitting nuclides met their respective LLDs (Table B–II.2, Appendix B).

C. Precipitation Water Results

Tritium

All tritium analyses met the required LLDs (Table B–III.1, Appendix B).

D. Drinking Water Well Survey

A drinking water well survey was conducted during the summer 2006 by CRA (CRA 2006) around the Limerick Generating Station. CRA reviewed the Pennsylvania Groundwater Information System database to identify wells within a 1-mile radius from the center of the Station. Forty-six domestic withdrawal wells, two industrial wells, two commercial wells, and one institutional well were identified within the specified radius. The well depths range from 78 to 345 feet blow ground surface (bgs), and they yield between 8 and 100 gallons per minute (gpm). All wells are completed in the Brunswick Formation.

The Limerick Generating Station has one potable supply well and one fire water well. The potable supply well is constructed as an open-rock borehole. Groundwater was measured at a depth 102 feet bgs during a well pump replacement in 2004 (personal communication with Station, 2006). The pump was placed at a depth of approximately 294 feet bgs. The total well depth and the depth of the steel casing are unknown. The well is located approximately 175 feet east of the Reactor Building. The Station estimates that the well is pumped at approximately 2 gpm. The fire water well is constructed as an open-rock borehole. Groundwater was encountered at 121 feet bgs during a well pump replacement in 2004. The well pump was placed at a depth of approximately 399 feet bgs. The total well depth and the depth of the steel casing are unknown. The well is located approximately 500 feet east of the cooling towers. The well is used only in an emergency fire situation; therefore, water use is estimated to be zero.

E. Summary of Results – Inter-Laboratory Comparison Program

Inter-Laboratory Comparison Program results for TBE are presented in the Annual Radiological Environmental Operating Report.

F. Leaks, Spills, and Releases

There were no spills to ground containing radioactive material in 2011.

However, the Power Block Foundation Sump, which collects groundwater around the reactor buildings, turbine building and rad waste building, had identified tritium in the first quarter sample and analysis of potentially contaminated systems (IR1200128). The activity was recorded as 21,000 pCi/L. The source of the tritium was determined to be from groundwater movement from the 2009 turbine building leak. Trending over a period of months showed that tritium activity returned to below the radioactive effluent control program's MDC of 3500 pCi/L.

G. Trends

Tritium concentrations in well MW-LR-9 continue to decrease from the levels observed from the 2009 leak. The tritium levels at well MW-LR-8 have increased to the same levels of well MW-LR-9.

H. Investigations

Conclusions from the Phase 1 report in 2006 have been made available to state and federal regulators and to the public. Currently no investigations are on going.

I. Actions Taken

1. Compensatory Actions

   There have been no station events requiring compensatory actions at the Limerick Generating Station.

2. Installation of Monitoring Wells

   No new wells have been installed in 2011

3. Actions to Recover/Reverse Plumes

   No actions were required to recover or reverse groundwater plumes.

V. References

1. Conestoga Rovers and Associates, Fleetwide Assessment, Limerick Generating Station, Sanatoga, Pennsylvania, Ref. No. 045136(17), September 2006

2. Pre-operational Radiological Environmental Monitoring Program Report, Limerick Generating Station Units 1 and 2, 1 January 1982 through 21 December 1984, Teledyne Isotopes and Radiation Management Corporation.

APPENDIX A

LOCATION DESIGNATION

TABLE A-1: Radiological Groundwater Protection Program – Sampling Locations for the Limerick Generating Station, 2011

Location	Type	Distance
MW-LR-1	Monitoring Well	Onsite
MW-LR-2	Monitoring Well	Onsite
MW-LR-3	Monitoring Well	Onsite
MW-LR-4	Monitoring Well	Onsite
MW-LR-5	Monitoring Well	Onsite
MW-LR-6	Monitoring Well	Onsite
MW-LR-7	Monitoring Well	Onsite
MW-LR-8	Monitoring Well	Onsite
MW-LR-9	Monitoring Well	Onsite
P11	Monitoring Well	Onsite
P14	Monitoring Well	Onsite
P16	Monitoring Well	Onsite
P17	Monitoring Well	Onsite
P3	Monitoring Well	Onsite
SP22	Monitoring Well	Onsite
SW-LR-2	Surface Water	Offsite
SW-LR-4	Surface Water	Offsite
SW-LR-6	Surface Water	Offsite
SW-LR-7	Surface Water	Onsite
SW-LR-8 (Hold Pond)	Surface Water	Onsite
SW-LR-9 (Spray Pond)	Surface Water	Onsite
SW-LR-10	Surface Water	Onsite
36S3	Precipitation Water	Onsite
E-5	Precipitation Water	Onsite
ESE-6	Precipitation Water	Onsite
SE-7	Precipitation Water	Onsite

