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Exelon Nuclear

TS 6.9.1.7

April 28, 2011

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: 2010 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 2010 Annual Radiological Environmental Operating Report No. 26. This report provides the 2010 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 15 groundwater monitoring locations that ranged up to 1,320 pCi/L.

There are no commitments contained in this letter.

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

Sincerely,

William F. Maguire
Vice President -LGS
Exelon Generation Company, LLC

Attachment: 2010 Annual Radiological Environmental Operating Report No. 26

cc: W. Dean, Administrator, Region I, USNRC (w/Attachment)
E. DiPaolo, USNRC Senior Resident Inspector, LGS (w/Attachment)
P. Bamford -Senior Project Manager-NRR, USNRC (w/Attachment)
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LIMERICK GENERATING STATION
ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT
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Docket No: 50-352
50-353

LIMERICK GENERATING STATION
UNITS 1 and 2

Annual Radiological
Environmental Operating Report

1 January Through 31 December 2010

Prepared By
Teledyne Brown Engineering
Environmental Services

Exelon SM
Nuclear
Limerick Generating Station
Sanatoga, PA 19464

April 2011

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Appendices

Figures

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I. Summary and Conclusions

In 2010, the Limerick Generating Station released to the environment through the radioactive effluent liquid and gaseous pathways approximately 73 curies of noble gas, fission and activation products and approximately 51curies 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 locations							
Effluent	**Applicable Organ**	**Estimated Dose**	**Age Group**	**Location**	**% of Applicable Limit**	**Limit**	**Unit**
Noble Gas	Gamma - Air Dose	4.04E-03	All	Nearest Residence	2.00E-02	20	mRad
Noble Gas	Beta – Air Dose	2.40E-03	All	Nearest Residence	6.00E-03	40	mRad
Noble Gas	Total Body (Gamma)	3.83E-03	All	Nearest Residence	3.80E-02	10	mrem
Noble Gas	Skin (Beta)	6.39E-03	All	Nearest Residence	2.10E-02	30	mrem
Iodine, Particulate & Tritium	Bone	1.60E-01	Child	Cow Milk	5.33E-01	30	mrem
Liquid	Total Body	1.76E-02	Child	Aqua PA	2.93E-01	6	mrem
Liquid	Liver	1.77E-02	Child	Aqua PA	8.90E-02	20	mrem

The calculated doses, as a result of 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 2010 through 31 December 2010. During that time period, 1133 analyses were performed on 926 samples.

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. 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 4.36E-04 mrem and 3.74E-04 mrem, respectively. This dose represents 2.18E-03% and 6.23E-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.

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 eight of 33 samples. Thorium-228 and Th-232 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. Well water samples were analyzed for tritium, Sr-90 and gamma emitters. Additionally, a select group of wells had hard-to-detect nuclides and gross alpha and gross beta analyses performed. Most tritium values were less than the lower limit of detection of 200 pCi/L.

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 3,458 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 2010 through 31 December 2010.

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 2010. 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, catfish/bullhead (bottom feeder) and sunfish (predator), 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.

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. Ten 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

The results of the surface water sampling program were used to determine if radioactive nuclide transport from the storage area into the Schuylkill River had occurred.

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 2010. 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 and milk.
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) was defined as the smallest concentration of radioactive material in a sample that would yield a net count (above background) that would be detected with only a

5% probability of falsely concluding that a blank observation represents a "real" signal. The LLD was intended as a before the fact estimate of a system (including instrumentation, procedure and sample type) and not as an after the fact criteria for the presence of activity. All analyses were designed to achieve the required LGS detection limits for environmental sample analysis.

The minimum detectable concentration (MDC) was 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 2010 the LGS REMP had a sample recovery rate in excess of 99%. Exceptions are listed below:

1. Air sample from location 14S1 for the week 3/22/10 – 3/29/10 was not available due to equipment malfunction (IR 01087252 01).
2. TLD data from station 29E1 was not available for the 2nd quarter due to the station being vandalized (IR 01087252 04).
3. Only two vegetation samples were available at station 11S3 and 13S3 for the month of June (IR 01087252 02).
4. Only two vegetation samples were available at station 13S3 for the month of September (IR 01087252 05).
5. Weekly grab samples were taken for the composite surface water sampler at location 13B1 during the following periods due to equipment malfunction or frozen sample line (IR 01087252 06):

   01/05/10 – 01/12/10
   06/28/10 – 07/05/10
   07/20/10 – 07/27/10
   09/28/10 – 10/05/10
   12/07/10 – 12/27/10

6. Grab samples were taken for the composite surface water sampler at location 24S1 during the following periods due to equipment malfunction (IR 01087252 06):

   02/09/10 – 02/16/10
   11/03/10 – 12/07/10

7. Weekly grab samples were taken for the composite drinking water sampler at location 16C2 during the following period due to equipment malfunction (IR 01087252 06):

   12/28/09 – 01/19/10

8. A grab sample was taken for the composite drinking water sampler at location 28F3 during the week of 12/29/09 – 01/05/10 due to equipment malfunction (IR 01087252 06).

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. Air sampling station 6C1 was added to the REMP program on December 13, 2010 due to the increased population of the nearby shopping center (IR 1074042).

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 were less than the MDC.

Gamma Spectrometry

Samples from all locations were analyzed for gamma emitting nuclides (Table C–I.2, Appendix C). All nuclides were less than the MDC.

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 2.5 to 6.7 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 were less than the MDC.

Gamma Spectrometry

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

3. Fish

Fish samples comprised of catfish/bullhead (bottom feeder) and sunfish (predator) 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 2,640 to 3,920 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 1,630 to 3,740 pCi/kg dry. Potassium-40 was found at all locations and ranged from 10,800 to 16,100 pCi/kg dry. The fission product Cs-137 was found at 16B2 and 16C4 locations and ranged from 164 to 166 pCi/kg dry. 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 4.36E-04 mrem and 3.74E-04 mrem, respectively. This dose represents 2.18E-03% and 6.23E-03%, of the Appendix I to 10 CFR Part 50 dose limits, respectively. The activity detected was consistent with those detected in the pre–operational years. (Figure C–4, Appendix C). 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 35 E–3 pCi/m^3 with a mean of 16.5 E–3 pCi/m^3. The results from the intermediate distance location (Group II) ranged from 6 E–3 to 31 E–3 pCi/m^3 with a mean of 16 E–3 pCi/m^3. The results from the Distant locations (Group III) ranged from 7 E–3 to 32 E–3 pCi/m^3 with a mean of 16 E–3 pCi/m^3. Comparison of the 2010 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 2010 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 47 E–3 to 135 E–3 pCi/m^3. All other nuclides were less than the MDC.

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 were less than the MDC.

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. 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 were less than the MDC.

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 1,050 to 1,500 pCi/L. All other nuclides were less than the MDC.

b. Broad Leaf Vegetation

Three 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 17 of 33 samples and ranged from 124 to 2,150 pCi/kg wet. Naturally occurring K-40 was found in all samples and ranged from 3,420 to 9,930 pCi/kg wet. All other nuclides were less than the MDC.

C. Ambient Gamma Radiation

Ambient gamma radiation levels were measured utilizing Panasonic 814 ($CaSO_4$) thermoluminescent dosimeters. 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.

All TLD measurements were below 10 mR/standard month, with a range of 4.9 to 9.8 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 2010 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 gardens in the N, ENE, E, and SW sectors are closer than in 2009. 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
1 N	3,109	3,775	24,775
2 NNE	2,706	9,610	-
3 NE	3,469	17,769	-
4 ENE	3,231	14,206	-
5 E	2,864	6,950	-
6 ESE	3,434	1,822	-
7 SE	5,108	1,282	-
8 SSE	5,403	6,898	-
9 S	4,347	6,103	22,115
10 SSW	5,063	5,320	10,390
11 SW	3,251	4,559	-
12 WSW	3,799	12,013	14,175
13 W	3,627	4,208	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 (i.e., 20% < bias < 30%). If the bias is greater than 30%, the results are deemed not acceptable.

For the primary laboratory, 16 out of 18 analytes met the specified acceptance criteria. Two analytes did not meet the specified acceptance criteria for the following reason:

1. Teledyne Brown Engineering's ERA November 2010 Sr-89 in water result of 77.8 pCi/L was higher than the known value of 68.5 pCi/L, resulting in a found to known ratio of 1.14. NCR 10-09 was initiated to investigate this failure. Since the ratio of 1.14 fell within an acceptance range of 20%, Teledyne considers this an acceptable result.

2. Teledyne Brown Engineering's ERA November 2010 Zn-65 in water result of 11.0 pCi/L was lower than the known value of 102 pCi/L. NCR 10-09 was initiated to investigate this failure. The Zn-65 result of 111 was incorrectly reported as 11.0.

For the secondary laboratory, Environmental, Inc., all analytes met the specified acceptance criteria.

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

V. References

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

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

3. 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, 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
SURFACE WATER (PCI/LITER)	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
	ZR-95		30	<LLD	<LLD	-		0
	I-131		15	<LLD	<LLD	-		0
	CS-134		15	<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:** 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)	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 45514 FEET SE OF SITE	0
	H-3	16	200	<LLD	<LLD	-		0
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
	I-131		15	<LLD	<LLD	-		0
	CS-134		15	<LLD	<LLD	-		0

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
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
	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

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
	CS-134		130	<LLD	<LLD	-		0

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
SEDIMENT (PCI/KG DRY)	GAMMA	6						
	BE-7		NA	2685 (2/4) (1630/3740)	<LLD	3740 (1/2)	16B2 INDICATOR LINFIELD BRIDGE 7128 FEET 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 7128 FEET SSE OF SITE	0
	MN-54		NA	<LLD	<LLD	-		0
	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	165 (2/4) (164/166)	<LLD	166 (1/2)	16C4 INDICATOR VINCENT DAM 11510 FEET SSE OF SITE	0

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

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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
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 2640 FEET 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
	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	267						
	I-131		70	<LLD	<LLD	-		0
MILK (PCI/LITER)	I-131	114	1	<LLD	<LLD	-		0
	GAMMA	114						
	K-40		NA	1283 (88/88) (1050/1500)	1290 (26/26) (1140/1410)	1310 (22/22) (1140/1410)	23F1 CONTROL 26506 FEET SW 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

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
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 PROUT'S JOLLYVIEW FARM 71808 FEET NW OF SITE	0
	K-40		NA	4799 (21/21) (3420/8510)	5330 (12/12) (3490/9660)	5330 (12/12) (3490/9660)	31G1 CONTROL PROUT'S JOLLYVIEW FARM 71808 FEET NW OF SITE	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
	CS-137		80	<LLD	<LLD	-		0
	RA-226		NA	2707 (7/21) (1380/4140)	2080 (1/12)	2707 (7/10) (1380/4140)	13S3 INDICATOR LGS 500 KV YARD 1267 FEET 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 1848 FEET ESE OF SITE	0
	TH-232		NA	45 (1/21)	35 (3/12) (35/36)	45 (1/10)	13S3 INDICATOR LGS 500 KV YARD 1267 FEET 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 LGS 500 KV YARD 2149 FEET SE OF SITE	0

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APPENDIX B

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

TABLE B-1: Location Designation and Identification System for the 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, 2010

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)	2,006 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, 2010

Location	Location Description	Distance & Direction From Site
H. 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, 2010

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	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 approved techniques	RMC-ER6 Collection of fish samples for radiological analysis (Limerick Generating Station)	1000 grams (wet)	TBE, 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, 2010

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

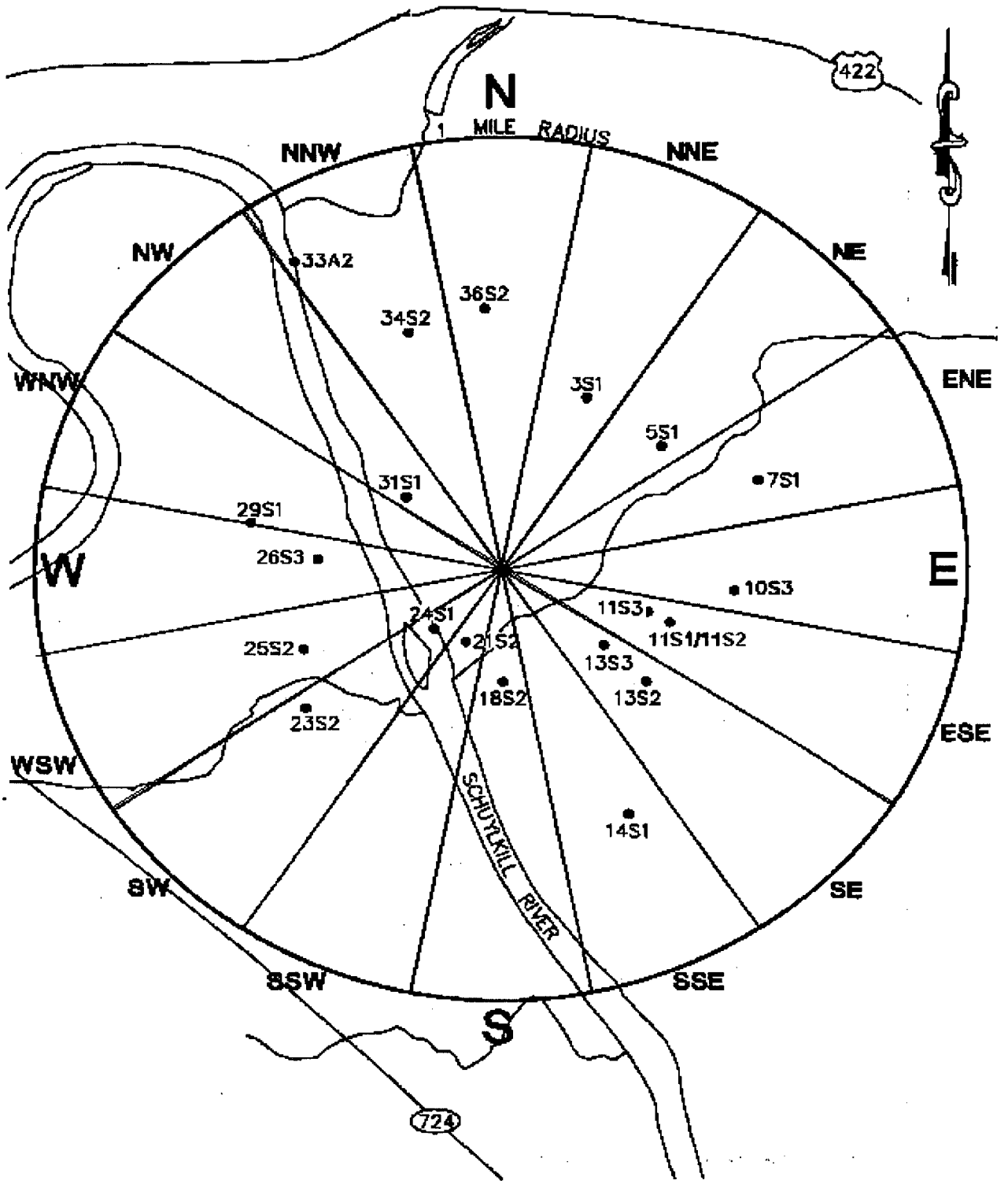


Figure B-1
Environmental Sampling Locations Within 5,280 Feet of the Limerick Generating Station, 2010

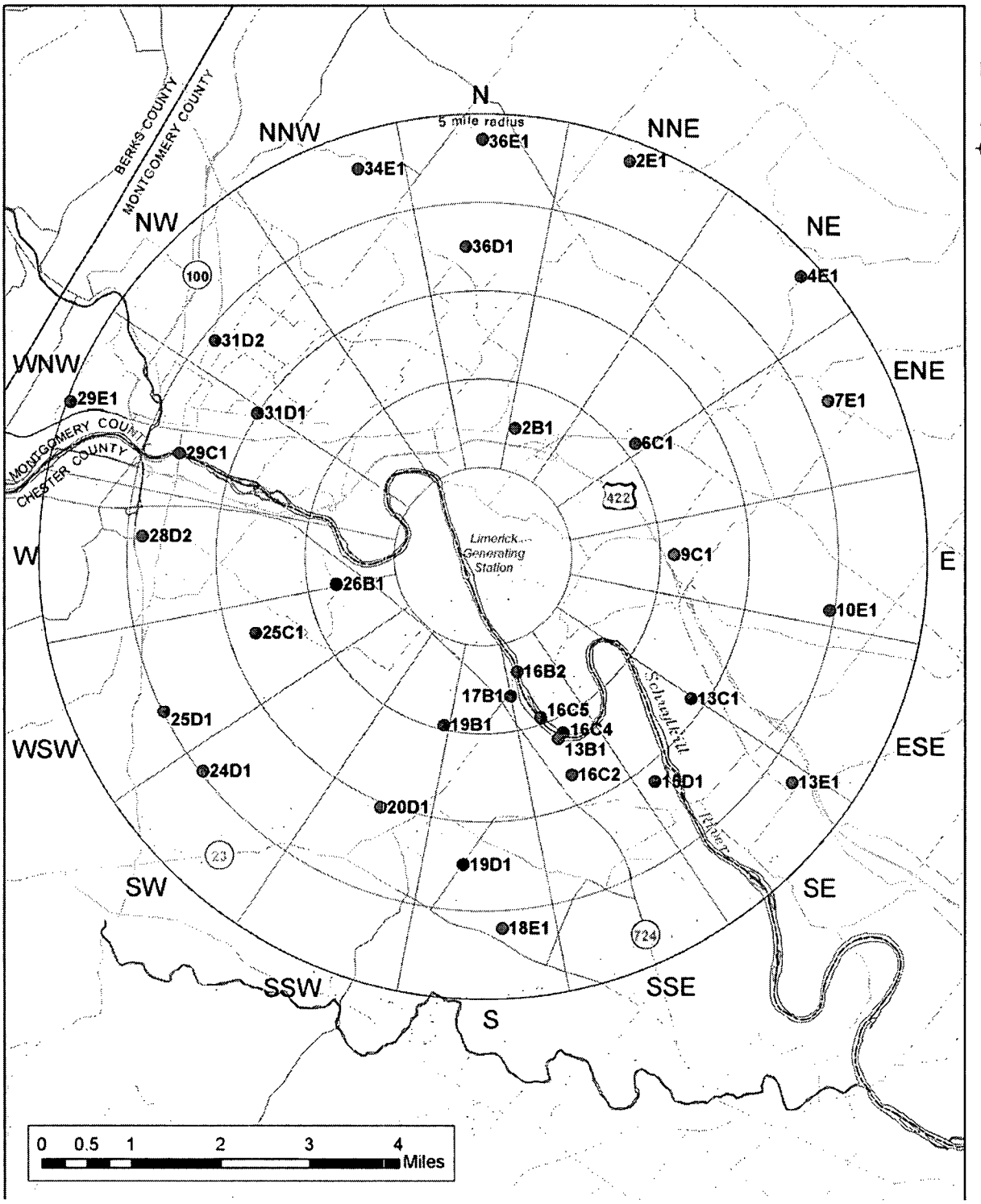


Figure B-2
Environmental Sampling Locations Between 5,280 and 26,400
Feet from the Limerick Generating Station, 2010

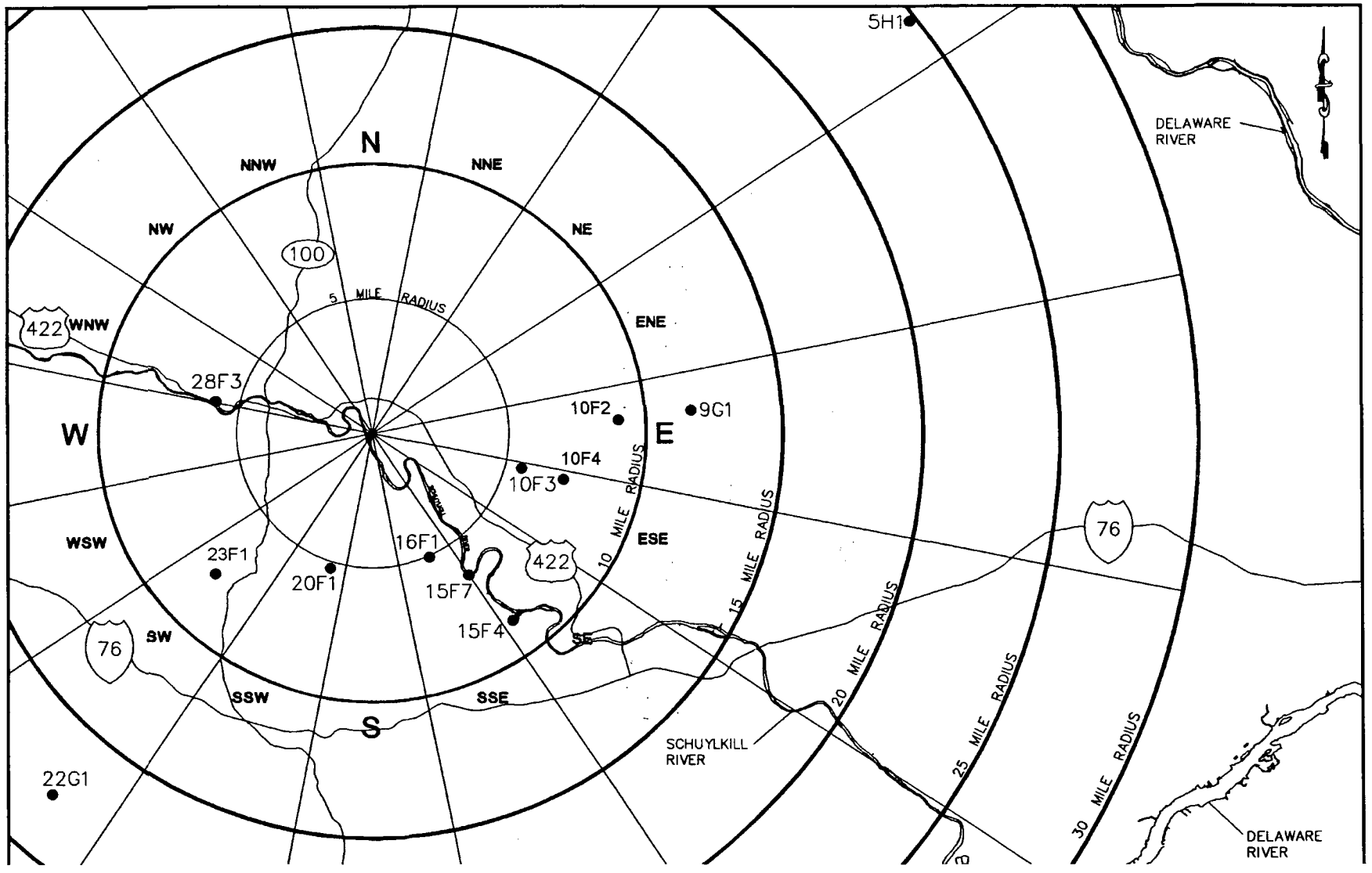


Figure B-3
Environmental Sampling Locations Greater than 26,400
Feet from the Limerick Generating Station, 2010

