aps

Technical Specification 5.6.2

Palo Verde
Nuclear Generating Station
PO Box 52034
Phoenix, Arizona 85072-2034
Mail Station 7636

102-07035-TNW/MDD/TMJ
April 24, 2015

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

Dear Sirs:

Subject: **Palo Verde Nuclear Generating Station (PVNGS)**
Units 1, 2, and 3
Docket Nos. STN 50-528/529/530
Annual Radiological Environmental Operating Report 2014

In accordance with PVNGS Technical Specification (TS) 5.6.2, enclosed please find the Annual Radiological Environmental Operating Report for 2014 which includes an appendix consisting of an amendment to the Annual Radiological Environmental Operating Report for 2012.

No new commitments are being made to the NRC by this letter. Should you need further information regarding this submittal, please contact Michael Dilorenzo, Licensing Section Leader, at (623) 393-3495.

Sincerely,

Thomas N. Weber
Department Leader, Regulatory Affairs

TNW/MDD/TMJ/hsc

Enclosure

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IE25
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ENCLOSURE

Palo Verde Nuclear Generating Station
UNITS 1, 2, and 3

Annual Radiological
Environmental Operating Report 2014

NUCLEAR GENERATING STATION

ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT 2014

(Reference: RCTSAI 1643, Legacy Item No. 036843.01)

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Manager, Radiation Protection

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ABSTRACT

The Radiological Environmental Monitoring Program (REMP) is an ongoing program conducted by Arizona Public Service Company (APS) for the Palo Verde Nuclear Generating Station (PVNGS). Various types of environmental samples are collected near PVNGS and analyzed for plant related radionuclide concentrations.

During 2014, the following categories of samples were collected by APS:

- Broad leaf vegetation
- Ground water
- Drinking water
- Surface water
- Airborne particulate and radioiodine
- Goat milk
- Sludge and sediment

Thermoluminescent dosimeters (TLDs) were used to measure environmental gamma radiation. The Environmental TLD program is also conducted by APS.

The Arizona Radiation Regulatory Agency (ARRA) performs radiochemistry analyses on various duplicate samples provided to them by APS. Samples analyzed by ARRA include onsite samples from the Reservoirs, Evaporation Ponds, and two (2) deep wells. Offsite samples analyzed by ARRA include two (2) local resident wells. ARRA also performs air sampling at seven (7) offsite locations identical to APS and maintains approximately fifty (50) environmental TLD monitoring locations, eighteen (18) of which are duplicates of APS locations.

A comparison of pre-operational and operational data indicates no changes to environmental radiation levels.

(NOTE: Reference to APS throughout this report refers to PVNGS personnel)

OPERATIONAL RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

1. Introduction

This report presents the results of the operational radiological environmental monitoring program conducted by Arizona Public Service Company (APS). The Radiological Environmental Monitoring Program (REMP) was established for the Palo Verde Nuclear Generating Station (PVNGS) by APS in 1979.

This report contains the measurements and findings for 2014. All references are specifically identified in Section 12.

The Radiological Environmental Monitoring Program provides representative measurements of radiation and of radioactive materials in those exposure pathways and for those radionuclides that lead to the highest potential radiation exposures of members of the public resulting from the station operation. This monitoring program implements Section IV.B.2 of Appendix I to 10 CFR Part 50 and thereby supplements the radiological effluent monitoring program by verifying that the measurable concentrations of radioactive materials and levels of radiation are not higher than expected on the basis of the effluent measurements and the modeling of the environmental exposure pathways. Guidance for this monitoring program is provided by the US Nuclear Regulatory Commission (USNRC) in their Radiological Assessment Branch Technical Position on Environmental Monitoring, Revision 1, November 1979 (incorporated into NUREG 1301). Results from the REMP help to evaluate sources of elevated levels of radioactivity in the environment (e.g., atmospheric nuclear detonations or abnormal plant releases).

The Land Use Census ensures that changes in the use of areas at and beyond the site boundary are identified and that modifications to the REMP are made if required by the results of this census. This census satisfies the requirements of Section IV.B.3 of Appendix I to 10 CFR Part 50.

The Interlaboratory Comparison Program is provided to ensure that independent checks on the precision and accuracy of the measurements of radioactive material in environmental sample matrices are performed as part of the quality assurance program for environmental monitoring in order to demonstrate that the results are valid for the purposes of Section IV.B.2 of Appendix I to 10 CFR Part 50.

Results of the PVNGS pre-operational environmental monitoring program are presented in Reference 1.

The initial criticality of Unit 1 occurred May 25, 1985. Initial criticality for Units 2 and 3 were April 18, 1986, and October 25, 1987, respectively. PVNGS operational findings (historical) are presented in Reference 2.

2. Description of the Monitoring Program

APS and vendor organizations performed the pre-operational radiological environmental monitoring program between 1979 and 1985. APS and vendors continued the program into the operational phase.

2.1. Radiological Environmental Monitoring Program

The assessment program consists of routine measurements of environmental gamma radiation and of radionuclide concentrations in media such as air, groundwater, drinking water, surface water, vegetation, milk, sludge, and sediment.

Samples were collected by APS at the monitoring sites shown in Figures 2.1 and 2.2. The specific sample types, sampling locations, and sampling frequencies, as set forth in the PVNGS Offsite Dose Calculation Manual (ODCM), Reference 4, are presented in Tables 2.1, 2.2 and 9.1. Additional onsite sampling (outside the scope of the ODCM) is performed to supplement the REMP. All results are included in this report. Routine sample analyses were performed at the onsite Central Chemistry Laboratory and Operating Unit laboratories. Analyses for hard-to-detect radionuclides were performed by GEL Laboratories LLC.

Environmental gamma radiation measurements were performed by APS using TLDs at fifty (50) locations near PVNGS. The PVNGS Dosimetry Department is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP) to perform ionizing radiation dosimeter analyses.

In addition to monitoring environmental media, a land use census is performed annually to identify the nearest milk animals, residents, and gardens. This information is used to evaluate the potential dose to members of the public for those exposure pathways that are indicated.

2.2. Radiological Environmental Monitoring Program Changes for 2014

There were no changes to the Radiological Environmental Monitoring Program that impacted the Off-site Dose Calculation Manual (ODCM) Revision 26.

2.3. REMP Deviations/Abnormal Events Summary

During calendar year 2014, there were three (2) deviations/abnormal events with regard to the monitoring program. Refer to Table 2.3 for more detail and any corrective actions taken.

The first two (1-2) deviations were exceedances of the quarterly I-131 reporting level of 20 pCi/L. This occurred at the following locations: 45 acre reservoir first calendar quarters, Evaporation Pond 1A first calendar quarters, Evaporation Pond 2A third quarter. The source is radiopharmaceutical I-131 that originates in the Phoenix sewage effluent that supplies makeup to the Reservoirs and Circulating Water system. This water is wasted to the Evaporation Ponds. This is not a plant effluent.

The third (3) and final deviation for 2014 was an air sample pump failure at site #17. This resulted in an undetermined sample volume sample for that week's sample. Default flow values were assumed for analysis of this sample. This is a supplemental site, not required per the ODCM.

2.4. Ground Water Protection

PVNGS has implemented a groundwater protection initiative developed by the Nuclear Energy Institute (NEI). The implementation of this initiative, NEI 07-07 (Industry Ground Water Protection Initiative – Final Guidance Document, August 2007), provides added assurance that groundwater will not be adversely affected by PVNGS operations.

Several monitoring wells have been installed to monitor the subsurface water and shallow aquifer at Units 1, 2, and 3. These wells are sampled monthly and quarterly for chemical and radiological parameters. The State of Arizona Aquifer Protection Permit (Area-Wide) No. P-100388 (APP) provides agreed upon monitoring parameters and reporting thresholds. Sample results for the shallow aquifer wells are reported in the PVNGS Annual Radioactive Effluent Release Report (ARERR). The State of Arizona APP provides specific regulatory criteria for groundwater protection.

Three subsurface samples were obtained, one each from Units 2 and 3 tritium monitoring wells, and one from the shallow aquifer outside of the Unit 1 radiological controlled area (RCA). These samples were analyzed for hard-to-detect radionuclides (e.g. C-14, Fe-55, Ni-63, Sr-90) as a verification that there are no underground leaks from plant systems that may affect groundwater. All results were <MDA. Refer to Table 8.12 for sample results.

Table 2.1 SAMPLE COLLECTION LOCATIONS

SAMPLE SITE #	***SAMPLE TYPE***	***LOCATION (a)***	***LOCATION DESCRIPTION***
4	air	E16	APS Office
6A*	air	SSE13	Old US 80
7A	air	ESE3	Arlington School
14A	air	NNE2	371st Ave. and Buckeye-Salome Rd.
15	air	NE2	NE Site Boundary
17A	air	E3	351st Ave.
21	air	S3	S Site Boundary
29	air	W1	W Site Boundary
35	air	NNW8	Tonopah
40	air	N2	Transmission Rd
46	drinking water	NNW8	local resident
47	vegetation	N3	local resident
48	drinking water	SW1	local resident
49	drinking water	N2	local resident
51	milk	NNE3	local resident- goats
53*	milk	NE30	local resident- goats
54	milk (supplemental)	NNE4	local resident-goats
55	drinking water (supplemental)	SW3	local resident
57	ground water	ONSITE	Well 27ddc
58	ground water	ONSITE	Well 34abb
59	surface water	ONSITE	Evaporation Pond 1
60	surface water	ONSITE	85 acre Reservoir
61	surface water	ONSITE	45 acre Reservoir
62*	vegetation	ENE26	Commercial farm
63	surface water	ONSITE	Evaporation Pond 2
64	surface water	ONSITE	Evaporation Pond 3

NOTES:

* Designates a control site

(a) Distances and direction are from the center-line of Unit 2 containment and rounded to the nearest mile

Air sample sites designated with the letter 'A' are sites that have the same site number as a TLD location, but are not in the same location (e.g. site #**6** TLD location is different from site #**6A** air sample location; site #**4** TLD location is the same as site #**4** air sample location)

Table 2.2 SAMPLE COLLECTION SCHEDULE

SAMPLE SITE #	*AIR PARTICULATE*	*MILK*	*AIRBORNE RADIOIODINE*	*VEGETATION*	*GROUND WATER*	*DRINKING WATER*	*SURFACE WATER*
4	W		W				
6A	W		W				
7A	W		W				
14A	W		W				
15	W		W				
17A	W		W				
21	W		W				
29	W		W				
35	W		W				
40	W		W				
46						W	
47				M/AA			
48						W	
49						W	
51		M/AA					
53		M/AA					
54		M/AA					
55						W	
57					Q		
58					Q		
59							Q
60							Q
61							Q
62				M/AA			
63							Q
64							Q

W = WEEKLY M/AA = MONTHLY AS AVAILABLE Q = QUARTERLY

TABLE 2.3 SUMMARIES OF REMP DEVIATIONS/ABNORMAL EVENTS

Deviation/Abnormal Event	Actions taken
1. The 45 acre Reservoir and Evaporation Pond 1A exceeded the first quarter I-131 reporting level of 20 pCi/liter.	1. Initial sample results exceeding 20 pCi/liter are validated when seen in surface water. The verification analysis results also showed levels ≥ 20 pCi/liter for the Evaporation Pond 1A sample. However, the 45 acre Reservoir validating count was less than 20 pCi/liter. The elevated I-131 concentration is due to radiopharmaceutical I-131 that is present in the reclaimed sewage water that supplies Circulating Water and is not the result of plant effluents. The source is radiopharmaceutical I-131 that originates in the Phoenix sewage effluent that supplies makeup to the Reservoirs and Circulating Water system. This water is wasted to the Evaporation Ponds via Circulating Water blowdown. Because the I-131 is not the result of plant effluents, no Special Report is required. This information is provided in this report as required by the ODCM. Refer to Corrective Action Program documents CRDR 4499971, CRDR 4604440, and 4568037 for the evaluation of exceeding the ODCM Reporting Level. No additional actions are necessary.
2. Evaporation Pond 1A exceeded the first quarter I-131 reporting level of 20 pCi/liter resulting in a unity value greater than 1.0 (one). The quarterly tritium sample had a value of 2,640 pCi/liter.	2. Evaporation Pond 1A had an I-131 validated result greater than the ODCM Reporting Level. Low level tritium (2,640 ± 244 pCi/liter) was detected in Evaporation Pond 1A. This tritium value is below the ODCM Reporting Level. If more than one radionuclide from the ODCM Reporting Level table is detected, a unity value calculation must be performed. The elevated I-131 concentration, originating from Phoenix radiopharmaceuticals, accounted for 96% of the unity value. Corrective Action Program document 4604440 documents this occurrence and subsequent evaluation. No further actions required.

3. Air sample site #17 sample pump lost power between 2/24/2014 and 03/04/2014.	3. The air sample pump lost power during the sample period, resulting in the inability to determine the actual sample volume. Power was restored and sample volume for the next week was valid. Event documented through CRDR 4509720. No further actions required.
4. Interlaboratory blind sample failure of procedural acceptance criteria for gamma emitters in water matrix.	4. Environmental radiochemical interlaboratory blind sample for mixed gamma emitters in water matrix for the 2nd half of 2014 failed the procedural acceptance criteria for Cs-134 for the Chemistry Central Lab MCA detector #2 analysis. The Cs-134 result as documented in letter 237-02963-CAS had a ratio of 0.73 with an acceptance range of 0.75 - 1.33. Refer to Corrective Action Program document CRDR 4600038. Corrective actions include verification of results for both Central Lab MCA detectors for the water geometry, calibration verification of detector #2, and analyzing a separate sample geometry to check bias. Corrective actions are complete at this time. No additional actions are necessary.
5. WRF Centrifuge Waste Sludge samples for December 11 and 18, 2012, entered into the REMP database, were not included in the 2012 Annual Radiological Environmental Operating Report (AREOR). Additionally, the Air Sample Data for sample period December 25-31, 2012, entered into the REMP database, were not included in the 2012 or 2013 AREOR.	5. The sample data identified is being submitted as Appendix A of this report. This sample data was reviewed and analyzed. The samples were not unusual or remarkable. This event was documented through Correction Action Program document CRDR 4616525.
6. WRF 45-acre reservoir was taken out of service for liner inspection during the 4th quarter.	6. Technicians verified there was insufficient water to obtain the quarterly sample. The liner inspection will be complete prior to 1st quarter 2015 sample collection date. The normal sampling regime will resume after the reservoir is placed back into service. No additional actions are necessary.

FIGURE 2.1 REMP SAMPLE SITES - MAP (0-10 miles)

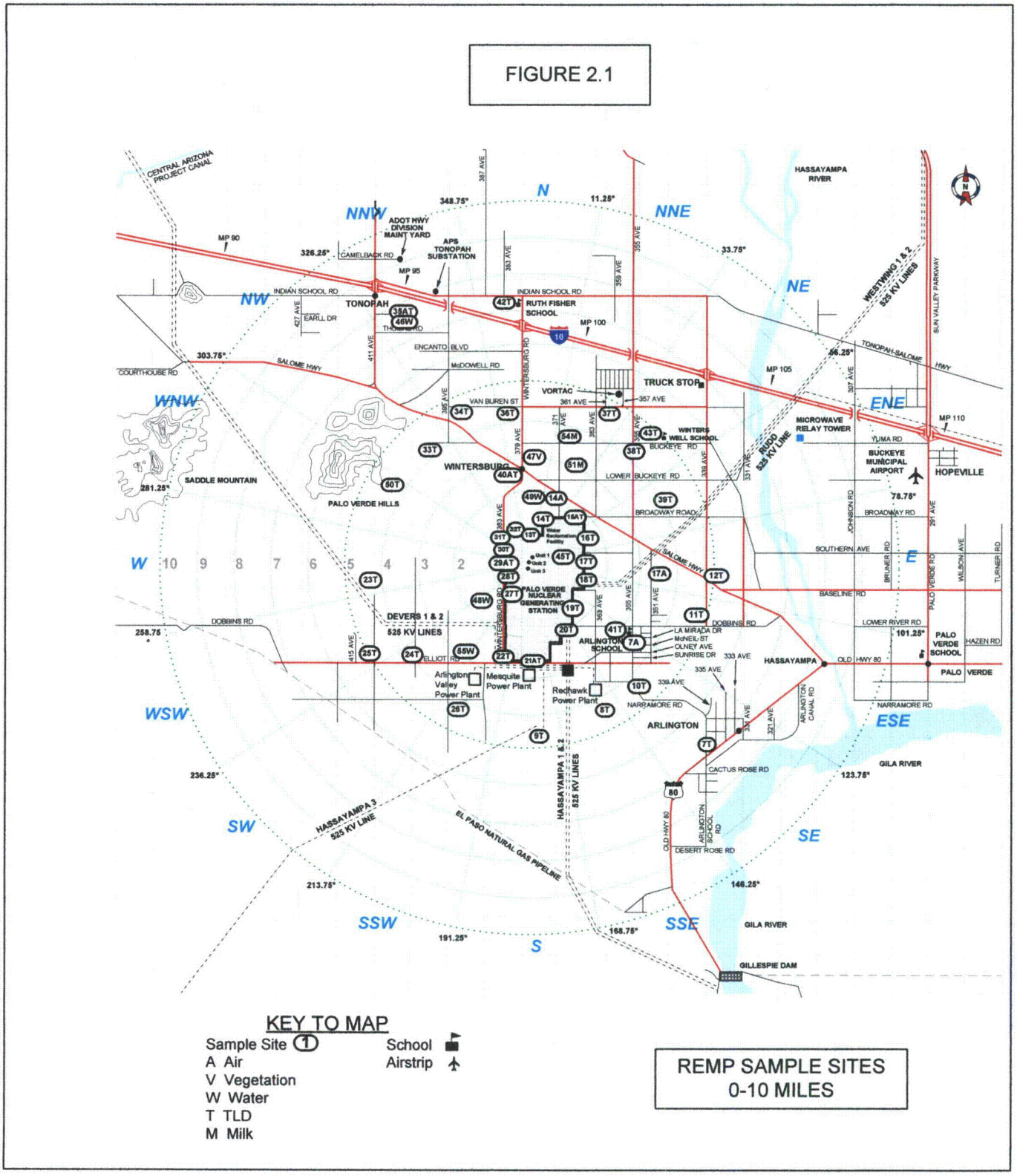
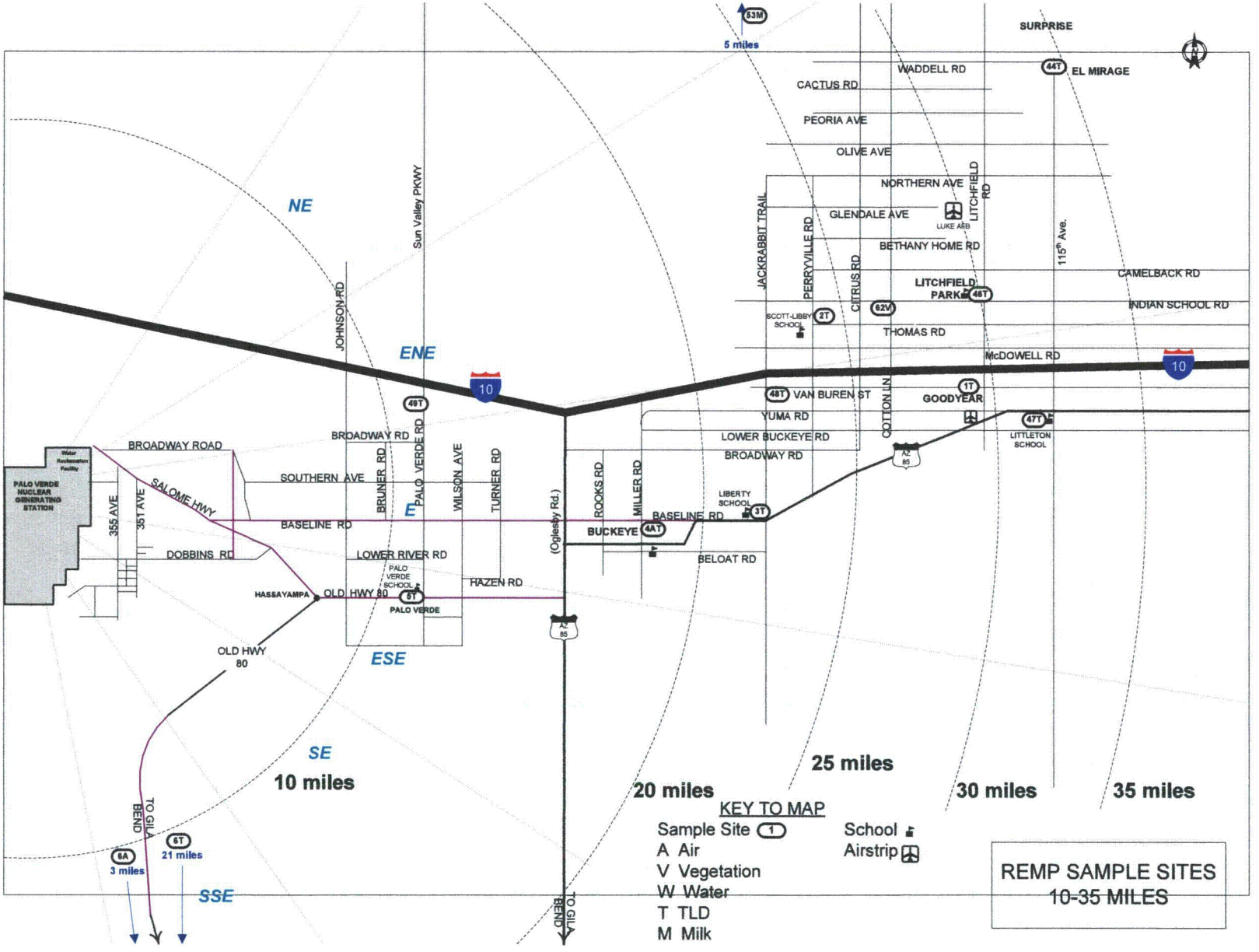


FIGURE 2.2 REMP SAMPLE SITES - MAP (10-35 miles)



3. Sample Collection Program

APS personnel using PVNGS procedures collected all samples.