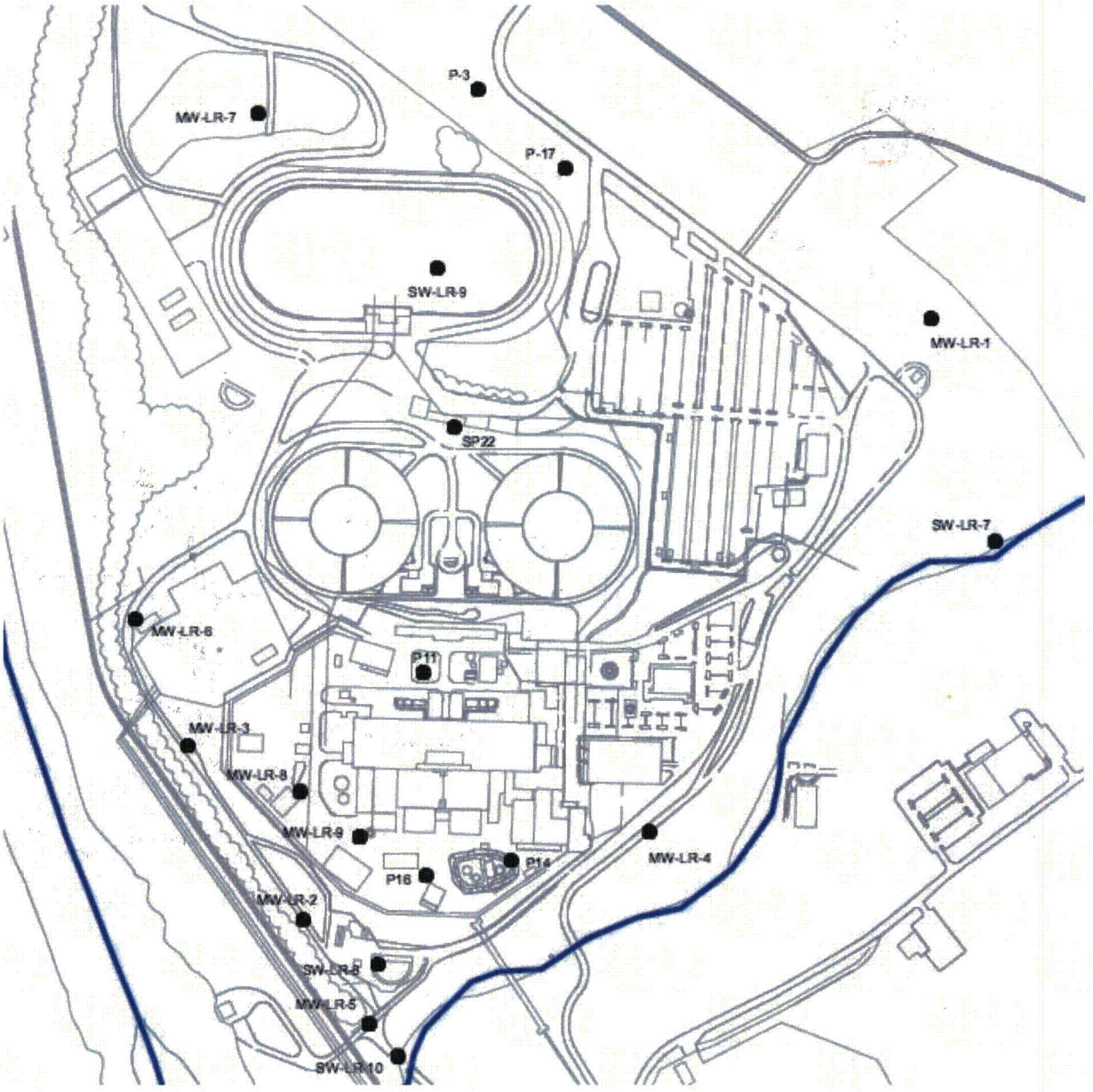

Figure 1 Routine Well Water, Surface Water and Precipitation Sample Locations for the Radiological Groundwater Protection Program, Limerick Generating Station, 2011.

Figure 1 Routine Well Water, Surface Water and Precipitation Sample Locations for the Radiological Groundwater Protection Program, Limerick Generating Station, 2011.