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, 2010

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	13B1	24S1
12/28/2009 - 03/30/2010	< 161	< 161
03/30/2010 - 06/28/2010	< 159	< 158
06/28/2010 - 09/28/2010	< 175	< 177
09/28/2010 - 12/27/2010	< 182	< 178
MEAN	-	-

TABLE C-I.2 CONCENTRATIONS OF GAMMA EMITTERS IN SURFACE WATER SAMPLES COLLECTED IN THE VICINITY OF LIMERICK GENERATING STATION, 2010

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

STC	COLLECTION PERIOD	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	I-131	Cs-134	Cs-137	Ba-140	La-140
13B1	12/28/2009 - 02/01/2010	< 5	< 5	< 12	< 5	< 11	< 6	< 10	< 7	< 6	< 5	< 24	< 8
	02/01/2010 - 03/02/2010	< 8	< 8	< 13	< 7	< 24	< 10	< 14	< 10	< 15	< 9	< 33	< 10
	03/02/2010 - 03/30/2010	< 4	< 5	< 13	< 5	< 8	< 5	< 9	< 14	< 4	< 5	< 36	< 9
	03/30/2010 - 04/27/2010	< 3	< 4	< 8	< 4	< 7	< 4	< 7	< 15	< 3	< 4	< 30	< 8
	04/27/2010 - 06/01/2010	< 2	< 2	< 4	< 2	< 4	< 2	< 4	< 13	< 2	< 2	< 21	< 7
	06/01/2010 - 06/28/2010	< 6	< 6	< 11	< 6	< 12	< 7	< 10	< 8	< 6	< 7	< 24	< 9
	06/28/2010 - 08/03/2010	< 1	< 2	< 4	< 1	< 3	< 2	< 3	< 9	< 1	< 2	< 15	< 5
	08/03/2010 - 08/30/2010	< 1	< 1	< 3	< 1	< 2	< 1	< 2	< 6	< 1	< 1	< 11	< 4
	08/30/2010 - 09/28/2010	< 6	< 6	< 11	< 7	< 11	< 6	< 12	< 10	< 6	< 6	< 28	< 9
	09/28/2010 - 11/02/2010	< 6	< 7	< 13	< 6	< 10	< 7	< 10	< 12	< 6	< 5	< 31	< 9
	11/02/2010 - 11/29/2010	< 5	< 4	< 13	< 5	< 9	< 4	< 12	< 12	< 6	< 6	< 29	< 10
	11/29/2010 - 12/27/2010	< 5	< 6	< 13	< 7	< 12	< 6	< 12	< 12	< 6	< 6	< 35	< 14
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-
24S1	12/28/2009 - 02/02/2010	< 4	< 4	< 8	< 4	< 7	< 4	< 7	< 5	< 4	< 4	< 17	< 5
	02/02/2010 - 03/02/2010	< 7	< 8	< 17	< 9	< 18	< 10	< 13	< 10	< 7	< 9	< 29	< 10
	03/02/2010 - 03/30/2010	< 4	< 5	< 11	< 5	< 9	< 5	< 9	< 15	< 4	< 4	< 31	< 15
	03/30/2010 - 04/27/2010	< 3	< 3	< 7	< 4	< 6	< 4	< 5	< 14	< 3	< 3	< 22	< 8
	04/27/2010 - 06/01/2010	< 1	< 2	< 3	< 1	< 3	< 2	< 3	< 10	< 1	< 1	< 16	< 5
	06/01/2010 - 06/28/2010	< 6	< 5	< 14	< 10	< 11	< 6	< 11	< 6	< 5	< 6	< 22	< 8
	06/28/2010 - 08/03/2010	< 1	< 2	< 4	< 1	< 3	< 2	< 3	< 14	< 1	< 1	< 20	< 6
	08/03/2010 - 08/30/2010	< 1	< 1	< 3	< 1	< 3	< 2	< 3	< 7	< 1	< 1	< 13	< 4
	08/30/2010 - 09/28/2010	< 7	< 6	< 12	< 6	< 11	< 8	< 12	< 12	< 7	< 6	< 27	< 11
	09/28/2010 - 11/02/2010	< 6	< 4	< 11	< 7	< 10	< 5	< 10	< 11	< 5	< 6	< 35	< 8
	11/02/2010 - 11/29/2010	< 4	< 5	< 10	< 4	< 9	< 5	< 9	< 10	< 4	< 4	< 22	< 7
	11/29/2010 - 12/27/2010	< 4	< 4	< 5	< 3	< 8	< 4	< 6	< 7	< 3	< 4	< 18	< 6
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-

TABLE C-II.1 CONCENTRATIONS OF GROSS BETA IN DRINKING WATER SAMPLES COLLECTED IN THE VICINITY OF LIMERICK GENERATING STATION, 2010

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	15F4	15F7	16C2	28F3
12/28/2009 - 02/02/2010	3.9 ± 1.8	3.0 ± 1.7	3.3 ± 1.8	< 2.5
02/02/2010 - 03/02/2010	5.2 ± 2.9	4.1 ± 1.3	4.4 ± 1.3	5.3 ± 2.8
03/02/2010 - 03/30/2010	< 2.9	< 3.2	< 3.3	< 3.1
03/30/2010 - 04/27/2010	< 2.6	< 2.6	< 2.8	3.2 ± 1.8
04/27/2010 - 06/01/2010	5.0 ± 1.8	4.0 ± 1.8	2.5 ± 1.7	3.6 ± 1.7
06/01/2010 - 06/28/2010	5.7 ± 2.0	< 2.7	3.8 ± 2.0	4.2 ± 2.0
06/28/2010 - 08/03/2010	6.2 ± 2.1	5.3 ± 2.0	< 2.8	4.2 ± 2.0
08/03/2010 - 08/30/2010	6.7 ± 2.0	5.9 ± 2.0	3.3 ± 1.8	3.4 ± 1.8
08/30/2010 - 09/28/2010	6.4 ± 1.9	5.0 ± 1.9	3.4 ± 1.8	3.3 ± 1.7
09/28/2010 - 11/02/2010	3.7 ± 1.8	3.8 ± 1.8	3.6 ± 1.9	3.4 ± 1.8
11/02/2010 - 11/29/2010	4.0 ± 1.7	3.6 ± 1.6	3.1 ± 1.7	3.9 ± 1.7
11/29/2010 - 12/27/2010	< 3.2	4.4 ± 2.2	< 3.7	3.4 ± 2.2
MEAN	5.2 ± 2.3	4.3 ± 1.8	3.4 ± 1.1	3.8 ± 1.3

TABLE C-II.2 CONCENTRATIONS OF TRITIUM IN DRINKING WATER SAMPLES COLLECTED IN THE VICINITY OF LIMERICK GENERATING STATION, 2010

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	15F4	15F7	16C2	28F3
12/28/2009 - 03/30/2010	< 158	< 161	< 161	< 163
03/30/2010 - 06/28/2010	< 159	< 159	< 159	< 162
06/28/2010 - 09/28/2010	< 177	< 178	< 182	< 178
09/28/2010 - 12/27/2010	< 176	< 180	< 182	< 185
MEAN	-	-	-	-

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

TABLE C-II.3 CONCENTRATIONS OF GAMMA EMITTERS IN DRINKING WATER SAMPLES COLLECTED IN THE VICINITY OF LIMERICK GENERATING STATION, 2010

RESULTS IN UNITS OF PCI/LITER ± SIGMA

STC	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	12/28/2009 - 02/02/2010	< 7	< 7	< 9	< 6	< 8	< 6	< 8	< 8	< 5	< 6	< 27	< 8
	02/02/2010 - 03/02/2010	< 4	< 5	< 11	< 5	< 11	< 6	< 10	< 7	< 5	< 5	< 22	< 8
	03/02/2010 - 03/30/2010	< 4	< 4	< 7	< 3	< 7	< 4	< 8	< 15	< 4	< 4	< 29	< 9
	03/30/2010 - 04/27/2010	< 3	< 4	< 7	< 4	< 7	< 4	< 7	< 14	< 3	< 4	< 30	< 8
	04/27/2010 - 06/01/2010	< 1	< 2	< 4	< 1	< 3	< 2	< 3	< 11	< 1	< 2	< 18	< 5
	06/01/2010 - 06/28/2010	< 6	< 4	< 11	< 6	< 9	< 5	< 10	< 7	< 6	< 7	< 25	< 6
	06/28/2010 - 08/03/2010	< 2	< 2	< 5	< 2	< 4	< 2	< 4	< 11	< 2	< 2	< 20	< 6
	08/03/2010 - 08/30/2010	< 1	< 1	< 3	< 1	< 2	< 1	< 2	< 7	< 1	< 1	< 12	< 4
	08/30/2010 - 09/28/2010	< 7	< 6	< 11	< 10	< 14	< 8	< 12	< 12	< 7	< 7	< 31	< 13
	09/28/2010 - 11/02/2010	< 4	< 5	< 11	< 6	< 10	< 7	< 9	< 11	< 5	< 5	< 25	< 10
	11/02/2010 - 11/29/2010	< 5	< 4	< 8	< 4	< 9	< 5	< 8	< 9	< 3	< 5	< 23	< 8
	11/29/2010 - 12/27/2010	< 5	< 5	< 12	< 5	< 10	< 6	< 11	< 13	< 6	< 6	< 32	< 11
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-
15F7	12/28/2009 - 02/02/2010	< 8	< 10	< 13	< 9	< 14	< 9	< 15	< 12	< 8	< 8	< 31	< 14
	02/02/2010 - 03/02/2010	< 4	< 4	< 8	< 4	< 10	< 5	< 8	< 6	< 4	< 4	< 17	< 5
	03/02/2010 - 03/30/2010	< 4	< 4	< 9	< 4	< 6	< 4	< 7	< 15	< 4	< 4	< 32	< 10
	03/30/2010 - 04/27/2010	< 3	< 3	< 7	< 3	< 6	< 4	< 6	< 14	< 3	< 3	< 28	< 7
	04/27/2010 - 06/01/2010	< 2	< 2	< 5	< 2	< 4	< 2	< 4	< 15	< 2	< 2	< 23	< 6
	06/01/2010 - 06/28/2010	< 6	< 6	< 12	< 7	< 14	< 6	< 10	< 8	< 8	< 6	< 24	< 7
	06/28/2010 - 08/03/2010	< 2	< 2	< 5	< 2	< 4	< 2	< 4	< 12	< 2	< 2	< 21	< 5
	08/03/2010 - 08/30/2010	< 1	< 2	< 3	< 1	< 3	< 2	< 3	< 8	< 1	< 1	< 13	< 5
	08/30/2010 - 09/28/2010	< 6	< 7	< 10	< 8	< 13	< 8	< 13	< 12	< 6	< 6	< 25	< 4
	09/28/2010 - 11/02/2010	< 4	< 4	< 8	< 4	< 8	< 4	< 8	< 8	< 4	< 4	< 23	< 6
	11/02/2010 - 11/29/2010	< 6	< 7	< 12	< 7	< 12	< 7	< 11	< 14	< 5	< 7	< 34	< 13
	11/29/2010 - 12/27/2010	< 4	< 4	< 10	< 5	< 9	< 5	< 8	< 10	< 4	< 5	< 23	< 6
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-

TABLE C-II.3 CONCENTRATIONS OF GAMMA EMITTERS IN DRINKING WATER SAMPLES COLLECTED IN THE VICINITY OF LIMERICK GENERATING STATION, 2010

RESULTS IN UNITS OF PCI/LITER ± SIGMA

STC	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	12/28/2009 - 02/01/2010 (1)	< 6	< 5	< 14	< 5	< 14	< 6	< 10	< 9	< 7	< 7	< 22	< 7
	02/01/2010 - 03/02/2010	< 6	< 5	< 13	< 5	< 14	< 6	< 9	< 7	< 5	< 7	< 22	< 7
	03/02/2010 - 03/30/2010	< 5	< 5	< 10	< 4	< 10	< 5	< 9	< 15	< 4	< 5	< 33	< 10
	03/30/2010 - 04/27/2010	< 3	< 4	< 7	< 3	< 7	< 3	< 6	< 15	< 3	< 4	< 26	< 7
	04/27/2010 - 06/01/2010	< 2	< 2	< 5	< 2	< 4	< 2	< 4	< 14	< 2	< 2	< 23	< 7
	06/01/2010 - 06/28/2010	< 5	< 4	< 10	< 5	< 12	< 5	< 9	< 7	< 5	< 6	< 18	< 7
	06/28/2010 - 08/03/2010	< 2	< 2	< 4	< 2	< 3	< 2	< 4	< 11	< 2	< 2	< 20	< 5
	08/03/2010 - 08/30/2010	< 2	< 2	< 4	< 2	< 4	< 2	< 4	< 9	< 2	< 2	< 17	< 5
	08/30/2010 - 09/28/2010	< 6	< 7	< 11	< 8	< 14	< 6	< 13	< 12	< 7	< 6	< 32	< 12
	09/28/2010 - 11/02/2010	< 4	< 4	< 7	< 4	< 9	< 5	< 8	< 10	< 4	< 4	< 25	< 8
	11/02/2010 - 11/29/2010	< 6	< 5	< 11	< 6	< 10	< 7	< 10	< 14	< 5	< 5	< 29	< 9
	11/29/2010 - 12/27/2010	< 5	< 5	< 11	< 6	< 12	< 6	< 9	< 12	< 5	< 5	< 29	< 10
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-
28F3	12/28/2009 - 02/02/2010 (1)	< 4	< 4	< 8	< 4	< 8	< 5	< 6	< 6	< 4	< 5	< 16	< 6
	02/02/2010 - 03/02/2010	< 6	< 6	< 13	< 5	< 13	< 6	< 9	< 7	< 5	< 6	< 26	< 7
	03/02/2010 - 03/30/2010	< 5	< 4	< 10	< 4	< 10	< 6	< 8	< 14	< 5	< 5	< 32	< 13
	03/30/2010 - 04/27/2010	< 3	< 4	< 7	< 4	< 7	< 4	< 7	< 13	< 3	< 3	< 24	< 8
	04/27/2010 - 06/01/2010	< 2	< 2	< 4	< 2	< 3	< 2	< 3	< 13	< 2	< 2	< 21	< 6
	06/01/2010 - 06/28/2010	< 5	< 5	< 10	< 6	< 12	< 6	< 9	< 6	< 5	< 6	< 23	< 6
	06/28/2010 - 08/03/2010	< 2	< 2	< 5	< 2	< 4	< 2	< 4	< 11	< 2	< 2	< 18	< 5
	08/03/2010 - 08/30/2010	< 2	< 2	< 4	< 2	< 3	< 2	< 3	< 10	< 2	< 2	< 18	< 5
	08/30/2010 - 09/28/2010	< 5	< 6	< 8	< 6	< 10	< 5	< 8	< 10	< 6	< 5	< 27	< 8
	09/28/2010 - 11/02/2010	< 5	< 5	< 10	< 5	< 10	< 5	< 8	< 10	< 4	< 4	< 23	< 8
	11/02/2010 - 11/29/2010	< 5	< 5	< 11	< 4	< 8	< 5	< 8	< 10	< 4	< 5	< 25	< 8
	11/29/2010 - 12/27/2010	< 5	< 5	< 9	< 6	< 9	< 4	< 10	< 11	< 4	< 5	< 28	< 10
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-

(1) SEE PROGRAM EXCEPTIONS SECTION FOR EXPLANATION

TABLE C-III.1 CONCENTRATIONS OF GAMMA EMMITTERS IN PREDATOR AND BOTTOM FEEDER (FISH) SAMPLES COLLECTED IN THE VICINITY OF LIMERICK GENERATING STATION, 2010

RESULTS IN UNITS OF PCI/KG WET ± 2 SIGMA

STC	COLLECTION PERIOD	K-40	Mn-54	Co-58	Fe-59	Co-60	Zn-65	I-131	Cs-134	Cs-137
16C5	PREDATOR									
	05/20/2010	2640 ± 586	< 36	< 40	< 95	< 47	< 86	< 624	< 39	< 38
	11/03/2010	3510 ± 783	< 45	< 55	< 99	< 49	< 87	< 164	< 49	< 43
	MEAN	3075 ± 1230	-	-	-	-	-	-	-	-
16C5	BOTTOM FEEDER									
	05/20/2010	3640 ± 799	< 55	< 66	< 171	< 51	< 115	< 955	< 41	< 48
	11/03/2010	3920 ± 857	< 54	< 60	< 120	< 42	< 126	< 187	< 53	< 60
	MEAN	3780 ± 396	-	-	-	-	-	-	-	-
29C1	PREDATOR									
	05/14/2010	3310 ± 677	< 34	< 37	< 90	< 44	< 84	< 146	< 37	< 38
	11/03/2010	3110 ± 796	< 70	< 73	< 128	< 63	< 131	< 212	< 65	< 69
	MEAN	3210 ± 283	-	-	-	-	-	-	-	-
29C1	BOTTOM FEEDER									
	05/14/2010	3260 ± 708	< 29	< 41	< 89	< 29	< 83	< 169	< 42	< 34
	11/03/2010	3280 ± 937	< 56	< 61	< 140	< 75	< 143	< 221	< 61	< 69
	MEAN	3270 ± 28.3	-	-	-	-	-	-	-	-

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

TABLE C-IV.1 CONCENTRATIONS OF GAMMA EMITTERS IN SEDIMENT SAMPLES COLLECTED IN THE VICINITY OF LIMERICK GENERATING STATION, 2010

RESULTS IN UNITS OF PCI/KG DRY ± 2 SIGMA

STC	COLLECTION PERIOD	Be-7	K-40	Mn-54	Co-58	Co-60	I-131	Cs-134	Cs-137
16B2	06/07/2010	3740 ± 947	16100 ± 1570	< 76	< 63	< 71	< 388	< 63	164 ± 86
	12/03/2010	< 925	15300 ± 1470	< 64	< 70	< 79	< 642	< 67	< 81
	MEAN	-	15700 ± 1131	-	-	-	-	-	-
16C4	06/07/2010	< 396	10800 ± 1270	< 37	< 32	< 22	< 160	< 28	166 ± 75
	12/03/2010	1630 ± 1380	14700 ± 1910	< 103	< 120	< 116	< 925	< 82	< 134
	MEAN	-	12750 ± 5515	-	-	-	-	-	-
33A2	06/07/2010	< 871	13700 ± 1320	< 81	< 82	< 73	< 425	< 114	< 88
	12/03/2010	< 697	13000 ± 1280	< 66	< 66	< 73	< 495	< 55	< 68
	MEAN	-	13350 ± 990	-	-	-	-	-	-

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

TABLE C-V.1 **CONCENTRATIONS OF GROSS BETA IN AIR PARTICULATE SAMPLES COLLECTED IN THE VICINITY OF LIMERICK GENERATING STATION, 2010**

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

COLLECTION	GROUP I			GROUP II		GROUP III
PERIOD	10S3	11S1	14S1	13C1	6C1	22G1
12/28/2009 - 01/04/2010	14 ± 5	12 ± 5	13 ± 5	8 ± 5		12 ± 5
01/04/2010 - 01/11/2010	8 ± 5	8 ± 5	7 ± 5	< 7		10 ± 5
01/11/2010 - 01/18/2010	24 ± 5	26 ± 5	29 ± 6	26 ± 5		25 ± 5
01/18/2010 - 01/26/2010	15 ± 4	18 ± 4	16 ± 4	24 ± 5		17 ± 4
01/26/2010 - 02/01/2010	25 ± 6	17 ± 6	22 ± 6	16 ± 6		19 ± 6
02/01/2010 - 02/08/2010	14 ± 5	17 ± 5	21 ± 6	16 ± 5		17 ± 5
02/08/2010 - 02/15/2010	8 ± 4	11 ± 4	8 ± 4	10 ± 4		10 ± 4
02/15/2010 - 02/22/2010	14 ± 4	12 ± 4	10 ± 4	14 ± 4		10 ± 4
02/22/2010 - 03/01/2010	< 6	< 6	< 6	< 6		8 ± 4
03/01/2010 - 03/08/2010	11 ± 4	9 ± 4	< 7	12 ± 5		7 ± 4
03/08/2010 - 03/15/2010	15 ± 5	16 ± 5	20 ± 5	13 ± 5		14 ± 5
03/15/2010 - 03/22/2010	16 ± 5	16 ± 5	16 ± 5	17 ± 5		19 ± 5
03/22/2010 - 03/29/2010	12 ± 5	16 ± 5	(1)	18 ± 5		16 ± 5
03/29/2010 - 04/05/2010	8 ± 4	8 ± 4	9 ± 5	8 ± 4		7 ± 4
04/05/2010 - 04/12/2010	21 ± 4	16 ± 4	16 ± 4	19 ± 5		18 ± 4
04/12/2010 - 04/19/2010	< 7	11 ± 5	9 ± 5	9 ± 5		10 ± 5
04/19/2010 - 04/26/2010	9 ± 4	15 ± 5	12 ± 4	13 ± 5		13 ± 4
04/26/2010 - 05/03/2010	16 ± 5	17 ± 5	18 ± 5	17 ± 5		13 ± 5
05/03/2010 - 05/10/2010	15 ± 5	12 ± 5	11 ± 5	13 ± 5		9 ± 5
05/10/2010 - 05/17/2010	10 ± 5	11 ± 5	10 ± 5	13 ± 5		10 ± 5
05/17/2010 - 05/24/2010	13 ± 5	16 ± 5	13 ± 5	12 ± 5		14 ± 5
05/24/2010 - 06/01/2010	14 ± 4	16 ± 4	17 ± 5	15 ± 4		17 ± 4
06/01/2010 - 06/07/2010	17 ± 6	15 ± 6	14 ± 6	13 ± 6		15 ± 6
06/07/2010 - 06/14/2010	15 ± 5	10 ± 5	11 ± 5	13 ± 5		15 ± 5
06/14/2010 - 06/21/2010	18 ± 4	16 ± 4	14 ± 4	17 ± 4		17 ± 4
06/21/2010 - 06/28/2010	23 ± 5	22 ± 5	23 ± 5	20 ± 5		22 ± 6
06/28/2010 - 07/06/2010	16 ± 5	20 ± 5	15 ± 5	16 ± 5		14 ± 5
07/06/2010 - 07/12/2010	29 ± 6	31 ± 6	26 ± 6	29 ± 6		29 ± 6
07/12/2010 - 07/19/2010	26 ± 5	22 ± 4	25 ± 5	22 ± 4		22 ± 4
07/19/2010 - 07/26/2010	17 ± 6	21 ± 6	14 ± 5	17 ± 5		17 ± 5
07/26/2010 - 08/02/2010	20 ± 4	19 ± 4	15 ± 4	18 ± 4		18 ± 4
08/02/2010 - 08/09/2010	22 ± 6	21 ± 6	19 ± 5	20 ± 5		22 ± 6
08/09/2010 - 08/16/2010	29 ± 5	24 ± 5	25 ± 5	21 ± 5		25 ± 5
08/16/2010 - 08/23/2010	30 ± 5	25 ± 5	26 ± 5	27 ± 5		27 ± 5
08/23/2010 - 08/30/2010	17 ± 5	15 ± 5	15 ± 5	16 ± 5		12 ± 5
08/30/2010 - 09/06/2010	34 ± 6	27 ± 6	35 ± 6	31 ± 6		32 ± 6
09/06/2010 - 09/13/2010	14 ± 4	15 ± 4	15 ± 4	15 ± 4		12 ± 4
09/13/2010 - 09/20/2010	17 ± 5	14 ± 5	15 ± 5	19 ± 5		17 ± 5
09/20/2010 - 09/27/2010	24 ± 6	21 ± 6	21 ± 6	21 ± 6		21 ± 6
09/27/2010 - 10/04/2010	13 ± 4	8 ± 4	11 ± 4	12 ± 4		8 ± 4
10/04/2010 - 10/11/2010	16 ± 4	16 ± 4	16 ± 4	16 ± 4		20 ± 4
10/11/2010 - 10/18/2010	18 ± 6	16 ± 6	18 ± 6	17 ± 6		29 ± 6
10/18/2010 - 10/25/2010	14 ± 5	17 ± 5	18 ± 5	15 ± 5		20 ± 5
10/25/2010 - 11/01/2010	9 ± 4	7 ± 4	9 ± 4	8 ± 4		7 ± 4
11/01/2010 - 11/08/2010	8 ± 4	6 ± 4	7 ± 4	6 ± 4		< 6
11/08/2010 - 11/15/2010	16 ± 4	19 ± 4	16 ± 4	15 ± 4		13 ± 4
11/15/2010 - 11/22/2010	24 ± 5	19 ± 5	20 ± 5	16 ± 5		19 ± 5
11/22/2010 - 11/29/2010	14 ± 5	27 ± 6	31 ± 6	23 ± 5		19 ± 5
11/29/2010 - 12/06/2010	11 ± 4	13 ± 4	13 ± 4	15 ± 4		15 ± 4
12/06/2010 - 12/13/2010	17 ± 4	17 ± 4	13 ± 4	12 ± 4	(2)	12 ± 4
12/13/2010 - 12/20/2010	13 ± 6	14 ± 6	13 ± 6	10 ± 6	13 ± 6	10 ± 6
12/20/2010 - 12/27/2010	9 ± 4	9 ± 4	10 ± 4	7 ± 4	10 ± 4	10 ± 4
12/27/2010 - 01/03/2011	27 ± 5	23 ± 4	24 ± 4	25 ± 4	21 ± 4	21 ± 4
MEAN	17 ± 13	16 ± 11	16 ± 13	16 ± 11	15 ± 11	16 ± 12