3.1. Water

Weekly samples were collected from four (4) residence wells for monthly and quarterly composites. Samples were collected in one-gallon containers and 500 mL glass bottles. The samples were analyzed for gross beta, gamma emitting radionuclides and tritium.

Quarterly grab samples were collected from the 45 and 85 acre Reservoirs, Evaporation Ponds 1A/B/C, 2A/B, and 3A/B, and onsite wells 34abb and 27ddc. Samples were collected in one-gallon containers and 500 mL glass bottles. Samples were analyzed for gamma emitting radionuclides and tritium.

Treated sewage effluent from the City of Phoenix was sampled as a weekly composite at the onsite Water Reclamation Facility (WRF), and analyzed for gamma emitting radionuclides. A monthly composite was analyzed for tritium.

3.2. Vegetation

Vegetation samples were collected monthly, as available, and were analyzed for gamma emitting radionuclides.

3.3. Milk

Goat milk samples were collected monthly, as available, and were analyzed for gamma emitting radionuclides, including low level I-131.

3.4. Air

Air particulate filters and charcoal cartridges were collected at ten (10) sites on a weekly basis. Particulate filters were analyzed for gross beta. Charcoal cartridges were analyzed for I-131. Particulate filters were composited quarterly, by location, and analyzed for gamma emitting radionuclides.

3.5. Sludge and Sediment

Sludge samples were obtained weekly from the WRF waste centrifuge (whenever the plant was operational) and analyzed for gamma emitting radionuclides. Cooling tower sludge was analyzed for gamma emitting radionuclides prior to disposal in the WRF sludge landfill. A sediment sample was obtained from Sedimentation Basin #2 and analyzed for gamma emitting radionuclides.

4. Analytical Procedures

The procedures described in this report are those used by APS to routinely analyze samples.

4.1. Air Particulate

4.1.1. Gross Beta

A glass fiber filter sample is placed in a stainless steel planchet and counted for gross beta activity utilizing a low background gas flow proportional counter.

4.1.2. Gamma Spectroscopy

The glass fiber filters are counted on a multichannel analyzer equipped with an HPGe detector. The resulting spectrum is analyzed by a computer for specific radionuclides.

4.2. Airborne Radioiodine

The charcoal cartridge is counted on a multichannel analyzer equipped with an HPGe detector. The resulting spectrum is analyzed by a computer for I-131.

4.3. Milk

4.3.1. Gamma Spectroscopy

The sample is placed in a plastic marinelli beaker and counted on a multichannel analyzer equipped with an HPGe detector. The resulting spectrum is analyzed by a computer for specific radionuclides.

4.3.2. Radiochemical I-131 Separation

Iodine in milk sample is reduced with sodium bisulfite and iodine is absorbed by the anion exchange resin. The iodine is eluted with NaOCl. Iodine is extracted from the sample with carbon tetrachloride. The iodine is back extracted from the organic with water containing sodium bisulfate and then precipitated as CuI. The precipitate is mounted in a planchet and counted for gross beta.

4.4. Vegetation

4.4.1. Gamma Spectroscopy

The sample is pureed in a food processor, placed in a one liter plastic marinelli beaker, weighed, and counted on a multichannel analyzer equipped with an HPGe detector. The resulting spectrum is analyzed by a computer for specific radionuclides.

4.5. Sludge/Sediment

4.5.1. Gamma Spectroscopy

The wet/dry sample is placed in a one-liter plastic marinelli beaker, weighed, and counted on a multichannel analyzer equipped with an HPGe detector. The resulting spectrum is analyzed by a computer for specific radionuclides.

4.6. Water

4.6.1. Gamma Spectroscopy

The sample is placed in a one-liter plastic marinelli beaker and counted on a multichannel analyzer equipped with an HPGe detector. The resulting spectrum is analyzed by a computer for specific radionuclides.

4.6.2. Tritium

The sample is evaluated to determine the appropriate method of preparation prior to counting. If the sample contains suspended solids or is turbid, it may be filtered, distilled, and/or de-ionized, as appropriate. Eight (8) milliliters of sample are mixed with fifteen (15) milliliters of liquid scintillation cocktail. The mixture is dark adapted and counted for tritium activity using a liquid scintillation counting system.

4.6.3. Gross Beta

A 200-250 milliliter sample is placed in a beaker. Five (5) milliliters of concentrated nitric (HNO_3) acid is added and the sample is evaporated down to about twenty (20) milliliters. The remaining sample is transferred to a stainless steel planchet. The sample is heated to dryness and counted for gross beta in a gas flow proportional counter.

4.7. Soil

4.7.1. Gamma Spectroscopy

The samples are sieved, placed in a one-liter plastic marinelli beaker, and weighed. The samples are then counted on a multichannel analyzer equipped with an HPGe detector. The resulting spectrum is analyzed by a computer for specific radionuclides.

5. Nuclear Instrumentation

5.1. Gamma Spectrometer

The Canberra Gamma Spectrometer consists of a Canberra System equipped with HPGe detectors having resolutions of 1.73 keV and 1.88 keV (as determined by full width half max with an energy of 0.5 keV per channel) and respective efficiencies of 21.5% and 38.4% (as determined by the manufacturer with Co-60). The Canberra System is used for all gamma counting. The system uses Canberra developed software to search, identify, and quantify the peaks of interest.

5.2. Liquid Scintillation Spectrometer

A Beckman LS-6500 Liquid Scintillation Counter is used for tritium determinations. The system background averages approximately 12-16 cpm with a counting efficiency of approximately 40% using a quenched standard.

5.3. Gas Flow Proportional Counter

The Tennelec S5E is a low background gas flow proportional counter for gross beta analysis. The system contains an automatic sample changer capable of counting 50 samples in succession. Average beta background count rate is about 1-2 cpm with a beta efficiency of approximately 30% for Cs-137.

6. Isotopic Detection Limits and Reporting Criteria

6.1. Lower Limits of Detection

The lower limits of detection (LLD) and the method for calculation are specified in the PVNGS ODCM, Reference 4. The ODCM required *a priori* LLDs are presented in Table 6.1. For reference, *a priori* LLDs are indicated at the top of data tables for samples having required LLD values.

6.2. Data Reporting Criteria

All results that are greater than the Minimum Detectable Activity (MDA) (a posteriori LLD) are reported as positive activity with its associated 2σ counting error. All results that are less than the MDA are reported as less than values at the associated MDA. For example, if the MDA is 12 pCi/liter, the value is reported as <12.

Typical MDA values are presented in Table 6.3.

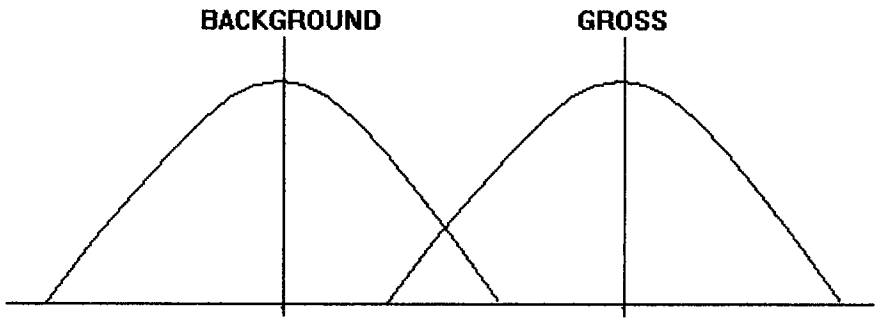
Occasionally, the PVNGS ODCM *a priori* LLDs may not be achieved as a result of:

- Background fluctuations
- Unavoidably small sample sizes
- The presence of interfering radionuclides
- Self absorption corrections
- Decay corrections for short half-life radionuclides
- Other uncontrollable circumstances

In these instances, the contributing factors will be noted in the table where the data are presented. A summary of deviations/abnormal events is presented in Table 2.3 and includes a description of any sample results that did not meet *a priori* LLD requirements.

6.3. LLD and Reporting Criteria Overview

Making a reasonable estimate of the limits of detection for a counting procedure or a radiochemical method is usually complicated by the presence of significant background. It must be considered that the background or blank is not a fixed value but that a series of replicates would be normally distributed. The desired net activity is the difference between the gross and background activity distributions. The interpretation of this difference becomes a problem if the two distributions intersect as indicated in the diagram.



If a sufficient number of replicate analyses are run, it is expected that the results would fall in a normal Gaussian distribution. Standard statistics allow an estimate of the probability of any particular deviation from the mean value. It is common practice to report the mean ± one or two standard deviations as the result. In routine analysis, such replication is not carried out, and it is not possible to report a Gaussian standard deviation. With counting procedures, however, it is possible to estimate a Poisson standard deviation directly from the count. Data are commonly reported as the measured value ± one or two Poisson standard deviations. The reported values are then considered to give some indication of the range in which the true value might be expected to occur.

A LLD is the smallest amount of sample activity that will yield a net count for which there is confidence at a predetermined level that activity is present. LLDs are calculated values for individual radionuclides based on a number of different factors including sample size, counting efficiency and background count rate of the instrument, the background and sample counting time, the decay time, and the chemical recovery of the analytical procedures. A minimum detectable activity value (MDA) is the smallest amount of activity that can be detected in an actual sample and uses the values obtained from the instrument and outcome of the analytical process. Therefore, the MDA values may differ from the calculated LLD values if the sample size and chemical recovery, decay values, or the instrument efficiency, background, or count time differed from those used in the LLD calculation.

The factors governing the calculation of the LLD and MDA values are discussed below:

1. Sample Size

2. Counting Efficiency

The fundamental quantity in the measurement of a radioactive substance is the number of disintegrations per unit time. As with most physical measurements in analytical chemistry, an absolute measurement of the disintegration rate is seldom possible, rather it is necessary to compare the sample with one or more standards. The standards determine the counter efficiency that may then be used to convert sample counts per minute (cpm) to disintegrations per minute (dpm).

3. Background Count Rate

Any counter will show a certain counting rate without a sample in position. This background counting rate comes from several sources: 1) natural environmental radiation from the surrounding materials, 2) cosmic radiation, and 3) the natural radioactivity in the counter material itself. The background counting rate will depend on the amounts of these types of radiation and the sensitivity of the counter to the radiation.

4. Background and Sample Counting Time

The amount of time devoted to the counting of the background depends on the level of activity being measured. In general, with low level samples, this time should be about equal to that devoted to counting a sample.

5. Time Interval between Sample Collection and Counting

Decay measurements are useful in identifying certain short-lived nuclides. The disintegration constant is one of the basic characteristics of a specific radionuclide and is readily determined, if the half-life is sufficiently short. To ensure the required LLDs are achieved, appropriate decay correction values are used to account for radioactive decay during transit time and sample processing.

Table 6.1 ODCM REQUIRED LOWER LIMITS OF DETECTION (*a priori*)

ANALYSIS/ NUCLIDE	WATER (pCi/liter)	AIRBORNE PARTICULATE or GAS (pCi/m^3)	MILK (pCi/liter)	VEGETATION (pCi/kg, wet)
Gross Beta	4	0.01		
H-3	2000*			
Mn-54	15			
Fe-59	30			
Co-58, 60	15			
Zn-65	30			
Zr-95	30			
Nb-95	15			
I-131	1**	0.07	1	60
Cs-134	15	0.05	15	60
Cs-137	18	0.06	18	80
Ba-140	60		60	
La-140	15		15	

* If no drinking water pathway exists, a value of 3000 pCi/liter may be used
** If no drinking water pathway exists, a value of 15 pCi/liter may be used

NOTES:
This list does not mean that only these nuclides are to be detected and reported. Other peaks that are measurable and identifiable, together with the above nuclides, shall also be identified and reported.

Table 6.2 ODCM REQUIRED REPORTING LEVELS

ANALYSIS/ NUCLIDE	WATER (pCi/liter)	AIRBORNE PARTICULATE or GAS (pCi/m^3)	MILK (pCi/liter)	VEGETATION (pCi/kg, wet)
H-3	20,000*			
Mn-54	1,000			
Fe-59	400			
Co-58	1,000			
Co-60	300			
Zn-65	300			
Zr/Nb-95	400			
I-131	2**	0.9	3	100
Cs-134	30	10	60	1,000
Cs-137	50	20	70	2,000
Ba/La-140	200		300	

The values in this table are quarterly average values, as stated in the ODCM.

NOTES:

* For drinking water samples. This is a 40CFR141 value. If no drinking water pathway exists, a value of 30,000 pCi/liter may be used

** If no drinking water pathway exists, a reporting level of 20 pCi/liter may be used

Table 6.3 TYPICAL MDA VALUES

ANALYSIS/ NUCLIDE	WATER (pCi/liter)	MILK (pCi/liter)	AIRBORNE PARTICULATE or GAS (pCi/m3)	VEGETATION (pCi/kg, wet)
Gross Beta	1.9		0.004	
H-3	340			
Mn-54	11			
Fe-59	21			
Co-58	10			
Co-60	12			
Zn-65	24			
Zr-95	19			
Nb-95	11			
I-131	9	1	0.04	50
Cs-134	11	1	0.003	49
Cs-137	11	1	0.003	58
Ba-140	36	4		
La-140	13	1		

NOTES:

a - low level I-131 is not required since there is no drinking water pathway
b - Based on 433 m^3, the normal weekly sample volume

7. Interlaboratory Comparison Program

7.1. Quality Control Program

APS maintains an extensive QA/QC Program to provide assurance that samples are collected, handled, tracked, and analyzed to specified requirements. This program includes appropriate elements of USNRC Regulatory Guide 4.15, Quality Assurance for Radiological Monitoring Programs (Normal Operations) - Effluent Streams and the Environment, Rev. 1. Included in the program are procedures for sample collection, preparation and tracking, sample analysis, equipment calibration and checks, and ongoing participation in an interlaboratory comparison program. Duplicate/replicate samples are analyzed to verify analytical precision and sample methodology. Comprehensive data reviews are performed including trending of data where appropriate.

During 2014, APS analyzed the following sample types under the interlaboratory comparison program;

- Beta/Gamma/ in Air Filter
- I-131 in Air
- Beta in Water
- Gamma in Water
- Tritium in Water
- Gamma in Milk

7.2. Intercomparison Results

APS participates in a crosscheck program using vendor supplied blind radionuclide samples. Results for the interlaboratory comparison program are presented in Table 7.1.

TABLE 7.1 INTERLABORATORY COMPARISON RESULTS

Sample ID	Analysis Type	Nuclide	Units	Known Value**	PVNGS Value	1 sigma Error	Resolution*	Ratio	NRC Range	Acceptable?
E10843	Gross Beta Filter	G. Beta	pCi/ea	8.85E+01	1.03E+02	7.20E+00	14	1.16	0.60 - 1.66	YES
E10845	I-131 Cartridge	I-131	pCi/ea	7.54E+01	7.70E+01	4.30E+00	18	1.02	0.75 - 1.33	YES
E10844	Gamma Filter	Ce-141	pCi/ea	5.36E+01	5.20E+01	3.67E+00	14	0.97	0.60 - 1.66	YES
		Cr-51	pCi/ea	2.21E+02	2.75E+02	2.78E+01	10	1.24	0.60 - 1.66	YES
		Cs-134	pCi/ea	9.47E+01	8.70E+01	6.00E+00	15	0.92	0.60 - 1.66	YES
		Cs-137	pCi/ea	1.14E+02	1.20E+02	8.20E+00	15	1.05	0.60 - 1.66	YES
		Co-58	pCi/ea	1.21E+02	1.23E+02	7.90E+00	16	1.02	0.75 - 1.33	YES
		Mn-54	pCi/ea	1.34E+02	1.46E+02	8.70E+00	17	1.09	0.75 - 1.33	YES
		Fe-59	pCi/ea	9.87E+01	1.00E+02	1.05E+01	10	1.01	0.60 - 1.66	YES
		Zn-65	pCi/ea	1.46E+02	1.37E+02	1.40E+01	10	0.94	0.60 - 1.66	YES
		Co-60	pCi/ea	1.52E+02	1.54E+02	8.90E+00	17	1.01	0.75 - 1.33	YES
E10842	Gamma Milk	I-131	pCi/L	1.65E+01	1.69E+01	1.82E+00	9	1.02	0.60 - 1.66	YES
		Ce-141	pCi/L	1.58E+01	1.70E+01	2.19E+00	8	1.08	0.60 - 1.66	YES
		Cr-51	pCi/L	6.51E+01	8.00E+01	1.06E+01	8	1.23	0.60 - 1.66	YES
		Cs-134	pCi/L	2.79E+01	2.83E+01	2.08E+00	14	1.01	0.60 - 1.66	YES
		Cs-137	pCi/L	3.36E+01	3.47E+01	2.36E+00	15	1.03	0.60 - 1.66	YES
		Co-58	pCi/L	3.55E+01	3.69E+01	2.48E+00	15	1.04	0.60 - 1.66	YES
		Mn-54	pCi/L	3.94E+01	4.10E+01	2.95E+00	14	1.04	0.60 - 1.66	YES
		Fe-59	pCi/L	2.90E+01	3.56E+01	3.52E+00	10	1.23	0.60 - 1.66	YES
		Zn-65	pCi/L	4.28E+01	4.53E+01	4.75E+00	10	1.06	0.60 - 1.66	YES
		Co-60	pCi/L	4.47E+01	4.30E+01	2.56E+00	17	0.96	0.75 - 1.33	YES
E10953	Gross Beta Water	G. Beta	pCi/L	2.50E+02	2.68E+02	6.00E+00	45	1.07	0.75 - 1.33	YES
E10954	Tritium	H-3	pCi/L	9.85E+03	9.73E+03	3.29E+02	30	0.99	0.75 - 1.33	YES

TABLE 7.1 INTERLABORATORY COMPARISON RESULTS

E10955	Gamma Water	I-131	pCi/L	9.88E+01	7.67E+01	5.47E+00	14	0.78	0.60 - 1.66	YES
		Ce-141	pCi/L	1.25E+02	9.70E+01	4.33E+00	22	0.78	0.75 - 1.33	YES
		Cr-51	pCi/L	2.86E+02	2.13E+02	2.17E+01	10	0.74	0.60 - 1.66	YES
		Cs-134	pCi/L	1.56E+02	1.14E+02	4.80E+00	24	0.73	0.75 - 1.33	NO
		Cs-137	pCi/L	1.92E+02	1.49E+02	5.80E+00	26	0.78	0.75 - 1.33	YES
		Co-58	pCi/L	1.42E+02	1.08E+02	4.90E+00	22	0.76	0.75 - 1.33	YES
		Mn-54	pCi/L	1.41E+02	1.09E+02	5.00E+00	22	0.77	0.75 - 1.33	YES
		Fe-59	pCi/L	1.57E+02	1.33E+02	8.40E+00	16	0.85	0.75 - 1.33	YES
		Zn-65	pCi/L	7.24E+01	6.08E+01	5.94E+00	10	0.84	0.60 - 1.66	YES
		Co-60	pCi/L	2.95E+02	2.35E+02	8.30E+00	28	0.80	0.75 - 1.33	YES
E10956	I-131 Cartridge	I-131	pCi/ea	9.00E+01	8.68E+01	3.69E+00	24	0.96	0.75 - 1.33	YES
E10957	Gamma Filter	Ce-141	pCi/ea	8.39E+01	8.97E+01	4.26E+00	21	1.07	0.75 - 1.33	YES
		Cr-51	pCi/ea	1.92E+02	2.21E+02	2.02E+01	11	1.15	0.60 - 1.66	YES
		Cs-134	pCi/ea	1.05E+02	8.82E+01	5.04E+00	18	0.84	0.75 - 1.33	YES
		Cs-137	pCi/ea	1.28E+02	1.42E+02	7.60E+00	19	1.11	0.75 - 1.33	YES
		Co-58	pCi/ea	9.51E+01	1.01E+02	6.00E+00	17	1.06	0.75 - 1.33	YES
		Mn-54	pCi/ea	9.43E+01	1.13E+02	6.50E+00	17	1.20	0.75 - 1.33	YES
		Fe-59	pCi/ea	1.05E+02	1.36E+02	1.01E+01	13	1.30	0.60 - 1.66	YES
		Zn-65	pCi/ea	4.85E+01	6.46E+01	6.66E+00	10	1.33	0.60 - 1.66	YES
		Co-60	pCi/ea	1.98E+02	2.14E+02	1.02E+01	21	1.08	0.75 - 1.33	YES

* calculated from PVNGS value/1 sigma error value

** Eckert & Ziegler Analytics, Inc. NIST-traceable known value

NRC Acceptance Criteria [1]

Resolution	Ratio
4-7	0.5-2.0
8-15	0.6-1.66
16-50	0.75-1.33
51-200	0.80-1.25
>200	0.85-1.18

[1] From NRC Inspection Manual, procedure #84750, "Radioactive Waste Systems; Water Chemistry; Confirmatory Measurements"

TABLE 7.1 INTERLABORATORY COMPARISON RESULTS

Sample Type	Analysis Type	ERA PT Study	Nuclide	Units	PVNGS Value	Assigned Value [1]	Acceptance Limit [2]	Results
Water	Gross Beta	RAD-97	g beta	pCi/L	36.2	33	21.4 - 40.7	Acceptable
Water	Tritium	RAD-97	H-3	pCi/L	8,790	8,770	7610 - 9550	Acceptable
Water	Gamma	RAD-97	Ba-133	pCi/L	92.2	87.9	74.0 - 96.7	Acceptable
			Cs-134	pCi/L	41.7	44.3	35.5 - 48.7	Acceptable
			Cs-137	pCi/L	91.2	89.1	80.2 - 101	Acceptable
			Co-60	pCi/L	64.3	64.2	57.8 - 73.1	Acceptable
			Zn-65	pCi/L	258	235	212 - 275	Acceptable
Filter	Gross Beta	MRAD-21	g beta	pCi/ea	28.2	21.1	13.3 - 30.8	Acceptable

[1] The ERA assigned values are established per the guidelines contained in the National Environmental Laboratory Accreditation Conference (NELAC) program criteria as applicable.