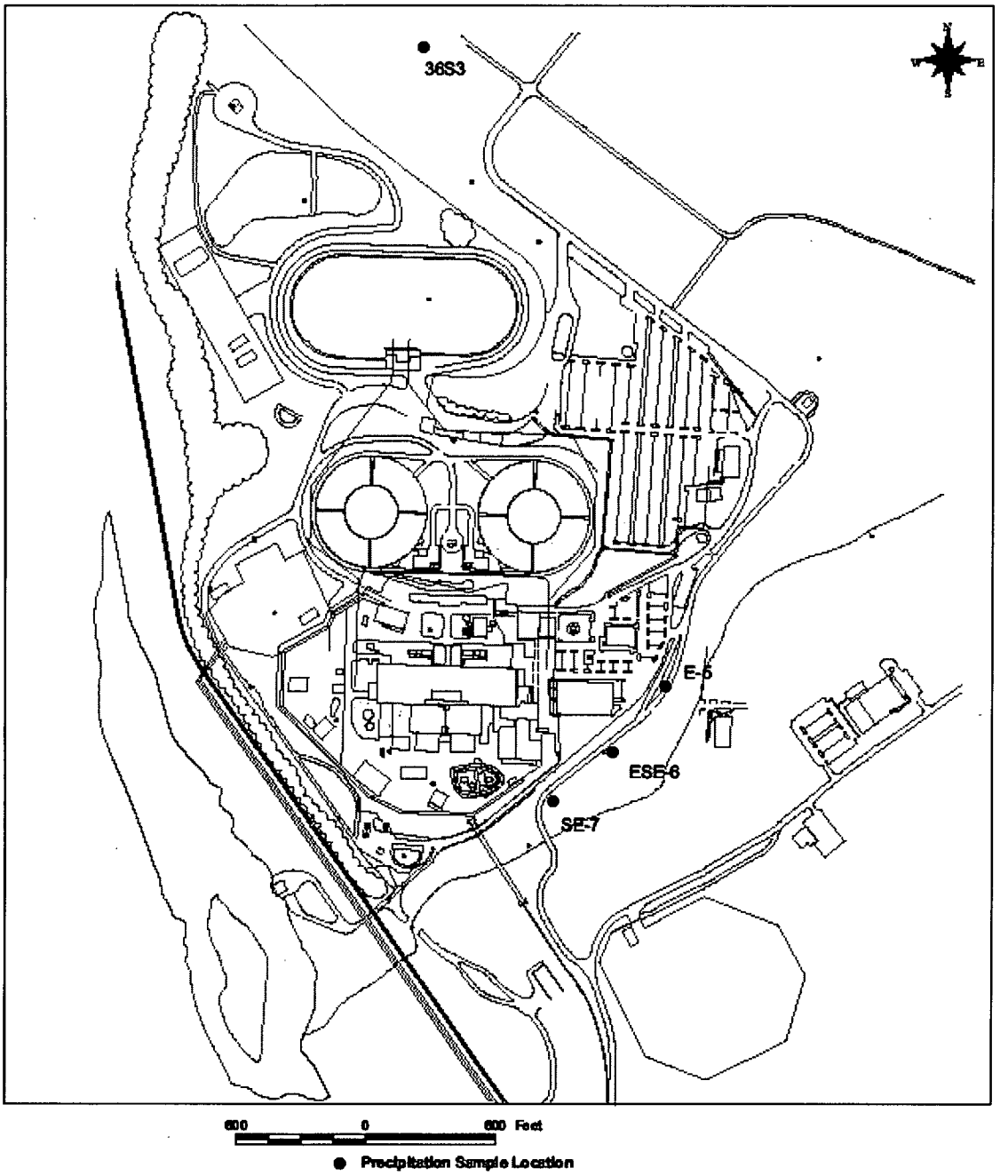

Figure 1 Routine Well Water, Surface Water and Precipitation Sample Locations for the Radiological Groundwater Protection Program, Limerick Generating Station, 2011.

APPENDIX B

DATA TABLES

TABLE B-I.1 CONCENTRATIONS OF TRITIUM, STRONTIUM-90, GROSS ALPHA, AND GROSS BETA IN WELL WATER SAMPLES COLLECTED AS PART OF THE RADIOLOGICAL GROUNDWATER PROTECTION PROGRAM, LIMERICK GENERATING STATION, 2011