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

(1) SEE PROGRAM EXCEPTIONS SECTION FOR EXPLANATION

(2) SEE PROGRAM CHANGES 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, 2010**

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
12/28/2009 - 02/01/2010	7	29	16.8 ± 14	12/28/2009 - 02/01/2010	8	26	18.3 ± 16.6	12/28/2009 - 02/01/2010	10	25	16.6 ± 12
02/01/2010 - 02/22/2010	8	21	12.7 ± 9	02/01/2010 - 02/22/2010	10	16	13.3 ± 7	02/01/2010 - 03/01/2010	8	17	11.2 ± 8
03/01/2010 - 04/05/2010	8	20	13.7 ± 8	03/01/2010 - 04/05/2010	8	18	13.7 ± 9	03/01/2010 - 04/05/2010	7	19	12.4 ± 11
03/30/2010 - 05/03/2010	9	21	14.1 ± 8	04/05/2010 - 05/03/2010	9	19	14.4 ± 9	04/05/2010 - 05/03/2010	10	18	13.1 ± 7
05/03/2010 - 06/01/2010	10	17	13.3 ± 5	05/03/2010 - 06/01/2010	12	15	13.3 ± 3	05/03/2010 - 06/01/2010	9	17	12.5 ± 8
06/01/2010 - 06/28/2010	10	23	16.4 ± 8	06/01/2010 - 06/28/2010	13	20	15.7 ± 7	06/01/2010 - 06/28/2010	15	22	17 ± 7
06/28/2010 - 08/02/2010	14	31	21 ± 10	06/28/2010 - 08/02/2010	16	29	20.3 ± 10	06/28/2010 - 08/02/2010	14	29	19.9 ± 11
08/02/2010 - 08/30/2010	15	30	22.3 ± 10	08/02/2010 - 08/30/2010	16	27	20.8 ± 9	08/02/2010 - 08/30/2010	12	27	21.5 ± 13
08/30/2010 - 10/04/2010	8	35	18.9 ± 15.9	08/30/2010 - 10/04/2010	12	31	19.4 ± 15	08/30/2010 - 10/04/2010	8	32	17.8 ± 19
10/04/2010 - 11/01/2010	7	18	14.6 ± 8	10/04/2010 - 11/01/2010	8	17	13.8 ± 8	10/04/2010 - 11/01/2010	7	29	19 ± 18
11/01/2010 - 11/29/2010	6	31	17.2 ± 16	11/01/2010 - 11/29/2010	6	23	15 ± 13	11/08/2010 - 11/29/2010	13	19	17.1 ± 7
11/29/2010 - 01/03/2011	9	27	15 ± 11.1	11/29/2010 - 01/03/2011	7	25	14 ± 12	11/29/2010 - 01/03/2011	10	21	13.6 ± 9
12/28/2009 - 01/03/2011	6	35	17 ± 12	12/28/2009 - 01/03/2011	6	31	16 ± 11	12/28/2009 - 01/03/2011	7	32	16 ± 12

* 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, 2010

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

STC	COLLECTION PERIOD		Be-7	Mn-54	Co-58	Co-60	Cs-134	Cs-137
10S3	12/28/2009 - 03/29/2010		126 ± 42	< 4	< 6	< 3	< 4	< 4
	03/29/2010 - 06/28/2010		69 ± 32	< 2	< 3	< 4	< 3	< 3
	06/28/2010 - 09/27/2010		106 ± 33	< 3	< 3	< 2	< 3	< 3
	09/27/2010 - 01/03/2011		52 ± 15	< 2	< 2	< 2	< 3	< 2
	MEAN		88 ± 68	-	-	-	-	-
11S1	12/28/2009 - 03/29/2010		86 ± 29	< 3	< 3	< 3	< 3	< 3
	03/29/2010 - 06/28/2010		91 ± 36	< 3	< 7	< 5	< 4	< 4
	06/28/2010 - 09/27/2010		110 ± 31	< 3	< 5	< 3	< 3	< 3
	09/27/2010 - 01/03/2011		47 ± 24	< 3	< 3	< 3	< 3	< 3
	MEAN		84 ± 53	-	-	-	-	-
13C1	12/28/2009 - 03/29/2010		117 ± 40	< 3	< 5	< 2	< 2	< 4
	03/29/2010 - 06/28/2010		88 ± 27	< 3	< 4	< 4	< 3	< 3
	06/28/2010 - 09/27/2010		86 ± 27	< 3	< 5	< 4	< 4	< 3
	09/27/2010 - 01/03/2011		60 ± 15	< 2	< 2	< 3	< 2	< 2
	MEAN		88 ± 46	-	-	-	-	-
14S1	12/28/2009 - 03/29/2010		91 ± 36	< 3	< 4	< 3	< 4	< 3
	03/30/2010 - 06/28/2010		88 ± 35	< 3	< 4	< 2	< 3	< 3
	06/28/2010 - 09/27/2010		75 ± 38	< 2	< 4	< 2	< 3	< 3
	09/27/2010 - 01/03/2011		60 ± 19	< 2	< 2	< 2	< 2	< 2
	MEAN		79 ± 29	-	-	-	-	-
22G1	12/28/2009 - 03/29/2010		89 ± 30	< 4	< 4	< 3	< 3	< 3
	03/29/2010 - 06/28/2010		103 ± 40	< 5	< 6	< 4	< 5	< 4
	06/28/2010 - 09/27/2010		79 ± 26	< 3	< 3	< 3	< 2	< 2
	09/27/2010 - 01/03/2011		82 ± 22	< 2	< 3	< 2	< 3	< 3
	MEAN		88 ± 21	-	-	-	-	-
6C1	12/13/2010 - 01/03/2011	(1)	135 ± 75	< 16	< 18	< 12	< 13	< 12
	MEAN		-	-	-	-	-	-

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

(1) SEE PROGRAM CHANGES SECTION FOR EXPLANATION

TABLE C-VI.1 **CONCENTRATIONS OF I-131 IN AIR IODINE SAMPLES COLLECTED IN THE VICINITY OF LIMERICK GENERATING STATION, 2010**

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

COLLECTION	GROUP I			GROUP II		GROUP III
PERIOD	10S3	11S1	14S1	13C1	6C1	22G1
12/28/2009 - 01/04/2010	< 60	< 61	< 61	< 34		< 60
01/04/2010 - 01/11/2010	< 66	< 29	< 68	< 68		< 67
01/11/2010 - 01/18/2010	< 22	< 22	< 22	< 12		< 22
01/18/2010 - 01/26/2010	< 29	< 30	< 30	< 13		< 29
01/26/2010 - 02/01/2010	< 19	< 35	< 35	< 36		< 34
02/01/2010 - 02/08/2010	< 26	< 27	< 15	< 27		< 27
02/08/2010 - 02/15/2010	< 16	< 30	< 30	< 31		< 29
02/15/2010 - 02/22/2010	< 21	< 21	< 21	< 21		< 11
02/22/2010 - 03/01/2010	< 16	< 30	< 30	< 30		< 28
03/01/2010 - 03/08/2010	< 15	< 37	< 37	< 37		< 36
03/08/2010 - 03/15/2010	< 20	< 37	< 37	< 37		< 36
03/15/2010 - 03/22/2010	< 52	< 23	< 53	< 54		< 52
03/22/2010 - 03/29/2010	< 14	< 14	(1)	< 15		< 14
03/29/2010 - 04/05/2010	< 31	< 31	< 37	< 18		< 31
04/05/2010 - 04/12/2010	< 12	< 22	< 22	< 22		< 21
04/12/2010 - 04/19/2010	< 24	< 24	< 25	< 25		< 24
04/19/2010 - 04/26/2010	< 22	< 30	< 30	< 30		< 29
04/26/2010 - 05/03/2010	< 35	< 36	< 36	< 36		< 15
05/03/2010 - 05/10/2010	< 12	< 30	< 30	< 30		< 29
05/10/2010 - 05/17/2010	< 14	< 26	< 26	< 27		< 26
05/17/2010 - 05/24/2010	< 12	< 22	< 22	< 23		< 21
05/24/2010 - 06/01/2010	< 40	< 17	< 41	< 41		< 39
06/01/2010 - 06/07/2010	< 13	< 32	< 32	< 32		< 32
06/07/2010 - 06/14/2010	< 34	< 34	< 35	< 15		< 34
06/14/2010 - 06/21/2010	< 9	< 18	< 18	< 18		< 17
06/21/2010 - 06/28/2010	< 43	< 43	< 24	< 42		< 51
06/28/2010 - 07/06/2010	< 12	< 28	< 29	< 28		< 29
07/06/2010 - 07/12/2010	< 37	< 37	< 37	< 36		< 16
07/12/2010 - 07/19/2010	< 16	< 22	< 22	< 22		< 22
07/19/2010 - 07/26/2010	< 16	< 28	< 29	< 28		< 29
07/26/2010 - 08/02/2010	< 13	< 30	< 31	< 30		< 30
08/02/2010 - 08/09/2010	< 23	< 12	< 23	< 22		< 23
08/09/2010 - 08/16/2010	< 14	< 33	< 33	< 33		< 33
08/16/2010 - 08/23/2010	< 26	< 26	< 27	< 14		< 27
08/23/2010 - 08/30/2010	< 22	< 22	< 12	< 22		< 22
08/30/2010 - 09/06/2010	< 34	< 34	< 19	< 33		< 34
09/06/2010 - 09/13/2010	< 37	< 37	< 37	< 37		< 16
09/13/2010 - 09/20/2010	< 28	< 28	< 29	< 16		< 30
09/20/2010 - 09/27/2010	< 14	< 26	< 26	< 26		< 26
09/27/2010 - 10/04/2010	< 37	< 37	< 38	< 37		< 16
10/04/2010 - 10/11/2010	< 18	< 41	< 41	< 41		< 43
10/11/2010 - 10/18/2010	< 16	< 29	< 30	< 29		< 30
10/18/2010 - 10/25/2010	< 40	< 40	< 40	< 39		< 17
10/25/2010 - 11/01/2010	< 41	< 17	< 41	< 41		< 41
11/01/2010 - 11/08/2010	< 50	< 50	< 50	< 50		< 28
11/08/2010 - 11/15/2010	< 42	< 42	< 42	< 31		< 43
11/15/2010 - 11/22/2010	< 16	< 37	< 38	< 37		< 38
11/22/2010 - 11/29/2010	< 55	< 55	< 24	< 55		< 56
11/29/2010 - 12/06/2010	< 56	< 56	< 57	< 56		< 24
12/06/2010 - 12/13/2010	< 36	< 36	< 36	< 36	(2)	< 16
12/13/2010 - 12/20/2010	< 54	< 54	< 58	< 57	< 56	< 58
12/20/2010 - 12/27/2010	< 58	< 58	< 54	< 53	< 36	< 54
12/27/2010 - 01/03/2011	< 44	< 44	< 49	< 48	< 44	< 49
MEAN	-	-	-	-	-	-

(1) SEE PROGRAM EXCEPTIONS SECTION FOR EXPLANATION

(2) SEE PROGRAM CHANGES SECTION FOR EXPLANATION

TABLE C-VII.1 CONCENTRATIONS OF I-131 IN MILK SAMPLES COLLECTED IN THE VICINITY OF LIMERICK GENERATING STATION, 2010

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

	CONTROL FARM		INDICATOR FARM			
COLLECTION PERIOD	23F1	36E1	10F4	18E1	19B1	25C1
01/12/2010	< 0.4	< 0.5	< 0.4	< 0.5	< 0.5	< 0.3
02/09/2010	< 0.6		< 0.7	< 0.8	< 0.7	< 0.8
03/16/2010	< 0.5		< 0.4	< 0.4	< 0.4	< 0.6
04/06/2010	< 0.6	< 0.4	< 0.5	< 0.5	< 0.5	< 0.4
04/20/2010	< 0.4		< 0.8	< 0.6	< 0.6	< 0.7
05/04/2010	< 0.7		< 0.9	< 0.9	< 0.9	< 0.6
05/18/2010	< 0.5		< 0.7	< 0.5	< 0.5	< 0.6
06/01/2010	< 0.6		< 0.6	< 0.5	< 0.6	< 0.6
06/15/2010	< 0.6		< 0.8	< 0.8	< 0.8	< 0.8
06/30/2010	< 0.4		< 0.6	< 0.7	< 0.4	< 0.6
07/13/2010	< 0.5	< 0.7	< 0.6	< 0.7	< 0.7	< 0.6
07/27/2010	< 0.8		< 0.8	< 0.8	< 0.8	< 0.8
08/11/2010	< 0.5		< 0.7	< 0.6	< 0.7	< 0.9
08/24/2010	< 0.5		< 0.6	< 0.6	< 0.6	< 0.9
09/07/2010	< 0.6		< 0.7	< 0.7	< 0.8	< 0.7
09/22/2010	< 0.6		< 0.6	< 0.6	< 0.8	< 0.7
10/05/2010	< 0.6	< 0.8	< 0.7	< 0.7	< 0.6	< 0.6
10/19/2010	< 0.6		< 0.7	< 0.8	< 0.8	< 0.8
11/02/2010	< 0.5		< 0.6	< 0.7	< 0.7	< 0.7
11/16/2010	< 0.6		< 0.7	< 0.7	< 0.7	< 0.7
11/30/2010	< 0.3		< 0.4	< 0.4	< 0.4	< 0.5
12/14/2010	< 0.5		< 0.7	< 0.7	< 0.7	< 0.6
MEAN	-	-	-	-	-	-

TABLE C-VII.2 CONCENTRATIONS OF GAMMA EMITTERS IN MILK SAMPLES COLLECTED IN THE VICINITY OF LIMERICK GENERATING STATION, 2010

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

STC	COLLECTION PERIOD	K-40	Cs-134	Cs-137	Ba-140	La-140
10F4	01/12/2010	1220 ± 94	< 4	< 4	< 27	< 7
	02/09/2010	1310 ± 146	< 5	< 7	< 30	< 8
	03/16/2010	1370 ± 153	< 5	< 8	< 24	< 8
	04/06/2010	1220 ± 122	< 7	< 8	< 57	< 11
	04/20/2010	1280 ± 98	< 4	< 4	< 40	< 11
	05/04/2010	1280 ± 135	< 5	< 7	< 43	< 14
	05/18/2010	1290 ± 128	< 5	< 7	< 37	< 13
	06/01/2010	1320 ± 166	< 6	< 7	< 50	< 8
	06/15/2010	1390 ± 131	< 6	< 6	< 42	< 14
	06/29/2010	1470 ± 156	< 6	< 7	< 35	< 7
	07/13/2010	1370 ± 144	< 5	< 6	< 22	< 7
	07/27/2010	1340 ± 151	< 7	< 7	< 29	< 9
	08/10/2010	1260 ± 111	< 3	< 5	< 22	< 6
	08/24/2010	1310 ± 150	< 4	< 4	< 39	< 8
	09/07/2010	1190 ± 166	< 7	< 8	< 34	< 13
	09/21/2010	1240 ± 125	< 5	< 6	< 32	< 8
	10/05/2010	1300 ± 138	< 5	< 6	< 21	< 7
	10/19/2010	1390 ± 150	< 6	< 6	< 29	< 9
	11/02/2010	1280 ± 104	< 4	< 5	< 19	< 6
	11/16/2010	1210 ± 131	< 6	< 6	< 29	< 9
	11/30/2010	1270 ± 149	< 7	< 8	< 38	< 10
	12/14/2010	1340 ± 128	< 5	< 6	< 27	< 8
	MEAN	1302 ± 137	-	-	-	-
18E1	01/12/2010	1350 ± 113	< 4	< 5	< 36	< 10
	02/09/2010	1330 ± 159	< 6	< 7	< 35	< 8
	03/16/2010	1290 ± 143	< 6	< 7	< 24	< 7
	04/06/2010	1240 ± 108	< 10	< 7	< 45	< 12
	04/20/2010	1240 ± 94	< 3	< 4	< 41	< 12
	05/04/2010	1140 ± 130	< 5	< 5	< 44	< 14
	05/18/2010	1310 ± 133	< 5	< 6	< 34	< 11
	06/01/2010	1260 ± 114	< 5	< 4	< 34	< 9
	06/15/2010	1290 ± 136	< 5	< 4	< 43	< 8
	06/30/2010	1160 ± 151	< 7	< 7	< 37	< 9
	07/13/2010	1230 ± 166	< 7	< 8	< 26	< 6
	07/27/2010	1440 ± 157	< 10	< 9	< 42	< 12
	08/11/2010	1230 ± 160	< 5	< 5	< 25	< 7
	08/24/2010	1050 ± 137	< 3	< 4	< 35	< 10
	09/07/2010	1160 ± 141	< 7	< 7	< 42	< 11
	09/22/2010	1220 ± 118	< 5	< 6	< 33	< 8
	10/05/2010	1060 ± 152	< 6	< 7	< 29	< 6
	10/19/2010	1180 ± 142	< 7	< 6	< 31	< 9
	11/02/2010	1210 ± 107	< 5	< 5	< 24	< 6
	11/16/2010	1260 ± 122	< 5	< 6	< 26	< 8
	11/30/2010	1200 ± 135	< 5	< 6	< 32	< 9
	12/14/2010	1460 ± 137	< 5	< 5	< 28	< 9
	MEAN	1241 ± 203	-	-	-	-

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

TABLE C-VII.2 CONCENTRATIONS OF GAMMA EMITTERS IN MILK SAMPLES COLLECTED IN THE VICINITY OF LIMERICK GENERATING STATION, 2010

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

STC	COLLECTION PERIOD	K-40	Cs-134	Cs-137	Ba-140	La-140
19B1	01/12/2010	1220 ± 102	< 4	< 5	< 31	< 9
	02/09/2010	1260 ± 146	< 6	< 8	< 35	< 9
	03/16/2010	1310 ± 131	< 9	< 8	< 33	< 8
	04/06/2010	1300 ± 130	< 5	< 6	< 37	< 10
	04/20/2010	1360 ± 83	< 7	< 5	< 53	< 15
	05/04/2010	1350 ± 119	< 7	< 7	< 49	< 14
	05/18/2010	1190 ± 124	< 5	< 6	< 32	< 7
	06/01/2010	1370 ± 120	< 5	< 5	< 38	< 12
	06/15/2010	1190 ± 111	< 5	< 6	< 33	< 10
	06/29/2010	1400 ± 137	< 8	< 8	< 40	< 13
	07/13/2010	1380 ± 190	< 7	< 9	< 33	< 8
	07/27/2010	1330 ± 142	< 5	< 8	< 26	< 7
	08/10/2010	1390 ± 139	< 5	< 6	< 28	< 8
	08/24/2010	1320 ± 128	< 5	< 5	< 47	< 14
	09/07/2010	1160 ± 145	< 7	< 7	< 39	< 11
	09/21/2010	1440 ± 126	< 5	< 6	< 42	< 10
	10/05/2010	1240 ± 157	< 5	< 7	< 24	< 6
	10/19/2010	1460 ± 154	< 7	< 7	< 33	< 10
	11/02/2010	1380 ± 98	< 4	< 4	< 20	< 6
	11/16/2010	1320 ± 122	< 4	< 5	< 26	< 7
	11/30/2010	1050 ± 136	< 5	< 7	< 33	< 9
	12/14/2010	1320 ± 105	< 8	< 7	< 33	< 10
	MEAN	1306 ± 198	-	-	-	-
23F1	01/12/2010	1330 ± 128	< 6	< 6	< 47	< 14
	02/09/2010	1260 ± 178	< 9	< 9	< 52	< 15
	03/16/2010	1360 ± 116	< 4	< 5	< 20	< 6
	04/06/2010	1320 ± 120	< 5	< 5	< 40	< 11
	04/20/2010	1400 ± 85	< 4	< 4	< 44	< 12
	05/04/2010	1390 ± 112	< 4	< 5	< 36	< 10
	05/18/2010	1320 ± 123	< 4	< 5	< 34	< 9
	06/01/2010	1300 ± 171	< 6	< 7	< 56	< 11
	06/15/2010	1340 ± 126	< 6	< 6	< 42	< 14
	06/29/2010	1260 ± 125	< 5	< 6	< 28	< 9
	07/13/2010	1410 ± 168	< 10	< 7	< 31	< 10
	07/27/2010	1390 ± 143	< 8	< 7	< 35	< 9
	08/10/2010	1390 ± 139	< 6	< 6	< 31	< 10
	08/24/2010	1270 ± 143	< 2	< 3	< 36	< 6
	09/07/2010	1230 ± 135	< 5	< 6	< 27	< 10
	09/21/2010	1220 ± 103	< 4	< 5	< 25	< 8
	10/05/2010	1360 ± 130	< 5	< 5	< 19	< 6
	10/19/2010	1140 ± 143	< 5	< 6	< 28	< 9
	11/02/2010	1360 ± 119	< 5	< 5	< 23	< 7
	11/16/2010	1170 ± 126	< 6	< 6	< 23	< 8
	11/30/2010	1270 ± 132	< 5	< 5	< 26	< 7
	12/14/2010	1320 ± 101	< 4	< 5	< 24	< 6
	MEAN	1310 ± 150	-	-	-	-