[2] "Acceptance Limits" have been calculated per ERA's Standard Operating Procedure for the Generation of Performance Acceptance Limits.

8. Data Interpretations and Conclusions

Associated with the analytical process are potential random and systematic errors. Systematic errors can be caused by instrument malfunctions, incomplete precipitation, back scattering, and self-absorption. Random errors are beyond the control of the analyst.

Efforts are made to minimize both systematic and random errors in the data reported. Systematic errors are minimized by performing reviews throughout the analysis. For example, instruments are checked routinely with radioactive sources, and recovery and self-absorption factors based on individual sample analyses are incorporated into the calculation equations where necessary. Random errors are reduced by comparing all data to historical data for the same site and performing comparisons between analytical results when available. In addition, when data do not appear to match historical results, analyses may be rerun on a separate aliquot of the sample to verify the presence of the activity. The acceptance of data is dependent upon the results of quality control samples and is part of the data review process for all analytical results.

The "plus or minus value" reported with each analytical result represents the counting error associated with the result and gives the 95% confidence (2σ) interval around the data.

Most samples contain radioactivity associated with natural background/cosmic radioactivity (e.g. K-40, Th-234, and Be-7). Gross beta results for drinking water and air are due to natural background. Gamma emitting radionuclides, which can be attributed to natural background sources, are not indicated in this report.

Results and interpretation of the data for all of the samples analyzed during 2014 are presented in the following sections.

8.1. Air Particulates

Weekly gross beta results, in quarterly format, are presented in Tables 8.1 and 8.2. Gross beta activity at indicator locations ranged from 0.010 to 0.071 pCi/m^3. Mean quarterly activity is normally calculated using weekly activity over a thirteen (13) week period. Also presented in the tables are the weekly mean values of all the sites as well as the percent relative standard deviation (RSD %) for the data.

Tables 8.3 displays the results of gamma spectroscopy on the quarterly composites of the weekly samples.

8.2. Airborne Radioiodine

Tables 8.4 and 8.5 present the quarterly radioiodine results. Radioiodine was not observed in any samples.

8.3. Vegetation

Table 8.6 presents gamma isotopic data for the vegetation samples. No gamma emitting radionuclides were observed in any of the samples.

8.4. Milk

Table 8.7 presents gamma isotopic data for the goat milk samples. No gamma emitting radionuclides were observed in any of the samples.

8.5. Drinking Water

Samples were analyzed for gross beta, tritium, and gamma emitting radionuclides. Results of these analyses are presented in Table 8.8. No tritium or gamma emitting radionuclides were detected in any samples. Gross beta activity ranged from less than detectable to a high of 6.6 pCi/liter. The gross beta activity is attributable to natural (background) radioactive materials.

8.6. Ground Water

Ground water samples were analyzed from two onsite wells (regional aquifer) for tritium and gamma emitting radionuclides. Results obtained from the analysis of the samples are presented in Table 8.9.

No tritium or gamma emitting radionuclides were observed in any of the samples.

8.7. Surface Water

Surface water samples from the Reservoirs and Evaporation Ponds were analyzed for tritium and gamma emitting radionuclides. The two Reservoirs contain processed sewage water from the City of Phoenix and are approximately 45 and 85 acres in size. The three Evaporation Ponds receive mostly circulating water from main turbine condenser cooling and are about 200-250 acres each.

Sample results are presented in Table 8.10. I-131 was observed in both reservoirs and Evaporation Ponds 1A, 1B, and 2A. The I-131 levels ranged from 14 pCi/L – 42 pCi/L. I-131 in these surface water locations is a result of radiopharmaceutical I-131 in the Phoenix sewage effluent and is not attributable to plant effluents.

Tritium was routinely observed in the Evaporation Ponds. The highest concentration was 2640 pCi/liter. Tritium was not detected in the Reservoirs. The tritium identified in the Evaporation Ponds has been attributed to permitted plant gaseous effluent releases and secondary plant liquid discharges (e.g. condensate overboard discharge, secondary side steam generator drains, secondary plant sumps, demineralizer regeneration waste). The tritium concentrations were compared to historical values and are considered typical for the Evaporation Ponds.

WRF Influent (Phoenix sewage effluent containing radiopharmaceutical I-131) samples collected by the WRF were analyzed for gamma emitting radionuclides and tritium. The results, presented in Table 8.10, demonstrate that I-131 was observed routinely. The I-131 concentration ranged from less than detectable to 59 pCi/liter. None of the samples analyzed indicated the presence of tritium.

Table 8.10 also presents gamma spectroscopy and tritium measurements of samples collected from Sedimentation Basin 2. This basin collects rain water from site runoff and was dry for most of the year. Low concentrations of tritium were identified in two (2) of eleven (11) samples ranging from less than detectable to 534 pCi/liter. The tritium was attributed to rain washout of plant gaseous effluent releases. No gamma emitting radionuclides were observed in the samples.

8.8. Sludge and Sediment

8.8.1. WRF Centrifuge waste sludge

Sludge samples were obtained from the WRF centrifuge and analyzed by gamma spectroscopy. I-131 activity in the sludge is consistent with historical values and, as previously discussed, is due to radiopharmaceuticals in the WRF Influent. The concentration of I-131 ranged from 202 to 843 pCi/kg.

In-111 was also identified in the sludge in one sample at 139 pCi/kg. It was previously established that In-111 is also used in the Phoenix area as a radiopharmaceutical.

Results for WRF centrifuge waste sludge can be found in Table 8.11.

8.8.2. Cooling Tower sludge

Sludge/sediment originating from the Unit 1 and Unit 2 Cooling Towers and Circulating Water canals was disposed of in the WRF sludge landfill during 2014. Sample results can be found in Table 8.11.

8.9. Data Trends

Figures 8.1-8.8 present data in graphical format. Historical data are displayed for comparison where practical.

8.10. Hard-to-Detect Radionuclide Results

Table 8.12 shows the results of the three subsurface samples obtained from 3 tritium monitoring points. These samples were analyzed for hard-to-detect radionuclides (e.g. C-14, Fe-55, Ni-63, Sr-90) and all results were <MDA. These results indicate that no leaks from plant systems have affected groundwater.

TABLE 8.1 PARTICULATE GROSS BETA IN AIR 1st - 2nd QUARTER

ODCM required samples denoted by *

units are pCi/m^3

1st Quarter

Week #	START DATE	STOP DATE	Site 4	(control) Site 6A*	Site 7A	Site 14A*	Site 15*	Site 17A	Site 21	Site 29*	Site 35	Site 40*	Mean	RSD (%)
1	30-Dec-13	7-Jan-14	0.049	0.054	0.046	0.043	0.042	0.043	0.047	0.047	0.040	0.043	0.045	8.8
2	7-Jan-14	14-Jan-14	0.048	0.046	0.046	0.043	0.043	0.042	0.045	0.043	0.041	0.047	0.044	4.9
3	14-Jan-14	21-Jan-14	0.040	0.043	0.037	0.036	0.036	0.034	0.040	0.037	0.035	0.036	0.037	7.9
4	21-Jan-14	28-Jan-14	0.062	0.063	0.063	0.059	0.063	0.061	0.064	0.052	0.058	0.066	0.061	6.4
5	28-Jan-14	4-Feb-14	0.033	0.033	0.032	0.030	0.027	0.031	0.035	0.030	0.028	0.033	0.031	7.6
6	4-Feb-14	11-Feb-14	0.021	0.020	0.022	0.018	0.018	0.018	0.019	0.017	0.017	0.022	0.019	9.7
7	11-Feb-14	18-Feb-14	0.036	0.038	0.036	0.034	0.033	0.036	0.035	0.035	0.032	0.034	0.035	5.6
8	18-Feb-14	24-Feb-14	0.037	0.039	0.036	0.036	0.037	0.037	0.031	0.041	0.036	0.029	0.036	9.9
9	24-Feb-14	4-Mar-14	0.023	0.026	0.026	0.023	0.024	**0.0363	0.025	0.026	0.022	0.025	0.024	5.8
10	4-Mar-14	11-Mar-14	0.017	0.020	0.019	0.016	0.019	0.018	0.015	0.020	0.020	0.020	0.018	9.5
11	11-Mar-14	18-Mar-14	0.026	0.028	0.025	0.027	0.027	0.027	0.023	0.025	0.025	0.026	0.026	5.5
12	18-Mar-14	25-Mar-14	0.028	0.029	0.032	0.028	0.031	0.033	0.027	0.027	0.028	0.025	0.029	7.9
13	25-Mar-14	1-Apr-14	0.023	0.023	0.024	0.023	0.024	0.022	0.023	0.023	0.024	0.023	0.023	2.4
Mean			0.034	0.036	0.034	0.032	0.032	0.034	0.033	0.033	0.031	0.033	0.033	3.7

2nd Quarter

Week #	START DATE	STOP DATE	Site 4	(control) Site 6A*	Site 7A	Site 14A*	Site 15*	Site 17A	Site 21	Site 29*	Site 35	Site 40*	Mean	RSD (%)
14	1-Apr-14	8-Apr-14	0.018	0.017	0.014	0.016	0.014	0.014	0.010	0.016	0.017	0.016	0.015	14.8
15	8-Apr-14	15-Apr-14	0.030	0.027	0.027	0.026	0.028	0.026	0.024	0.025	0.027	0.028	0.027	5.7
16	15-Apr-14	22-Apr-14	0.035	0.036	0.032	0.034	0.032	0.033	0.031	0.027	0.031	0.031	0.032	8.0
17	22-Apr-14	29-Apr-14	0.027	0.027	0.027	0.026	0.024	0.025	0.027	0.025	0.025	0.024	0.026	5.4
18	29-Apr-14	6-May-14	0.029	0.027	0.027	0.026	0.027	0.030	0.026	0.028	0.026	0.027	0.027	5.4
19	6-May-14	13-May-14	0.021	0.021	0.024	0.022	0.020	0.020	0.023	0.022	0.020	0.020	0.021	6.0
20	13-May-14	20-May-14	0.028	0.030	0.030	0.029	0.030	0.028	0.027	0.027	0.028	0.028	0.028	4.2
21	20-May-14	27-May-14	0.032	0.031	0.033	0.020	0.029	0.029	0.029	0.028	0.032	0.031	0.029	12.9
22	27-May-14	3-Jun-14	0.036	0.036	0.033	0.033	0.035	0.037	0.034	0.034	0.034	0.034	0.034	3.6
23	3-Jun-14	10-Jun-14	0.035	0.037	0.040	0.032	0.039	0.039	0.037	0.036	0.039	0.037	0.037	6.1
24	10-Jun-14	16-Jun-14	0.040	0.040	0.040	0.041	0.041	0.042	0.041	0.036	0.039	0.038	0.040	4.6
25	16-Jun-14	24-Jun-14	0.025	0.025	0.025	0.026	0.026	0.025	0.024	0.025	0.023	0.025	0.025	3.2
26	24-Jun-14	1-Jul-14	0.025	0.025	0.028	0.027	0.024	0.026	0.023	0.023	0.027	0.020	0.025	9.6
Mean			0.029	0.029	0.029	0.028	0.028	0.029	0.027	0.027	0.028	0.028	0.028	2.8

** Sample pump lost power, evaluated under CRDR 4509720

TABLE 8.2 PARTICULATE GROSS BETA IN AIR 3rd - 4th QUARTER

ODCM required samples denoted by *

units are pCi/m^3

3rd Quarter

Week #	START DATE	STOP DATE	Site 4	(control) Site 6A*	Site 7A	Site 14A*	Site 15*	Site 17A	Site 21	Site 29*	Site 35	Site 40*	Mean	RSD (%)
27	1-Jul-14	8-Jul-14	0.026	0.028	0.027	0.026	0.026	0.027	0.024	0.026	0.027	0.027	0.026	3.4
28	8-Jul-14	15-Jul-14	0.026	0.026	0.024	0.024	0.025	0.025	0.024	0.027	0.025	0.027	0.025	4.1
29	15-Jul-14	22-Jul-14	0.030	0.028	0.029	0.028	0.024	0.029	0.021	0.023	0.024	0.028	0.027	12.0
30	22-Jul-14	29-Jul-14	0.034	0.035	0.032	0.034	0.035	0.035	0.033	0.031	0.032	0.030	0.033	5.4
31	29-Jul-14	5-Aug-14	0.035	0.032	0.034	0.037	0.036	0.035	0.036	0.037	0.035	0.036	0.035	4.5
32	5-Aug-14	12-Aug-14	0.030	0.031	0.034	0.035	0.032	0.034	0.032	0.035	0.034	0.034	0.033	5.3
33	12-Aug-14	19-Aug-14	0.024	0.027	0.030	0.027	0.027	0.029	0.028	0.026	0.027	0.026	0.027	5.8
34	19-Aug-14	26-Aug-14	0.021	0.023	0.020	0.020	0.021	0.022	0.021	0.020	0.023	0.022	0.021	5.2
35	26-Aug-14	2-Sep-14	0.037	0.035	0.040	0.036	0.037	0.034	0.033	0.036	0.035	0.036	0.036	4.8
36	2-Sep-14	9-Sep-14	0.025	0.026	0.026	0.025	0.026	0.025	0.025	0.025	0.025	0.023	0.025	3.6
37	9-Sep-14	16-Sep-14	0.024	0.026	0.025	0.027	0.025	0.024	0.023	0.026	0.025	0.026	0.025	4.3
38	16-Sep-14	23-Sep-14	0.022	0.021	0.023	0.020	0.020	0.018	0.021	0.020	0.019	0.021	0.020	6.7
39	23-Sep-14	30-Sep-14	0.026	0.026	0.025	0.026	0.024	0.026	0.023	0.023	0.024	0.022	0.024	6.4
Mean			0.028	0.028	0.028	0.028	0.027	0.028	0.026	0.027	0.027	0.028	0.028	2.045

4th Quarter

Week #	START DATE	STOP DATE	Site 4	(control) Site 6A*	Site 7A	Site 14A*	Site 15*	Site 17A	Site 21	Site 29*	Site 35	Site 40*	Mean	RSD (%)
40	30-Sep-14	7-Oct-14	0.037	0.038	0.037	0.039	0.037	0.039	0.031	0.036	0.035	0.036	0.037	6.4
41	7-Oct-14	14-Oct-14	0.043	0.046	0.044	0.046	0.041	0.044	0.043	0.046	0.044	0.045	0.044	3.4
42	14-Oct-14	21-Oct-14	0.043	0.041	0.043	0.042	0.038	0.043	0.042	0.042	0.040	0.035	0.041	6.4
43	21-Oct-14	28-Oct-14	0.038	0.040	0.038	0.036	0.036	0.039	0.038	0.037	0.033	0.037	0.037	5.2
44	28-Oct-14	4-Nov-14	0.031	0.030	0.031	0.030	0.029	0.027	0.029	0.028	0.027	0.029	0.029	5.0
45	4-Nov-14	11-Nov-14	0.040	0.041	0.042	0.040	0.038	0.041	0.039	0.038	0.037	0.041	0.043	23.6
46	11-Nov-14	18-Nov-14	0.032	0.032	0.036	0.035	0.030	0.034	0.032	0.034	0.032	0.033	0.033	5.2
47	18-Nov-14	25-Nov-14	0.045	0.047	0.042	0.042	0.040	0.041	0.037	0.043	0.041	0.040	0.042	6.7
48	25-Nov-14	2-Dec-14	0.031	0.034	0.029	0.029	0.031	0.032	0.032	0.031	0.030	0.028	0.031	5.8
49	2-Dec-14	9-Dec-14	0.033	0.033	0.030	0.035	0.033	0.027	0.034	0.035	0.032	0.033	0.033	7.4
50	9-Dec-14	16-Dec-14	0.042	0.044	0.036	0.040	0.043	0.045	0.043	0.043	0.041	0.037	0.041	7.1
51	16-Dec-14	22-Dec-14	0.026	0.030	0.026	0.028	0.027	0.025	0.028	0.028	0.024	0.027	0.027	6.4
52	23-Dec-14	29-Dec-14	0.027	0.028	0.027	0.025	0.023	0.025	0.025	0.024	0.022	0.023	0.025	7.9
	Mean		0.036	0.037	0.035	0.036	0.034	0.038	0.035	0.036	0.034	0.034	0.036	3.7
	Annual Average		***0.0317***	***0.0325***	***0.0317***	***0.0309***	***0.0307***	***0.0319***	***0.0303***	***0.0306***	***0.0301***	***0.0305***	***0.0311***	***6.7206***

TABLE 8.3 GAMMA IN AIR FILTER COMPOSITES

ODCM required samples denoted by *

units are pCi/m^3

QUARTER ENDPOINT	NUCLIDE	Site 4	(control) Site 6A*	Site 7A	Site 14A*	Site 15*	Site 17A	Site 21	Site 29*	Site 35	Site 40*
25-Mar-14	Cs-134	<0.0023	<0.0050	<0.0030	<0.0022	<0.0040	<0.0024	<0.0040	<0.0020	<0.0036	<0.0028
	Cs-137	<0.0026	<0.0011	<0.0038	<0.0006	<0.0054	<0.0018	<0.0038	<0.0032	<0.0044	<0.0021
24-Jun-14	Cs-134	<0.0024	<0.0021	<0.0034	<0.0030	<0.0030	<0.0028	<0.0049	<0.0033	<0.0013	<0.0034
	Cs-137	<0.0026	<0.0033	<0.0046	<0.0045	<0.0025	<0.0037	<0.0028	<0.0046	<0.0023	<0.0024
30-Sep-14	Cs-134	<0.0018	<0.0027	<0.0034	<0.0015	<0.0022	<0.0019	<0.0040	<0.0018	<0.0034	<0.0015
	Cs-137	<0.0019	<0.0033	<0.0044	<0.0018	<0.0041	<0.0015	<0.0049	<0.0026	<0.0009	<0.0022
30-Dec-13	Cs-134	<0.0017	<0.0033	<0.0008	<0.0016	<0.0034	<0.0022	<0.0033	<0.0021	<0.0033	<0.0019
	Cs-137	<0.0021	<0.0032	<0.0046	<0.0020	<0.0052	<0.0022	<0.0046	<0.0016	<0.0044	<0.0028

TABLE 8.4 RADIOIODINE IN AIR 1st - 2nd QUARTER

ODCM required samples denoted by *

units are pCi/m^3

1st Quarter

Week #	START DATE	STOP DATE	Site 4	Site 6A* (control)	Site 7A	Site 14A*	Site 15* required LLD <0.070	Site 17A	Site 21	Site 29*	Site 35	Site 40*
1	30-Dec-13	7-Jan-14	<0.0261	<0.0405	<0.0482	<0.0233	<0.0482	<0.0240	<0.0428	<0.0263	<0.0564	<0.0161
2	7-Jan-14	14-Jan-14	<0.0592	<0.0365	<0.0557	<0.0507	<0.0210	<0.0426	<0.0359	<0.0344	<0.0450	<0.0260
3	14-Jan-14	21-Jan-14	<0.0318	<0.0529	<0.0592	<0.0329	<0.0561	<0.0353	<0.0499	<0.0428	<0.0678	<0.0323
4	21-Jan-14	28-Jan-14	<0.0357	<0.0459	<0.0467	<0.0187	<0.0329	<0.0443	<0.0367	<0.0586	<0.0366	<0.0629
5	28-Jan-14	4-Feb-14	<0.0287	<0.0565	<0.0330	<0.0580	<0.0263	<0.0499	<0.0336	<0.0402	<0.0216	<0.0577
6	4-Feb-14	11-Feb-14	<0.0181	<0.0466	<0.0549	<0.0183	<0.0524	<0.0312	<0.0585	<0.0296	<0.0465	<0.0200
7	11-Feb-14	18-Feb-14	<0.0443	<0.0460	<0.0461	<0.0458	<0.0552	<0.0249	<0.0144	<0.0320	<0.0606	<0.0298
8	18-Feb-14	25-Feb-14	<0.0365	<0.0603	<0.0665	<0.0079	<0.0653	<0.0323	<0.0490	<0.0343	<0.0662	<0.0226
9	25-Feb-14	4-Mar-14	<0.0281	<0.0336	<0.0441	<0.0263	<0.0564	<0.0395	<0.0579	<0.0207	<0.0447	<0.0179
10	4-Mar-14	11-Mar-14	<0.0216	<0.0531	<0.0615	<0.0406	<0.0327	<0.0265	<0.0375	<0.0348	<0.0352	<0.0349
11	11-Mar-14	18-Mar-14	<0.0364	<0.0282	<0.0685	<0.0354	<0.0360	<0.0344	<0.0626	<0.0319	<0.0603	<0.0267
12	18-Mar-14	25-Mar-14	<0.0209	<0.0523	<0.0343	<0.0245	<0.0493	<0.0300	<0.0565	<0.0299	<0.0560	<0.0328
13	25-Mar-14	1-Apr-14	<0.0279	<0.0635	<0.0486	<0.0306	<0.0414	<0.0202	<0.0508	<0.0242	<0.0496	<0.0323