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION DATE		H-3	SR-90	GR-A (DIS)	GR-A (SUS)	GR-B (DIS)	GR-B (SUS)
MW-LR-1	04/19/11		< 191	< 0.8	< 0.8	< 0.9	4.5 ± 0.9	< 1.6
MW-LR-2	01/19/11		< 147		2.0 ± 0.8	< 0.8	6.4 ± 2.9	2.7 ± 1.6
MW-LR-2	04/19/11		< 192	< 0.8	1.5 ± 0.7	< 0.9	3.7 ± 0.9	< 1.6
MW-LR-2	07/19/11		< 172		< 1.3	< 0.8	2.0 ± 1.1	1.6 ± 1.0
MW-LR-2	11/15/11		< 169		< 0.8	< 0.6	4.4 ± 1.1	< 1.7
MW-LR-3	01/19/11		< 150		1.2 ± 0.7	< 0.7	6.2 ± 2.9	< 2.3
MW-LR-3	04/19/11		< 189	< 0.8	1.4 ± 0.9	< 0.9	3.9 ± 1.1	< 1.6
MW-LR-3	07/20/11		< 169		< 1.5	< 0.8	2.8 ± 1.1	< 1.5
MW-LR-3	11/15/11		< 167		2.7 ± 1.0	< 0.6	4.3 ± 1.1	< 1.7
MW-LR-4	01/19/11		< 147		< 1.3	1.3 ± 0.8	7.5 ± 3.5	< 2.4
MW-LR-4	04/19/11		< 190	< 0.8	< 1.9	< 0.9	5.2 ± 1.3	< 1.6
MW-LR-4	07/20/11		< 170		< 2.2	< 0.8	5.0 ± 1.3	< 1.5
MW-LR-4	11/15/11		< 169		< 1.3	< 0.6	5.6 ± 1.2	< 1.7
MW-LR-5	01/19/11		< 155		< 4.2	< 2.1	23.5 ± 10.2	< 3.5
MW-LR-5	04/19/11		< 189	< 0.7	< 0.8	< 0.9	5.0 ± 1.0	< 1.6
MW-LR-5	07/19/11		< 171		< 1.6	< 0.4	5.8 ± 1.2	1.6 ± 0.9
MW-LR-5	11/15/11		< 190		1.7 ± 0.8	< 0.4	13.5 ± 1.4	2.1 ± 1.1
MW-LR-7	01/19/11		< 146		< 2.0	< 0.9	5.3 ± 2.3	3.7 ± 1.7
MW-LR-7	04/19/11		< 190	< 0.8	< 0.6	< 0.5	3.8 ± 0.8	< 1.5
MW-LR-7	07/19/11		< 169		< 0.9	< 0.4	2.9 ± 0.9	< 1.3
MW-LR-7	11/15/11		< 170		< 0.5	< 0.4	4.1 ± 0.9	< 1.6
MW-LR-8	01/19/11	TBE	< 160		< 1.0	< 0.7	5.0 ± 3.2	2.4 ± 1.6
MW-LR-8	01/19/11	TBE	181 ± 105		1.9 ± 0.9	< 0.7	3.1 ± 1.1	< 2.4
MW-LR-8	01/19/11	EIML	289 ± 95					
MW-LR-8	01/19/11	EIML	211 ± 86					
MW-LR-8	04/19/11	TBE	< 188	< 0.9	< 1.7	< 0.5	2.2 ± 1.2	< 1.5
MW-LR-8	04/19/11	TBE	< 192	< 0.7	< 1.6	< 0.5	3.8 ± 1.2	< 1.5
MW-LR-8	04/19/11	EIML	217 ± 97	< 0.5				
MW-LR-8	07/19/11		265 ± 122		< 3.5	< 0.7	< 2.3	< 1.8
MW-LR-8	07/19/11		296 ± 120		< 2.4	< 0.4	2.3 ± 1.2	< 1.3
MW-LR-8	07/19/11	EIML	211 ± 86					
MW-LR-8	11/16/11	TBE	278 ± 130		< 1.6	< 0.8	3.8 ± 1.2	< 1.5
MW-LR-8	11/16/11	TBE	360 ± 132		2.3 ± 1.2	< 0.4	4.6 ± 1.3	< 1.6
MW-LR-8	11/16/11	EIML	287 ± 85					
MW-LR-9	01/19/11	TBE	177 ± 106		1.3 ± 0.8	< 0.8	8.6 ± 3.1	< 2.4
MW-LR-9	01/19/11	TBE	388 ± 116		< 0.7	< 0.8	6.2 ± 2.8	< 2.4
MW-LR-9	01/19/11	EIML	348 ± 97					
MW-LR-9	01/19/11	EIML	361 ± 93					
MW-LR-9	04/12/11		626 ± 363					
MW-LR-9	04/19/11	TBE	1070 ± 172	< 0.7	< 1.4	5.3 ± 2.5	8.6 ± 1.7	### ± 3.6
MW-LR-9	04/19/11	TBE	1090 ± 175	< 0.8	< 1.3	7.9 ± 3.5	8.0 ± 1.6	### ± 5.2
MW-LR-9	04/19/11	EIML	1154 ± 130	< 0.6				
MW-LR-9	05/09/11		546 ± 143					
MW-LR-9	06/07/11		568 ± 137					
MW-LR-9	07/19/11		447 ± 128		< 0.6	< 0.7	3.0 ± 0.7	< 1.8
MW-LR-9	07/19/11		303 ± 120		< 1.7	< 0.7	6.3 ± 1.2	< 1.6
MW-LR-9	07/19/11	EIML	361 ± 93					
MW-LR-9	11/16/11	TBE	243 ± 124		1.5 ± 0.8	1.4 ± 0.8	7.7 ± 1.1	2.1 ± 1.1
MW-LR-9	11/16/11	TBE	270 ± 126		2.0 ± 0.9	1.7 ± 0.9	8.1 ± 1.2	2.8 ± 1.2
MW-LR-9	11/16/11	EIML	271 ± 85					
P11	01/19/11		< 157		< 2.6	< 1.9	31.2 ± 9.4	2.2 ± 1.3
P11	04/19/11		< 191	< 0.8	< 4.5	< 2.5	22.5 ± 5.2	< 4.0
P11	07/19/11		< 172		< 4.1	< 0.7	22.8 ± 2.1	< 1.6
P11	11/16/11		< 181		< 1.7	< 0.6	20.2 ± 1.7	< 1.6
P14	01/19/11		< 154		< 1.8	30.1 ± 11.9	5.6 ± 2.4	### ± 9.7
P14	04/19/11		< 191	< 0.7	< 2.0	6.7 ± 2.6	3.7 ± 1.8	### ± 3.5
P14	07/19/11		< 169		< 5.0	2.4 ± 1.2	4.7 ± 1.6	### ± 1.9
P14	11/16/11		< 181		< 2.6	< 0.7	14.9 ± 1.8	3.4 ± 1.3
P16	01/20/11		< 158		< 2.9	82.8 ± 16.0	26.5 ± 7.3	407 ± 16.1
P16	04/19/11		< 189	< 0.7	< 5.1	< 2.6	24.3 ± 5.7	< 4.1
P16	07/19/11		< 182		< 8.6	< 3.6	9.9 ± 5.9	< 4.2
P16	11/16/11		< 184		< 4.1	5.5 ± 1.6	17.9 ± 2.3	4.7 ± 1.6
P17	04/19/11		< 193	< 0.6	< 1.3	< 0.5	2.8 ± 1.1	< 1.5