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

TABLE C-VII.2 CONCENTRATIONS OF GAMMA EMITTERS IN MILK SAMPLES COLLECTED IN THE VICINITY OF LIMERICK GENERATING STATION, 2010

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

STC	COLLECTION PERIOD	K-40	Cs-134	Cs-137	Ba-140	La-140
25C1	01/12/2010	1380 ± 118	< 6	< 6	< 45	< 10
	02/09/2010	1260 ± 119	< 4	< 4	< 22	< 6
	03/16/2010	1370 ± 129	< 10	< 8	< 38	< 10
	04/06/2010	1350 ± 118	< 6	< 5	< 39	< 13
	04/20/2010	1340 ± 88	< 4	< 4	< 44	< 14
	05/04/2010	1230 ± 101	< 4	< 4	< 30	< 11
	05/18/2010	1380 ± 123	< 5	< 6	< 45	< 11
	06/01/2010	1340 ± 142	< 5	< 6	< 48	< 14
	06/15/2010	1350 ± 158	< 5	< 7	< 48	< 11
	06/29/2010	1360 ± 131	< 6	< 6	< 29	< 8
	07/13/2010	1180 ± 137	< 6	< 5	< 21	< 6
	07/27/2010	1210 ± 155	< 6	< 8	< 29	< 7
	08/10/2010	1140 ± 182	< 7	< 9	< 41	< 11
	08/24/2010	1120 ± 110	< 3	< 3	< 34	< 6
	09/07/2010	1190 ± 126	< 5	< 6	< 29	< 9
	09/21/2010	1240 ± 116	< 5	< 5	< 32	< 9
	10/05/2010	1500 ± 151	< 6	< 7	< 25	< 9
	10/19/2010	1270 ± 139	< 5	< 6	< 31	< 8
	11/02/2010	1280 ± 112	< 4	< 4	< 21	< 6
	11/16/2010	1290 ± 131	< 5	< 6	< 28	< 9
	11/30/2010	1220 ± 135	< 5	< 5	< 30	< 8
	12/14/2010	1230 ± 110	< 4	< 5	< 21	< 7
	MEAN	1283 ± 184	-	-	-	-
36E1	01/12/2010	1150 ± 120	< 5	< 5	< 33	< 13
	04/06/2010	1160 ± 98	< 3	< 4	< 24	< 9
	07/13/2010	1200 ± 93	< 3	< 4	< 15	< 4
	10/05/2010	1210 ± 147	< 6	< 6	< 23	< 6
	MEAN	1180 ± 59	-	-	-	-

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

TABLE C-VIII.1

CONCENTRATIONS OF GAMMA EMITTERS IN BROAD LEAF VEGETATION
SAMPLES COLLECTED IN THE VICINITY OF LIMERICK GENERATING STATION, 2010

RESULTS IN UNITS OF PCI/KG WET ± 2 SIGMA

STC	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	06/24/2010	Cabbage	(1)	< 169	5190 ± 468	< 19	< 20	< 18	< 42	< 18	< 18	< 381	< 30	< 93
	06/24/2010	Collards		< 191	4760 ± 448	< 19	< 22	< 25	< 49	< 18	< 22	< 395	< 31	< 94
	07/20/2010	Cabbage		267 ± 207	3420 ± 506	< 25	< 25	< 22	< 28	< 24	< 24	< 527	< 45	< 115
	07/20/2010	Collards		168 ± 133	4550 ± 446	< 23	< 22	< 21	< 26	< 19	< 19	< 439	< 42	< 83
	07/20/2010	Swiss Chard		< 272	5430 ± 471	< 26	< 26	< 26	< 31	< 27	< 27	< 697	< 54	< 110
	08/17/2010	Cabbage		< 169	4430 ± 369	< 17	< 16	< 15	< 56	< 15	< 17	< 365	71 ± 20	< 51
	08/17/2010	Collards		< 168	3680 ± 334	< 17	< 17	< 16	< 58	< 16	< 17	< 373	< 26	< 77
	08/17/2010	Swiss Chard		425 ± 125	4040 ± 293	< 14	< 14	< 13	< 42	< 12	< 12	< 263	< 22	< 60
	09/13/2010	Cabbage		< 112	4740 ± 305	< 12	< 12	< 15	< 48	< 11	< 12	< 301	< 19	< 45
	09/13/2010	Collards		124 ± 101	4840 ± 299	< 13	< 13	< 14	< 53	< 12	< 14	< 247	< 21	< 55
	09/13/2010	Swiss Chard		138 ± 121	3720 ± 278	< 12	< 13	< 15	< 46	< 11	< 12	< 204	< 21	< 50
	MEAN			224 ± 251	4436 ± 1297	-	-	-	-	-	-	-	-	-
13S3	06/24/2010	Collards	(1)	< 178	6370 ± 490	< 22	< 18	< 21	< 45	< 18	< 20	< 453	< 32	< 80
	06/24/2010	Swiss Chard		< 194	6100 ± 532	< 24	< 22	< 24	< 44	< 18	< 23	1390 ± 424	< 29	< 93
	07/20/2010	Cabbage		564 ± 248	3500 ± 577	< 31	< 29	< 34	< 36	< 25	< 35	4000 ± 810	< 46	< 134
	07/20/2010	Collards		< 191	3830 ± 508	< 20	< 24	< 20	< 29	< 19	< 23	1380 ± 478	< 44	< 108
	07/20/2010	Swiss Chard		308 ± 144	5220 ± 532	< 23	< 17	< 17	< 27	< 23	< 20	< 556	< 43	< 94
	08/17/2010	Cabbage		364 ± 184	3490 ± 327	< 16	< 16	< 16	< 58	< 16	< 19	3260 ± 487	99 ± 28	< 85
	08/17/2010	Collards		< 173	4970 ± 406	< 15	< 17	< 15	< 49	< 13	< 13	2010 ± 433	< 31	< 59
	08/17/2010	Swiss Chard		327 ± 98	8510 ± 281	< 12	< 13	< 14	< 43	< 11	< 12	2770 ± 271	58 ± 18	< 50
	09/13/2010	Collards	(1)	< 125	4830 ± 288	< 12	< 14	< 15	< 53	< 11	< 12	4140 ± 342	< 23	45 ± 32
	09/13/2010	Swiss Chard		< 91	5160 ± 233	< 9	< 10	< 11	< 54	< 9	< 8	< 200	20 ± 11	< 33
	MEAN			391 ± 236	5198 ± 3056	-	-	-	-	-	-	2707 ± 2312	59 ± 79	-
31G1	06/24/2010	Broccoli Leaves		< 206	4320 ± 455	< 20	< 22	< 20	< 56	< 19	< 24	< 515	< 42	< 95
	06/24/2010	Cabbage		< 211	5620 ± 561	< 26	< 23	< 38	< 43	< 19	< 27	< 445	< 34	< 110
	06/24/2010	Cauliflower Leaves		< 175	4760 ± 471	< 20	< 23	< 21	< 48	< 19	< 20	< 475	< 38	< 101
	07/20/2010	Pickel Leaves		1140 ± 227	3990 ± 476	< 26	< 23	< 25	< 31	< 23	< 25	< 569	< 50	< 101
	07/20/2010	Yellow Squash Leaves		2070 ± 298	3940 ± 507	< 22	< 25	< 22	< 27	< 23	< 28	< 513	< 47	< 108
	07/20/2010	Zucchini Leaves		1210 ± 209	3490 ± 432	< 22	< 15	< 21	< 25	< 18	< 22	< 500	< 30	< 104
	08/17/2010	Mellon Leaves		2150 ± 134	6250 ± 263	< 8	< 9	< 11	< 30	< 8	< 9	< 203	68 ± 16	35 ± 20
	08/17/2010	Yellow Squash Leaves		1930 ± 106	5880 ± 207	< 7	< 8	< 9	< 26	< 7	< 8	< 161	30 ± 12	< 37
	08/17/2010	Zucchini Leaves		1830 ± 125	5330 ± 240	< 9	< 10	< 12	< 33	< 9	< 10	< 191	< 16	36 ± 21
	09/13/2010	Broccoli Leaves		85 ± 72	5120 ± 186	< 7	< 7	< 8	< 40	< 6	< 7	< 164	< 12	< 28
	09/13/2010	Brussel Sprout Leaves		< 91	5600 ± 201	< 9	< 10	< 10	< 54	< 8	< 9	< 208	< 17	< 35
	09/13/2010	Cabbage		263 ± 74	9660 ± 221	< 9	< 10	< 10	< 54	< 8	< 8	2080 ± 224	< 15	36 ± 16
	MEAN			1335 ± 1616	5330 ± 3222	-	-	-	-	-	-	-	49 ± 54	36 ± 2

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

TABLE C-IX.1 QUARTERLY TLD RESULTS FOR LIMERICK GENERATING STATION, 2010

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	7.0 ± 1.3	6.7 ± 0.6	6.5 ± 0.3	7.7 ± 0.8	7.2 ± 0.8
3S1	7.0 ± 0.6	6.7 ± 0.6	7.0 ± 1.0	7.3 ± 1.0	6.9 ± 0.8
4E1	5.3 ± 0.6	5.0 ± 0.3	5.2 ± 0.4	5.6 ± 0.7	6.1 ± 0.6
5H1	8.4 ± 1.3	7.8 ± 0.4	8.3 ± 0.6	9.1 ± 0.4	8.2 ± 1.3
5S1	7.5 ± 1.0	7.5 ± 0.6	7.0 ± 0.3	8.0 ± 0.5	7.5 ± 1.0
6C1	7.3 ± 1.6	6.4 ± 0.9	7.4 ± 1.4	8.0 ± 0.6	6.9 ± 0.7
7E1	7.1 ± 0.6	7.2 ± 0.8	6.8 ± 0.5	7.4 ± 1.0	8.0 ± 0.5
7S1	7.0 ± 1.2	7.0 ± 1.1	6.4 ± 0.5	7.6 ± 0.8	7.4 ± 1.3
9C1	6.8 ± 1.1	6.6 ± 0.9	6.3 ± 0.5	7.4 ± 1.0	6.5 ± 0.7
10E1	6.9 ± 1.1	6.6 ± 0.7	6.5 ± 0.4	7.5 ± 0.7	7.4 ± 0.4
10F3	6.9 ± 1.1	7.1 ± 1.0	6.3 ± 0.1	7.3 ± 1.4	7.4 ± 0.7
10S3	7.0 ± 1.7	6.6 ± 0.6	6.5 ± 0.8	8.0 ± 0.6	7.2 ± 0.8
11S1	7.9 ± 1.7	7.6 ± 0.5	7.2 ± 0.7	8.8 ± 1.2	8.1 ± 1.1
13C1	5.3 ± 0.8	5.2 ± 0.5	4.9 ± 0.2	5.7 ± 0.5	5.5 ± 0.5
13E1	7.0 ± 1.3	6.6 ± 0.4	6.7 ± 0.5	7.8 ± 0.7	7.1 ± 1.0
13S2	9.3 ± 1.0	9.2 ± 1.2	8.8 ± 1.3	9.8 ± 1.4	9.5 ± 1.0
14S1	6.2 ± 1.0	6.1 ± 0.6	5.7 ± 0.7	6.7 ± 1.1	6.8 ± 0.8
15D1	6.9 ± 1.4	6.7 ± 0.5	6.3 ± 0.6	7.7 ± 0.8	7.4 ± 0.8
16F1	7.0 ± 0.8	6.8 ± 0.5	6.7 ± 0.5	7.4 ± 0.6	7.5 ± 0.7
17B1	6.6 ± 0.6	6.6 ± 0.5	6.3 ± 0.3	6.9 ± 0.9	6.5 ± 0.2
18S2	7.2 ± 1.5	7.1 ± 0.7	6.5 ± 1.7	8.0 ± 0.8	7.9 ± 1.0
19D1	6.6 ± 1.0	6.5 ± 0.7	6.2 ± 0.4	7.2 ± 1.0	7.0 ± 0.8
20D1	6.3 ± 0.8	6.6 ± 0.5	5.8 ± 0.5	6.4 ± 0.8	6.2 ± 0.4
20F1	6.6 ± 0.6	6.7 ± 0.8	6.3 ± 1.3	6.9 ± 0.5	7.2 ± 0.9
21S2	6.8 ± 1.7	6.5 ± 0.8	6.1 ± 0.6	7.7 ± 0.6	6.7 ± 0.4
23S2	6.3 ± 1.2	5.8 ± 0.3	6.2 ± 0.3	7.0 ± 0.9	6.8 ± 1.0
24D1	6.4 ± 0.9	6.5 ± 0.7	5.9 ± 1.1	6.8 ± 0.8	5.9 ± 0.4
25D1	5.9 ± 0.7	6.0 ± 1.0	5.5 ± 0.8	6.2 ± 0.7	6.1 ± 0.8
25S2	6.0 ± 0.7	5.9 ± 0.8	5.7 ± 0.7	6.4 ± 1.0	6.1 ± 1.1
26S3	5.9 ± 1.2	5.5 ± 0.6	5.7 ± 0.6	6.6 ± 0.7	6.4 ± 0.7
28D2	6.2 ± 1.3	6.1 ± 0.4	5.6 ± 0.4	6.9 ± 0.4	6.6 ± 0.6
29E1	6.9 ± 1.1	6.5 ± 1.0	(1)	7.3 ± 0.9	6.7 ± 0.5
29S1	6.3 ± 1.3	6.7 ± 1.9	5.6 ± 0.4	6.7 ± 0.4	6.6 ± 0.8
31D1	8.0 ± 1.9	8.6 ± 1.2	6.9 ± 0.5	8.4 ± 1.3	8.4 ± 0.6
31D2	6.8 ± 1.2	6.6 ± 0.6	6.3 ± 0.3	7.5 ± 0.3	7.3 ± 0.6
31S1	7.1 ± 1.6	7.2 ± 1.4	6.3 ± 0.6	7.9 ± 0.7	7.5 ± 0.5
34E1	6.5 ± 1.4	6.2 ± 0.5	6.0 ± 0.9	7.3 ± 0.4	7.1 ± 0.4
34S2	7.0 ± 0.8	6.9 ± 0.8	6.6 ± 0.5	7.4 ± 1.0	7.8 ± 0.8
36D1	6.3 ± 0.8	5.9 ± 0.7	6.2 ± 0.7	6.7 ± 0.7	6.5 ± 0.7
36S2	7.6 ± 0.8	7.7 ± 0.6	7.1 ± 0.7	7.9 ± 0.6	7.2 ± 0.3

(1) SEE PROGRAM EXCEPTIONS SECTION FOR EXPLANATION

TABLE C-IX.2 **MEAN QUARTERLY TLD RESULTS FOR THE SITE BOUNDARY, MIDDLE AND CONTROL LOCATIONS FOR LIMERICK GENERATING STATION, 2010**

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	6.9 ± 1.8	6.5 ± 1.4	7.8 ± 0.0
APR-JUN	6.5 ± 1.6	6.2 ± 1.1	8.3 ± 0.0
JUL-SEP	7.6 ± 1.8	7.1 ± 1.4	9.1 ± 0.0
OCT-DEC	7.3 ± 1.6	6.9 ± 1.4	8.2 ± 0.0

TABLE C-IX.3 **SUMMARY OF THE AMBIENT DOSIMETRY PROGRAM FOR LIMERICK GENERATING STATION, 2010**

RESULTS IN UNITS OF MILLI-ROENTGEN/STD. MONTH

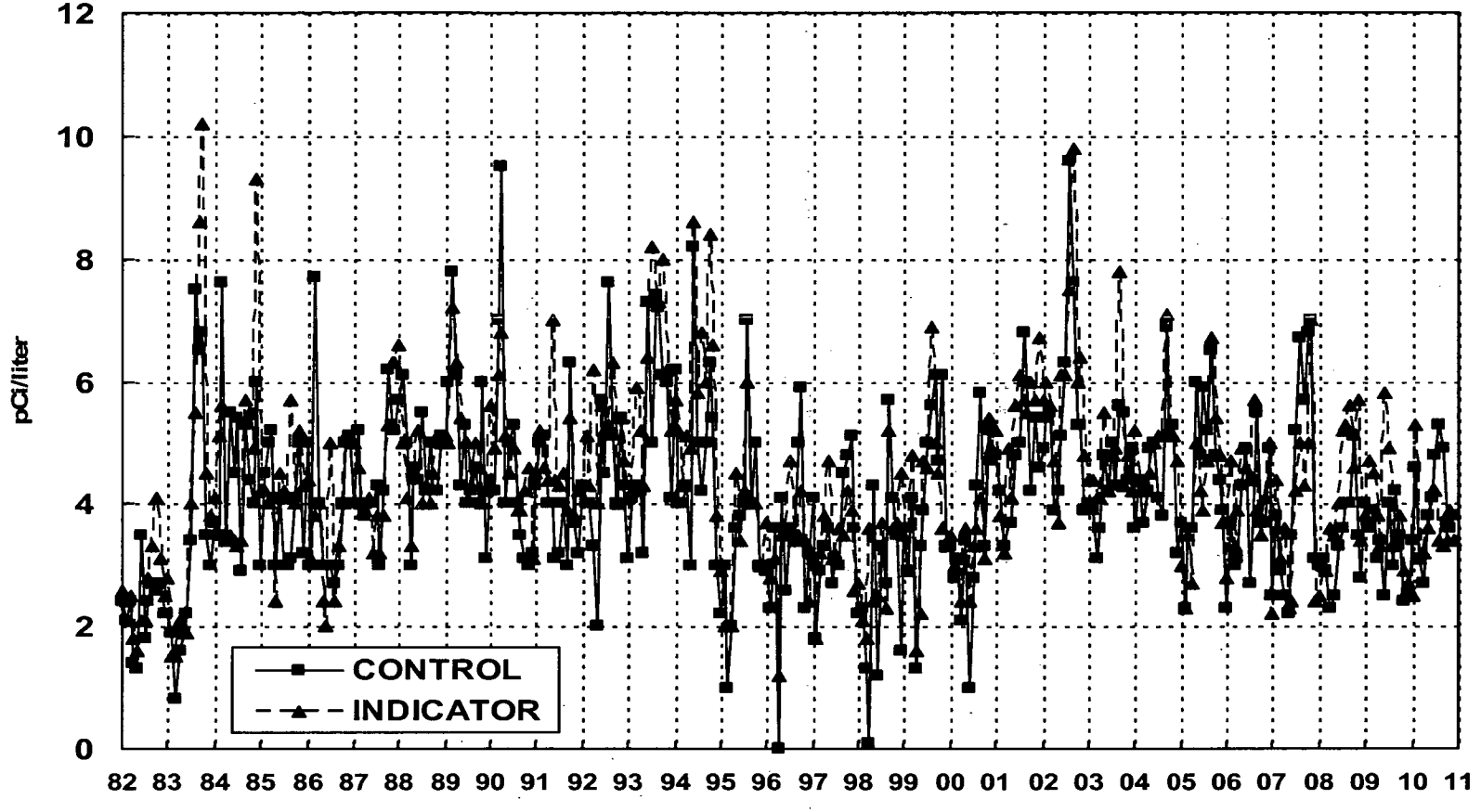
LOCATION	SAMPLES ANALYZED	PERIOD MINIMUM	PERIOD MAXIMUM	PERIOD MEAN ± 2 S.D.
SITE BOUNDARY	64	5.5	9.8	7.1 ± 1.9
INTERMEDIATE	91	4.9	8.6	6.7 ± 1.5
CONTROL	4	7.8	9.1	8.4 ± 1.1