2nd Quarter

Week #	START DATE	STOP DATE	Site 4	Site 6A* (control)	Site 7A	Site 14A*	Site 15* required LLD <0.070	Site 17A	Site 21	Site 29*	Site 35	Site 40*
14	1-Apr-14	8-Apr-14	<0.0240	<0.0422	<0.0618	<0.0255	<0.0520	<0.0443	<0.0471	<0.0338	<0.0417	<0.0231
15	8-Apr-14	15-Apr-14	<0.0512	<0.0483	<0.0387	<0.0571	<0.0485	<0.0622	<0.0685	<0.0463	<0.0500	<0.0500
16	15-Apr-14	22-Apr-14	<0.0369	<0.0496	<0.0232	<0.0432	<0.0220	<0.0672	<0.0233	<0.0379	<0.0259	<0.0539
17	22-Apr-14	29-Apr-14	<0.0580	<0.0666	<0.0688	<0.0699	<0.0694	<0.0603	<0.0456	<0.0289	<0.0616	<0.0376
18	29-Apr-14	6-May-14	<0.0335	<0.0540	<0.0617	<0.0247	<0.0538	<0.0335	<0.0621	<0.0391	<0.0484	<0.0302
19	6-May-14	13-May-14	<0.0305	<0.0668	<0.0512	<0.0190	<0.0625	<0.0447	<0.0648	<0.0386	<0.0678	<0.0329
20	13-May-14	20-May-14	<0.0350	<0.0620	<0.0484	<0.0337	<0.0611	<0.0277	<0.0444	<0.0127	<0.0567	<0.0272
21	20-May-14	27-May-14	<0.0632	<0.0364	<0.0324	<0.0508	<0.0311	<0.0663	<0.0382	<0.0468	<0.0260	<0.0640
22	27-May-14	3-Jun-14	<0.0540	<0.0228	<0.0510	<0.0308	<0.0127	<0.0188	<0.0638	<0.0456	<0.0563	<0.0267
23	3-Jun-14	10-Jun-14	<0.0304	<0.0120	<0.0429	<0.0238	<0.0427	<0.0239	<0.0577	<0.0274	<0.0674	<0.0359
24	10-Jun-14	16-Jun-14	<0.0345	<0.0615	<0.0594	<0.0337	<0.0662	<0.0350	<0.0632	<0.0319	<0.0510	<0.0286
25	16-Jun-17	24-Jun-14	<0.0292	<0.0443	<0.0537	<0.0285	<0.0455	<0.0241	<0.0516	<0.0162	<0.0394	<0.0237
26	24-Jun-14	1-Jul-14	<0.0365	<0.0662	<0.0296	<0.0333	<0.0424	<0.0537	<0.0285	<0.0604	<0.0068	<0.0473

TABLE 8.5 RADIOIODINE IN AIR 3rd – 4th QUARTER

ODCM required samples denoted by *

units are pCi/m^3

3rd Quarter

Week #	START DATE	STOP DATE	Site 4	(control) Site 6A*	Site 7A	Site 14A*	0.070 Site 15*	Site 17A	Site 21	Site 29*	Site 35	Site 40*
27	1-Jul-14	8-Jul-14	<0.0429	<0.0699	<0.0274	<0.0143	<0.0246	<0.0570	<0.0337	<0.0535	<0.0340	<0.0619
28	8-Jul-14	15-Jul-14	<0.0317	<0.0623	<0.0578	<0.0261	<0.0570	<0.0243	<0.0639	<0.237	<0.0357	<0.0323
29	15-Jul-14	22-Jul-14	<0.0258	<0.0345	<0.0395	<0.0128	<0.0498	<0.0275	<0.0431	<0.0372	<0.0431	<0.0126
30	22-Jul-14	29-Jul-14	<0.0190	<0.0207	<0.0653	<0.0331	<0.0317	<0.0223	<0.0506	<0.0183	<0.0493	<0.0267
31	29-Jul-14	5-Aug-14	<0.0295	<0.0436	<0.0426	<0.0354	<0.0543	<0.0288	<0.0452	<0.0185	<0.0486	<0.0272
32	5-Aug-14	12-Aug-14	<0.0332	<0.0608	<0.0547	<0.0233	<0.0573	<0.0248	<0.0483	<0.0194	<0.0688	<0.0244
33	12-Aug-14	19-Aug-14	<0.0310	<0.0666	<0.0552	<0.0315	<0.0541	<0.0323	<0.0501	<0.0199	<0.0660	<0.0222
34	19-Aug-14	26-Aug-14	<0.0342	<0.0561	<0.0410	<0.0322	<0.0418	<0.0226	<0.0560	<0.0532	<0.0512	<0.0477
35	26-Aug-14	2-Sep-14	<0.0244	<0.0568	<0.0485	<0.0329	<0.0554	<0.0319	<0.0575	<0.0276	<0.0556	<0.0228
36	2-Sep-14	9-Sep-14	<0.284	<0.0444	<0.0686	<0.236	<0.624	<0.0191	<0.0368	<0.0234	<0.422	<0.0306
37	9-Sep-14	16-Sep-14	<0.0280	<0.0488	<0.0217	<0.0468	<0.0319	<0.0468	<0.0314	<0.0681	<0.0229	<0.0596
38	16-Sep-14	23-Sep-14	<0.0247	<0.0660	<0.0337	<0.0353	<0.0585	<0.0194	<0.0689	<0.0267	<0.0642	<0.0401
39	23-Sep-14	30-Sep-14	<0.0342	<0.0437	<0.0341	<0.0301	<0.0435	<0.0197	<0.0133	<0.0324	<0.0600	<0.0271

4th Quarter

Week #	START DATE	STOP DATE	Site 4	(control) Site 6A*	Site 7A	Site 14A*	0.070 Site 15*	Site 17A	Site 21	Site 29*	Site 35	Site 40*
40	30-Sep-14	7-Oct-14	<0.0256	<0.0353	<0.0592	<0.0260	<0.0511	<0.0311	<0.0452	<0.0324	<0.0359	<0.0294
41	7-Oct-14	14-Oct-14	<0.0269	<0.0332	<0.0180	<0.0429	<0.0306	<0.0672	<0.0248	<0.0592	<0.0232	<0.0514
42	14-Oct-14	21-Oct-14	<0.0073	<0.0420	<0.0650	<0.0339	<0.0691	<0.0239	<0.0431	<0.0336	<0.0599	<0.0265
43	21-Oct-14	28-Oct-14	<0.0365	<0.0551	<0.0581	<0.0221	<0.0672	<0.0404	<0.0696	<0.0338	<0.0542	<0.0262
44	28-Oct-14	4-Nov-14	<0.0335	<0.0411	<0.0332	<0.0264	<0.0594	<0.0227	<0.0589	<0.0312	<0.0588	<0.0219
45	4-Nov-14	11-Nov-14	<0.0296	<0.0602	<0.0500	<0.0338	<0.0335	<0.0278	<0.0562	<0.0339	<0.0444	<0.0341
46	11-Nov-14	18-Nov-14	<0.0214	<0.0475	<0.0614	<0.0299	<0.0677	<0.0394	<0.0381	<0.0337	<0.0647	<0.0394
47	18-Nov-14	25-Nov-14	<0.0423	<0.0306	<0.240	<0.0342	<0.0369	<0.0541	<0.0479	<0.0455	<0.0362	<0.0685
48	25-Nov-14	2-Dec-14	<0.0418	<0.0697	<0.0399	<0.0427	<0.0461	<0.0222	<0.0408	<0.0250	<0.0386	<0.0312
49	2-Dec-14	9-Dec-14	<0.0585	<0.0343	<0.0132	<0.0072	<0.0559	<0.0293	<0.0367	<0.0247	<0.0564	<0.0295
50	9-Dec-14	16-Dec-14	<0.0284	<0.0645	<0.0533	<0.0267	<0.0514	<0.0316	<0.0595	<0.0347	<0.0528	<0.0223
51	16-Dec-14	22-Dec-14	<0.0372	<0.0425	<0.0332	<0.0436	<0.0478	<0.0465	<0.0408	<0.0233	<0.0334	<0.0221
52	23-Dec-14	29-Dec-14	<0.0412	<0.0310	<0.0482	<0.0317	<0.0179	<0.0538	<0.0303	<0.0590	<0.0489	<0.0240

TABLE 8.6 VEGETATION

ODCM required samples denoted by *
units are pCi/kg, wet

LOCATION	TYPE	DATE COLLECTED	<60 I-131	<60 Cs-134	<80 Cs-137
LOCAL RESIDENCE (Site #47)*	NONE AVAILABLE				
COMMERCIAL FARM (Site #62)*	Green Cabbage	16-Jan-14	<53	<52	<60
	Green Cabbage	13-Feb-14	<58	<51	<66
	Green Cabbage	13-Mar-14	<47	<57	<62
	Green Cabbage	09-Apr-14	<59	<55	<67
	Red Cabbage	09-Apr-14	<45	<42	<73
	Green Cabbage	08-May-14	<38	<28	<32
		17-Jul-14	None Available		
	Green Cabbage	16-Oct-14	<60	<43	<57
	Green Cabbage	14-Nov-14	<45	<56	<47
	Green Cabbage	12-Dec-14	<45	<59	<56

TABLE 8.7 MILK

ODCM required samples denoted by *
units are pCi/liter

SAMPLE LOCATION	DATE COLLECTED	<1 I-131	<15 Cs-134	<18 Cs-137	<60 Ba-140	<15 La-140
Local Resident Goats (Site #51)*	16-Jan-14	*No milk available due to small quantity				
	27-Feb-14	*No milk available due to small quantity				
	28-Mar-14	*No milk available due to small quantity				
	17-Apr-14	<1.00	<0.84	<0.96	<3.28	<0.99
	22-May-14	<1.00	<0.85	<0.99	<3.5014	<0.99
	09-Jun-14	<1.00	<0.84	<0.95	<3.34	<1.01
	17-Jul-14	<1.00	<0.82	<0.94	<3.26	<0.95
	13-Aug-14	<1.00	<0.85	<0.98	<3.41	<1.06
	18-Sep-14	<1.00	<0.79	<0.92	<3.38	<0.98
	16-Oct-14	<1.00	<0.80	<0.91	<3.28	<1.01
	20-Nov-14	<1.00	<0.81	<0.94	<3.27	<0.97
	14-Dec-14	<1.00	<0.80	<0.94	<3.29	<1.03
Local Resident Goats (Site #53)*	16-Jan-14	*No milk available due to small quantity				
	27-Feb-14	<1.00	<0.82	<0.94	<3.31	<0.98
	28-Mar-14	<1.00	<0.83	<0.95	<3.33	<1.01
	24-Apr-14	<1.00	<0.81	<0.95	<3.35	<1.00
	15-May-14	<1.00	<0.86	<0.98	<3.35	<0.95
	26-Jun-14	<1.00	<0.83	<0.98	<3.37	<1.02
	24-Jul-14	<1.00	<0.85	<0.97	<3.44	<0.99
	28-Aug-14	<1.00	<0.86	<1.00	<1.39	<1.02
	26-Sep-14	<1.00	<0.83	<0.97	<3.36	<1.02
	23-Oct-14	<1.00	<0.83	<0.98	<3.33	<0.98
	20-Nov-14	<1.00	<0.80	<0.91	<3.37	<0.93
	14-Dec-14	<1.00	<0.78	<0.93	<3.38	<0.98
Local Resident Goats (Site #54)	16-Jan-14	<1.00	<0.84	<0.97	<3.38	<1.01
	13-Feb-14	<1.00	<0.80	<0.94	<3.27	<0.97
	13-Mar-14	<1.00	<0.81	<0.93	<3.32	<1.00
	09-Apr-14	<1.00	<0.84	<0.98	<3.37	<0.97
	08-May-14	<1.00	<0.82	<0.96	<3.31	<1.01
	12-Jun-14	<1.00	<0.84	<0.98	<3.33	<0.96
	10-Jul-14	<1.00	<0.79	<0.94	<3.28	<0.93
	07-Aug-14	<1.00	<0.99	<1.08	<3.65	<1.07
	10-Sep-14	<1.00	<0.87	<1.02	<3.46	<1.05
	09-Oct-14	<1.00	<0.82	<0.94	<3.34	<1.00
	05-Nov-14	<1.00	<0.84	<1.00	<3.44	<1.00
	14-Dec-14	<1.00	<0.82	<0.97	<3.44	<0.96

TABLE 8.8 DRINKING WATER

ODCM required samples denoted by *
units are pCi/liter

SAMPLE LOCATION	MONTH ENDPOINT	<15 Mn-54	<15 Co-58	<30 Fe-59	<15 Co-60	<30 Zn-65	<15 Nb-95	<30 Zr-95	<15 I-131	<15 Cs-134	<18 Cs-137	<60 Ba-140	<15 La-140	<2000 Qtrly Tritium	<4.0 Gross Beta
LOCAL RESIDENCE (Site #48) *	28-Jan-14	<12	<13	<28	<12	<25	<11	<17	<10	<12	<9	<38	<14		<3.29
	24-Feb-14	<12	<11	<24	<12	<21	<13	<20	<10	<13	<12	<39	<15		<2.15
	25-Mar-14	<12	<12	<27	<11	<25	<12	<19	<11	<11	<12	<40	<15	<335	<1.95
	29-Apr-14	<12	<12	<24	<13	<24	<12	<21	<10	<13	<12	<36	<15		<2.05
	27-May-14	<12	<10	<25	<14	<24	<12	<20	<9	<9	<12	<37	<15		<3.18
	24-Jun-14	<12	<13	<29	<12	<27	<12	<20	<10	<11	<12	<38	<15	<327	3.31 ± 1.97
	29-Jul-14	<14	<11	<26	<15	<25	<11	<16	<12	<10	<10	<38	<13		4.07 ± 2.04
	26-Aug-14	<10	<10	<19	<11	<26	<11	<18	<9	<10	<12	<37	<15		<3.74
	30-Sep-14	<13	<10	<23	<9	<21	<15	<22	<12	<14	<15	<44	<14	<331	<3.79
	28-Oct-14	<11	<12	<21	<15	<30	<14	<22	<14	<12	<13	<45	<14		<3.65
	24-Nov-14	<12	<11	<20	<11	<22	<11	<22	<11	<11	<12	<34	<15		4.85 ± 2.03
	29-Dec-14	<10	<12	<24	<13	<25	<11	<20	<10	<10	<12	<40	<15	<333	4.27 ± 2.28
LOCAL RESIDENCE (Site #55)	28-Jan-14	<12	<11	<26	<15	<22	<13	<20	<13	<11	<13	<43	<14		6.5 ± 1.7
	24-Feb-14	<10	<8	<19	<10	<18	<9	<15	<9	<9	<10	<28	<12		4.05 ± 1.59
	25-Mar-14	<10	<9	<19	<9	<26	<11	<16	<9	<9	<12	<36	<15	<335	4.35 ± 1.52
	29-Apr-14	<13	<12	<28	<15	<23	<12	<20	<11	<10	<10	<35	<14		6.19 ± 1.65
	27-May-14	<10	<11	<25	<15	<24	<9	<17	<11	<10	<11	<38	<13		3.04 ± 1.39
	24-Jun-14	<13	<12	<25	<13	<18	<12	<20	<11	<11	<13	<42	<15	<324	6.58 ± 1.56
	29-Jul-14	<12	<12	<24	<11	<30	<15	<21	<13	<11	<14	<41	<8		3.63 ±1.44
	26-Aug-14	<14	<11	<25	<14	<27	<14	<20	<12	<11	<13	<41	<15		3.36 ±1.44
	30-Sep-14	<12	<9	<19	<13	<22	<10	<19	<10	<10	<11	<35	<15	<332	2.72 ± 1.52
	28-Oct-14	<13	<14	<19	<12	<24	<15	<24	<11	<12	<11	<55	<15		3.49 ± 1.63
	25-Nov-14	<11	<8	<20	<12	<25	<9	<17	<10	<8	<10	<36	<15		5.98 ± 1.52
	30-Dec-14	<11	<11	<21	<14	<28	<13	<22	<9	<11	<12	<36	<14	<334	3.55 ± 1.63

TABLE 8.8 DRINKING WATER

ODCM required samples denoted by *

units are pCi/liter

SAMPLE LOCATION	MONTH ENDPOINT	<15 Mn-54	<15 Co-58	<30 Fe-59	<15 Co-60	<30 Zn-65	<15 Nb-95	<30 Zr-95	<15 I-131	<15 Cs-134	<18 Cs-137	<60 Ba-140	<15 La-140	<2000 Qtrly Tritium	<4.0 Gross Beta
LOCAL RESIDENCE (Site #46) *	28-Jan-14	<9	<13	<23	<14	<22	<12	<17	<10	<10	<11	<37	<13		2.1 ± 1.3
	24-Feb-14	<13	<11	<21	<14	<23	<13	<19	<12	<11	<13	<37	<15		<1.36
	25-Mar-14	<10	<10	<20	<12	<25	<10	<19	<10	<9	<10	<36	<14	<339	2.89 ± 1.35
	29-Apr-14	<13	<11	<23	<11	<28	<12	<24	<12	<11	<13	<44	<12		3.29 ± 1.42
	27-May-14	<11	<12	<28	<8	<24	<13	<17	<11	<11	<12	<46	<15		<1.97
	24-Jun-14	<14	<10	<26	<13	<27	<12	<24	<11	<8	<14	<42	<15	<324	3.67 ± 1.36
	29-Jul-14	<15	<13	<27	<14	<28	<14	<26	<13	<11	<15	<47	<15		3.62 ± 1.39
	26-Aug-14	<13	<11	<16	<11	<26	<13	<23	<13	<11	<11	<37	<15		<2.35
	30-Sep-14	<13	<11	<19	<10	<27	<12	<30	<13	<10	<13	<35	<15	<335	<2.26
	28-Oct-14	<9	<11	<29	<13	<30	<12	<19	<12	<11	<12	<38	<13		<2.37
	25-Nov-14	<11	<9	<19	<11	<20	<11	<18	<10	<10	<9	<36	<15		4.78 ± 1.37
	30-Dec-14	<13	<12	<26	<14	<25	<12	<22	<11	<13	<13	<44	<15	<332	2.66 ± 1.49
LOCAL RESIDENCE (Site #49) *	28-Jan-14	<9	<9	<16	<10	<21	<10	<18	<9	<9	<9	<30	<15		2.1 ± 1.3
	24-Feb-14	<9	<10	<18	<15	<22	<12	<18	<10	<10	<12	<32	<13		<1.28
	25-Mar-14	<13	<13	<23	<14	<30	<14	<20	<12	<11	<14	<49	<12	<340	<1.22
	29-Apr-14	<11	<12	<23	<15	<28	<13	<20	<11	<12	<13	<31	<15		<1.31
	27-May-14	<13	<11	<26	<11	<25	<11	<18	<10	<10	<11	<40	<15		<1.97
	24-Jun-14	<10	<10	<20	<9	<17	<8	<15	<8	<9	<11	<27	<15	<324	2.20 ± 1.27
	29-Jul-14	<12	<14	<26	<12	<24	<11	<20	<12	<12	<13	<44	<15		2.92 ± 1.34
	26-Aug-14	<11	<13	<30	<13	<30	<12	<25	<11	<10	<13	<45	<12		<2.32
	30-Sep-14	<8	<8	<16	<8	<15	<8	<15	<9	<8	<10	<33	<12	<334	<2.25
	28-Oct-14	<15	<12	<25	<14	<22	<13	<19	<10	<10	<13	<44	<13		<2.39
	25-Nov-14	<11	<13	<21	<14	<27	<12	<20	<13	<11	<12	<44	<15		1.98 ± 1.22
	30-Dec-14	<12	<13	<19	<13	<20	<10	<18	<11	<11	<11	<42	<15	<335	<2.25

TABLE 8.9 GROUNDWATER

ODCM required samples denoted by *
units are pCi/liter

SAMPLE LOCATION	DATE COLLECTED	<15 Mn-54	<15 Co-58	<30 Fe-59	<15 Co-60	<30 Zn-65	<15 Nb-95	<30 Zr-95	<15 I-131	<15 Cs-134	<18 Cs-137	<60 Ba-140	<15 La-140	<2000 Tritium
WELL 27ddc (Site #57)*	28-Jan-14	<9	<10	<24	<11	<22	<12	<17	<11	<9	<9	<35	<15	<345
	29-Apr-14	<11	<9	<22	<11	<25	<13	<18	<11	<10	<10	<37	<15	<344
	29-Jul-14	<12	<11	<20	<10	<22	<12	<18	<12	<11	<11	<43	<15	<319
	28-Oct-14	<12	<11	<21	<13	<24	<11	<19	<11	<10	<11	<39	<15	<323
WELL 34abb (Site #58)*	28-Jan-14	<12	<10	<18	<13	<21	<13	<16	<14	<9	<9	<43	<12	<348
	29-Apr-14	<11	<10	<20	<12	<22	<11	<16	<9	<9	<10	<33	<15	<344
	29-Jul-14	<10	<10	<26	<15	<25	<11	<19	<11	<11	<13	<44	<15	<322
	28-Oct-14	<10	<10	<20	<11	<23	<12	<20	<10	<10	<10	<36	<15	<322