TABLE B-I.2 **CONCENTRATIONS OF GAMMA EMITTERS IN WELL WATER SAMPLES COLLECTED AS PART OF THE RADIOLOGICAL GROUNDWATER PROTECTION PROGRAM, LIMERICK GENERATING STATION, 2011**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION DATE		Be-7	K-40	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	I-131	Cs-134	Cs-137	Ba-140	La-140
P11	04/19/11		< 18	< 16	< 2	< 2	< 3	< 2	< 4	< 2	< 3	< 13	< 2	< 2	< 21	< 5
P14	04/19/11		< 13	< 50	< 2	< 2	< 3	< 1	< 3	< 2	< 3	< 15	< 1	< 2	< 20	< 6
P16	04/19/11		< 15	< 10	< 1	< 2	< 3	< 1	< 2	< 2	< 3	< 14	< 1	< 1	< 19	< 5
P17	04/19/11		< 19	< 11	< 1	< 2	< 3	< 1	< 3	< 2	< 3	< 14	< 1	< 1	< 24	< 7
MW-LR-1	04/19/11		< 13	< 11	< 1	< 1	< 4	< 1	< 2	< 2	< 3	< 10	< 1	< 1	< 15	< 4
MW-LR-2	04/19/11		< 20	< 55	< 2	< 2	< 5	< 2	< 4	< 3	< 4	< 14	< 2	< 2	< 23	< 7
MW-LR-3	04/19/11		< 18	< 38	< 2	< 2	< 4	< 1	< 3	< 2	< 3	< 12	< 2	< 1	< 19	< 6
MW-LR-4	04/19/11		< 21	< 15	< 2	< 2	< 4	< 2	< 3	< 2	< 3	< 13	< 2	< 2	< 20	< 7
MW-LR-5	04/19/11		< 19	< 40	< 1	< 2	< 5	< 1	< 3	< 2	< 3	< 14	< 2	< 2	< 17	< 6
MW-LR-7	04/19/11		< 14	< 14	< 1	< 2	< 3	< 1	< 3	< 2	< 3	< 11	< 1	< 2	< 17	< 5
MW-LR-8	04/19/11	TBE	< 16	< 16	< 1	< 2	< 4	< 2	< 3	< 2	< 3	< 14	< 1	< 2	< 21	< 5
MW-LR-8	04/19/11	TBE	< 21	< 19	< 2	< 2	< 4	< 2	< 4	< 2	< 4	< 14	< 2	< 2	< 25	< 8
MW-LR-8	04/19/11	EIML	< 20	< 58	< 2	< 3	< 5	< 2	< 4	< 2	< 5	< 8	< 2	< 3	< 19	< 3
MW-LR-8	11/16/11	EIML	< 59	< 118	< 7	< 5	< 12	< 6	< 16	< 13	< 14	< 10	< 6	< 7	< 37	< 10
MW-LR-9	04/12/11		< 37	< 49	< 4	< 3	< 9	< 4	< 9	< 5	< 7	< 15	< 4	< 4	< 32	< 12
MW-LR-9	04/19/11	TBE	< 14	< 13	< 1	< 2	< 3	< 2	< 3	< 2	< 3	< 15	< 1	< 1	< 18	< 6
MW-LR-9	04/19/11	TBE	< 18	81 ± 40	< 2	< 2	< 5	< 2	< 4	< 2	< 3	< 14	< 2	< 2	< 22	< 8
MW-LR-9	04/19/11	EIML	< 29	< 69	< 2	< 2	< 7	< 2	< 5	< 2	< 7	< 12	< 3	< 3	< 23	< 3
MW-LR-9	11/16/11	EIML	< 40	< 90	< 5	< 4	< 13	< 5	< 9	< 3	< 7	< 9	< 6	< 5	< 29	< 2

TABLE B-II.1 CONCENTRATIONS OF TRITIUM AND STRONTIUM-90 IN SURFACE WATER SAMPLES COLLECTED AS PART OF THE RADIOLOGICAL GROUNDWATER PROTECTION PROGRAM, LIMERICK GENERATING STATION, 2011

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION DATE		H-3	SR-90
SW-LR-10	01/20/11		< 162	
SW-LR-10	04/20/11		< 192	< 0.7
SW-LR-10	07/18/11		< 173	
SW-LR-10	11/14/11		< 158	
SW-LR-2	01/20/11		< 157	
SW-LR-2	04/20/11		< 170	< 0.7
SW-LR-2	07/18/11		< 172	
SW-LR-2	11/14/11		< 181	
SW-LR-4	01/20/11		< 157	
SW-LR-4	04/20/11		< 170	< 0.7
SW-LR-4	07/18/11		< 169	
SW-LR-4	11/14/11		< 183	
SW-LR-6	01/20/11		< 155	
SW-LR-6	04/20/11		< 170	< 0.6
SW-LR-6	07/18/11		< 173	
SW-LR-6	11/14/11		< 183	
SW-LR-7	01/20/11		< 161	
SW-LR-7	04/20/11		< 169	< 0.8
SW-LR-7	07/18/11		< 171	
SW-LR-7	11/14/11		< 184	
SW-LR-8	01/19/11		301 ± 113	
SW-LR-8	04/19/11	TBE	1450 ± 200	< 0.8
SW-LR-8	04/19/11	EIML	1607 ± 136	< 0.6
SW-LR-8	07/20/11		< 173	
SW-LR-8	11/14/11		236 ± 112	
SW-LR-9	01/18/11		< 163	
SW-LR-9	04/19/11		< 191	< 0.7
SW-LR-9	07/20/11		< 171	
SW-LR-9	11/17/11		< 154	