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

INTERMEDIATE 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 - 2010

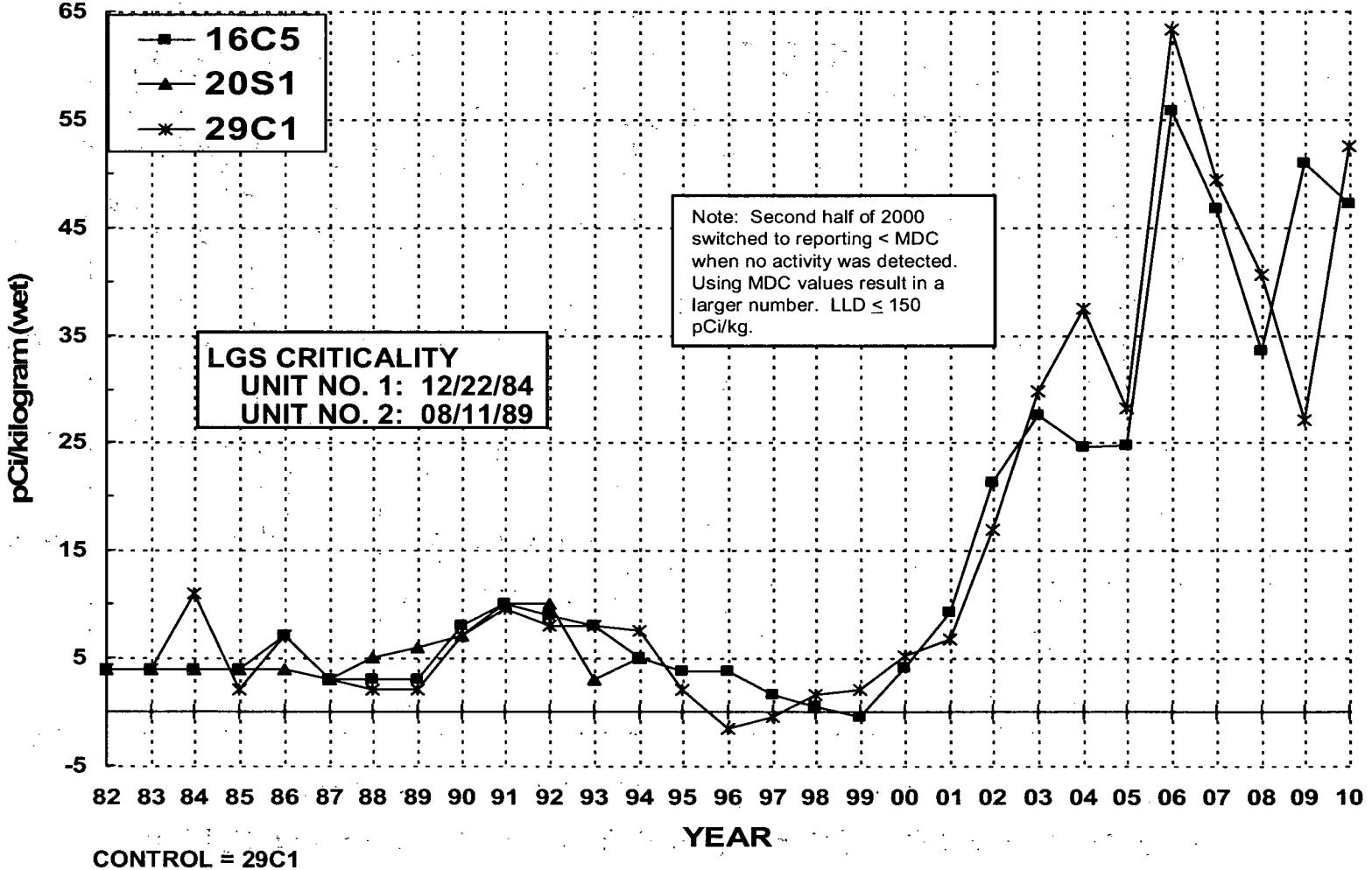


Note: 2005 analysis changed from Insoluble & Soluble to Total Gross Beta

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 - 2010



CONTROL = 29C1

Station 20S1 discontinued in 1995

FIGURE C-3
CONCENTRATIONS OF CS-137 IN SEDIMENT SAMPLES COLLECTED IN THE VICINITY OF LGS, 1982 – 2010

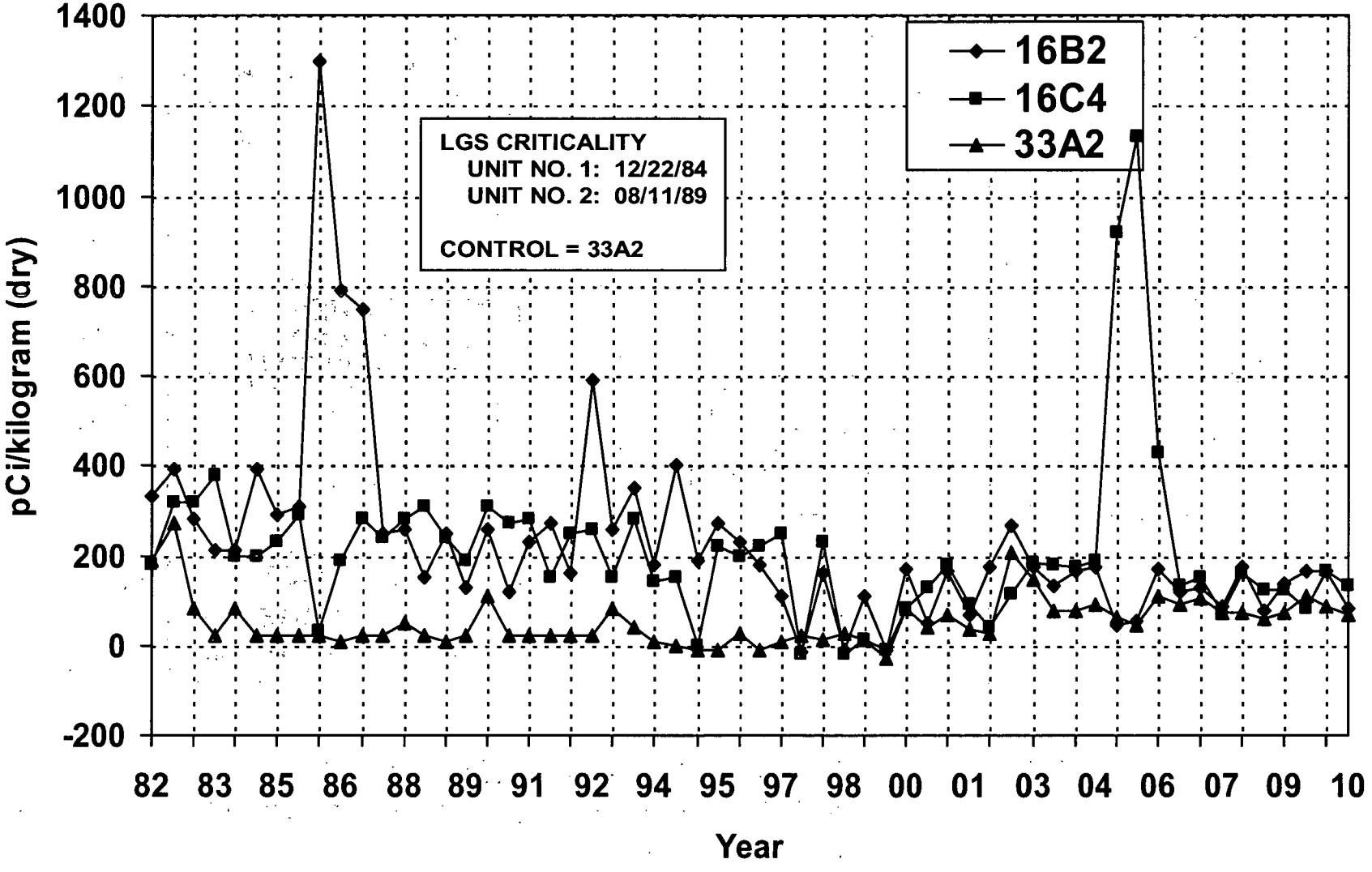


FIGURE C-4
MEAN MONTHLY GROSS BETA CONCENTRATIONS IN AIR PARTICULATE SAMPLES COLLECTED IN THE VICINITY OF LGS, 1982 – 2010

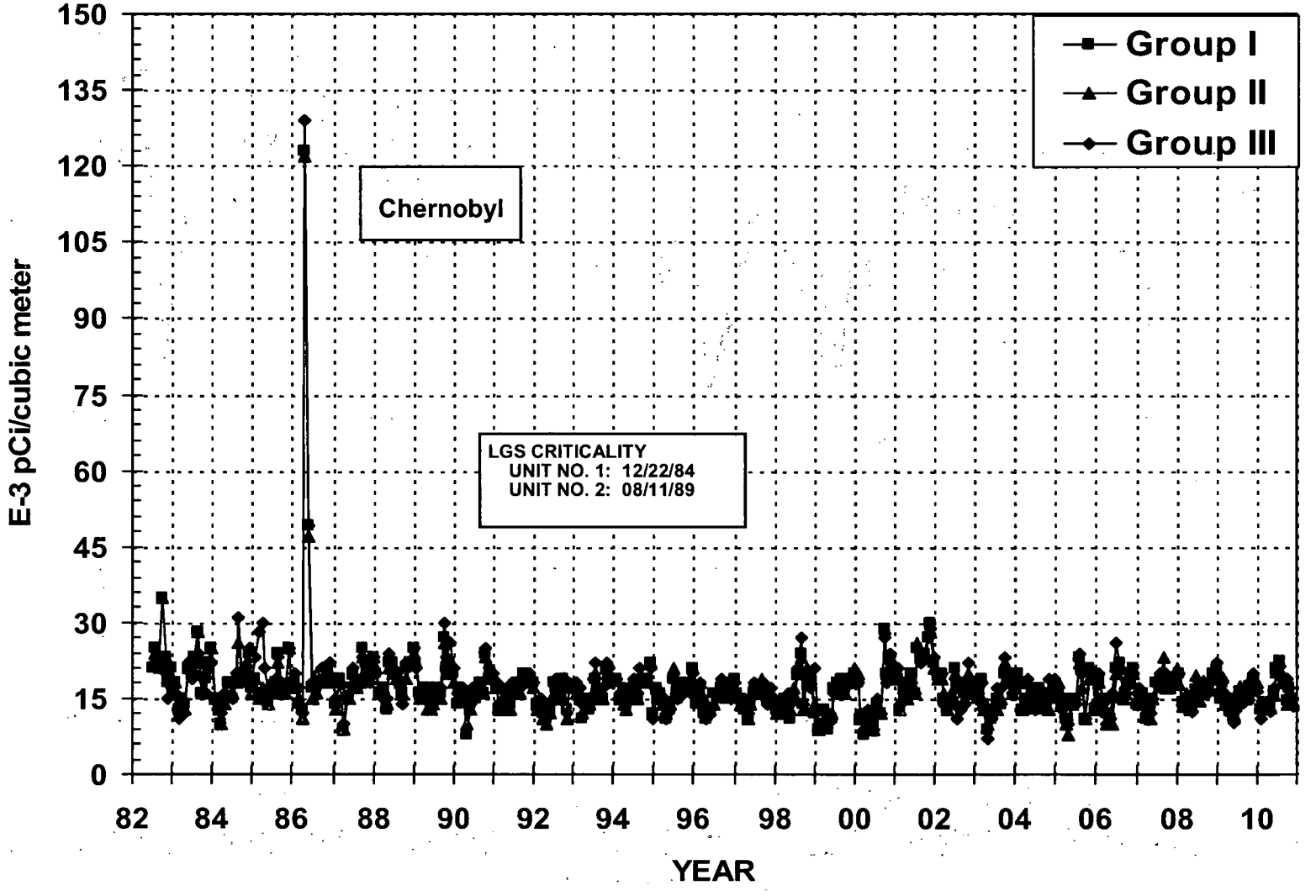


FIGURE C-5
MEAN WEEKLY GROSS BETA CONCENTRATIONS IN AIR PARTICULATE SAMPLES COLLECTED IN THE VICINITY OF LGS, 2010

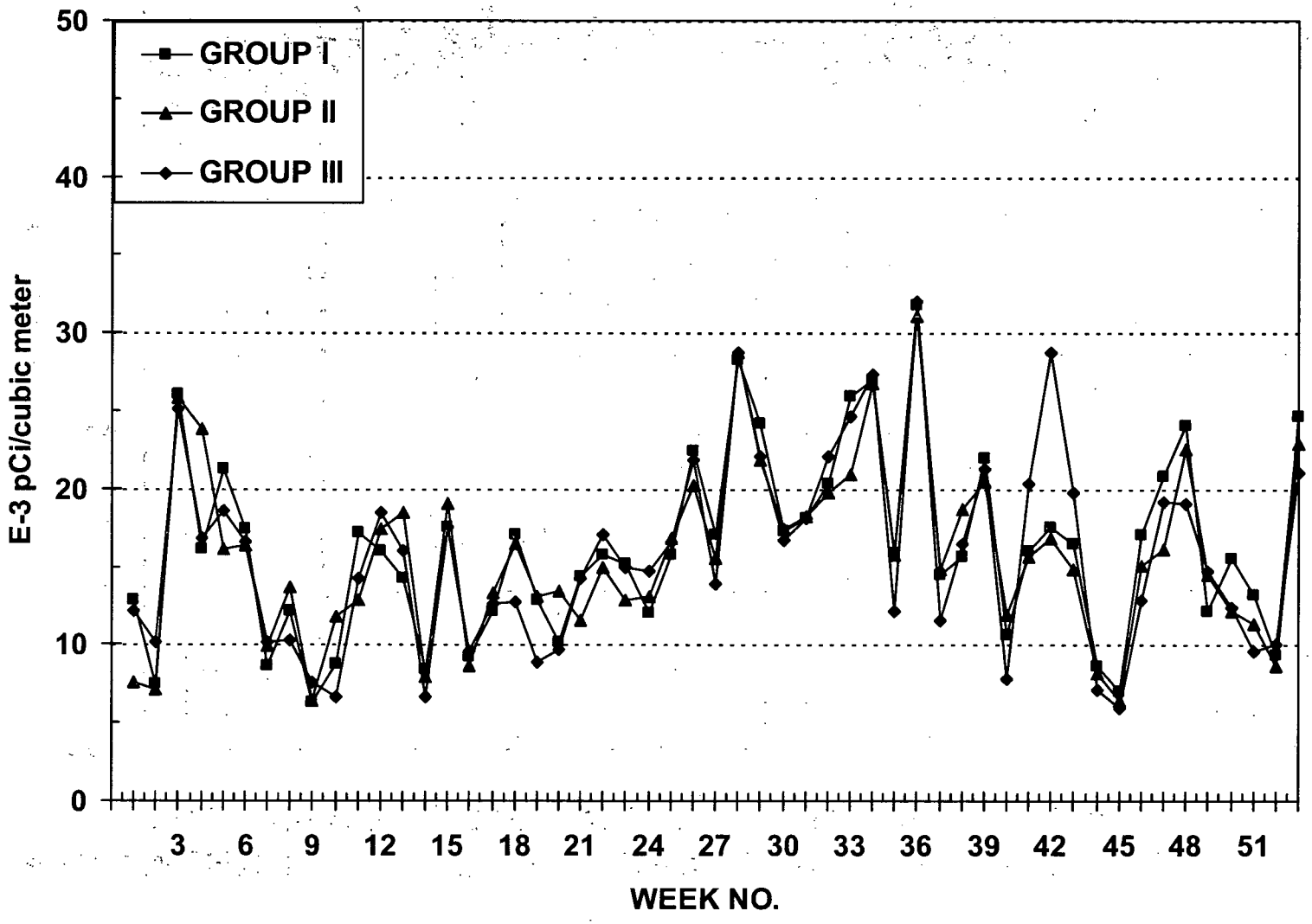
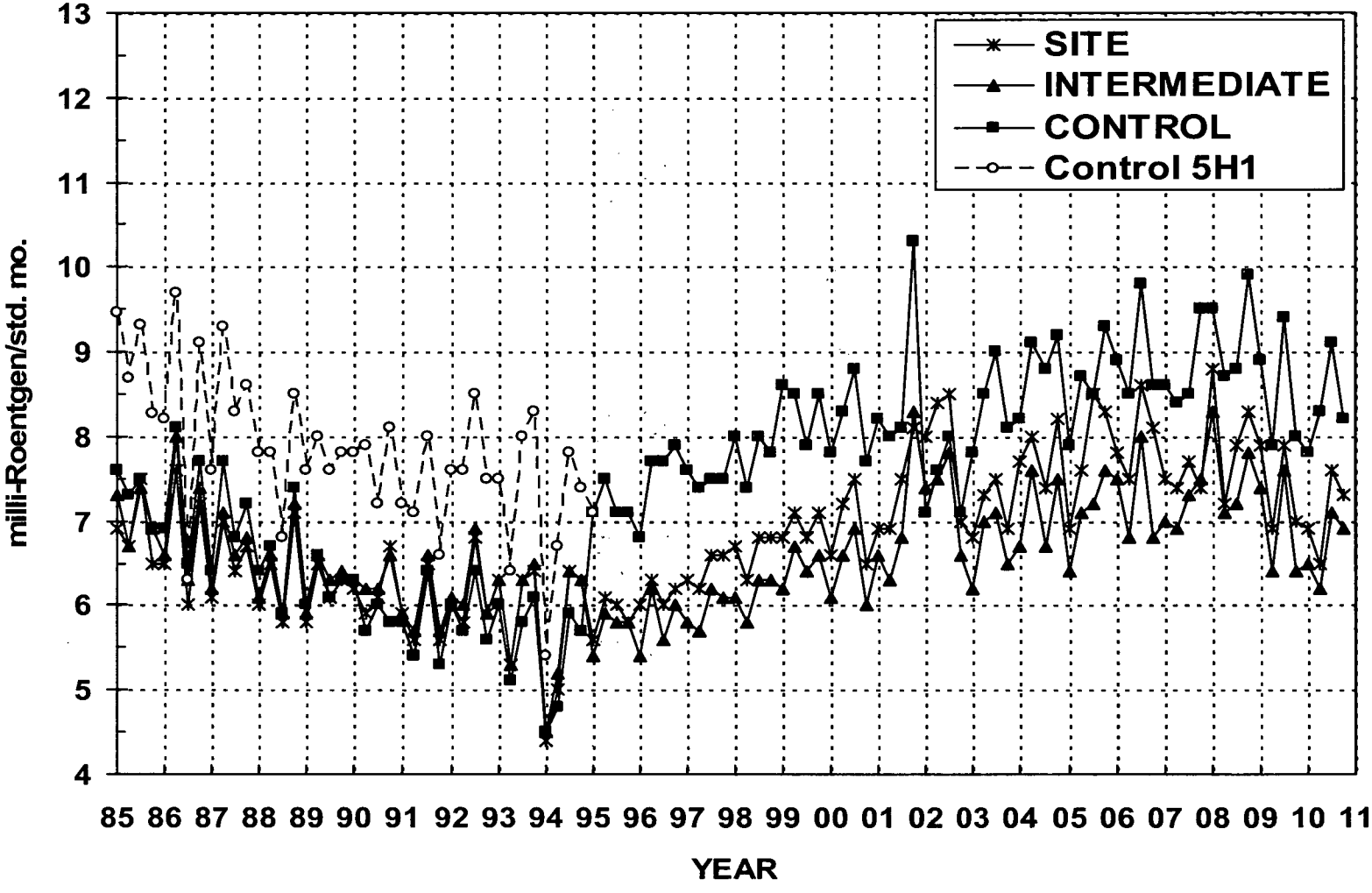


FIGURE C-6
MEAN QUARTERLY AMBIENT GAMMA RADIATION LEVELS (TLD) IN THE VICINITY OF LGS, 1985 – 2010



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

APPENDIX D

DATA TABLES AND FIGURES
COMPARISON LABORATORY

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

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TABLE D-I.1 CONCENTRATIONS OF TOTAL GROSS BETA IN DRINKING WATER SAMPLES COLLECTED IN THE VICINITY OF LIMERICK GENERATING STATION, 2010

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD			16C2
12/28/2009	-	02/01/2010	1.2 ± 0.6
02/01/2010	-	03/02/2010	2.9 ± 1.1
03/02/2010	-	03/30/2010	< 1.8
03/30/2010	-	04/27/2010	< 2.0
04/27/2010	-	06/01/2010	1.0 ± 0.6
06/01/2010	-	06/28/2010	2.5 ± 0.9
06/28/2010	-	08/03/2010	2.5 ± 1.1
08/03/2010	-	08/30/2010	2.5 ± 1.1
08/30/2010	-	09/28/2010	2.3 ± 1.1
09/28/2010	-	11/02/2010	2.3 ± 1.1
11/02/2010	-	11/29/2010	2.8 ± 0.9
11/29/2010	-	12/27/2010	2.3 ± 0.8
MEAN			2.2 ± 1.2

TABLE D-I.2 CONCENTRATIONS OF TRITIUM IN DRINKING WATER SAMPLES COLLECTED IN THE VICINITY OF LIMERICK GENERATING STATION, 2010

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD			16C2
12/28/2009	-	03/30/2010	< 138
03/30/2010	-	06/28/2010	< 168
06/28/2010	-	09/28/2010	< 154
09/28/2010	-	12/27/2010	< 144
MEAN			-

TABLE D-I.3 CONCENTRATIONS OF GAMMA EMITTERS IN DRINKING WATER SAMPLES COLLECTED IN THE VICINITY OF LIMERICK GENERATING STATION, 2010

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

STC	COLLECTION PERIOD	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Zr-95	Nb-95	I-131	Cs-134	Cs-137	Ba-140	La-140
16C2	12/28/2009 - 02/02/2010	< 3	< 3	< 6	< 2	< 5	< 4	< 3	< 5	< 3	< 3	< 17	< 2
	02/02/2010 - 03/02/2010	< 3	< 1	< 7	< 3	< 5	< 4	< 4	< 3	< 3	< 2	< 12	< 2
	03/02/2010 - 03/30/2010	< 3	< 3	< 5	< 3	< 4	< 3	< 2	< 3	< 2	< 3	< 11	< 2
	03/30/2010 - 04/27/2010	< 4	< 3	< 9	< 3	< 8	< 5	< 4	< 4	< 5	< 4	< 11	< 2
	04/27/2010 - 06/01/2010	< 2	< 2	< 6	< 3	< 5	< 7	< 4	< 7	< 4	< 3	< 19	< 4
	06/01/2010 - 06/28/2010	< 4	< 3	< 8	< 3	< 8	< 3	< 3	< 6	< 4	< 3	< 14	< 2
	06/28/2010 - 08/03/2010	< 4	< 2	< 7	< 3	< 4	< 7	< 4	< 8	< 4	< 3	< 16	< 3
	08/03/2010 - 08/30/2010	< 3	< 2	< 2	< 2	< 3	< 5	< 3	< 4	< 3	< 3	< 12	< 1
	08/30/2010 - 09/28/2010	< 3	< 2	< 7	< 3	< 7	< 4	< 4	< 4	< 4	< 3	< 14	< 2
	09/28/2010 - 11/02/2010	< 3	< 4	< 9	< 3	< 5	< 8	< 2	< 5	< 3	< 4	< 19	< 1
	11/02/2010 - 11/29/2010	< 5	< 4	< 5	< 4	< 6	< 8	< 3	< 4	< 5	< 3	< 14	< 3
	11/29/2010 - 12/27/2010	< 3	< 3	< 5	< 2	< 4	< 6	< 2	< 6	< 3	< 2	< 16	< 1
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-

TABLE D-II.1 CONCENTRATIONS OF GROSS BETA IN AIR PARTICULATE SAMPLES COLLECTED IN THE VICINITY OF LIMERICK GENERATING STATION, 2010