TABLE 8.10 SURFACE WATER

ODCM required samples denoted by *

units are pCi/liter

SAMPLE LOCATION	DATE COLLECTED	<15 Mn-54	<15 Co-58	<30 Fe-59	<15 Co-60	<30 Zn-65	<15 Nb-95	<30 Zr-95	<15 I-131	<15 Cs-134	<18 Cs-137	<60 Ba-140	<15 La-140	<3000 Tritium
45 ACRE RESERVOIR (Site #61) *	28-Jan-14	<12	<12	<24	<11	<24	<11	<20	23 ± 10	<11	<12	<40	<14	<353
	29-Apr-14	<11	<11	<19	<12	<20	<10	<16	15 ± 10	<10	<11	<38	<14	<348
	29-Jul-14	<10	<10	<23	<13	<28	<14	<16	14 ± 9	<10	<11	<48	<13	<323
	28-Oct-14	No Sample due to liner inspection												
85 ACRE RESERVOIR (Site #60) *	28-Jan-14	<12	<9	<18	<13	<25	<11	<18	<11	<9	<10	<37	<15	<352
	29-Apr-14	<13	<12	<20	<15	<19	<9	<20	<14	<9	<10	<39	<15	<349
	29-Jul-14	<13	<10	<23	<13	<23	<10	<20	18 ± 10	<10	<12	<45	<15	<325
	28-Oct-14	<10	<10	<16	<15	<20	<13	<18	<14	<10	<12	<38	<15	<327
EVAP POND 1 (Site #59) * CELL 1A	28-Jan-14	<11	<11	<24	<14	<24	<12	<19	42 ± 15	<10	<12	<40	<15	2640 ± 244
	29-Apr-14	<11	<12	<24	<14	<22	<10	<16	<9	<10	<12	<35	<13	1866 ± 233
	29-Jul-14	<10	<11	<22	<14	<22	<10	<21	<10	<11	<11	<33	<15	1738 ± 222
	28-Oct-14	<9	<11	<25	<15	<19	<8	<16	<10	<10	<12	<34	<15	1396 ± 226
CELL 1B	28-Jan-14	<12	<12	<21	<12	<30	<11	<18	<9	<11	<11	<39	<14	1280 ± 221
	29-Apr-14	<11	<12	<26	<13	<27	<12	<18	14 ± 9	<10	<11	<40	<15	777 ± 215
	29-Jul-14	<12	<11	<22	<14	<25	<11	<21	<8	<11	<12	<38	<15	1190 ± 212
	28-Oct-14	<9	<9	<18	<11	<24	<11	<18	<8	<9	<12	<31	<10	781 ± 217
CELL 1C	28-Jan-14	<9	<11	<24	<15	<29	<11	<21	<10	<10	<12	<35	<13	797 ± 212
	29-Apr-14	<11	<12	<24	<15	<29	<12	<20	<10	<10	<10	<36	<13	806 ± 217
	29-Jul-14	<12	<11	<29	<15	<29	<12	<21	<11	<11	<14	<38	<10	687 ± 204
	28-Oct-14	<12	<10	<22	<12	<30	<10	<18	<9	<9	<12	<41	<13	395 ± 209

TABLE 8.10 SURFACE WATER

ODCM required samples denoted by *

units are pCi/liter

EVAP POND 2	28-Jan-14	<13	<12	<22	<14	<23	<13	<20	<12	<11	<15	<50	<15	727 ± 206
(Site #63) *	29-Apr-14	<13	<13	<27	<15	<25	<14	<20	<10	<11	<12	<38	<14	658 ± 213
CELL 2A	29-Jul-14	<11	<11	<26	<15	<26	<12	<21	<19 ± 11	<9	<11	<33	<15	929 ± 208
	28-Oct-14	<10	<10	<23	<11	<26	<10	<17	<10	<9	<11	<34	<15	698 ± 216
CELL 2B	28-Jan-14	<12	<9	<27	<10	<27	<13	<19	<12	<11	<12	<44	<15	718 ± 209
	29-Apr-14	<14	<12	<25	<13	<24	<15	<21	<14	<11	<12	<51	<13	798 ± 216
	29-Jul-14	<13	<12	<26	<15	<28	<10	<20	<10	<10	<14	<40	<14	817 ± 206
	28-Oct-14	<11	<10	<22	<15	<22	<12	<19	<11	<9	<11	<35	<12	422 ± 211
EVAP POND 3	28-Jan-14	<10	<11	<28	<14	<30	<11	<20	<12	<10	<14	<41	<11	695 ± 211
(Site #64) *	29-Apr-14	<12	<11	<26	<13	<30	<11	<20	<11	<9	<13	<38	<10	422 ± 208
CELL 3A	29-Jul-14	<11	<11	<26	<12	<30	<12	<18	<11	<9	<13	<32	<11	559 ± 202
	28-Oct-14	<12	<10	<28	<15	<28	<11	<19	<11	<9	<13	<38	<10	438 ± 211
CELL 3B	28-Jan-14	<11	<10	<26	<12	<30	<11	<18	<10	<8	<12	<38	<13	954 ± 214
	29-Apr-14	<11	<11	<25	<11	<30	<11	<18	<10	<9	<12	<37	<13	656 ± 213
	29-Jul-14	<13	<13	<24	<13	<27	<11	<20	<10	<11	<15	<37	<15	677 ± 204
	28-Oct-14	<10	<11	<27	<13	<30	<10	<19	<10	<9	<13	<36	<12	438 ± 212

TABLE 8.10 SURFACE WATER

ODCM required samples denoted by *
units are pCi/liter

SAMPLE LOCATION	DATE COLLECTED	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	I-131	Cs-134	Cs-137	Ba-140	La-140	Tritium **
WRF INFLUENT	7-Jan-14	<11	<10	<30	<13	<22	<15	<17	15 ± 11	<12	<10	<47	<14	
	14-Jan-14	<13	<15	<22	<13	<30	<14	<21	42 ± 12	<9	<14	<46	<13	
	21-Jan-14	<10	<11	<23	<12	<22	<13	<17	39 ± 10	<10	<11	<34	<15	
	28-Jan-14	<11	<11	<23	<13	<25	<13	<17	53 ± 15	<10	<12	<36	<15	<356
	4-Feb-14	<9	<8	<19	<10	<23	<10	<17	26 ± 8	<9	<10	<33	<13	
	11-Feb-14	<10	<12	<25	<15	<28	<9	<19	47 ± 14	<10	<11	<36	<14	
	17-Feb-14	<13	<11	<25	<13	<23	<9	<16	59 ± 14	<12	<12	<44	<13	
	24-Feb-14	<13	<9	<17	<15	<15	<9	<25	22 ± 10	<10	<15	<44	<15	<342
	4-Mar-14	<11	<10	<26	<9	<20	<11	<22	38 ± 13	<12	<14	<36	<15	
	11-Mar-14	<12	<13	<30	<14	<30	<14	<19	43 ± 14	<13	<12	<42	<11	
	18-Mar-14	<12	<10	<22	<13	<30	<9	<18	50 ± 12	<10	<10	<33	<10	
	25-Mar-14	<13	<13	<23	<9	<27	<12	<21	30 ± 13	<11	<12	<44	<15	<351
	1-Apr-14	<11	<13	<22	<12	<30	<12	<21	40 ± 12	<11	<12	<41	<13	
	8-Apr-14	<9	<11	<24	<15	<26	<11	<18	41 ± 15	<9	<11	<36	<12	
	15-Apr-14	WRF Out of Service												
	22-Apr-14	<12	<14	<22	<12	<23	<13	<23	42 ± 12	<10	<14	<39	<15	
	29-Apr-14	<9	<10	<21	<11	<23	<11	<16	16 ± 10	<10	<9	<35	<12	<354
	6-May-14	<12	<10	<22	<14	<20	<12	<19	19 ± 9	<11	<12	<34	<11	
	13-May-14	<12	<10	<22	<15	<28	<10	<20	44 ±12	<9	<13	<42	<13	
	20-May-14	<12	<11	<27	<12	<28	<12	<20	17 ± 9	<10	<12	<41	<13	
	27-May-14	<12	<11	<22	<11	<27	<13	<18	15 ± 9	<9	<14	<39	<15	<339
	3-Jun-14	<11	<12	<24	<15	<28	<12	<21	9 ± 9	<11	<10	<36	<14	
	10-Jun-14	<10	<9	<20	<12	<22	<10	<17	36 ± 10	<10	<9	<29	<15	
	16-Jun-14	<13	<11	<28	<9	<24	<12	<17	41 ± 13	<10	<12	<43	<15	
	24-Jun-14	<10	<9	<19	<10	<22	<9	<19	17 ± 9	<8	<10	<34	<12	<335
	1-Jul-14	<12	<11	<20	<12	<18	<11	<18	13 ± 10	<9	<10	<34	<15	
	8-Jul-14	<10	<9	<20	<12	<20	<9	<13	<10	<9	<9	<31	<15	
	15-Jul-14	<11	<13	<27	<15	<28	<13	<18	11 ± 9	<13	<12	<37	<11	
	22-Jul-14	<9	<10	<22	<14	<23	<11	<16	20 ± 12	<8	<9	<36	<15	

TABLE 8.10 SURFACE WATER

ODCM required samples denoted by *
units are pCi/liter

SAMPLE LOCATION	DATE COLLECTED	<15 Mn-54	<15 Co-58	<30 Fe-59	<15 Co-60	<30 Zn-65	<15 Nb-95	<30 Zr-95	<15 I-131	<15 Cs-134	<18 Cs-137	<60 Ba-140	<15 La-140	<3000 Tritium **
WRF INFLUENT	29-Jul-14	<10	<10	<22	<13	<30	<10	<18	13 ± 9	<9	<10	<38	<14	<332
	5-Aug-14	<11	<11	<21	<9	<26	<11	<21	48 ± 12	<10	<9	<36	<15	
	12-Aug-14	<11	<12	<23	<15	<27	<11	<15	22 ± 11	<10	<14	<36	<15	
	19-Aug-14	<11	<9	<24	<12	<22	<14	<18	14 ± 10	<9	<13	<41	<11	
	26-Aug-14	<15	<13	<28	<13	<29	<14	<24	48 ± 12	<15	<15	<52	<12	<340
	2-Sep-14	<15	<14	<30	<14	<28	<11	<17	30 ± 10	<12	<17	<48	<13	
	9-Sep-14	<11	<11	<20	<15	<27	<10	<20	25 ± 10	<9	<11	<38	<12	
	16-Sep-14	<11	<10	<23	<12	<24	<9	<17	8 ± 7	<9	<9	<32	<15	
	23-Sep-14	<11	<12	<18	<12	<29	<13	<21	22 ± 12	<12	<11	<43	<13	
	30-Sep-14	<10	<10	<20	<10	<24	<10	<20	15 ± 9	<10	<11	<33	<15	<342
	7-Oct-14	<10	<12	<24	<12	<20	<9	<15	11 ± 11	<10	<10	<29	<10	
	14-Oct-14	<14	<13	<25	<15	<29	<13	<20	16 ± 11	<11	<13	<50	<11	
	21-Oct-14	No Sample available due to WRF outage												
	28-Oct-14	<12	<10	<29	<9	<24	<11	<18	<12	<11	<10	<32	<12	<333
	4-Nov-14	<15	<9	<27	<13	<28	<9	<22	25 ± 13	<11	<13	<44	<14	
	12-Nov-14	<13	<9	<25	<13	<30	<13	<20	14 ± 11	<11	<13	<43	<11	
	18-Nov-14	<14	<11	<24	<13	<21	<10	<20	17 ± 11	<12	<10	<38	<14	
	24-Nov-14	<13	<13	<27	<11	<19	<13	<25	25 ± 17	<11	<9	<35	<15	<327
	2-Dec-14	<11	<10	<23	<15	<29	<10	<21	20 ± 11	<11	<12	<41	<14	
	9-Dec-14	<11	<9	<20	<9	<27	<12	<16	<12	<10	<13	<38	<15	
	16-Dec-14	<11	<10	<21	<14	<24	<12	<18	<11	<10	<10	<36	<15	
	23-Dec-14	<11	<11	<26	<15	<23	<12	<18	33 ± 14	<11	<12	<39	<14	
	29-Dec-14	<12	<13	<24	<11	<30	<12	<17	30 ± 14	<11	<13	<51	<14	<348

TABLE 8.10 SURFACE WATER

ODCM required samples denoted by *
units are pCi/liter

SAMPLE LOCATION	DATE COLLECTED	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	I-131	Cs-134	Cs-137	Ba-140	La-140	Tritium
SEDIMENTATION BASIN #2	7-Jan-14	<11	<10	<22	<10	<25	<12	<18	<10	<9	<11	<36	<15	<357
	14-Jan-14	<11	<11	<23	<14	<28	<13	<24	<12	<14	<15	<46	<13	534 ± 205
	21-Jan-14	*No samples available, basin was empty												
	28-Jan-14	*No samples available, basin was empty												
	4-Feb-14	*No samples available, basin was empty												
	11-Feb-14	*No samples available, basin was empty												
	18-Feb-14	*No samples available, basin was empty												
	24-Feb-14	*No samples available, basin was empty												
	4-Mar-14	<11	<11	<19	<14	<30	<8	<20	<10	<12	<14	<37	<14	<354
	11-Mar-14	<10	<9	<21	<12	<24	<10	<16	<8	<10	<10	<39	<15	<369
	18-Mar-14	<10	<12	<24	<14	<15	<11	<18	<10	<10	<11	<34	<12	<320
	25-Mar-14	<8	<8	<18	<9	<17	<8	<14	<8	<8	<8	<30	<11	<362
	1-Apr-14	*No samples available, basin was empty												
	8-Apr-14	*No samples available, basin was empty												
	15-Apr-14	*No samples available, basin was empty												
	22-Apr-14	*No samples available, basin was empty												
	29-Apr-14	*No samples available, basin was empty												
	6-May-14	*No samples available, basin was empty												
	13-May-14	*No samples available, basin was empty												
	20-May-14	*No samples available, basin was empty												
	27-May-14	*No samples available, basin was empty												
	3-Jun-14	*No samples available, basin was empty												
	10-Jun-14	*No samples available, basin was empty												
	16-Jun-14	*No samples available, basin was empty												
	24-Jun-14	*No samples available, basin was empty												

TABLE 8.10 SURFACE WATER

ODCM required samples denoted by *
units are pCi/liter

SAMPLE LOCATION	DATE COLLECTED	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	I-131	Cs-134	Cs-137	Ba-140	La-140	Tritium
SEDIMENTATION BASIN #2	1-Jul-14	*No samples available, basin was empty												
	8-Jul-14	*No samples available, basin was empty												
	15-Jul-14	*No samples available, basin was empty												
	22-Jul-14	*No samples available, basin was empty												
	29-Jul-14	*No samples available, basin was empty												
	5-Aug-14	*No samples available, basin was empty												
	12-Aug-14	*No samples available, basin was empty												
	19-Aug-14	*No samples available, basin was empty												
	26-Aug-14	<11	<8	<24	<13	<21	<11	<19	<10	<10	<11	<34	<15	391 ± 216
	2-Sep-14	*No samples available, basin was empty												
	9-Sep-14	<14	<11	<23	<11	<24	<10	<20	<10	<10	<12	<39	<14	<348
	16-Sep-14	<12	<9	<26	<9	<26	<11	<23	<10	<9	<13	<32	<13	<342
	23-Sep-14	*No samples available, basin was empty												
	30-Sep-14	<11	<11	<21	<13	<26	<12	<21	<11	<10	<10	<44	<15	<350
	7-Oct-14	<11	<11	<21	<12	<19	<10	<20	<9	<9	<9	<37	<15	<349
	14-Oct-14	*No samples available, basin was empty												
	21-Oct-14	*No samples available, basin was empty												
	28-Oct-14	*No samples available, basin was empty												
	4-Nov-14	*No samples available, basin was empty												
	12-Nov-14	*No samples available, basin was empty												
	18-Nov-14	*No samples available, basin was empty												
	24-Nov-14	*No samples available, basin was empty												
	2-Dec-14	*No samples available, basin was empty												
	9-Dec-14	*No samples available, basin was empty												
	16-Dec-14	*No samples available, basin was empty												
	22-Dec-14	*No samples available, basin was empty												
	29-Dec-14	*No samples available, basin was empty												

TABLE 8.11 SLUDGE/SEDIMENT

ODCM required samples denoted by *
units are pCi/kg, wet

SAMPLE LOCATION	DATE COLLECTED	<6,000 I-131	<150 Cs-134	<180 Cs-137	In-111
WRF CENTRIFUGE WASTE SLUDGE	7-Jan-14	272 ± 188	<143	<153	
	14-Jan-14	520 ± 171	<136	<165	
	21-Jan-14	514 ± 166	<136	<160	
	28-Jan-14	593 ± 181	<143	<147	
	4-Feb-14	622 ± 167	<113	<116	
	11-Feb-14	555 ± 214	<138	<168	
	17-Feb-14	843 ± 206	<144	<150	
	24-Feb-14	616 ± 199	<148	<161	
	4-Mar-14	762 ± 206	<149	<112	
	11-Mar-14	770 ± 181	<143	<142	
	18-Mar-14	457 ± 170	<142	<175	
	25-Mar-14	764 ± 173	<129	<173	
	1-Apr-14	534 ± 182	<128	<152	
	8-Apr-14	748 ± 186	<149	<145	
	15-Apr-14	WRF Out of Service			
	22-Apr-14	85 ± 95	<147	<138	
	29-Apr-14	267 ± 121	<104	<91	
	6-May-14	397 ± 152	<145	<172	
	13-May-14	528 ± 145	<145	<115	
	20-May-14	673 ± 220	<66	<176	
	27-May-14	688 ± 162	<90	<129	
	3-Jun-14	481 ± 159	<148	<149	
	10-Jun-14	243 ± 139	<120	<178	
	16-Jun-14	625 ± 193	<143	<121	139 ± 71
	24-Jun-14	764 ± 196	<140	<167	
	1-Jul-13	595 ± 202	<123	<170	
	8-Jul-14	500 ± 134	<104	<77	
	15-Jul-14	202 ± 156	<107	<162	
	22-Jul-14	333 ± 202	<149	<160	
	29-Jul-14	None Detected	<124	<165	
	5-Aug-14	641 ± 185	<149	<114	
	12-Aug-14	609 ± 217	<142	<160	
	19-Aug-14	592 ± 179	<148	<157	

TABLE 8.11 SLUDGE/SEDIMENT

SLUDGE/SEDIMENT

ODCM required samples denoted by *
units are pCi/kg, wet

SAMPLE LOCATION	DATE COLLECTED	I-131	Cs-134	Cs-137	In-111
WRF CENTRIFUGE WASTE SLUDGE	26-Aug-14	615 ± 193	<150	<120	
	2-Sep-14	828 ± 226	<146	<147	
	9-Sep-14	652 ± 178	<135	<179	
	16-Sep-14	535 ± 217	<148	<164	
	23-Sep-13	475 ± 147	<95	<134	
	30-Sep-14	495 ± 157	<132	<164	
	7-Oct-14	367 ± 166	<148	<100	
	14-Oct-14	487 ± 141	<95	<156	
	21-Oct-14		WRF Out of Service		
	28-Oct-14	359 ± 114	<64	<117	
	4-Nov-14	None Detected	<117	<168	
	12-Nov-14	463 ± 135	<119	<100	
	18-Nov-14	489 ± 192	<148	<149	
	24-Nov-14	580 ± 167	<84	<30	
	2-Dec-14	557 ± 179	<137	<170	
	9-Dec-14	624 ± 204	<122	<178	
	16-Dec-14	575 ± 184	<140	<164	
	23-Dec-14	289 ± 112	<86	<31	
	29-Dec-14	374 ± 188	<144	<143	
SEDIMENTATION BASIN #2	18-Nov-14	None Detected	<11	44 ±11	

TABLE 8.11 SLUDGE/SEDIMENT

COOLING TOWER SLUDGE

UNIT CYCLE	APPROXIMATE VOLUME (yd^3)	ISOTOPE	ACTIVITY RANGE (pCi/g)	SAMPLE TYPE
U2R18	351	All principal gamma emitters	<MDA	Towers/canal sludge
U1R18	369	All principal gamma emitters	<MDA	Towers/canal sludge

TABLE 8.12 HARD-TO-DETECT RADIONUCLIDE RESULTS

Units are pCi/liter

Sample Location	Well number	Sample Date	C-14	Fe-55	Ni-63	Sr-90
Unit 1 (outside RCA)	APP-12	11/10/2014	<139	<94.0	<3.68	<2.00
Unit 2 (inside RCA)	H0B	11/10/2014	<138	<97.5	<3.32	<1.92
Unit 3 (inside RCA)	H11	11/10/2014	<144	<97.7	<3.59	<1.47