TABLE B-II.2 **CONCENTRATIONS OF GAMMA EMITTERS IN SURFACE WATER SAMPLES COLLECTED AS PART OF THE RADIOLOGICAL GROUNDWATER PROTECTION PROGRAM, LIMERICK GENERATING STATION, 2011**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION DATE		Be-7	K-40	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	I-131	Cs-134	Cs-137	Ba-140	La-140
SW-LR-10	04/20/11		< 23	< 19	< 2	< 3	< 5	< 2	< 5	< 3	< 4	< 13	< 2	< 2	< 25	< 7
SW-LR-2	04/20/11		< 27	< 24	< 3	< 3	< 6	< 3	< 6	< 3	< 6	< 15	< 2	< 3	< 27	< 8
SW-LR-4	04/20/11		< 29	< 46	< 3	< 3	< 7	< 3	< 5	< 3	< 4	< 15	< 3	< 3	< 26	< 8
SW-LR-6	04/20/11		< 24	< 34	< 2	< 3	< 5	< 2	< 4	< 3	< 4	< 14	< 2	< 2	< 25	< 8
SW-LR-7	04/20/11		< 19	< 43	< 2	< 2	< 4	< 2	< 4	< 2	< 3	< 12	< 2	< 2	< 21	< 6
SW-LR-8	04/19/11		< 22	< 16	< 2	< 2	< 5	< 2	< 4	< 3	< 4	< 14	< 2	< 2	< 27	< 6
SW-LR-9	04/19/11	TBE	< 20	< 16	< 2	< 2	< 4	< 2	< 4	< 2	< 3	< 13	< 2	< 2	< 21	< 7
SW-LR-8	04/19/11	EIML	< 27	< 64	< 2	< 2	< 7	< 2	< 4	< 3	< 6	< 11	< 2	< 2	< 22	< 5

TABLE B-III.1 CONCENTRATIONS OF TRITIUM IN PRECIPITATION WATER SAMPLES COLLECTED AS PART OF THE RADIOLOGICAL GROUNDWATER PROTECTION PROGRAM, LIMERICK GENERATING STATION, 2011

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION DATE	H-3
36S3	03/18/11	< 181
36S3	03/29/11	< 179
36S3	05/02/11	< 187
36S3	05/31/11	< 176
36S3	06/27/11	< 184
36S3	07/26/11	< 169
36S3	08/30/11	< 175
36S3	09/23/11	< 185
36S3	10/26/11	< 185
36S3	11/28/11	< 179
E-5	03/18/11	< 182
E-5	03/29/11	< 180
E-5	05/02/11	< 186
E-5	05/31/11	< 186
E-5	06/27/11	< 185
E-5	07/26/11	< 169
E-5	08/30/11	< 177
E-5	09/23/11	< 182
E-5	10/26/11	< 188
E-5	11/28/11	< 178
ESE-6	03/18/11	< 183
ESE-6	03/29/11	< 179
ESE-6	05/02/11	< 185
ESE-6	05/31/11	< 175
ESE-6	06/27/11	< 184
ESE-6	07/26/11	< 168
ESE-6	08/30/11	< 176
ESE-6	09/23/11	< 187
ESE-6	10/26/11	< 185
ESE-6	11/28/11	< 181
SE-7	03/18/11	< 165
SE-7	03/29/11	< 181
SE-7	05/02/11	< 186
SE-7	05/31/11	< 187
SE-7	06/27/11	< 181
SE-7	07/26/11	< 167
SE-7	08/30/11	< 176
SE-7	09/23/11	< 189
SE-7	10/26/11	< 187
SE-7	11/28/11	< 184

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APPENDIX G

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TABLE A-1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY FOR THE LIMERICK GENERATING STATION, 2010

Name of Facility: LIMERICK GENERATING STATION **DOCKET NUMBER:** 50-352 & 50-353
Location of Facility: MONTGOMERY COUNTY PA **REPORTING PERIOD:** 2010

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	8	200	<LLD	<LLD	-		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
	NB-95		15	<LLD	<LLD	-		0

* THE MEAN AND 2 STANDARD DEVIATION VALUES ARE CALCULATED USING THE POSITIVE VALUES
FRACTION OF DETECTABLE MEASUREMENTS AT SPECIFIED LOCATIONS IS INDICATED IN PARENTHESES (F)

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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)	ZR-95		30	<LLD	<LLD	-		0
	I-131		15	<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	48	4	4.4 (26/36) (2.5/6.7)	3.8 (10/12) (3.2/5.3)	5.2 (9/12) (3.7/6.7)	15F4 INDICATOR PHILADELPHIA SUBURBAN WATER COMPANY 8.62 MILES SE OF SITE	0
	H-3	16	200	<LLD	<LLD	-		0