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

COLLECTION PERIOD	11S2
12/28/09 - 01/04/10	17 ± 4
01/04/10 - 01/11/10	17 ± 4
01/11/10 - 01/18/10	37 ± 5
01/18/10 - 01/26/10	18 ± 4
01/26/10 - 02/01/10	22 ± 4
02/01/10 - 02/08/10	24 ± 4
02/08/10 - 02/15/10	17 ± 4
02/15/10 - 02/22/10	12 ± 4
02/22/10 - 03/01/10	7 ± 3
03/01/10 - 03/08/10	22 ± 4
03/08/10 - 03/15/10	20 ± 4
03/15/10 - 03/22/10	27 ± 4
03/22/10 - 03/29/10	22 ± 4
03/29/10 - 04/05/10	13 ± 3
04/05/10 - 04/12/10	27 ± 4
04/12/10 - 04/19/10	19 ± 4
04/19/10 - 04/26/10	20 ± 4
04/26/10 - 05/03/10	19 ± 4
05/03/10 - 05/10/10	17 ± 4
05/10/10 - 05/17/10	15 ± 4
05/17/10 - 05/24/10	19 ± 4
05/24/10 - 06/01/10	16 ± 4
06/01/10 - 06/07/10	22 ± 4
06/07/10 - 06/14/10	17 ± 4
06/14/10 - 06/21/10	21 ± 4
06/21/10 - 06/28/10	28 ± 4
06/28/10 - 07/06/10	19 ± 3
07/06/10 - 07/12/10	31 ± 5
07/12/10 - 07/19/10	25 ± 4
07/19/10 - 07/26/10	29 ± 4
07/26/10 - 08/02/10	20 ± 4
08/02/10 - 08/09/10	23 ± 4
08/09/10 - 08/16/10	31 ± 4
08/16/10 - 08/23/10	25 ± 4
08/23/10 - 08/30/10	20 ± 4
08/30/10 - 09/06/10	29 ± 4
09/06/10 - 09/13/10	26 ± 4
09/13/10 - 09/20/10	25 ± 5
09/20/10 - 09/27/10	22 ± 4
09/27/10 - 10/04/10	12 ± 4
10/04/10 - 10/11/10	16 ± 4
10/11/10 - 10/18/10	25 ± 4
10/18/10 - 10/25/10	23 ± 4
10/25/10 - 11/01/10	12 ± 4
11/01/10 - 11/08/10	12 ± 3
11/08/10 - 11/15/10	24 ± 4
11/15/10 - 11/22/10	35 ± 4
11/22/10 - 11/29/10	30 ± 4
11/29/10 - 12/06/10	13 ± 4
12/06/10 - 12/13/10	17 ± 4
12/13/10 - 12/20/10	25 ± 4
12/20/10 - 12/27/10	15 ± 4
12/27/10 - 01/03/11	33 ± 4
MEAN	21 ± 13

TABLE D-II.2 CONCENTRATIONS OF GAMMA EMITTERS IN AIR PARTICULATE SAMPLES COLLECTED IN THE VICINITY OF LIMERICK GENERATING STATION, 2010

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

STC	COLLECTION PERIOD			Be-7	Mn-54	Co-58	Co-60	Cs-134	Cs-137
11S2	12/28/2009	-	03/29/2010	83 ± 13	< 0.5	< 0.6	< 0.3	< 0.7	< 0.5
	03/29/2010	-	06/28/2010	98 ± 16	< 0.8	< 1.0	< 0.8	< 0.8	< 1.2
	06/28/2010	-	09/27/2010	88 ± 16	< 0.9	< 1.0	< 0.4	< 0.8	< 0.5
	09/27/2010	-	01/03/2010	63 ± 13	< 0.8	< 0.9	< 0.4	< 0.9	< 0.6
	MEAN			83 ± 29	-	-	-	-	-

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, 2010

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

STC	COLLECTION PERIOD	I-131	K-40	Cs-134	Cs-137	Ba-140	La-140
19B1	01/12/10	< 0.3	1431 ± 109	< 3	< 4	< 26	< 5
	04/06/10	< 0.2	1385 ± 112	< 3	< 4	< 13	< 3
	07/13/10	< 0.3	1497 ± 118	< 3	< 2	< 16	< 3
	10/05/10	< 0.3	1513 ± 109	< 4	< 4	< 29	< 5
	MEAN	-	1457 ± 119	-	-	-	-
10F4	01/12/10	< 0.3	1389 ± 107	< 2	< 3	< 16	< 8
	04/06/10	< 0.2	1350 ± 100	< 3	< 3	< 19	< 6
	07/13/10	< 0.2	1426 ± 108	< 4	< 4	< 22	< 4
	10/05/10	< 0.3	1393 ± 101	< 5	< 4	< 39	< 6
	MEAN	-	1389 ± 62	-	-	-	-
25C1	01/12/10	< 0.2	1317 ± 109	< 4	< 4	< 16	< 2
	04/06/10	< 0.2	1380 ± 111	< 3	< 4	< 18	< 4
	07/13/10	< 0.3	1417 ± 109	< 4	< 3	< 17	< 3
	10/05/10	< 0.3	1380 ± 106	< 3	< 3	< 35	< 3
	MEAN	-	1374 ± 83	-	-	-	-

FIGURE D-1
COMPARISON OF MONTHLY TOTAL GROSS BETA CONCENTRATIONS IN DRINKING WATER SAMPLES SPLIT BETWEEN ENV AND TBE, 2010

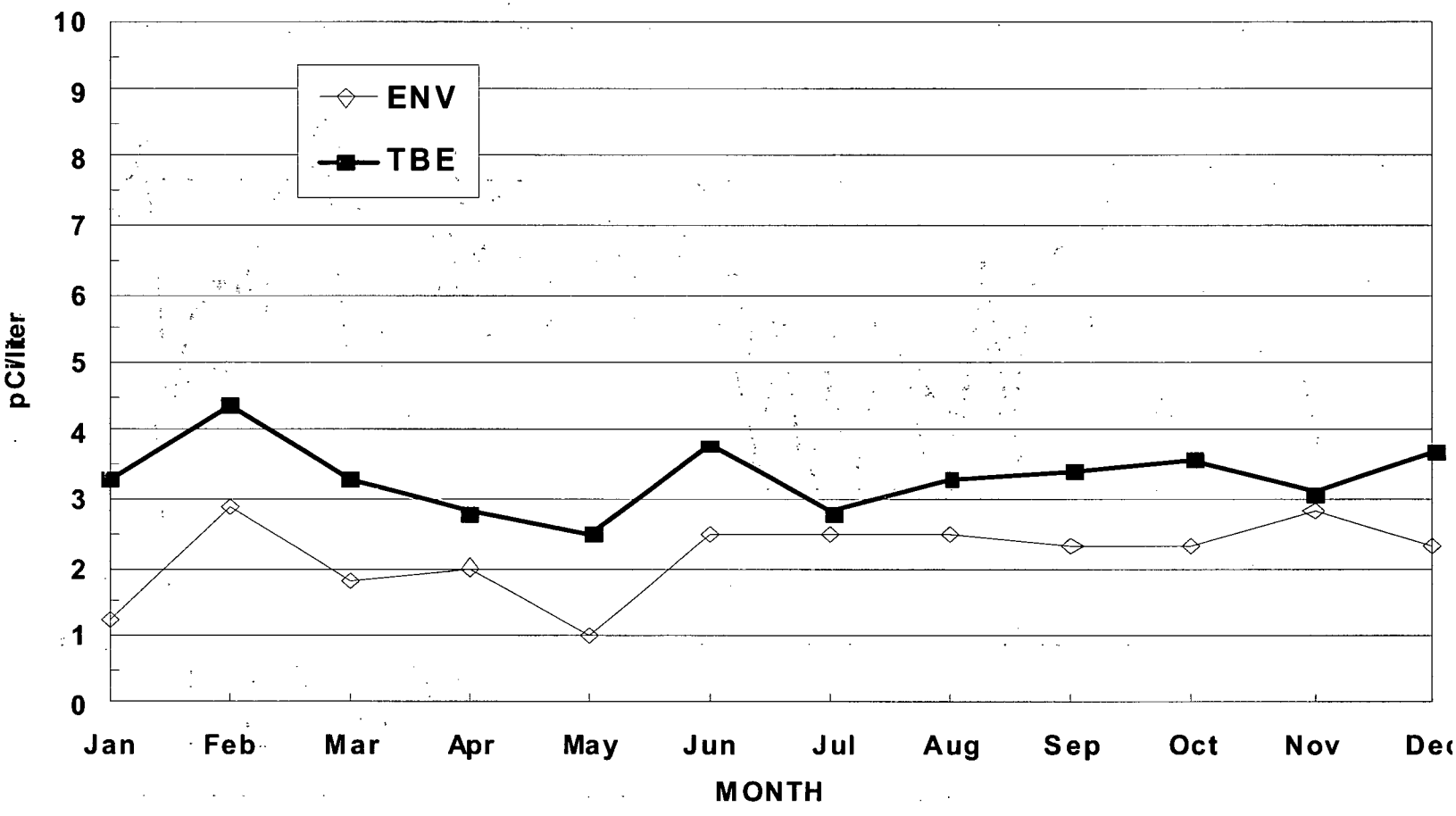
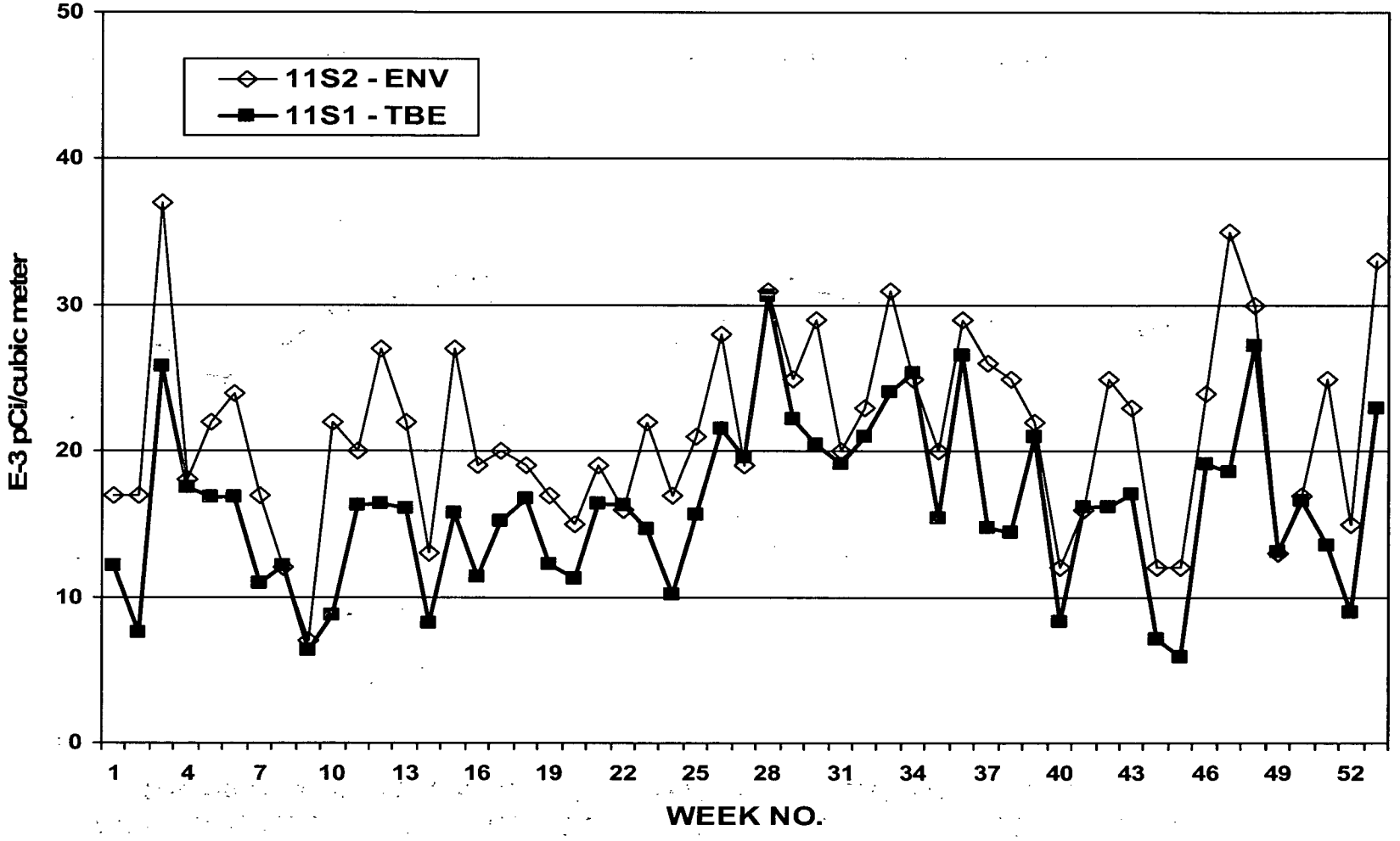


FIGURE D-2
COMPARISON OF WEEKLY GROSS BETA CONCENTRATIONS IN AIR PARTICULATE SAMPLES COLLECTED FROM LGS COLLOCATED LOCATIONS 11S1 AND 11S2, 2010



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APPENDIX E

INTER-LABORATORY COMPARISON PROGRAM

TABLE E-1 **ANALYTICS ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM**
TELEDYNE BROWN ENGINEERING, 2010
(PAGE 1 OF 2)

Month/Year	Identification Number	Matrix	Nuclide	Units	Reported Value (a)	Known Value (b)	Ratio (c) TBE/Analytics	Evaluation (d)
March 2010	E6978-396	Milk	Sr-89	pCi/L	89.3	92.8	0.96	A
			Sr-90	pCi/L	13.8	12.7	1.09	A
	E6979-396	Milk	I-131	pCi/L	65.2	74.0	0.88	A
			Ce-141	pCi/L	241	261	0.92	A
			Cr-51	pCi/L	388	361	1.07	A
			Cs-134	pCi/L	157	178	0.88	A
			Cs-137	pCi/L	150	158	0.95	A
			Co-58	pCi/L	143	143	1.00	A
			Mn-54	pCi/L	202	207	0.98	A
			Fe-59	pCi/L	146	137	1.07	A
			Zn-65	pCi/L	247	254	0.97	A
			Co-60	pCi/L	177	183	0.97	A
	E6981-396	AP	Ce-141	pCi	211	185	1.14	A
			Cr-51	pCi	304	255	1.19	A
			Cs-134	pCi	142	125	1.14	A
			Cs-137	pCi	131	111	1.18	A
			Co-58	pCi	119	101	1.18	A
			Mn-54	pCi	162	146	1.11	A
			Fe-59	pCi	110	97	1.14	A
			Zn-65	pCi	217	179	1.21	W
			Co-60	pCi	145	129	1.12	A
	E6980-396	Charcoal	I-131	pCi	80.2	85.6	0.94	A
June 2010	E7132-396	Milk	Sr-89	pCi/L	82.0	93.4	0.88	A
			Sr-90	pCi/L	15.8	16.7	0.95	A
	E7133-396	Milk	I-131	pCi/L	83.5	96.9	0.86	A
			Ce-141	pCi/L	107	110	0.97	A
			Cr-51	pCi/L	325	339	0.96	A
			Cs-134	pCi/L	114	126	0.90	A
			Cs-137	pCi/L	144	150	0.96	A
			Co-58	pCi/L	92.3	101	0.91	A
			Mn-54	pCi/L	165	169	0.98	A
			Fe-59	pCi/L	121	119	1.02	A
			Zn-65	pCi/L	197	206	0.96	A
			Co-60	pCi/L	190	197	0.96	A
	E7135-396	AP	Ce-141	pCi	88.4	91.6	0.97	A
			Cr-51	pCi	292	282	1.04	A
			Cs-134	pCi	101	105	0.96	A
			Cs-137	pCi	132	125	1.06	A
			Co-58	pCi	87.3	84.0	1.04	A
			Mn-54	pCi	150	140	1.07	A
			Fe-59	pCi	105	98.6	1.06	A
			Zn-65	pCi	168	171	0.98	A
			Co-60	pCi	170	163	1.04	A
	E7134-396	Charcoal	I-131	pCi	76.4	79.9	0.96	A
September 2010	E7229-396	Milk	Sr-89	pCi/L	85.0	92.8	0.92	A
			Sr-90	pCi/L	12.6	14.7	0.86	A

TABLE E-1 ANALYTICS ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM
TELEDYNE BROWN ENGINEERING, 2010
(PAGE 2 OF 2)

Month/Year	Identification Number	Matrix	Nuclide	Units	Reported Value (a)	Known Value (b)	Ratio (c) TBE/Analytics	Evaluation (d)
September 2010	E7230-396	Milk	I-131	pCi/L	80.2	94.1	0.85	A
			Ce-141	pCi/L	130	130	1.00	A
			Cr-51	pCi/L	235	234	1.00	A
			Cs-134	pCi/L	83.2	93.0	0.89	A
			Cs-137	pCi/L	95.1	94.5	1.01	A
			Co-58	pCi/L	77.3	73.7	1.05	A
			Mn-54	pCi/L	121	119	1.02	A
			Fe-59	pCi/L	96.4	91.1	1.06	A
			Zn-65	pCi/L	216	204	1.06	A
			Co-60	pCi/L	172	171	1.01	A
	E7232-396	AP	Ce-141	pCi	122	119	1.03	A
			Cr-51	pCi	228	214	1.07	A
			Cs-134	pCi	79.9	85.3	0.94	A
			Cs-137	pCi	93.8	86.7	1.08	A
			Co-58	pCi	71.5	67.6	1.06	A
			Mn-54	pCi	113	110	1.03	A
			Fe-59	pCi	73.8	83.6	0.88	A
			Zn-65	pCi	186	187	0.99	A
			Co-60	pCi	163	157	1.04	A
	E7231-396	Charcoal	I-131	pCi/L	62.3	59.9	1.04	A
December 2010	E7375-396	Milk	Sr-89	pCi/L	92.7	98.0	0.95	A
			Sr-90	pCi/L	13.5	13.5	1.00	A
	E7376-396	Milk	I-131	pCi/L	87.9	96.9	0.91	A
			Ce-141	pCi/L	not provided by Analytics for this study			
			Cr-51	pCi/L	389	456	0.85	A
			Cs-134	pCi/L	137	157	0.87	A
			Cs-137	pCi/L	172	186	0.92	A
			Co-58	pCi/L	84.3	90.2	0.93	A
			Mn-54	pCi/L	120	120	1.00	A
			Fe-59	pCi/L	134	131	1.02	A
			Zn-65	pCi/L	162	174	0.93	A
			Co-60	pCi/L	284	301	0.94	A
	E7378-396	AP	Ce-141	pCi	not provided by Analytics for this study			
			Cr-51	pCi	387	365	1.06	A
			Cs-134	pCi	135	126	1.07	A
			Cs-137	pCi	157	149	1.05	A
			Co-58	pCi	73.6	72.3	1.02	A
			Mn-54	pCi	88.7	96	0.92	A
			Fe-59	pCi	127	105	1.21	W
			Zn-65	pCi	151	139	1.09	A
			Co-60	pCi	249	241	1.03	A
December 2010	E7377-396	Charcoal	I-131	pCi	79.6	84.2	0.95	A

(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, 2010
(PAGE 1 OF 1)

Month/Year	Identification Number	Media	Nuclide	Units	Reported Value (a)	Known Value (b)	Control Limits	Evaluation (c)
May 2010	RAD-81	Water	Sr-89	pCi/L	64.4	60.4	48.6 - 68.2	A
			Sr-90	pCi/L	37.8	41.3	30.4 - 47.4	A
			Ba-133	pCi/L	66.4	65.9	54.9 - 72.5	A
			Cs-134	pCi/L	66.43	71.6	58.4 - 78.8	A
			Cs-137	pCi/L	137.33	146	131 - 163	A
			Co-60	pCi/L	83.33	84.5	76.0 - 95.3	A
			Zn-65	pCi/L	177	186	167 - 219	A
			Gr-A	pCi/L	26.37	32.9	16.9 - 42.6	A
			Gr-B	pCi/L	28.77	37.5	24.7 - 45.0	A
			I-131	pCi/L	26.27	26.4	21.9 - 31.1	A
			H-3	pCi/L	12967	12400	10800 - 13600	A
November 2010	RAD-83	Water	Sr-89	pCi/L	77.8	68.5	55.8 - 76.7	Note 1
			Sr-90	pCi/L	39.3	43.0	31.7 - 49.3	A
			Ba-133	pCi/L	70.3	68.9	57.5 - 75.8	A
			Cs-134	pCi/L	39.9	43.2	34.5 - 47.5	A
			Cs-137	pCi/L	117	123	111 - 138	A
			Co-60	pCi/L	53.5	53.4	48.1 - 61.3	A
			Zn-65	pCi/L	11.0	102	91.8 - 122	Note 2
			Gr-A	pCi/L	35.1	42.3	21.9 - 53.7	A
			Gr-B	pCi/L	35.5	36.6	24.0 - 44.2	A
			I-131	pCi/L	27.9	27.5	22.9 - 32.3	A
			H-3	pCi/L	13233	12900	11200 - 14200	A

(1) Sr-89 TBE to known ratio of 1.14 fell within acceptable range of ± 20%. No action required. NCR 10-09

(2) Zn-65 result of 111 was incorrectly reported as 11.0. No action required. NCR 10-09

(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, 2010
(PAGE 1 OF 2)

Month/Year	Identification Number	Media	Nuclide	Units	Reported Value (a)	Known Value (b)	Acceptance Range	Evaluation (c)
March 2010	10-MaW22	Water	Cs-134	Bq/L	-0.0942		(1)	A
			Cs-137	Bq/L	58.5	60.6	42.4 - 78.8	A
			Co-57	Bq/L	27.2	28.3	19.8 - 36.8	A
			Co-60	Bq/L	0.0226		(1)	A
			H-3	Bq/L	104	90.8	63.6 - 118.0	A
			Mn-54	Bq/L	26.6	26.9	18.8 - 35.0	A
			Sr-90	Bq/L	0.1029		(1)	A
			Zn-65	Bq/L	42.0	40.7	28.5 - 52.9	A
	10-GrW22	Water	Gr-A	Bq/L	0.5173	0.676	0.00 - 1.352	A
			Gr-B	Bq/L	3.98	3.09	1.55 - 4.64	A
	10-MaS22	Soil	Cs-134	Bq/kg	665	733	513 - 953	A
			Cs-137	Bq/kg	800	779	545 - 1013	A
			Co-57	Bq/kg	508	522	365 - 679	A
			Co-60	Bq/kg	648	622	435 - 809	A
			Mn-54	Bq/kg	893	849	594 - 1104	A
			K-40	Bq/kg	597	559	391 - 727	A
			Sr-90	Bq/kg	221	288	202 - 374	W
			Zn-65	Bq/kg	-4.97		(1)	A
	10-RdF22	AP	Cs-134	Bq/sample	1.81	2.13	1.49 - 2.77	A
			Cs-137	Bq/sample	1.70	1.53	1.07 - 1.99	A
			Co-57	Bq/sample	0.0056		(1)	A
			Co-60	Bq/sample	2.65	2.473	1.731 - 3.215	A
			Mn-54	Bq/sample	3.70	3.02	2.11 - 3.93	W
			Sr-90	Bq/sample	0.0523		(1)	A
			Zn-65	Bq/sample	-0.0627		(1)	A
	10-GrF22	AP	Gr-A	Bq/sample	0.1533	0.0427	0.00 - 0.854	A
			Gr-B	Bq/sample	1.240	1.29	0.65 - 1.94	A
	10-RdV22	Vegetation	Cs-134	Bq/sample	4.48	4.39	3.07 - 5.71	A
			Cs-137	Bq/sample	3.43	3.06	2.14 - 3.98	A
			Co-57	Bq/sample	-0.0117		(1)	A
			Co-60	Bq/sample	3.55	3.27	2.29 - 4.25	A
			Mn-54	Bq/sample	0.007		(1)	A
			Sr-90	Bq/sample	-0.0002		(1)	A
			Zn-65	Bq/sample	8.12	7.10	4.97 - 9.23	A
September 2010	10-MaW23	Water	Cs-134	Bq/L	27.1	31.4	22.0 - 40.8	A
			Cs-137	Bq/L	41.8	44.2	30.9 - 57.5	A
			Co-57	Bq/L	33.2	36.0	25.2 - 46.8	A
			Co-60	Bq/L	26.5	28.3	19.8 - 36.8	A
			H-3	Bq/L	500	453.4	317.4 - 589.4	A
			Mn-54	Bq/L	0.024		(1)	A
			Sr-90	Bq/L	8.10	8.3	5.8 - 10.8	A
			Zn-65	Bq/L	30.8	31.0	21.7 - 40.3	A
	10-GrW23	Water	Gr-A	Bq/L	2.36	1.92	0.58 - 3.26	A
			Gr-B	Bq/L	6.37	4.39	2.20 - 6.59	A