FIGURE 8.1 GROSS BETA IN AIR, 1st-2nd Quarter

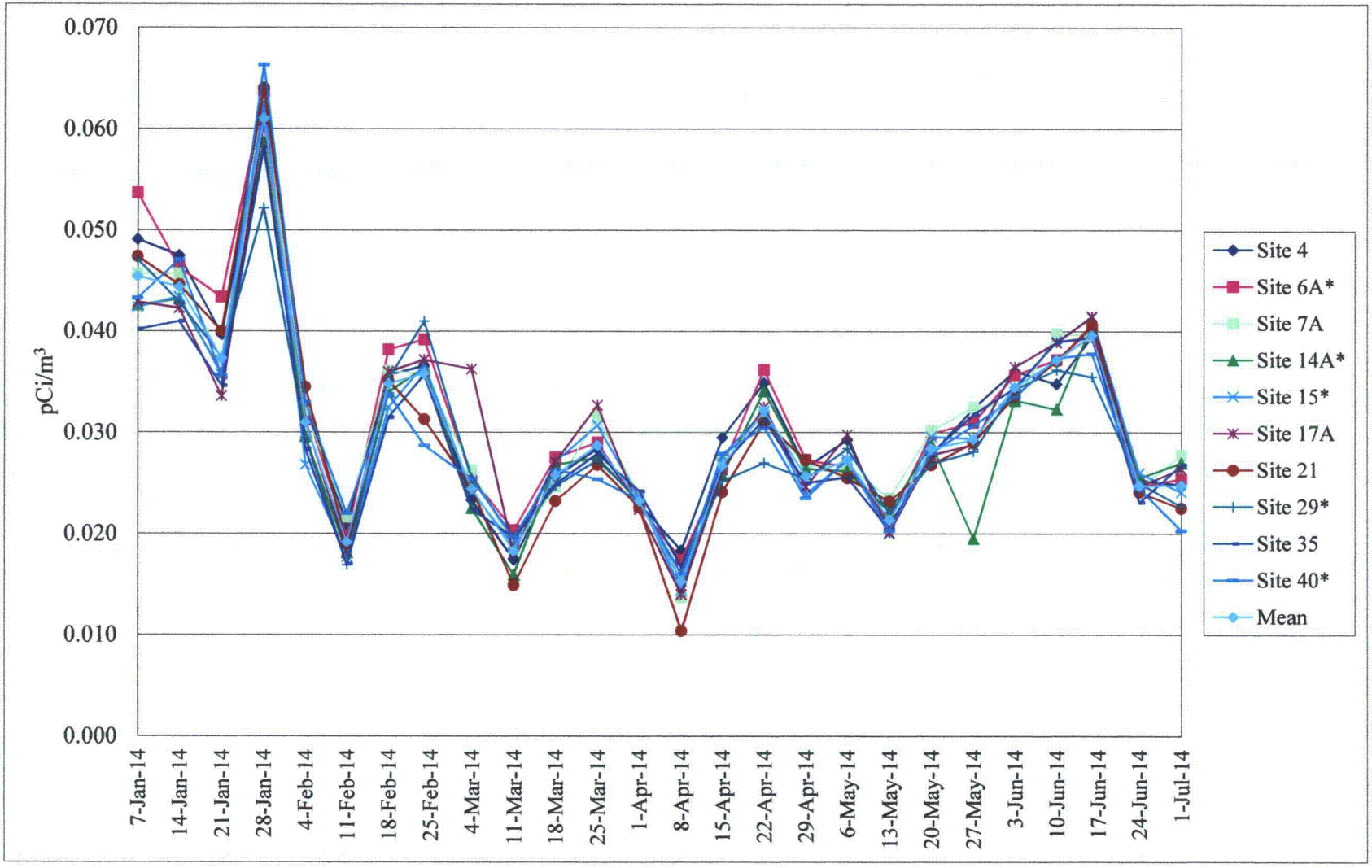


FIGURE 8.2 GROSS BETA IN AIR, 3rd-4th Quarter

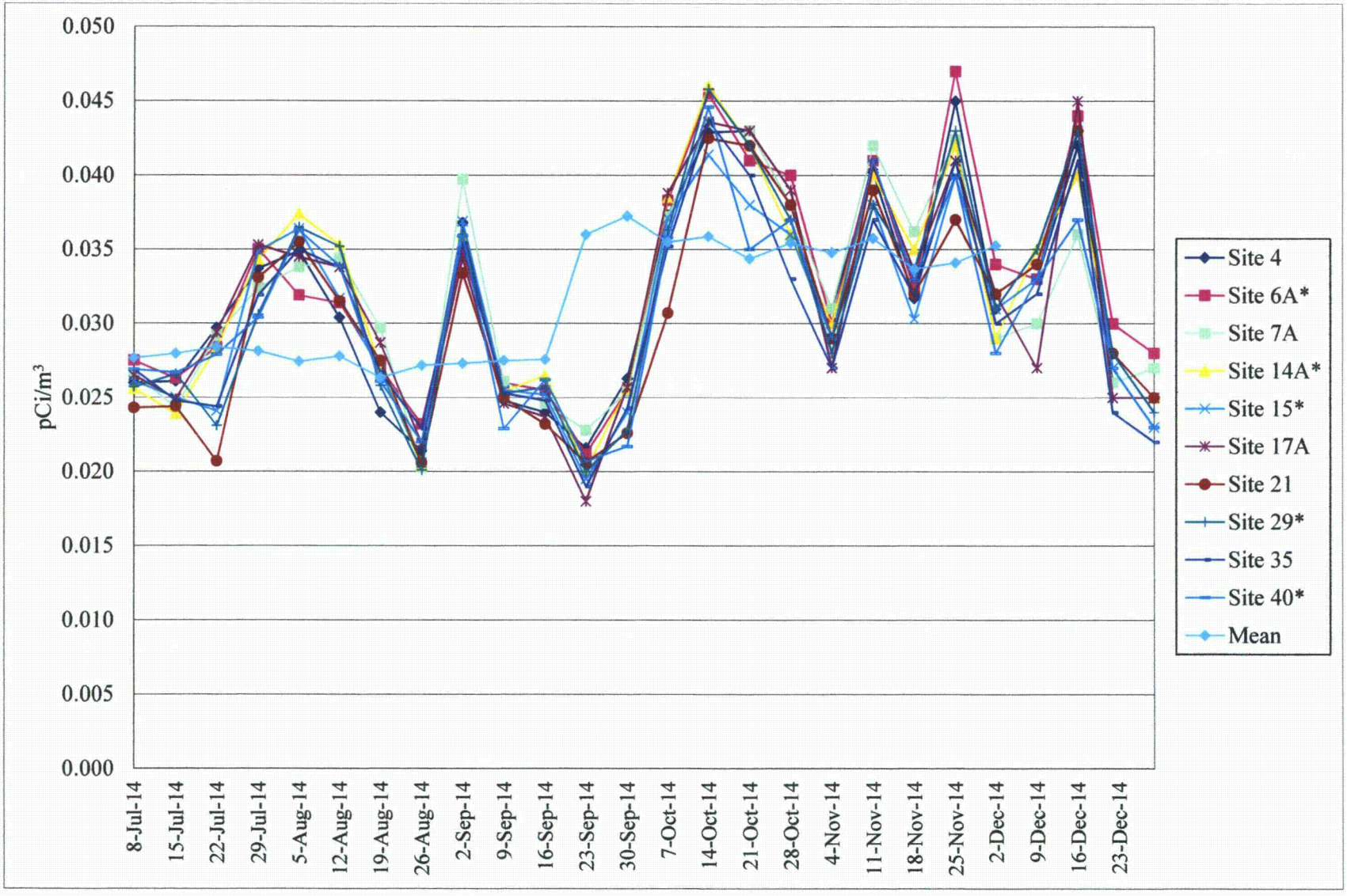


FIGURE 8.3 HISTORICAL GROSS BETA IN AIR (WEEKLY SYSTEM AVERAGES)

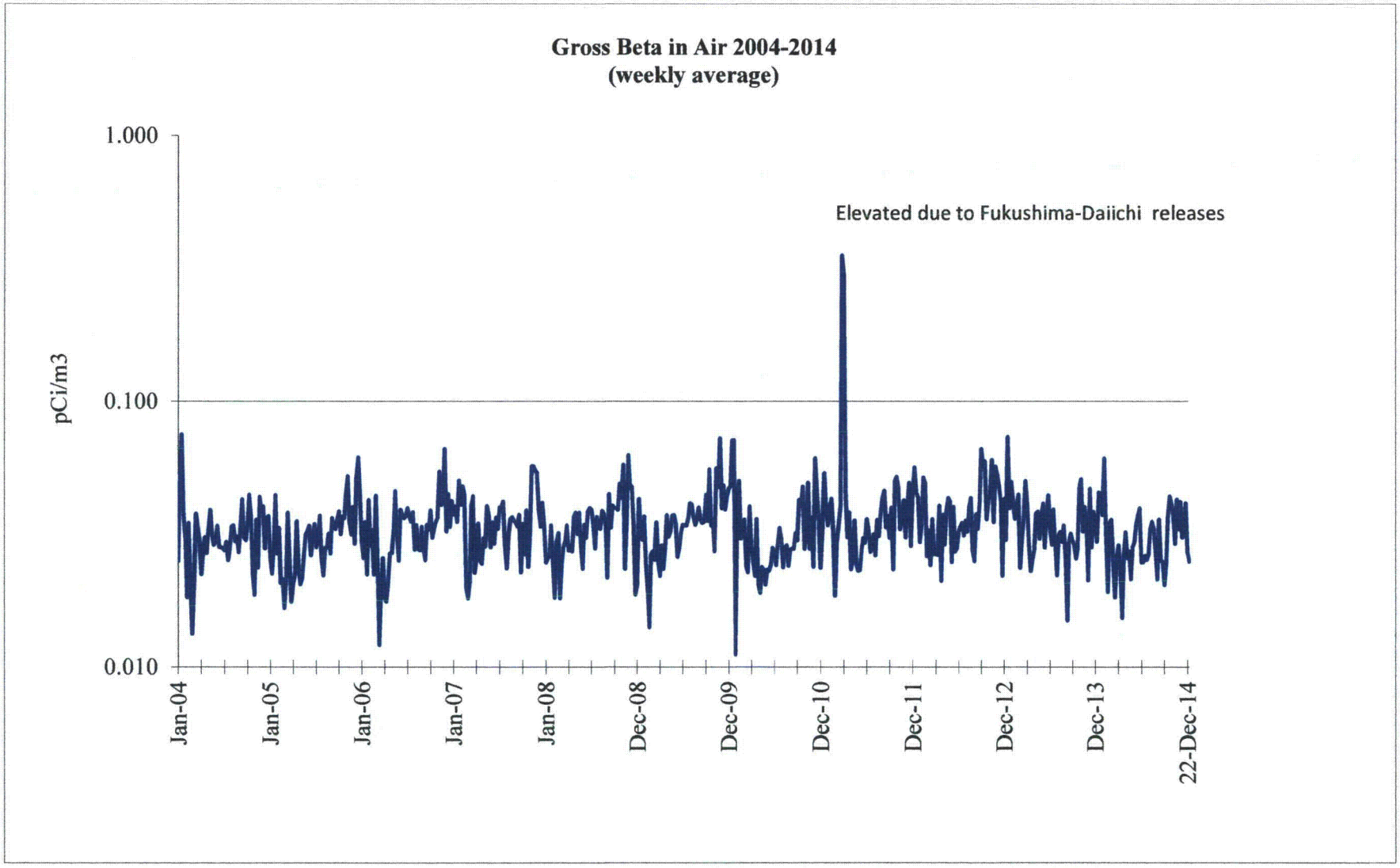
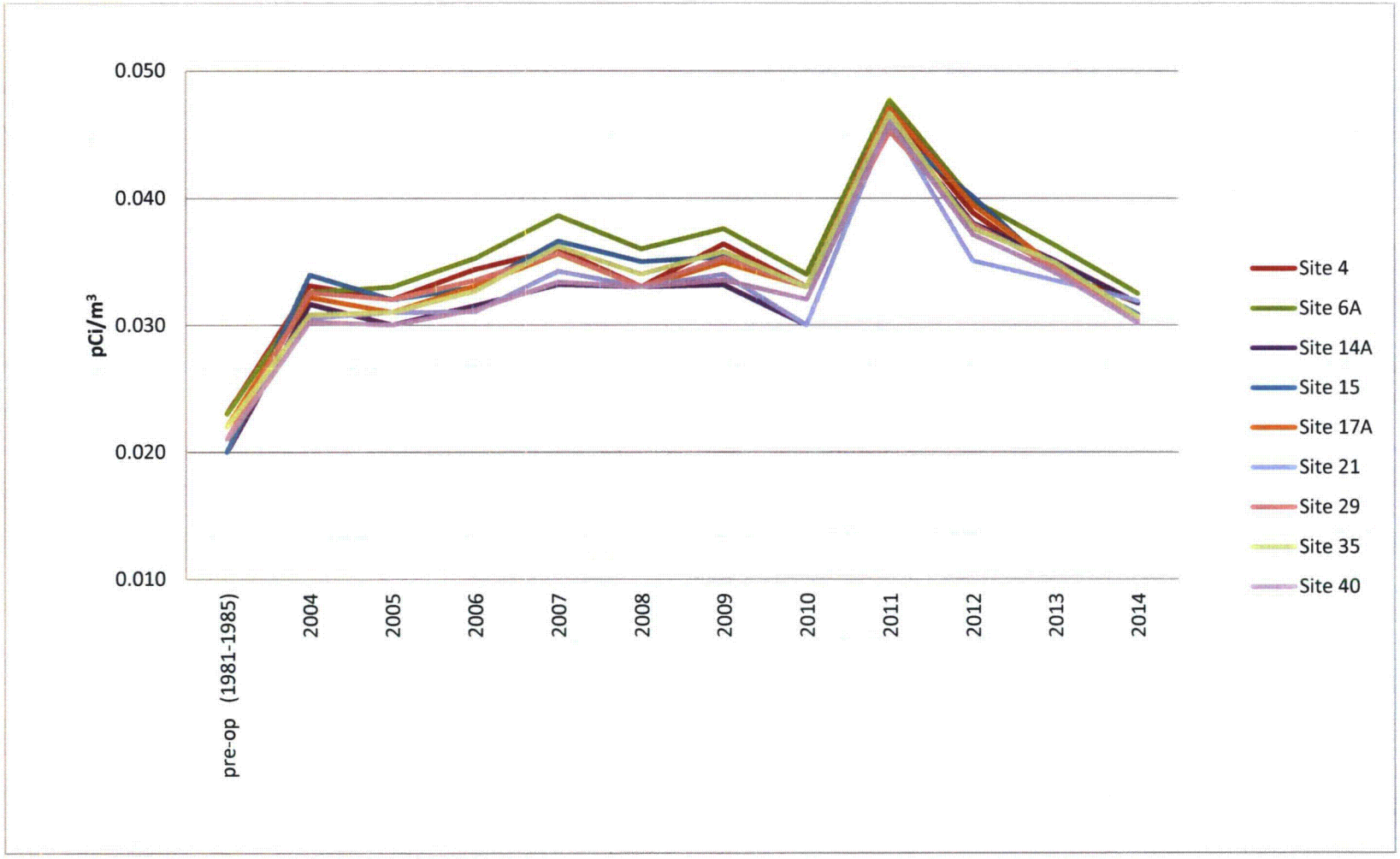


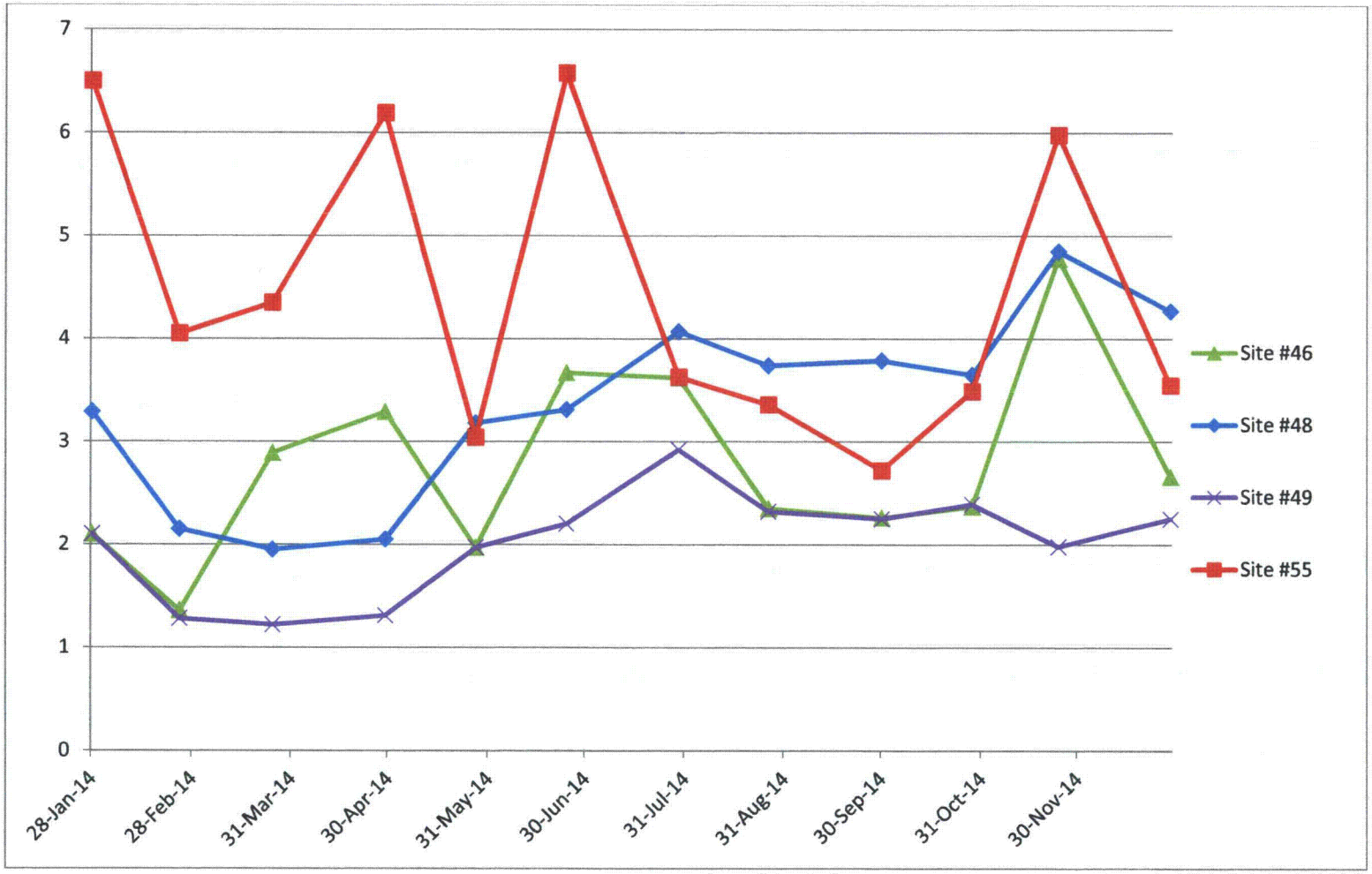
FIGURE 8.4 HISTORICAL GROSS BETA IN AIR (ANNUAL SITE TO SITE COMPARISONS) COMPARED TO PRE-OP



Site 7A is not included since the location changed since the pre-operational period
The 2011 annual average values are higher due to the Fukushima-Daiichi releases.