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Location of Facility: MONTGOMERY COUNTY PA **REPORTING PERIOD:** 2010

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
DRINKING WATER (PCI/LITER)	GAMMA	48						
	MN-54		15	<LLD	<LLD	-		0
	CO-58		15	<LLD	<LLD	-		0
	FE-59		30	<LLD	<LLD	-		0
	CO-60		15	<LLD	<LLD	-		0
	ZN-65		30	<LLD	<LLD	-		0
	NB-95		15	<LLD	<LLD	-		0
	ZR-95		30	<LLD	<LLD	-		0

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TABLE A-1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY FOR THE LIMERICK GENERATING STATION, 2010

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MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPES OF ANALYSIS PERFORMED	NUMBER OF ANALYSIS PERFORMED	REQUIRED LOWER LIMIT OF DETECTION (LLD)	INDICATOR LOCATIONS MEAN (M) (F) RANGE	CONTROL LOCATION MEAN (M) (F) RANGE	LOCATION WITH HIGHEST ANNUAL MEAN (M) MEAN (M) (F) RANGE	LOCATION WITH HIGHEST ANNUAL MEAN (M) STATION # NAME DISTANCE AND DIRECTION	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
DRINKING WATER (PCI/LITER)	I-131		15	<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
BOTTOM FEEDER (PCI/KG WET)	GAMMA	4						
	K-40		NA	3780 (2/2) (3640/3920)	3270 (2/2) (3260/3280)	3780 (2/2) (3640/3920)	16C5 INDICATOR VINCENT POOL DOWNSTREAM OF DISCHARGE	0
	MN-54		130	<LLD	<LLD			0

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TABLE A-1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY FOR THE LIMERICK GENERATING STATION, 2010

Name of Facility: LIMERICK GENERATING STATION **DOCKET NUMBER:** 50-352 & 50-353

Location of Facility: MONTGOMERY COUNTY PA **REPORTING PERIOD:** 2010

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
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
	I-131		NA	<LLD	<LLD	-		0
	CS-134		130	<LLD	<LLD	-		0
	CS-137		150	<LLD	<LLD	-		0

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TABLE A-1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY FOR THE LIMERICK GENERATING STATION, 2010

Name of Facility: LIMERICK GENERATING STATION **DOCKET NUMBER:** 50-352 & 50-353
Location of Facility: MONTGOMERY COUNTY PA **REPORTING PERIOD:** 2010

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPES OF ANALYSIS PERFORMED	NUMBER OF ANALYSIS PERFORMED	REQUIRED LOWER LIMIT OF DETECTION (LLD)	INDICATOR LOCATIONS MEAN (M) (F) RANGE	CONTROL LOCATION MEAN (M) (F) RANGE	LOCATION WITH HIGHEST ANNUAL MEAN (M) MEAN (M) (F) RANGE	LOCATION WITH HIGHEST ANNUAL MEAN (M) STATION # NAME DISTANCE AND DIRECTION	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
PREDATOR (PCI/KG WET)	GAMMA	4						
	K-40		NA	3075 (2/2) (2640/3510)	3210 (2/2) (3110/3310)	3210 (2/2) (3110/3310)	29C1 CONTROL POTTSTOWN VICINITY UPSTREAM OF INTAKE	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
	I-131		NA	<LLD	<LLD	-		0

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FRACTION OF DETECTABLE MEASUREMENTS AT SPECIFIED LOCATIONS IS INDICATED IN PARENTHESES (F)

TABLE A-1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY FOR THE LIMERICK GENERATING STATION, 2010

Name of Facility: LIMERICK GENERATING STATION **DOCKET NUMBER:** 50-352 & 50-353
Location of Facility: MONTGOMERY COUNTY PA **REPORTING PERIOD:** 2010

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
PREDATOR (PCI/KG WET)	CS-134		130	<LLD	<LLD	-		0
	CS-137		150	<LLD	<LLD	-		0
SEDIMENT (PCI/KG DRY)	GAMMA	6						
	BE-7		NA	2685 (2/4) (1630/3740)	<LLD	3740 (1/2)	16B2 INDICATOR LINFIELD BRIDGE 1.35 MILES SSE OF SITE	0
	K-40		NA	14225 (4/4) (10800/16100)	13350 (2/2) (13000/13700)	15700 (2/2) (15300/16100)	16B2 INDICATOR LINFIELD BRIDGE 1.35 MILES SSE OF SITE	0
	MN-54		NA	<LLD	<LLD	-		0
	CO-58		NA	<LLD	<LLD	-		0
	CO-60		NA	<LLD	<LLD			0

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TABLE A-1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY FOR THE LIMERICK GENERATING STATION, 2010

Name of Facility: LIMERICK GENERATING STATION **DOCKET NUMBER:** 50-352 & 50-353
Location of Facility: MONTGOMERY COUNTY PA **REPORTING PERIOD:** 2010