TABLE E-3 **DOE'S MIXED ANALYTE PERFORMANCE EVALUATION PROGRAM (MAPEP)**
TELEDYNE BROWN ENGINEERING, 2010
(PAGE 2 OF 2)

Month/Year	Identification Number	Media	Nuclide	Units	Reported Value (a)	Known Value (b)	Acceptance Range	Evaluation (c)
September 2010	10-MaS23	Soil	Cs-134	Bq/kg	837	940	658 - 1222	A
			Cs-137	Bq/kg	680	670	469 - 871	A
			Co-57	Bq/kg	2.78		(1)	A
			Co-60	Bq/kg	350	343	240 - 446	A
			Mn-54	Bq/kg	853	820	574 - 1066	A
			K-40	Bq/kg	721	699	489 - 909	A
			Sr-90	Bq/kg	2.24		(1)	A
			Zn-65	Bq/kg	287	265	186 - 345	A
	10-RdF23	AP	Cs-134	Bq/sample	2.31	2.98	2.09 - 3.87	W
			Cs-137	Bq/sample	-0.025		(1)	A
			Co-57	Bq/sample	3.64	4.08	2.86 - 5.38	A
			Co-60	Bq/sample	2.81	2.92	2.04 - 3.80	A
			Mn-54	Bq/sample	3.19	3.18	2.23- 4.13	A
			Sr-90	Bq/sample	1.01	1.01	0.71 - 1.31	A
			Zn-65	Bq/sample	0.0310		(1)	A
	10-GrF23	AP	Gr-A	Bq/sample	0.004		(1)	A
			Gr-B	Bq/sample	0.473	0.50	0.25 - 0.75	A
	10-RdV23	Vegetation	Cs-134	Bq/sample	4.90	4.79	3.35 - 6.23	A
			Cs-137	Bq/sample	6.78	5.88	4.12 - 7.64	A
			Co-57	Bq/sample	10.2	8.27	5.79 - 10.75	W
			Co-60	Bq/sample	0.00		(1)	A
			Mn-54	Bq/sample	7.36	6.287	4.401 - 8.173	A
			Sr-90	Bq/sample	2.53	2.63	1.84 - 3.42	A
			Zn-65	Bq/sample	6.40	5.3900	3.77 - 7.01	A

(1) False positive test.

(a) Teledyne Brown Engineering reported result.

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

(c) DOE/MAPEP evaluation: A=acceptable, W=acceptable with warning, N=not acceptable.

TABLE E-4 **ERA STATISTICAL SUMMARY PROFICIENCY TESTING PROGRAM[a]**
ENVIRONMENTAL, INC., 2010

Lab Code	Date	Analysis	Concentration (pCi/L) Laboratory Result[b]	ERA Result[c]	Control Limits	Acceptance
STW-1205	04/05/10	Sr-89	63.0 ± 5.7	60.4	48.6 - 68.2	Pass
STW-1205	04/05/10	Sr-90	37.4 ± 2.4	41.3	30.4 - 47.4	Pass
STW-1206	04/05/10	Ba-133	63.6 ± 3.3	65.9	54.9 - 72.5	Pass
STW-1206	04/05/10	Co-60	83.3 ± 2.9	84.5	76.0 - 95.3	Pass
STW-1206	04/05/10	Cs-134	71.0 ± 3.4	71.6	58.4 - 78.8	Pass
STW-1206	04/05/10	Cs-137	145.5 ± 5.1	146.0	131.0 - 163.0	Pass
STW-1206	04/05/10	Zn-65	194.9 ± 7.8	186.0	167.0 - 219.0	Pass
STW-1207	04/05/10	Gr. Alpha	26.5 ± 1.7	32.9	16.9 - 42.6	Pass
STW-1207	04/05/10	Gr. Beta	34.5 ± 1.6	37.5	24.7 - 45.0	Pass
STW-1208	04/05/10	I-131	22.7 ± 0.8	26.4	21.9 - 31.1	Pass
STW-1209	04/05/10	Ra-226	15.2 ± 0.7	14.6	10.9 - 16.8	Pass
STW-1209	04/05/10	Ra-228	15.6 ± 1.8	15.1	10.1 - 18.3	Pass
STW-1209	04/05/10	Uranium	59.5 ± 0.7	62.3	50.7 - 69.1	Pass
STW-1210	04/05/10	H-3	12955 ± 332	12400.0	10800 - 13600	Pass
STW-1224	10/04/10	Sr-89	65.3 ± 5.7	68.5	55.8 - 76.7	Pass
STW-1224	10/04/10	Sr-90	39.9 ± 2.3	43.0	31.7 - 49.3	Pass
STW-1225	10/04/10	Ba-133	67.2 ± 4.3	68.9	57.5 - 75.8	Pass
STW-1225	10/04/10	Co-60	53.2 ± 3.3	53.4	48.1 - 61.3	Pass
STW-1225	10/04/10	Cs-134	47.3 ± 5.1	43.2	34.5 - 47.5	Pass
STW-1225	10/04/10	Cs-137	118.0 ± 5.9	123.0	111.0 - 138.0	Pass
STW-1225	10/04/10	Zn-65	107.0 ± 8.7	102.0	91.8 - 122.0	Pass
STW-1226	10/04/10	Gr. Alpha	30.7 ± 2.9	42.3	21.9 - 53.7	Pass
STW-1226	10/04/10	Gr. Beta	32.7 ± 0.8	36.6	24.0 - 44.2	Pass
STW-1227	10/04/10	I-131	28.6 ± 1.1	27.5	22.9 - 32.3	Pass
STW-1228	10/04/10	Ra-226	11.8 ± 0.6	11.4	8.5 - 13.2	Pass
STW-1228	10/04/10	Ra-228	12.0 ± 1.8	9.9	6.4 - 12.3	Pass
STW-1228	10/04/10	Uranium	34.8 ± 0.4	36.8	29.8 - 41.0	Pass
STW-1229	10/04/10	H-3	13682 ± 352	12900.0	11200 - 14200	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.

TABLE E-5 DOE'S MIXED ANALYTE PERFORMANCE EVALUATION PROGRAM (MAPEP)[a]
ENVIRONMENTAL, INC., 2010
(Page 1 of 3)

			Concentration [b]			
Lab Code [c]	Date	Analysis	Laboratory Result	Known Activity	Control Limits [d]	Acceptance
STVE-1199	03/01/10	Co-57	0.01 ± 0.03	0.00	-	Pass
STVE-1199	03/01/10	Co-60	3.39 ± 0.12	3.27	2.29 - 4.25	Pass
STVE-1199	03/01/10	Cs-134	4.74 ± 0.15	4.39	3.07 - 5.71	Pass
STVE-1199	03/01/10	Cs-137	3.32 ± 0.17	3.06	2.14 - 3.98	Pass
STVE-1199	03/01/10	Mn-54	0.01 ± 0.05	0.00	-	Pass
STVE-1199	03/01/10	Zn-65	8.03 ± 0.33	7.10	4.97 - 9.23	Pass
STW-1200	03/01/10	Gr. Alpha	0.40 ± 0.05	0.68	0.00 - 1.35	Pass
STW-1200	03/01/10	Gr. Beta	3.03 ± 0.07	3.09	1.55 - 4.64	Pass
STW-1201	03/01/10	Am-241	1.05 ± 0.08	1.30	0.91 - 1.69	Pass
STW-1201	03/01/10	Co-57	28.90 ± 0.40	28.30	19.80 - 36.80	Pass
STW-1201	03/01/10	Co-60	0.06 ± 0.05	0.00	-	Pass
STW-1201	03/01/10	Cs-134	-0.03 ± 0.09	0.00	-	Pass
STW-1201	03/01/10	Cs-137	60.60 ± 0.60	60.60	42.40 - 78.80	Pass
STW-1201	03/01/10	Fe-55	3.00 ± 14.40	0.00	-	Pass
STW-1201	03/01/10	H-3	93.20 ± 18.30	90.80	63.60 - 118.00	Pass
STW-1201	03/01/10	Mn-54	27.80 ± 0.40	26.90	18.80 - 35.00	Pass
STW-1201	03/01/10	Ni-63	49.10 ± 3.50	59.90	41.90 - 77.90	Pass
STW-1201	03/01/10	Sr-90	-0.10 ± 0.60	0.00	-	Pass
STW-1201	03/01/10	Tc-99	0.50 ± 0.50	0.00	-	Pass
STW-1201	03/01/10	U-233/4	1.21 ± 0.05	1.22	0.85 - 1.59	Pass
STW-1201	03/01/10	U-238	1.20 ± 0.05	1.25	0.88 - 1.63	Pass
STW-1201	03/01/10	Zn-65	42.70 ± 0.80	40.70	28.50 - 52.90	Pass
STSO-1202	03/01/10	Co-57	520.00 ± 10.80	522.00	365.00 - 679.00	Pass
STSO-1202	03/01/10	Co-60	599.10 ± 2.80	622.00	435.00 - 809.00	Pass
STSO-1202	03/01/10	Cs-134	666.10 ± 4.70	733.00	513.00 - 953.00	Pass
STSO-1202	03/01/10	Cs-137	774.40 ± 4.50	779.00	545.00 - 1013.00	Pass
STSO-1202	03/01/10	K-40	562.00 ± 15.30	559.00	391.00 - 727.00	Pass
STSO-1202	03/01/10	Mn-54	866.20 ± 4.60	849.00	594.00 - 1104.00	Pass
STSO-1202	03/01/10	Sr-90	225.50 ± 11.80	288.00	202.00 - 374.00	Pass
STSO-1202	03/01/10	U-233/4	59.90 ± 2.50	60.00	42.00 - 78.00	Pass
STSO-1202	03/01/10	U-238	62.10 ± 2.60	64.00	45.00 - 83.00	Pass
STSO-1202	03/01/10	Zn-65	-1.23 ± 1.96	0.00	-	Pass
STAP-1203	03/01/10	Am-241	0.10 ± 0.01	0.15	0.10 - 0.19	Pass
STAP-1203	03/01/10	Co-57	0.01 ± 0.02	0.00	-	Pass
STAP-1203	03/01/10	Co-60	2.63 ± 0.19	2.47	1.73 - 3.22	Pass
STAP-1203	03/01/10	Cs-134	2.21 ± 0.34	2.13	1.49 - 2.77	Pass
STAP-1203	03/01/10	Cs-137	1.66 ± 0.22	1.53	1.07 - 1.99	Pass
STAP-1203	03/01/10	Mn-54	3.42 ± 0.26	3.02	2.11 - 3.93	Pass
STAP-1203	03/01/10	Sr-90	0.02 ± 0.06	0.00	-	Pass
STAP-1203	03/01/10	Zn-65	-0.05 ± 0.11	0.00	-	Pass

TABLE E-5 DOE'S MIXED ANALYTE PERFORMANCE EVALUATION PROGRAM (MAPEP)[a]
ENVIRONMENTAL, INC., 2010
(Page 2 of 3)

			Concentration [b]			
Lab Code [c]	Date	Analysis	Laboratory Result	Known Activity	Control Limits [d]	Acceptance
STAP-1204	03/01/10	Gr. Alpha	0.13 ± 0.03	0.43	0.00 - 0.85	Pass
STAP-1204	03/01/10	Gr. Beta	1.46 ± 0.07	1.29	0.65 - 1.94	Pass
STW-1211	08/01/10	Am-241	0.02 ± 0.02	0.00	-	Pass
STW-1211	08/01/10	Co-57	36.40 ± 4.80	36.00	25.20 - 46.80	Pass
STW-1211	08/01/10	Co-60	28.30 ± 1.00	28.30	19.80 - 36.80	Pass
STW-1211	08/01/10	Cs-134	29.30 ± 2.10	31.40	22.00 - 40.80	Pass
STW-1211	08/01/10	Cs-137	44.60 ± 1.80	44.20	30.90 - 57.50	Pass
STW-1211	08/01/10	Fe-55	48.50 ± 20.10	60.20	42.10 - 78.30	Pass
STW-1211	08/01/10	H-3	503.60 ± 12.80	453.40	317.40 - 589.40	Pass
STW-1211	08/01/10	K-40	38.50 ± 2.50	38.90	27.20 - 50.60	Pass
STW-1211	08/01/10	Mn-54	0.10 ± 0.30	0.00	-	Pass
STW-1211	08/01/10	Ni-63	49.30 ± 3.10	56.10	39.30 - 72.90	Pass
STW-1211	08/01/10	Pu-238	1.49 ± 0.15	1.81	1.27 - 2.35	Pass
STW-1211	08/01/10	Pu-239/40	1.20 ± 0.10	1.35	0.95 - 1.76	Pass
STW-1211	08/01/10	Sr-90	9.20 ± 1.30	8.30	5.80 - 10.80	Pass
STW-1211	08/01/10	Tc-99	28.10 ± 0.90	33.60	23.50 - 43.70	Pass
STW-1211	08/01/10	U-233/4	2.04 ± 0.14	2.01	1.41 - 2.61	Pass
STW-1211	08/01/10	U-238	2.05 ± 0.14	2.07	1.45 - 2.69	Pass
STW-1211	08/01/10	Zn-65	32.80 ± 3.00	31.00	21.70 - 40.30	Pass
STW-1212	08/01/10	Gr. Alpha	1.54 ± 0.09	1.92	0.58 - 3.26	Pass
STW-1212	08/01/10	Gr. Beta	4.13 ± 0.15	4.39	2.20 - 6.59	Pass
STVE-1213	08/01/10	Co-57	9.60 ± 0.54	8.27	5.79 - 10.75	Pass
STVE-1213	08/01/10	Co-60	0.05 ± 0.08	0.00	-	Pass
STVE-1213	08/01/10	Cs-134	4.83 ± 0.26	4.79	3.35 - 6.23	Pass
STVE-1213	08/01/10	Cs-137	6.45 ± 0.66	5.88	4.12 - 7.64	Pass
STVE-1213	08/01/10	Mn-54	7.12 ± 0.66	6.29	4.40 - 8.17	Pass
STVE-1213	08/01/10	Zn-65	6.05 ± 0.74	5.39	3.77 - 7.01	Pass
STSO-1214	08/01/10	Co-57	0.10 ± 1.60	0.00	-	Pass
STSO-1214	08/01/10	Co-60	370.00 ± 6.00	343.00	240.00 - 446.00	Pass
STSO-1214	08/01/10	Cs-134	1005.00 ± 21.00	940.00	658.00 - 1222.00	Pass
STSO-1214	08/01/10	Cs-137	755.00 ± 15.00	670.00	469.00 - 871.00	Pass
STSO-1214	08/01/10	K-40	783.00 ± 54.00	699.00	489.00 - 909.00	Pass
STSO-1214	08/01/10	Mn-54	942.00 ± 15.00	820.00	574.00 - 1066.00	Pass
STSO-1214	08/01/10	Pu-238	69.20 ± 6.20	64.00	45.00 - 83.00	Pass
STSO-1214	08/01/10	Pu-239/40	76.50 ± 6.20	71.00	50.00 - 92.00	Pass
STSO-1214	08/01/10	Sr-90	3.50 ± 8.00	0.00	-	Pass
STSO-1214	08/01/10	U-233/4	76.50 ± 6.20	71.00	50.00 - 92.00	Pass
STSO-1214	08/01/10	U-238	271.40 ± 9.00	289.00	202.00 - 376.00	Pass
STSO-1214	08/01/10	Zn-65	310.00 ± 18.00	265.00	186.00 - 345.00	Pass

TABLE E-5 DOE'S MIXED ANALYTE PERFORMANCE EVALUATION PROGRAM (MAPEP)[a] ENVIRONMENTAL, INC., 2010

			Concentration [b]			
Lab Code [c]	Date	Analysis	Laboratory Result	Known Activity	Control Limits [d]	Acceptance
STAP-1215	08/01/10	Co-57	4.47 ± 0.21	4.08	2.86 - 5.30	Pass
STAP-1215	08/01/10	Co-60	3.15 ± 0.30	2.92	2.04 - 3.80	Pass
STAP-1215	08/01/10	Cs-134	3.03 ± 0.17	2.98	2.09 - 3.87	Pass
STAP-1215	08/01/10	Cs-137	0.01 ± 0.05	0.00	-	Pass
STAP-1215	08/01/10	Mn-54	3.69 ± 0.39	3.18	2.23 - 4.13	Pass
STAP-1215	08/01/10	Sr-90	1.00 ± 0.12	1.01	0.71 - 1.31	Pass
STAP-1215	08/01/10	Zn-65	0.03 ± 0.15	0.00	-	Pass
STAP-1216	08/01/10	Gr. Alpha	0.01 ± 0.01	0.00	-	Pass
STAP-1216	08/01/10	Gr. Beta	0.54 ± 0.05	0.50	0.25 - 0.75	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.*

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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 2010

Prepared By

Teledyne Brown Engineering
Environmental Services

Exelon SM
Nuclear

Limerick Generating Station
Sanatoga, PA 19464

April 2011

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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 2010 through 31 December 2010. During that time period, 481 analyses were performed on 76 samples from 15 groundwater and 7 surface water locations collected from the environment, both on and off station property in 2010.

There were no spills that could affect the ground water monitoring program in 2010.

Tritium was not detected in any of the groundwater or surface water samples at concentrations greater than the United States Environmental Protection Agency (USEPA) drinking water standard (and the Nuclear Regulatory Commission Reporting Limit) of 20,000 pCi/L. Low levels of tritium were detected at two of the 15 groundwater monitoring locations. The tritium concentrations ranged from 238 to 1,320 pCi/L.

Strontium-90 was not detected in either the groundwater or surface water samples.

Gross Alpha and Gross Beta analyses in the dissolved and suspended fractions performed on groundwater surface water samples during the second sampling in 2010. Gross Alpha (dissolved) was detected at 5 of 15 groundwater locations. The concentrations ranged from 2.9 to 6.2 pCi/L. Gross Alpha (suspended) was detected at 8 of 15 groundwater and 2 of 7 surface water locations. The concentrations ranged from 1.1 to 60.0 pCi/L. Gross Beta (dissolved) was detected at 14 of 15 groundwater and all 7 surface water locations. The concentrations ranged from 2.1 to 38.5 pCi/L. Gross Beta (suspended) was detected at 11 of 15 groundwater and 5 of 7 locations. The concentrations ranged from 1.7 to 124.0 pCi/L.

Gamma-emitting radionuclides associated with licensed plant operations were not detected in either groundwater or surface water samples.

Hard-To-Detect analyses were performed on a select group of groundwater locations to establish background levels. The analyses included Fe-55, Ni-63, Am-241, Cm-242, Cm-243/244, Pu-238, Pu-239/240, U-233/234, U-235 and U-238. The isotopes of U-233/234, and U-238 were detected at four of six groundwater monitoring locations. The U-233/234 concentrations ranged from 1.4 to 2.7 pCi/L and the U-238 concentrations ranged from 0.8 to 1.2 pCi/L. The levels detected are considered background.

All other hard-to-detect nuclides were not detected at concentrations greater than their respective MDCs.

Although no drinking water pathway is available from groundwater, the dose via the drinking water pathway was calculated at 0.08 mrem to a child (total body), which was 1.30% 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 3458 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.

This report covers those analyses performed by Teledyne Brown Engineering (TBE) on samples collected in 2010.

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 2010. Sample locations can be found in Table A–1, Appendix A.

1. Sample Collection

Groundwater and Surface Water

Samples of both groundwater and surface 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 were 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. Like normal water, tritiated 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 (^{3}He). 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 2010.

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

1. Concentrations of tritium in groundwater and surface water.
2. Concentrations of Gross Alpha, Dissolved and Suspended and Gross Beta, Dissolved and Suspended in groundwater and surface water.
3. Concentrations of gamma emitters in groundwater and surface water.
4. Concentrations of strontium in groundwater and surface water.
5. Concentrations of Am-241 in groundwater.
6. Concentrations of Cm-242 and Cm-243/244 in groundwater.
7. Concentrations of Pu-238 and PU-239/240 in groundwater.
8. Concentrations of U-233/234, U-235 and U-238 in groundwater.
9. Concentrations of Fe-55 in groundwater.
10. Concentrations of Ni-63 in groundwater.

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. 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 criterion for the presence of activity. All analyses were 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 is 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. Midwest, 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. Clearly, these sample results cannot be distinguished as different from background at this concentration.

IV. Results and Discussion

Gamma spectroscopy results for groundwater and surface water sample were reported for twelve nuclides (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 fifteen locations were analyzed for tritium activity (Table B–I.1, Appendix B). Tritium values ranged from non detectable to 1,320 pCi/L. Well MW-LR-9 had the highest value of 1,320 pCi/L. Although no drinking water pathway is available from groundwater, the theoretical dose via the drinking water pathway was calculated at 0.08 mrem to a child (total body), which represents 1.30% of the 10 CFR 50, Appendix I dose limit of 6 mrem.

Strontium

No Sr-90 activity was detected in any of the ground water samples analyzed (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 surface water samples during the second sampling in 2010. Gross Alpha (dissolved) was detected in 5 of 15 groundwater locations. The concentrations ranged from 2.9 to 6.2 pCi/L. Gross Alpha (suspended) was detected in 8 of 15 groundwater locations. The concentrations ranged from 1.1 to 60.0 pCi/L. Gross Beta (dissolved) was detected in 14 of 15 groundwater locations. The concentrations ranged from 2.1 to 38.5 pCi/L. Gross Beta (suspended) was detected in 11 of 15 groundwater locations. The concentrations ranged from 1.7 to 124.0 pCi/L (Table B-I.1, Appendix B).