FIGURE 8.5 GROSS BETA IN DRINKING WATER

Units are pCi/L



NOTES: MDA values plotted as activity (e.g. <2.3 is plotted as 2.3)
The action level is 30 pCi/liter

FIGURE 8.6 EVAPORATION POND TRITIUM ACTIVITY PRE-OP - 2008

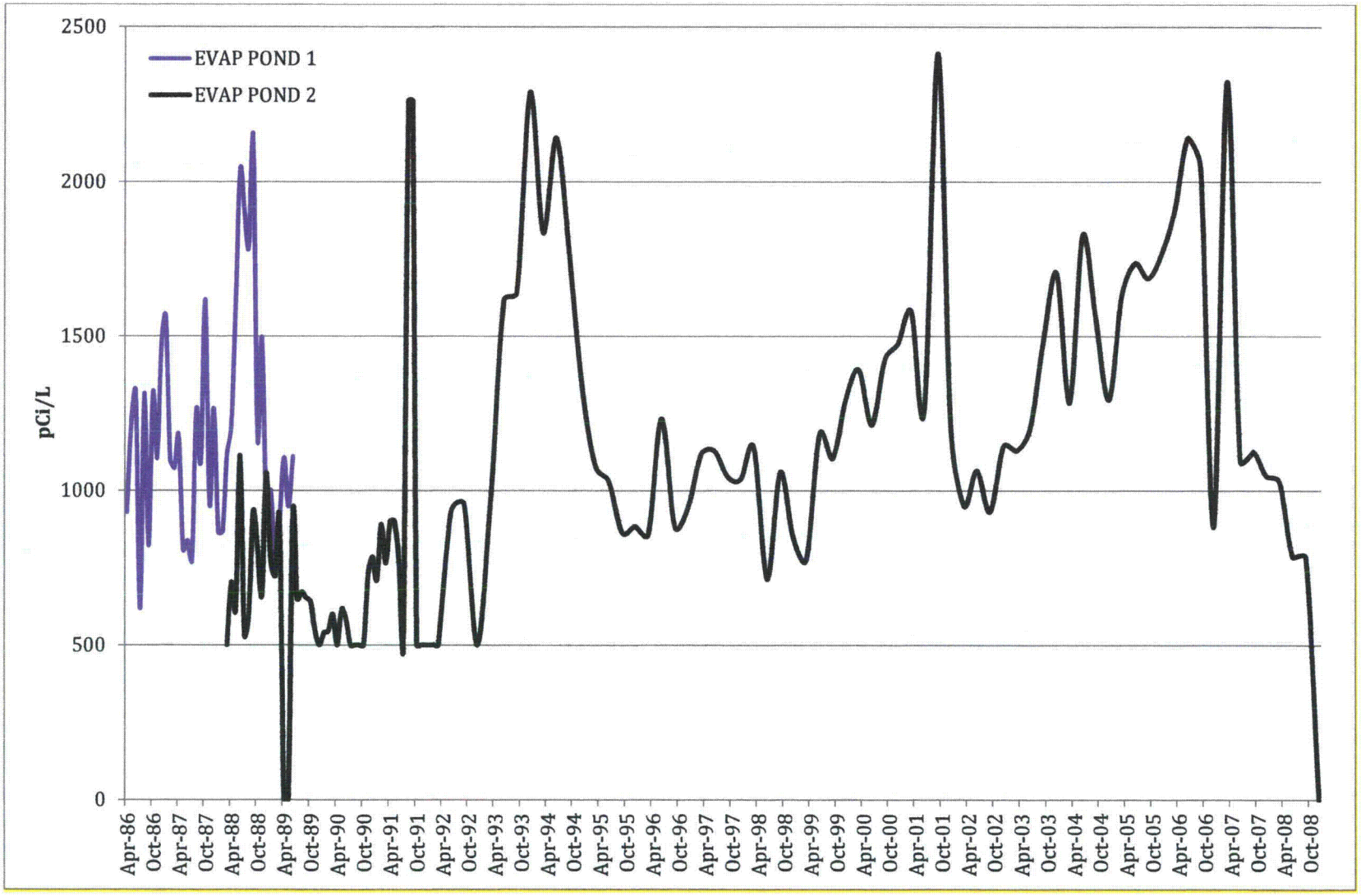


FIGURE 8.7 EVAPORATION POND TRITIUM ACTIVITY 2009-2014

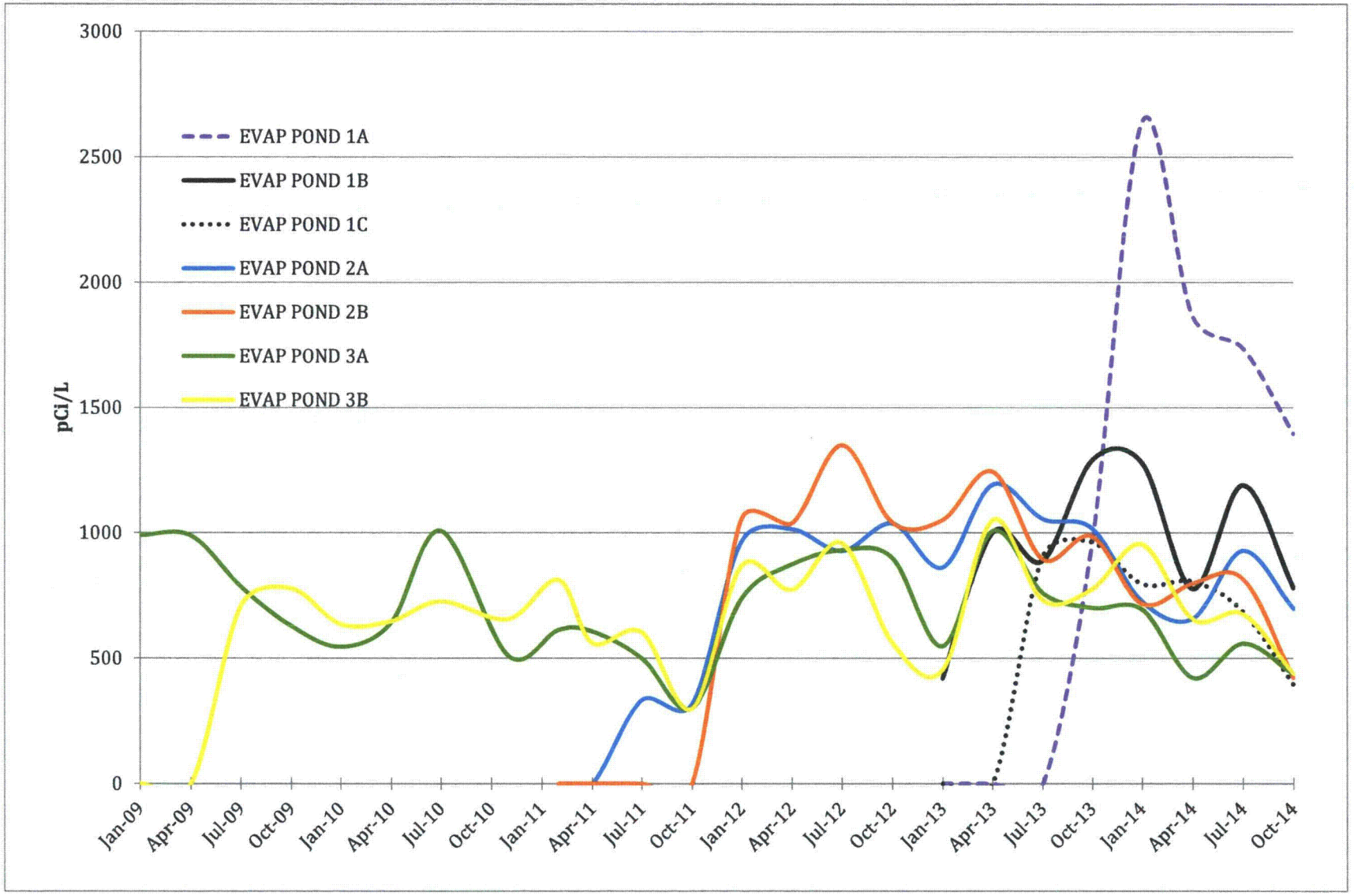
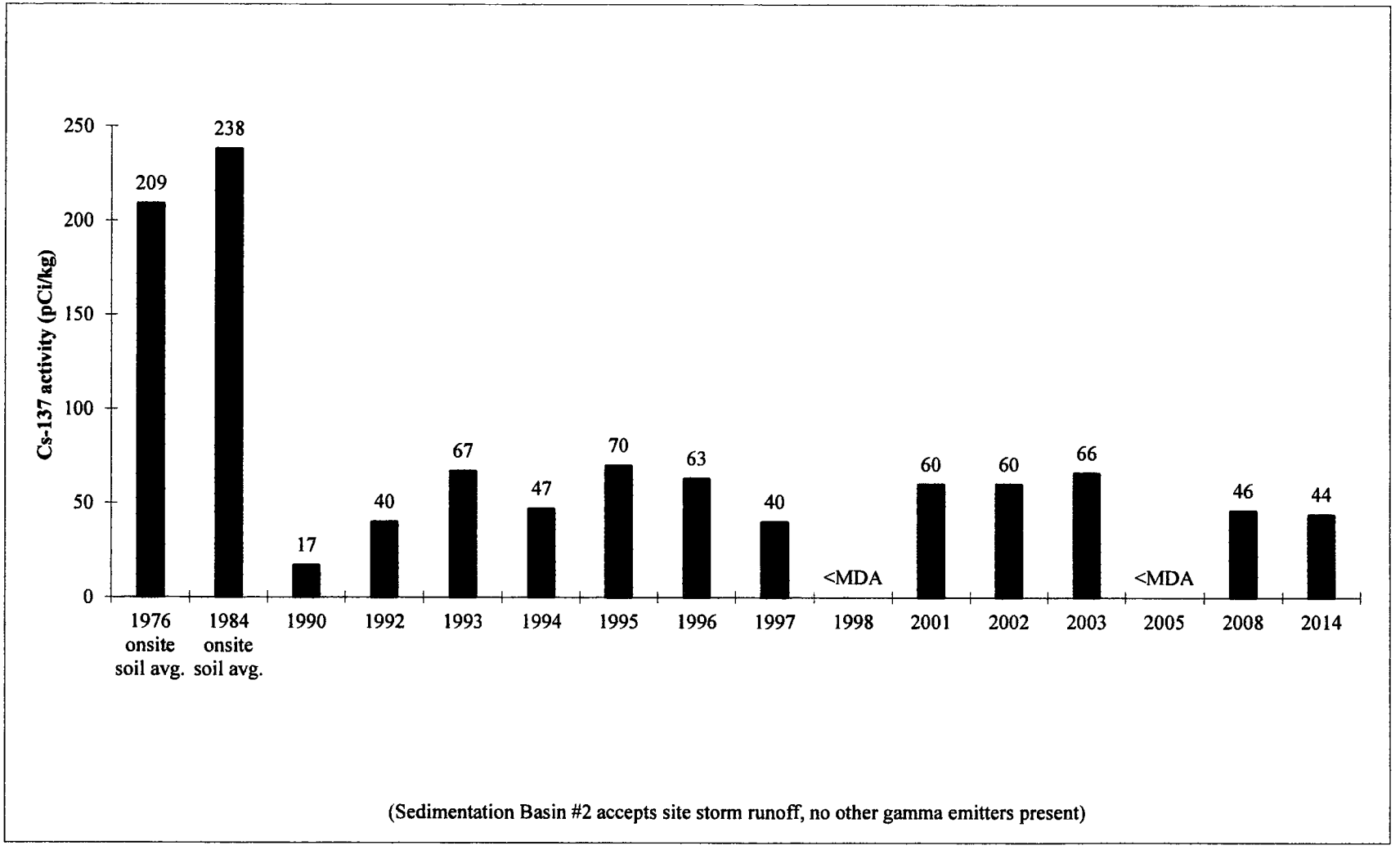


FIGURE 8.8 SEDIMENTATION BASIN 2 Cs-137



(Sedimentation Basin #2 accepts site storm runoff, no other gamma emitters present)

9. Thermoluminescent Dosimeter (TLD) Results and Data

The environmental TLD used at PVNGS is the Panasonic Model 812 Dosimeter. The Model 812 is a multi-element dosimeter combining two elements of lithium borate and two elements of calcium sulfate under various filters.

TLDs were placed in fifty locations from one to thirty-five miles from the PVNGS. TLD locations are shown in Figures 2.1 and 2.2 and are described in Table 9.1. TLD results for 2014 are presented in Table 9.2. Historical environmental gamma radiation results for 1985 through 2014 are presented in graphical form on Figure 9.1 (excluding transit control TLD #45).

Figure 9.2 depicts the environmental TLD results from 2014 as compared to the pre-operational TLD results (excluding sites #41 and #43, as they were deleted and later assigned to a new location, and #46-50, as they had no pre-op TLD at the location for comparison). The site to site comparisons indicate a direct correlation with respect to pre-operational results. It is evident that the offsite dose, as measured by TLDs, has not changed since Palo Verde became operational.

TABLE 9.1 TLD SITE LOCATIONS

(distances and directions are relative to Unit 2 in miles)

TLD SITE	LOCATION	LOCATION DESCRIPTION
1	E30	Goodyear
2	ENE24	Scott-Libby School
3	E21	Liberty School
4	E16	Buckeye
5	ESE11	Palo Verde School
6*	SSE31	APS Gila Bend substation
7	SE7	Old US 80 and Arlington School Rd
8	SSE4	Southern Pacific Pipeline Rd.
9	S5	Southern Pacific Pipeline Rd.
10	SE5	355th Ave. and Elliot Rd.
11	ESE5	339th Ave. and Dobbins Rd.
12	E5	339th Ave. and Buckeye-Salome Rd.
13	N1	N site boundary
14	NNE2	NNE site boundary
15	NE2	NE site boundary, WRF access road
16	ENE2	ENE site boundary
17	E2	E site boundary
18	ESE2	ESE site boundary
19	SE2	SE site boundary
20	SSE2	SSE site boundary
21	S3	S site boundary
22	SSW3	SSW site boundary
23	W5	N of Elliot Rd
24	SW4	N of Elliot Rd
25	WSW5	N of Elliot Rd
26	SSW4	S of Elliot Rd
27	SW1	SW site boundary
28	WSW1	WSW site boundary
29	W1	W site boundary
30	WNW1	WNW site boundary
31	NW1	NW site boundary
32	NNW1	NNW site boundary
33	NW4	S of Buckeye Rd
34	NNW5	395th Ave. and Van Buren St.
35	NNW8	Tonopah
36	N5	Wintersburg Rd. and Van Buren St.
37	NNE5	363rd Ave. and Van Buren St.
38	NE5	355th Ave. and Buckeye Rd.
39	ENE5	343rd Ave. N of Broadway Rd.
40	N2	Wintersburg
41	ESE3	Arlington School
42	N8	Ruth Fisher School
43	NE5	Winters Well School
44*	ENE35	El Mirage

TABLE 9.1 TLD SITE LOCATIONS

(distances and directions are relative to Unit 2 in miles)

TLD SITE	LOCATION	LOCATION DESCRIPTION
45**	Onsite	Central Laboratory (lead pig)
46	ENE30	Litchfield Park School
47	E35	Littleton School
48	E24	Jackrabbit Trail
49	ENE11	Palo Verde Rd.
50	WNW5	S of Buckeye-Salome Rd.

* Site #6 and site #44 are the control locations.

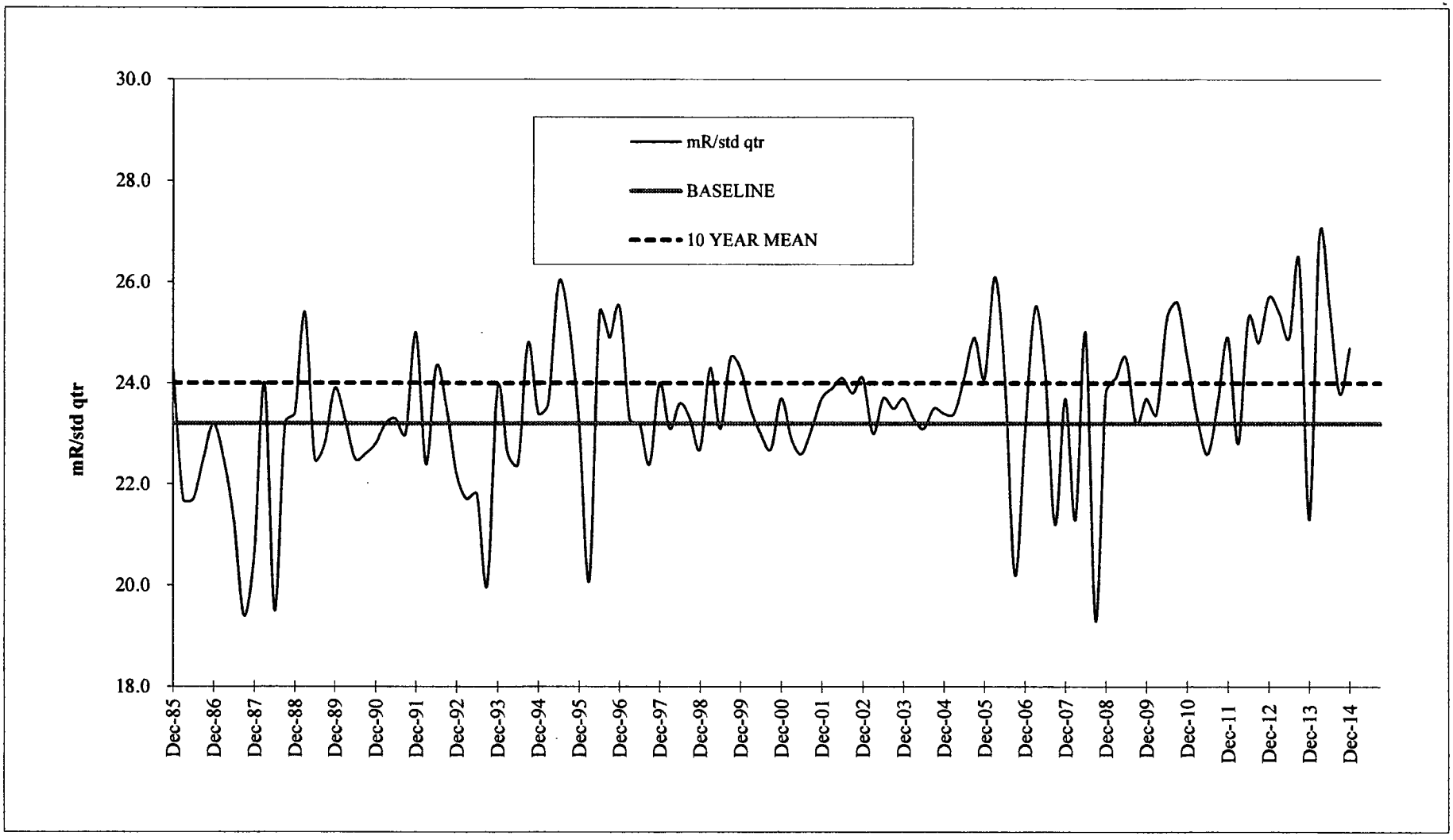
** Site #45 is the transit control TLD (stored in lead pig).

TABLE 9.2 ENVIRONMENTAL TLD RESULTS

Units are mRem/std qtr

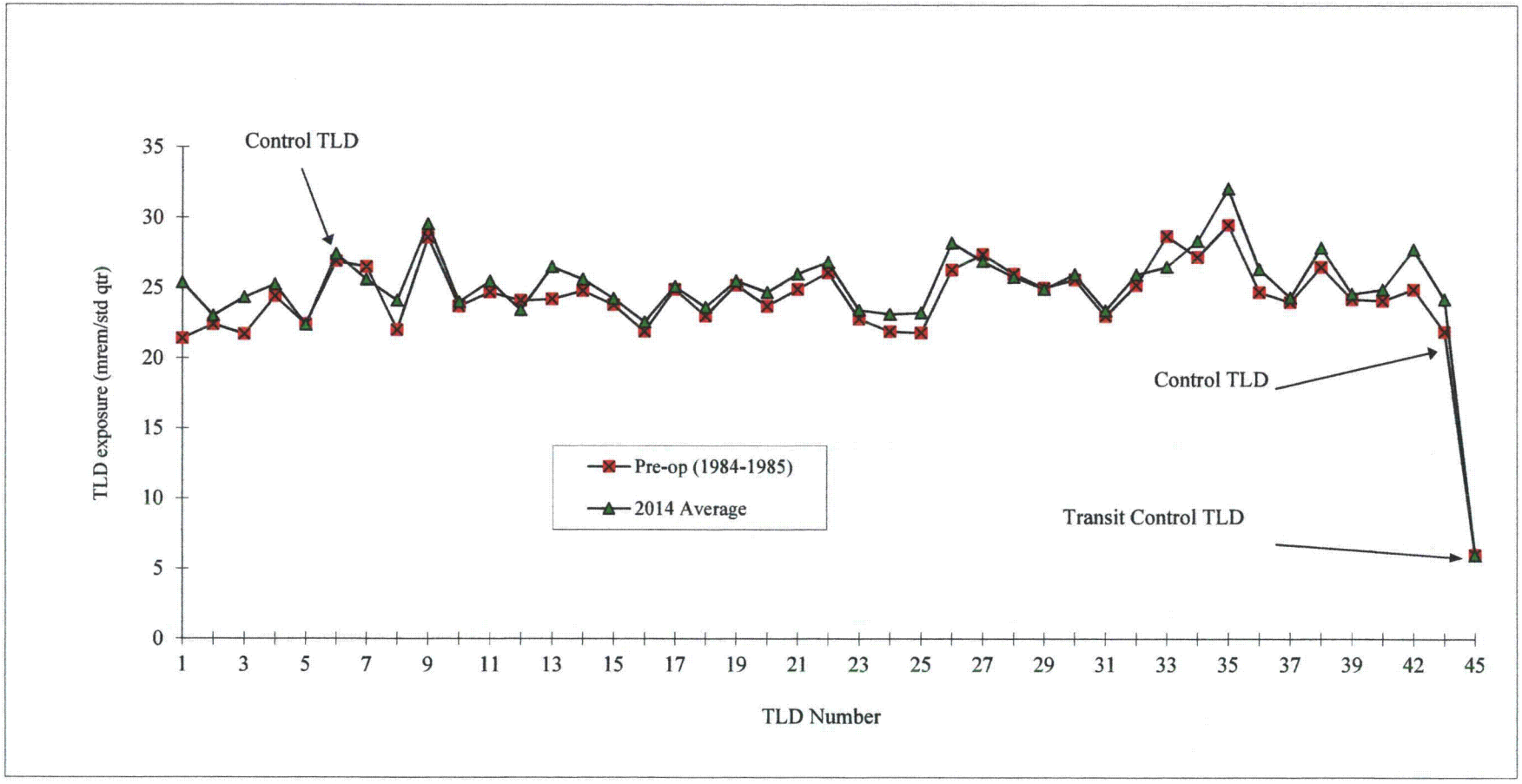
TLD Site #	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Average
1	27.4	25.1	23.4	25.6	25.4
2	24.1	23.7	21.7	22.6	23.0
3	26.6	24.3	23.0	23.4	24.3
4	27.3	24.8	23.8	25.1	25.3
5	23.2	23.6	20.7	22.0	22.4
6 (control)	29.7	27.4	26.4	26.2	27.4
7	28.4	25.7	23.7	24.6	25.6
8	25.2	24.9	22.6	23.7	24.1
9	32.2	27.5	28.4	30.1	29.6
10	25.0	25.1	22.0	23.9	24.0
11	26.3	27.0	24.0	24.6	25.5
12	25.8	23.5	21.8	22.6	23.4
13	27.9	26.3	26.2	25.6	26.5
14	26.1	26.1	25.1	25.2	25.6
15	26.1	25.4	21.4	24.1	24.3
16	23.8	22.6	21.4	22.5	22.6
17	26.4	25.9	23.5	24.6	25.1
18	25.3	24.2	21.4	23.6	23.6
19	26.2	26.2	24.2	25.4	25.5
20	27.0	24.5	23.4	23.8	24.7
21	27.3	27.0	24.4	25.3	26.0
22	28.3	26.7	26.5	25.8	26.8
23	24.0	24.3	23.0	22.4	23.4
24	25.3	23.2	21.0	23.0	23.1
25	23.9	23.9	22.4	22.7	23.2
26	29.3	29.4	26.9	27.3	28.2
27	28.3	27.1	25.5	26.7	26.9
28	27.2	27.4	23.5	25.0	25.8
29	26.4	24.4	24.2	24.7	24.9
30	28.1	25.9	23.9	26.0	26.0
31	25.0	22.6	22.6	23.4	23.4
32	27.9	26.4	24.1	25.4	26.0
33	28.5	25.6	25.9	26.0	26.5
34	30.8	28.5	26.9	27.2	28.4
35	32.9	31.3	31.0	33.2	32.1
36	28.4	25.1	25.0	26.9	26.4
37	26.0	25.0	22.7	23.6	24.3
38	31.7	26.9	26.0	26.9	27.9
39	26.0	24.5	22.8	25.0	24.6
40	26.6	24.9	23.1	25.0	24.9
41	30.0	26.6	25.1	26.2	27.0
42	29.7	28.6	26.2	26.5	27.8
43	30.0	28.3	26.1	27.8	28.1
44 (control)	27.1	25.1	21.7	22.9	24.2
45 (transit control)	6.6	6.3	5.4	5.6	6.0
46	24.6	24.1	22.7	22.8	23.6
47	26.3	23.4	22.1	21.2	23.3
48	27.0	26.4	21.6	23.7	24.7
49	24.3	233.8	21.4	21.1	75.2
50	22.5	20.7	18.5	18.6	20.1

FIGURE 9.1 NETWORK ENVIRONMENTAL TLD EXPOSURE RATES



The 10-year mean value is for the date range 2005-2014.