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPES OF ANALYSIS PERFORMED	NUMBER OF ANALYSIS PERFORMED	REQUIRED LOWER LIMIT OF DETECTION (LLD)	INDICATOR LOCATIONS MEAN (M) (F) RANGE	CONTROL LOCATION MEAN (M) (F) RANGE	LOCATION WITH HIGHEST ANNUAL MEAN (M) MEAN (M) (F) RANGE	LOCATION WITH HIGHEST ANNUAL MEAN (M) STATION # NAME DISTANCE AND DIRECTION	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
SEDIMENT (PCI/KG DRY)	I-131		NA	<LLD	<LLD	-		0
	CS-134		150	<LLD	<LLD	-		0
	CS-137		180	165 (2/4) (164/166)	<LLD	166 (1/2)	16C4 INDICATOR VINCENT DAM 2.18 MILES SSE OF SITE	0
AIR PARTICULATE (E-3 PCI/CU.METER)	GR-B	267	10	16 (207/214) (6/35)	16 (52/53) (7/32)	17 (51/53) (8/34)	10S3 INDICATOR KEEN ROAD 0.50 MILES E OF SITE	0
	GAMMA	21						
	BE-7		NA	87 (17/17) (47/135)	88 (4/4) (79/103)	135 (1/1)	6C1 INDICATOR 11305 FEET NE OF SITE	0
	MN-54		NA	<LLD	<LLD	-		0
	CO-58		NA	<LLD	<LLD	-		0

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TABLE A-1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY FOR THE LIMERICK GENERATING STATION, 2010

Name of Facility: LIMERICK GENERATING STATION **DOCKET NUMBER:** 50-352 & 50-353

Location of Facility: MONTGOMERY COUNTY PA **REPORTING PERIOD:** 2010

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
AIR PARTICULATE (E-3 PCI/CU.METER)	CO-60		NA	<LLD	<LLD	-		0
	CS-134		50	<LLD	<LLD	-		0
	CS-137		60	<LLD	<LLD	-		0
AIR IODINE (E-3 PCI/CU.METER)	GAMMA I-131	267	70	<LLD	<LLD	-		0
MILK (PCI/LITER)	I-131	114	1	<LLD	<LLD	-		0
	GAMMA K-40	114	NA	1283 (88/88) (1050/1500)	1290 (26/26) (1140/1410)	1310 (22/22) (1140/1410)	23F1 CONTROL 5.02 MILES SW OF SITE	0
	CS-134		15	<LLD	<LLD	-		0

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TABLE A-1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY FOR THE LIMERICK GENERATING STATION, 2010

Name of Facility: LIMERICK GENERATING STATION **DOCKET NUMBER:** 50-352 & 50-353
Location of Facility: MONTGOMERY COUNTY PA **REPORTING PERIOD:** 2010

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
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)	GAMMA	33						
	BE-7		NA	298 (9/21) (124/564)	1334 (8/12) (85/2150)	1334 (8/12) (85/2150)	31G1 CONTROL	0
	K-40		NA	4799 (21/21) (3420/8510)	5330 (12/12) (3490/9660)	5330 (12/12) (3490/9660)	31G1 CONTROL	0
	MN-54		NA	<LLD	<LLD	-		0
	CO-58		NA	<LLD	<LLD	-		0

* THE MEAN AND 2 STANDARD DEVIATION VALUES ARE CALCULATED USING THE POSITIVE VALUES
FRACTION OF DETECTABLE MEASUREMENTS AT SPECIFIED LOCATIONS IS INDICATED IN PARENTHESES (F)

TABLE A-1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY FOR THE LIMERICK GENERATING STATION, 2010

Name of Facility: LIMERICK GENERATING STATION **DOCKET NUMBER:** 50-352 & 50-353
Location of Facility: MONTGOMERY COUNTY PA **REPORTING PERIOD:** 2010

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
VEGETATION (PCI/KG WET)	CO-60		NA	<LLD	<LLD	-		0
	I-131		60	<LLD	<LLD	-		0
	CS-134		60	<LLD	<LLD	-		0
	CS-137		80	<LLD	<LLD	-		0
	RA-226		NA	2707 (7/21) (1380/4140)	2080 (1/12)	2707 (7/10) (1380/4140)	13S3 INDICATOR VINCENT DAM 0.24 MILES SE OF SITE	0
	TH-228		NA	62 (4/21) (20/99)	48 (2/12) (30/68)	71 (1/11)	11S3 INDICATOR LGS INFORMATION CENTER 0.35 MILES ESE OF SITE	0
	TH-232		NA	45 (1/21)	35 (3/12) (35/36)	45 (1/10)	13S3 INDICATOR VINCENT DAM 0.24 MILES SE OF SITE	0
DIRECT RADIATION (MILLI-ROENTGEN/STD.MO.)	TLD-QUARTERLY	159	NA	6.8 (155/155) (4.9/9.8)	8.4 (4/4) (7.8/9.1)	9.3 (4/4) (8.8/9.8)	13S2 INDICATOR 500 KV SUBSTATION 0.41 MILES SE	0

* THE MEAN AND 2 STANDARD DEVIATION VALUES ARE CALCULATED USING THE POSITIVE VALUES
FRACTION OF DETECTABLE MEASUREMENTS AT SPECIFIED LOCATIONS IS INDICATED IN PARENTHESES (F)

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