Gamma Emitters

Potassium-40 was detected at four of 15 groundwater locations with a range of 77 to 136 pCi/L. No other gamma emitting nuclides were detected (Table B-I.2, Appendix B).

Hard-To-Detect

Hard-To-Detect analyses were performed on a select group of groundwater locations to establish background levels. The analyses included Fe-55, Ni-63, Am-241, Cm-242, Cm-243/244, Pu-238, Pu-239/240, U-233/234, U-235 and U-238. The isotopes of U-233/234 and U-238 were detected at four of six groundwater monitoring locations. The U-233/234 concentrations ranged from 1.4 to 2.7 pCi/L and the U-238 concentrations ranged from 0.8 to 1.2 pCi/L (Table B-I.3, Appendix B). The concentrations detected are considered background.

All other hard-to-detect nuclides were not detected at concentrations greater than their respective MDCs.

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 nine locations were analyzed for tritium activity. Tritium activity was detected in station SW-LR-8 at a concentration of 196 pCi/Liter (Table B-II.1, Appendix B).

Strontium

No Sr-90 activity was detected in any of surface water samples analyzed (Table B–II.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 surface water samples during the second sampling in 2010. Gross Alpha (dissolved) was not detected in any surface water locations. Gross Alpha (suspended) was detected at 2 of 7 surface water locations. The concentration ranged from 1.3 to 1.9 pCi/L. Gross Beta (dissolved) was detected at all surface water locations. The concentrations ranged from 2.6 to 25.7 pCi/L. Gross Beta (suspended) was detected at 5 of 7 surface water location. The concentration ranged from 1.8 to 6.5 pCi/L (Table B-II.1, Appendix B).

Gamma Emitters

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

C. 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 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.

D. Summary of Results – Inter-Laboratory Comparison Program

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

E. Leaks, Spills, and Releases

There were no leaks, spills or releases to the ground that could impact the ground water.

F. Trends

Well MW-LR-9 tritium concentration levels continue to decrease from the levels observed from the 2009 leak.

G. Investigations

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

H. 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 2010

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.

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APPENDIX A

LOCATION DESIGNATION

TABLE A-1: Radiological Groundwater Protection Program – Sampling Locations for the Limerick Generating Station, 2010

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

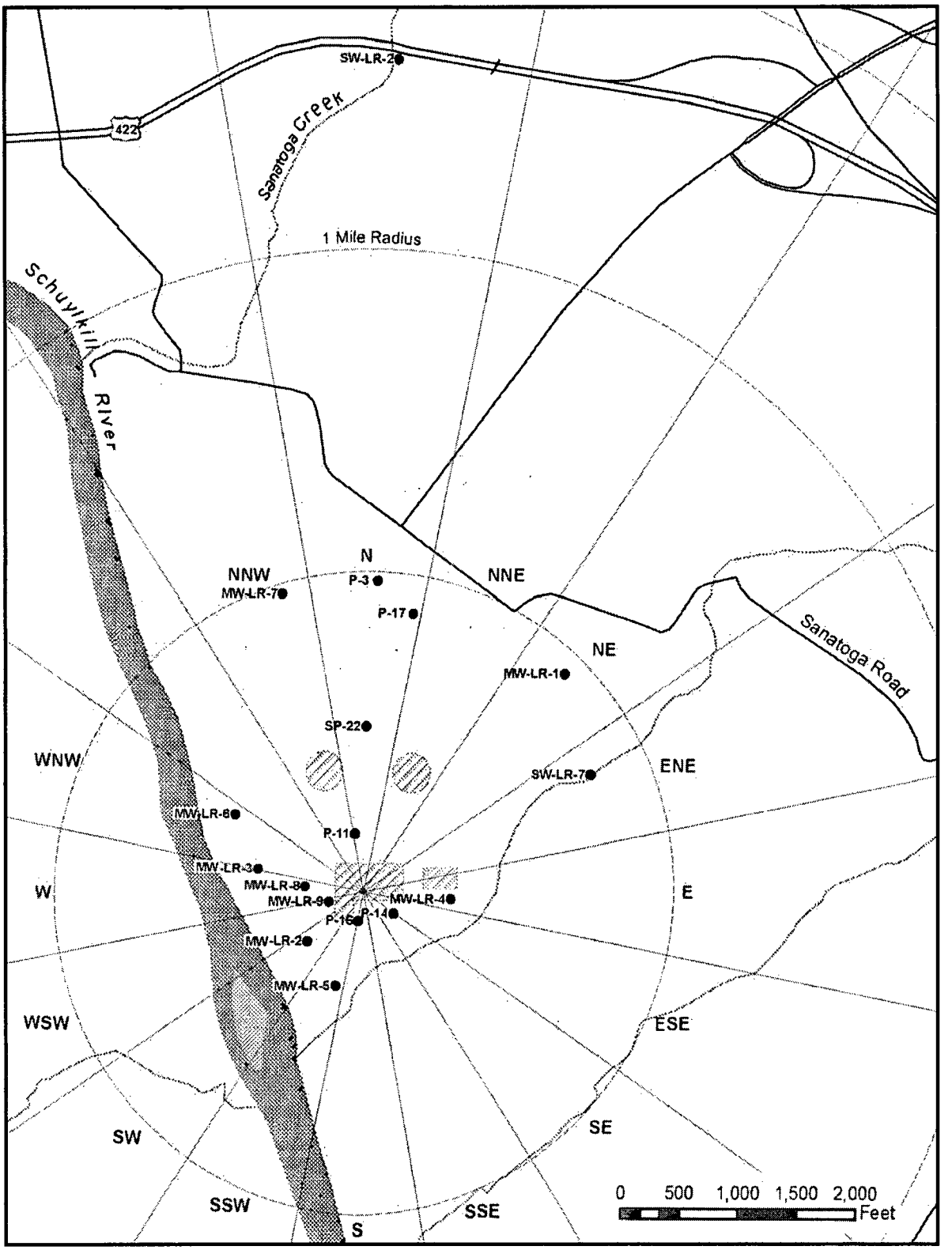

Figure 1 Routine Well Water and Surface Water Sample Locations for the Radiological Groundwater Protection Program, Limerick Generating Station, 2010

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, 2010

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	05/04/2010	< 172		< 3.9	< 0.9	14 ± 3.8	3.8 ± 1.4
MW-LR-1	08/11/2010	< 180	< 0.6	2.9 ± 1.9	< 2.2	39 ± 1.9	< 3.2
MW-LR-1	10/19/2010	< 179		< 2.0	< 1.5	8.0 ± 2.9	< 1.8
MW-LR-2	05/05/2010	< 173		< 2.5	1.3 ± 0.7	3.6 ± 1.9	< 1.6
MW-LR-2	08/13/2010	< 178	< 0.8	< 2.7	1.3 ± 0.9	3.9 ± 2.2	2.2 ± 1.2
MW-LR-2	10/19/2010	< 176		< 2.3	< 1.5	< 3.1	2.4 ± 1.3
MW-LR-3	05/05/2010	< 174		< 2.3	1.5 ± 0.9	5.1 ± 2.3	11 ± 1.7
MW-LR-3	05/05/2010	< 174		< 3.0	< 0.6	6.0 ± 2.5	< 1.6
MW-LR-3	08/13/2010	< 174	< 0.8	< 2.6	1.7 ± 1.0	< 3.2	3.3 ± 1.3
MW-LR-3	10/20/2010	< 175		< 2.0	< 1.4	5.8 ± 2.7	< 1.8
MW-LR-4	05/04/2010	< 177		< 3.3	< 0.6	7.1 ± 2.9	< 1.6
MW-LR-4	08/13/2010	< 171	< 0.5	< 3.1	< 0.9	< 3.9	< 1.7
MW-LR-4	10/20/2010	< 175		< 2.6	< 1.5	5.4 ± 3.0	< 1.8
MW-LR-5	05/05/2010	< 175		3.1 ± 2.0	2.7 ± 1.0	5.6 ± 2.1	4.1 ± 1.3
MW-LR-5	08/13/2010	< 176	< 0.8	< 2.6	< 1.0	12 ± 2.8	3.3 ± 1.3
MW-LR-5	08/13/2010	< 178	< 0.7	< 2.8	< 0.9	9.2 ± 2.5	2.0 ± 1.2
MW-LR-5	10/19/2010	< 178		6.2 ± 2.1	< 1.5	< 3.7	< 1.8
MW-LR-6	05/05/2010	< 177		< 0.5	1.6 ± 0.8	2.1 ± 1.1	1.9 ± 1.1
MW-LR-6	08/13/2010	< 173	< 0.5	< 2.5	3.6 ± 1.3	4.5 ± 2.5	4.9 ± 1.4
MW-LR-6	10/19/2010	< 181		< 2.3	< 1.7	3.7 ± 2.2	< 2.0
MW-LR-7	05/05/2010	< 180		< 2.2	< 0.6	3.6 ± 1.7	< 1.6
MW-LR-7	08/13/2010	< 177	< 0.9	< 2.0	< 1.0	2.7 ± 1.7	< 1.7
MW-LR-7	10/19/2010	< 176		< 1.1	< 4.0	14 ± 2.4	< 2.6
MW-LR-8	05/04/2010	243 ± 119		< 3.4	< 0.6	5.3 ± 2.8	1.9 ± 1.1
MW-LR-8	08/10/2010	245 ± 115	< 0.6	< 2.8	< 0.9	< 3.8	1.7 ± 1.1
MW-LR-8	10/19/2010	238 ± 117		< 2.4	< 1.4	3.7 ± 1.2	< 1.8
MW-LR-8	10/19/2010	< 178		< 2.5	< 1.4	5.2 ± 1.3	< 1.8
MW-LR-9	01/12/2010	1320 ± 180		(1)	(1)	(1)	(1)
MW-LR-9	05/04/2010	964 ± 162		3.1 ± 1.9	< 3.5	7.2 ± 2.5	< 2.6
MW-LR-9	05/04/2010	793 ± 145		< 2.3	11 ± 4.9	5.6 ± 2.3	24 ± 3.0
MW-LR-9	08/10/2010	< 179	< 0.8	< 2.8	< 1.0	9.2 ± 2.5	< 1.7
MW-LR-9	08/10/2010	308 ± 118	< 0.7	< 2.9	< 1.8	6.9 ± 2.3	8.9 ± 1.9
MW-LR-9	10/19/2010	455 ± 127		4.0 ± 1.9	< 3.4	6.0 ± 2.2	3.1 ± 1.7
MW-LR-9	10/19/2010	547 ± 126		< 2.3	4.4 ± 2.6	6.2 ± 2.3	10 ± 2.1
P11	05/04/2010	< 173		< 3.8	1.1 ± 0.7	19 ± 4.2	1.8 ± 1.1
P11	08/10/2010	< 178	< 0.7	< 3.5	< 0.9	< 4.0	2.8 ± 1.2
P11	08/10/2010	< 170	< 0.5	< 3.2	< 0.9	14 ± 3.4	< 1.6
P11	10/19/2010	< 168		< 2.3	< 1.4	15 ± 3.5	< 1.8
P11	10/19/2010	< 171		< 2.3	< 1.5	13 ± 3.4	< 1.8
P14	05/04/2010	< 173		< 3.8	12 ± 4.1	5.3 ± 3.2	32 ± 3.2
P14	08/11/2010	< 170	< 0.6	< 3.6	19 ± 6.4	< 4.0	28 ± 3.2
P14	10/19/2010	< 170		< 3.1	12 ± 5.5	4.3 ± 1.6	28 ± 3.6
P16	05/05/2010	< 173		< 8.7	60 ± 10.4	18 ± 8.0	124 ± 9.3
P16	08/10/2010	< 172		(2)	(2)	(2)	(2)
P16	10/19/2010	< 170		< 5.2	35 ± 8.0	16 ± 6.4	74 ± 6.4
P17	05/04/2010	< 169		< 2.4	< 0.5	< 3.6	< 1.5
P17	08/11/2010	< 168	< 0.6	< 2.5	< 0.9	< 3.4	< 1.6
P17	10/19/2010	< 176		< 2.0	< 1.4	< 3.8	< 1.8

(1) Analyses not added until May 2010

(2) Gross Alpha and Gross Beta analyses could not be performed due to low sample volume

Samples are distilled for H-3 analysis

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, 2010

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)
P3	05/04/2010	< 168		< 2.3	< 0.5	8.4 ± 2.5	< 1.5
P3	08/11/2010	< 171	< 0.7	< 2.8	< 0.9	< 3.0	< 1.6
P3	10/19/2010	< 177		4.0 ± 2.0	< 1.4	< 3.2	< 1.8
SP22	05/04/2010	< 171		< 2.4	< 0.5	6.7 ± 2.8	< 1.5
SP22	08/11/2010	< 177	< 0.9	5.8 ± 2.4	< 0.9	4.9 ± 2.7	3.3 ± 1.2
SP22	10/19/2010	< 172		< 2.3	< 1.4	7.7 ± 1.4	< 1.8

Samples are distilled for H-3 analysis

TABLE B-I.2 **CONCENTRATIONS OF GAMMA EMITTERS IN WELL WATER SAMPLES COLLECTED AS PART OF THE RADIOLOGICAL GROUNDWATER PROTECTION PROGRAM, LIMERICK GENERATING STATION, 2010**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

STC	COLLECTION PERIOD	Be-7	K-40	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	I-131	Cs-134	Cs-137	Ba-140	La-140
MW-LR-1	08/11/2010	< 46	133 ± 48	< 4	< 5	< 10	< 5	< 10	< 5	< 8	< 13	< 5	< 5	< 31	< 8
MW-LR-2	08/13/2010	< 45	< 47	< 5	< 6	< 12	< 4	< 11	< 6	< 8	< 13	< 5	< 5	< 34	< 12
MW-LR-3	08/13/2010	< 47	< 50	< 5	< 5	< 12	< 5	< 8	< 6	< 9	< 12	< 5	< 5	< 29	< 10
MW-LR-4	08/13/2010	< 44	< 110	< 5	< 6	< 10	< 9	< 13	< 6	< 10	< 12	< 5	< 5	< 30	< 9
MW-LR-5	08/13/2010	< 52	77 ± 49	< 4	< 4	< 10	< 4	< 12	< 5	< 8	< 11	< 5	< 5	< 29	< 10
MW-LR-5	08/13/2010	< 50	< 46	< 4	< 5	< 11	< 5	< 8	< 6	< 9	< 13	< 5	< 5	< 33	< 10
MW-LR-6	08/13/2010	< 65	< 65	< 7	< 7	< 15	< 7	< 15	< 10	< 13	< 15	< 6	< 7	< 36	< 12
MW-LR-7	08/13/2010	< 52	< 94	< 6	< 7	< 12	< 6	< 13	< 7	< 11	< 14	< 7	< 7	< 36	< 9
MW-LR-8	08/10/2010	< 34	< 54	< 4	< 3	< 7	< 4	< 7	< 4	< 6	< 7	< 3	< 4	< 21	< 7
MW-LR-9	08/10/2010	< 39	< 82	< 4	< 4	< 9	< 4	< 8	< 5	< 9	< 14	< 4	< 5	< 30	< 8
MW-LR-9	08/10/2010	< 41	< 41	< 4	< 4	< 8	< 4	< 8	< 5	< 8	< 10	< 4	< 4	< 23	< 8
P11	08/10/2010	< 39	< 77	< 4	< 4	< 9	< 4	< 9	< 5	< 7	< 14	< 4	< 4	< 30	< 9
P11	08/10/2010	< 43	< 32	< 4	< 4	< 9	< 3	< 9	< 5	< 8	< 11	< 4	< 6	< 29	< 8
P14	08/11/2010	< 60	136 ± 66	< 7	< 4	< 13	< 7	< 9	< 7	< 9	< 12	< 7	< 6	< 32	< 13
P16	08/10/2010	< 52	< 41	< 5	< 5	< 12	< 5	< 10	< 6	< 10	< 14	< 6	< 5	< 33	< 9
P17	08/11/2010	< 51	124 ± 54	< 5	< 5	< 11	< 5	< 9	< 5	< 8	< 14	< 5	< 6	< 33	< 8
P3	08/11/2010	< 43	< 79	< 5	< 4	< 10	< 6	< 9	< 7	< 9	< 10	< 5	< 5	< 28	< 7
SP-22	08/11/2010	< 42	< 37	< 4	< 4	< 8	< 4	< 9	< 5	< 8	< 13	< 5	< 4	< 29	< 8

TABLE B-I.3 CONCENTRATIONS OF HARD TO DETECTS IN GROUNDWATER SAMPLES COLLECTED AS PART OF THE RADIOLOGICAL GROUNDWATER PROTECTION PROGRAM, LIMERICK GENERATING STATION, 2010

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

STC	COLLECTION PERIOD	AM-241	CM-242	CM-243/244	PU-238	PU-239/240	U-233/234	U-235	U-238	FE-55	NI-63
MW-LR-1	05/04/2010	< 0.1	< 0.13	< 0.11	< 0.2	< 0.1	< 0.1	< 0.06	< 0.1	< 75	< 4.2
MW-LR-3	05/05/2010	< 0.1	< 0.10	< 0.10	< 0.2	< 0.1	2.7 ± 0.4	< 0.04	0.9 ± 0.2	< 141	< 4.3
MW-LR-7	05/05/2010	< 0.2	< 0.08	< 0.07	< 0.2	< 0.2	< 0.2	< 0.07	< 0.1	< 78	< 4.3
MW-LR-8	05/04/2010	< 0.1	< 0.05	< 0.02	< 0.1	< 0.2	2.1 ± 0.3	< 0.04	0.8 ± 0.2	< 72	< 3.9
P-17	05/04/2010	< 0.2	< 0.07	< 0.11	< 0.1	< 0.1	1.4 ± 0.3	< 0.06	0.9 ± 0.2	< 146	< 4.2
P-3	05/04/2010	< 0.2	< 0.15	< 0.03	< 0.1	< 0.1	2.5 ± 0.4	< 0.02	1.2 ± 0.2	< 179	< 4.2

TABLE B-II.1 CONCENTRATIONS OF TRITIUM, STRONTIUM-90, GROSS ALPHA AND GROSS BETA IN SURFACE WATER SAMPLES COLLECTED AS PART OF THE RADIOLOGICAL GROUNDWATER PROTECTION PROGRAM, LIMERICK GENERATING STATION, 2010

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)
SW-LR-2	05/03/2010	< 172		< 1.2	1.9 ± 1.1	3.6 ± 1.5	3.3 ± 1.4
SW-LR-2	08/12/2010	< 180	< 0.5	< 2.7	< 0.9	< 2.7	3.3 ± 1.2
SW-LR-2	10/18/2010	< 171		< 1.3	< 1.5	< 2.7	< 1.8
SW-LR-4	05/04/2010	< 170		< 1.1	< 0.6	2.9 ± 1.5	< 1.6
SW-LR-4	08/12/2010	< 174	< 0.8	< 2.1	< 0.9	< 2.6	3.3 ± 1.3
SW-LR-4	10/18/2010	< 171		< 1.3	< 1.5	< 2.7	< 1.8
SW-LR-6	05/03/2010	< 176		< 1.4	1.3 ± 0.8	2.6 ± 1.5	2.9 ± 1.3
SW-LR-6	08/12/2010	< 179	< 0.6	< 2.8	< 0.9	< 2.8	2.9 ± 1.2
SW-LR-6	10/18/2010	< 171		< 1.4	< 1.5	< 2.7	< 1.8
SW-LR-7	05/03/2010	< 172		< 1.6	< 0.6	3.9 ± 1.7	1.8 ± 1.1
SW-LR-7	08/12/2010	< 172	< 0.6	< 2.8	< 0.9	5.2 ± 2.2	< 1.6
SW-LR-7	10/18/2010	< 170		< 1.5	< 1.4	< 2.8	< 1.8
SW-LR-8	05/05/2010	< 171		< 2.3	< 0.9	9.6 ± 2.7	< 1.7
SW-LR-8	08/11/2010	< 171	< 0.5	< 2.5	< 0.9	20 ± 3.6	< 1.7
SW-LR-8	10/20/2010	196 ± 114		< 2.1	< 1.5	15 ± 3.1	< 1.8
SW-LR-9	05/05/2010	< 175		< 2.3	< 0.9	11 ± 2.8	< 1.7
SW-LR-9	08/11/2010	< 172	< 0.5	< 2.9	< 1.0	26 ± 4.0	< 1.7
SW-LR-9	10/20/2010	< 170		< 2.2	< 1.6	22 ± 3.9	< 1.9
SW-LR-10	05/04/2010	< 171		< 2.3	< 0.9	3.8 ± 2.0	< 1.7
SW-LR-10	05/04/2010	< 172		< 2.2	< 0.9	4.5 ± 2.0	< 1.7
SW-LR-10	08/12/2010	< 181	< 0.7	< 2.7	< 0.9	< 3.1	6.5 ± 1.4
SW-LR-10	10/18/2010	< 168		< 1.7	< 1.4	< 2.8	< 1.8

SAMPLES ARE DISTILLED FOR H-3 ANALYSIS

TABLE B-II.2 **CONCENTRATIONS OF GAMMA EMITTERS IN SURFACE WATER SAMPLES COLLECTED AS PART OF THE RADIOLOGICAL GROUNDWATER PROTECTION PROGRAM, LIMERICK GENERATING STATION, 2010**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

STC	COLLECTION PERIOD	Be-7	K-40	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	I-131	Cs-134	Cs-137	Ba-140	La-140
SW-LR-2	08/12/2010	< 40	171 ± 53	< 5	< 5	< 12	< 8	< 12	< 6	< 9	< 10	< 4	< 5	< 29	< 12
SW-LR-4	08/12/2010	< 52	199 ± 59	< 5	< 5	< 12	< 5	< 10	< 7	< 10	< 13	< 6	< 5	< 36	< 7
SW-LR-6	08/12/2010	< 27	< 44	< 3	< 3	< 6	< 2	< 7	< 3	< 6	< 10	< 3	< 3	< 19	< 6
SW-LR-7	08/12/2010	< 45	< 108	< 5	< 6	< 11	< 4	< 10	< 6	< 10	< 14	< 5	< 5	< 30	< 9
SW-LR-8	08/11/2010	< 38	< 89	< 4	< 4	< 9	< 3	< 9	< 5	< 8	< 10	< 4	< 5	< 24	< 8
SW-LR-9	08/11/2010	< 50	< 95	< 5	< 5	< 10	< 5	< 9	< 5	< 9	< 11	< 5	< 6	< 26	< 7
SW-LR-10	08/12/2010	< 46	< 88	< 4	< 5	< 10	< 5	< 9	< 6	< 9	< 13	< 4	< 5	< 31	< 8