FIGURE 9.2 ENVIRONMENTAL TLD COMPARISON - PRE-OPERATIONAL VS 2014



The following TLDs are not included on this graph;
TLD #41 monitoring location was deleted in June, 2000 due to school closing (this TLD was placed at new school in 2004)
TLD #43 monitoring location was deleted in 1994 due to school closing (this TLD was placed at a new school in 2007)
TLDs #46-50 are not included since they were not included in the pre-op monitoring program

10. Land Use Census

10.1. Introduction

In accordance with the PVNGS ODCM, Section 6.2, the annual Land Use Census was performed in April 2014.

Observations were made in each of the 16 meteorological sectors to determine the nearest milking animals, residences, and gardens of greater than 500 square feet. This census was completed by driving the roads and speaking with residents.

The results of the Land Use Census are presented in Table 10.1 and discussed below. The directions and distances listed are in sectors and miles from the Unit 2 containment.

10.2. Census Results

Nearest Resident

There was no change in nearest resident status from the previous year. Dose calculations indicated the highest dose to be 0.178 mRem.

Milk Animal

There was no change in milk animal status from the previous year. Dose calculations indicated the highest dose to be 0.508 mRem.

Vegetable Gardens

There was no change in nearest garden status. Dose calculations indicated the highest dose to be 0.490 mRem.

See Table 10.1 for a summary of the specific results and Table 2.1 for current sample locations.

Figures 10.1 through 10.3 provide graphs depicting historical calculated doses for nearest residents, nearest milk receptor, and nearest garden receptor locations in each sector.

Differences in calculated doses are the result of many variables, including;

- Changes in receptor locations from year to year (proximity to the power plant)
- Changes in local meteorology (wind direction, wind speed, precipitation, temperature)
- Concurrent meteorology at the time of effluent releases
- Exposure pathways

TABLE 10.1 LAND USE CENSUS

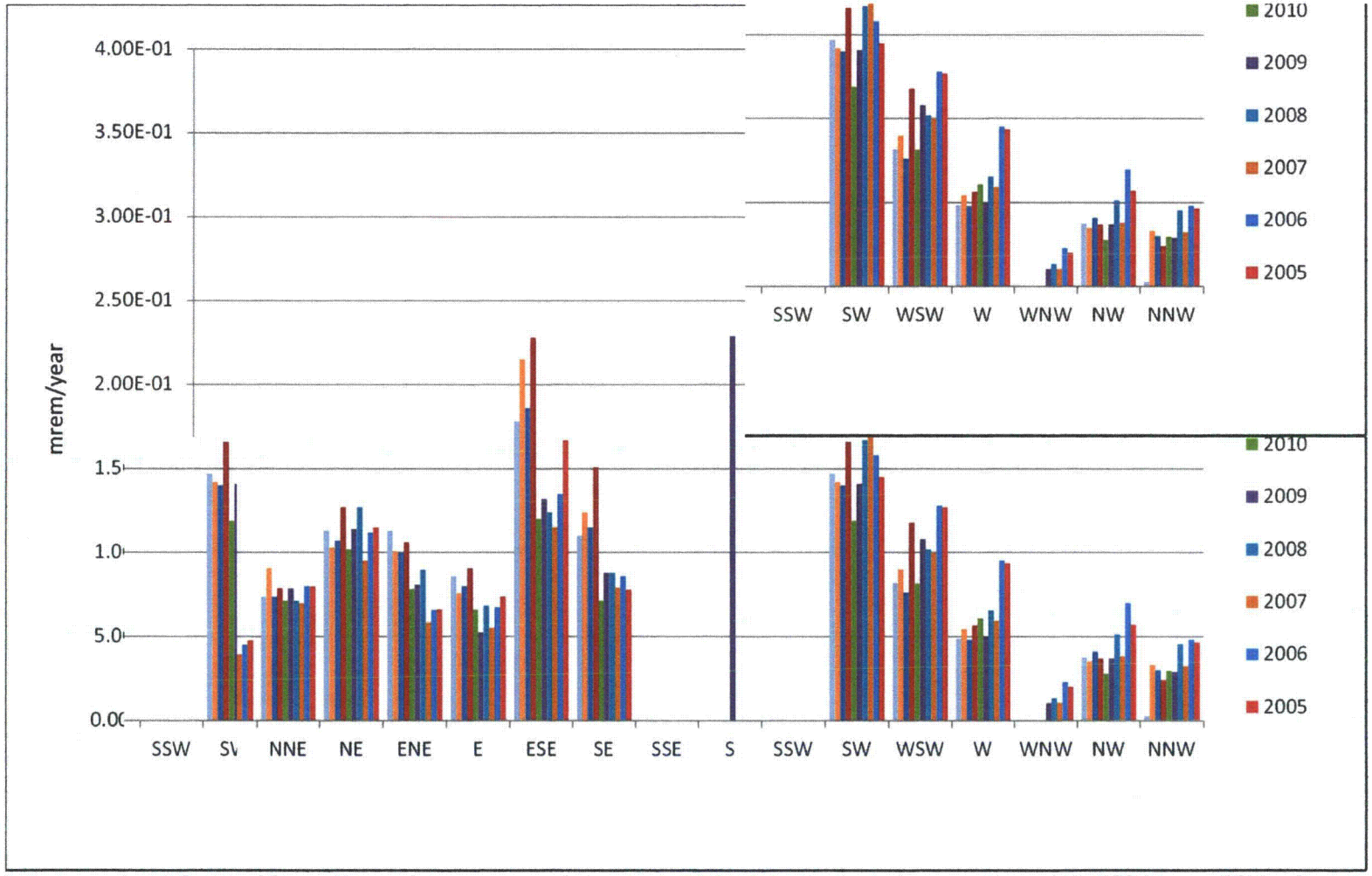
(Distances and directions are relative to Unit 2 in miles)

SECTOR	NEAREST RESIDENT	NEAREST GARDEN	NEAREST MILK ANIMAL (COW/GOAT)	CALCULATED DOSE (mRem)		CHANGE FROM 2013
N	1.55	3.10	3.66	Resident Garden Milk	3.86E-02 2.63E-01 2.07E-01	
NNE	1.52	3.30	3.05	Resident Garden Milk	7.39E-02 4.90E-01 5.08E-01	
NE	2.16	NONE	NONE	Resident	1.13E-01	
ENE	2.05	NONE	4.84	Resident Milk	1.13E-01 2.78E-01	
E	2.81	NONE	NONE	Resident	8.59E-02	
ESE	1.95	NONE	NONE	Resident	1.78E-01	
SE	3.36	NONE	NONE	Resident	1.10E-01	
SSE	NONE	NONE	NONE	NA		
S	NONE	NONE	NONE	NA		
SSW	NONE	NONE	NONE	NA		
SW	1.39	NONE	NONE	Resident	1.47E-01	
WSW	0.75	NONE	NONE	Resident	8.20E-02	
W	0.70	NONE	NONE	Resident	4.87E-02	
WNW	NONE	NONE	NONE	NA		
NW	0.93	NONE	NONE	Resident	3.77E-02	
NNW	1.30	NONE	NONE	Resident	2.92E-03	

COMMENTS:

Dose calculations were performed using the GASPAR code and 2014 meteorological data and source term. Dose reported for each location is the total for all three PVNGS Units and is the highest individual organ dose identified.

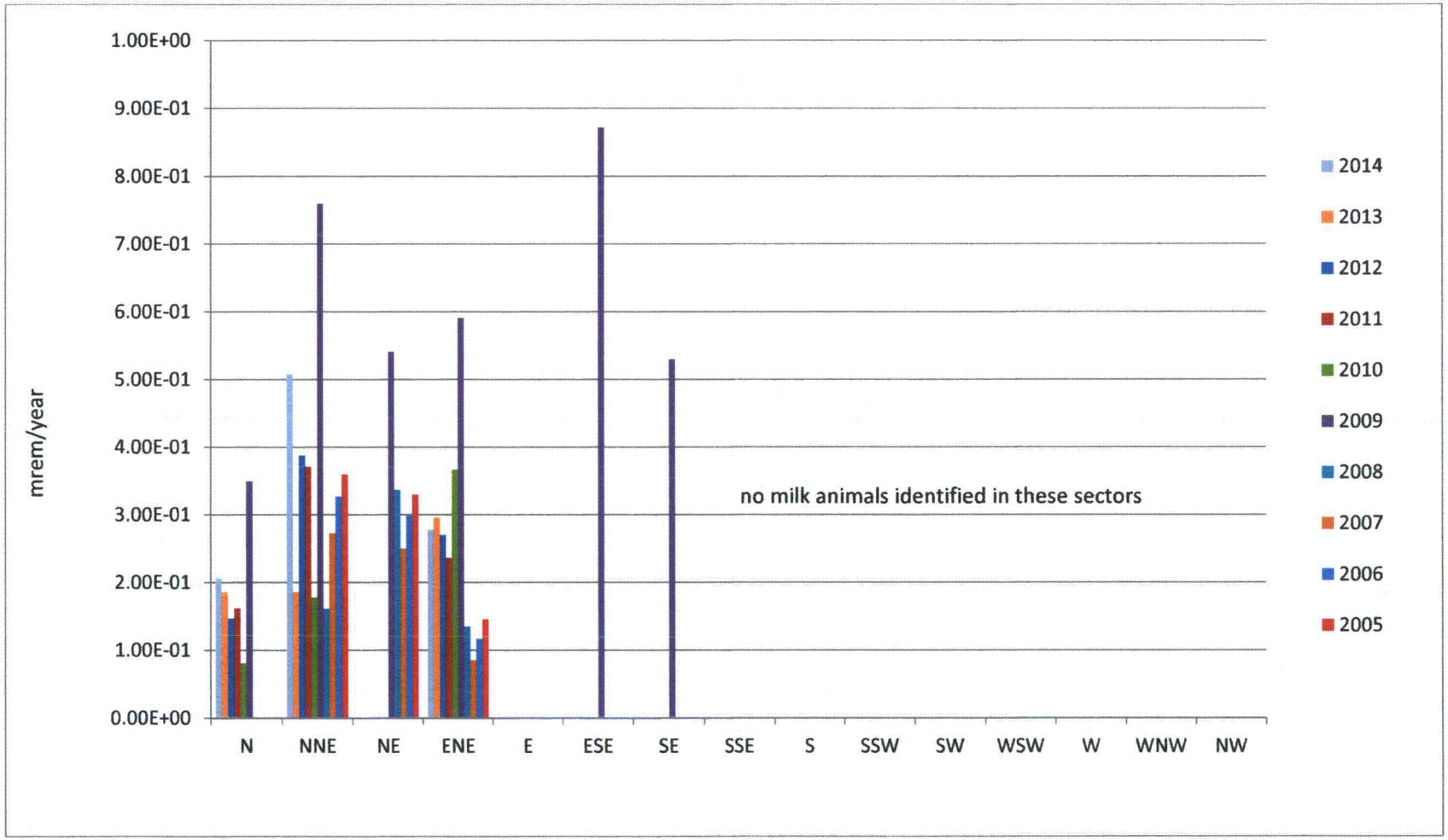
FIGURE 10.1 HISTORICAL COMPARISON OF NEAREST RESIDENT DOSE



Historical annual average most prevalent wind direction is from the SW, next highest is from the N. This is one reason for the higher doses assigned to residents in the S sector.

Historical annual average least prevalent wind direction is from the SE, next highest is from the ESE. This is one reason for the lower doses assigned to residents in the WNW, NW, and NNW sectors.

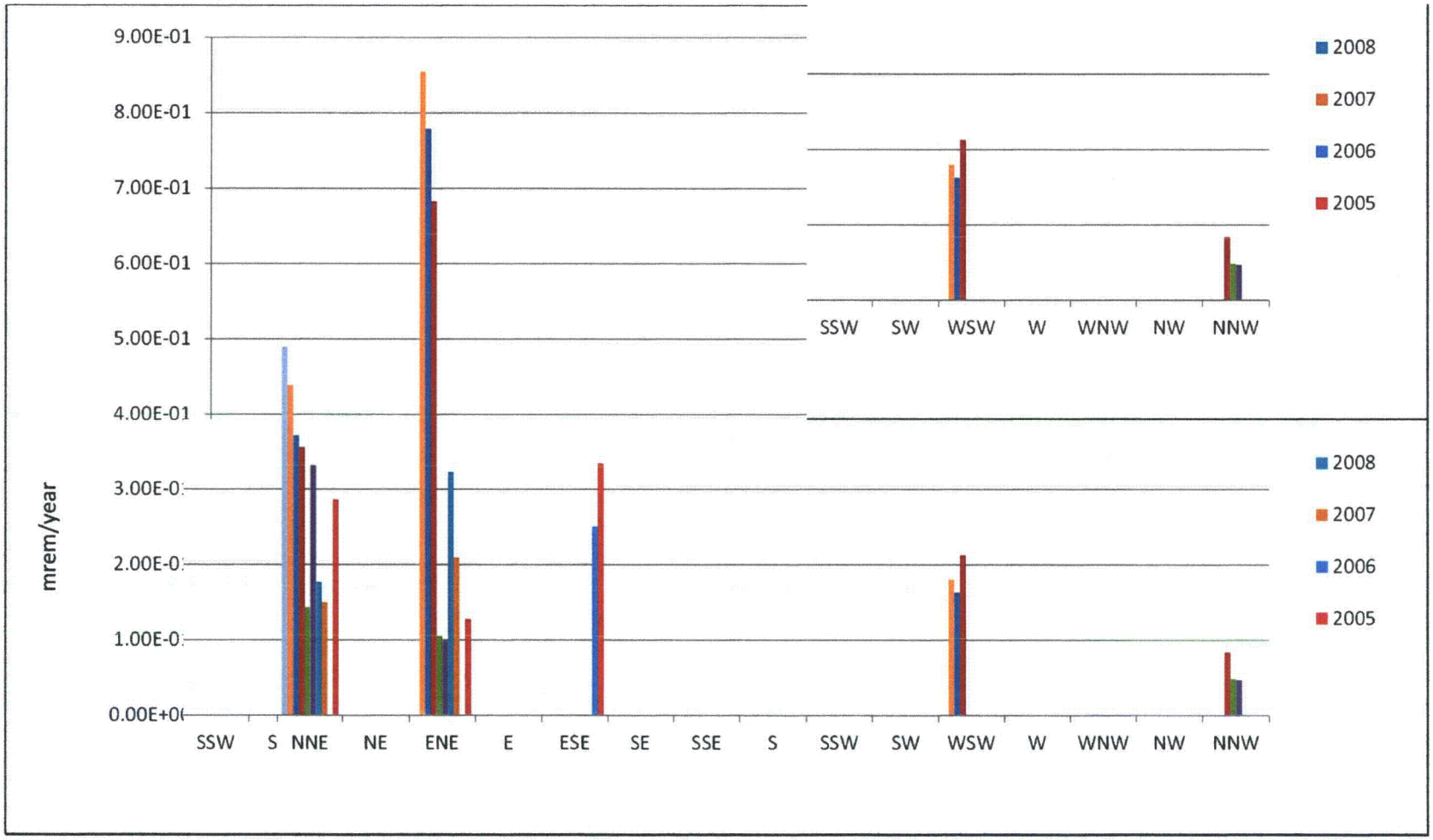
FIGURE 10.2 HISTORICAL COMPARISON OF NEAREST MILK ANIMAL DOSE



Milk animals include goats and/or cows. Several new milk animals were identified in 2009 that were closer to the power plant than in the past, resulting in generally higher calculated doses in that calendar year.

No milk samples have indicated any plant related radionuclides. Additionally, milk animals in the desert environment are normally fed stored feed and are not on pasture. The calculated doses are conservative since they include pastured feed as part of the calculation.

FIGURE 10.3 HISTORICAL COMPARISON OF NEAREST GARDEN DOSE



Gardens were sporadically identified from year to year. Gardening is not prevalent in the desert environment.

11. Summary and Conclusions

The conclusions are based on a review of the radio assay results and environmental gamma radiation measurements for the 2014 calendar year. Where possible, the data were compared to pre-operational sample data.

All sample results for 2014 are presented in Tables 8.1-8.12 and do not include observations of naturally occurring radionuclides, with the exception of gross beta in air and gross beta in drinking water. Table 11.1 summarizes the ODCM required samples and is in the format required by the NRC BTP on Environmental Monitoring.

I-131 identified in the Evaporation Ponds, WRF Influent, WRF Centrifuge sludge, and Reservoirs is the result of offsite sources and appears in the effluent sewage from Phoenix. The levels of I-131 detected in these locations are consistent with levels identified in previous years.

Tritium concentrations identified in surface water onsite have been attributed to PVNGS permitted gaseous effluent releases and secondary plant releases. These concentrations are consistent with historical values.

Environmental radiation levels are consistent with measurements reported in previous Pre-operational and Operational Radiological Environmental annual reports, References 1 and 2.

There was no measurable radiological impact on the environment in 2014 resulting from the operation of PVNGS.

TABLE 11.1 ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM ANNUAL SUMMARY

Palo Verde Nuclear Generating Station Docket Nos. STN 50-528/529/530

Maricopa County, Arizona Calendar Year 2014

Medium or Pathway Sampled (Unit of Measurement)	Type and Total Number of Analyses Performed	Lower Limit of Detection (LLD) (from Table 6.1)	All Indicator Locations	Location with Highest Annual Mean		Control Locations	Number of Nonroutine Reported Measurements
			Mean (f)[a]	Name (f)[a]	Mean	Mean (f)[a]	
			Range	Distance and Direction	Range	Range	
Direct Radiation (mrem/std. qtr.)	TLD - 200	NA	25.2 (188/188)	Site #35	32.1 (4/4)	25.8 (8/8)	0
			18.5 – 33.2	8 miles 330°	31.0 – 33.2	21.7 - 29.7	
Air Particulates (pCi/m^3)	Gross Beta - 519	0.01	0.031 (467/467)	Site # 7A	0.032 (52/52)	0.033 (52/52)	1
			0.010 - 0.066	3 miles 124°	0.014 - 0.063	0.017 - 0.063	
	Gamma Spec Composite - 40						
	Cs-134 (quarterly)	0.05	<LLD	NA	<LLD	<LLD	0
			<LLD	NA	<LLD	<LLD	
	Cs-137 (quarterly)	0.06	<LLD	NA	<LLD	<LLD	0
			<LLD	NA	<LLD	<LLD	
Air Radioiodine (pCi/m^3)	Gamma Spec. - 519 I-131	0.07	<LLD	NA	<LLD	<LLD	0
			<LLD	NA	<LLD	<LLD	

Broadleaf Vegetation (pCi/Kg-wet)	Gamma Spec. - 10						
	I-131	60	<LLD	NA	<LLD	<LLD	0
	Cs-134	60	<LLD	NA	<LLD	<LLD	0
	Cs-137	80	<LLD	NA	<LLD	<LLD	0
Groundwater (pCi/liter)	H-3 – 8	2000	<LLD	NA	<LLD	NA	0
	Gamma Spec. - 8						
	Mn-54	15	<LLD	NA	<LLD	NA	0
	Fe-59	30	<LLD	NA	<LLD	NA	0
	Co-58	15	<LLD	NA	<LLD	NA	0
	Co-60	15	<LLD	NA	<LLD	NA	0
	Zn-65	30	<LLD	NA	<LLD	NA	0
	Zr-95	30	<LLD	NA	<LLD	NA	0
	Nb-95	15	<LLD	NA	<LLD	NA	0
	I-131	15	<LLD	NA	<LLD	NA	0
	Cs-134	15	<LLD	NA	<LLD	NA	0
	Cs-137	18	<LLD	NA	<LLD	NA	0
	Ba-140	60	<LLD	NA	<LLD	NA	0
	La-140	15	<LLD	NA	<LLD	NA	0
	Gross Beta – 48	4	3.8 (27/48) 2.0 – 6.6	Site #55 3 miles 214°	4.5 (11/12) 2.7 -6.6	NA	0

	H-3 – 16	2000	<LLD	NA	<LLD	NA	0
	Gamma Spec. – 48						
Drinking Water (pCi/liter)	Mn-54	15	<LLD	NA	<LLD	NA	0
	Fe-59	30	<LLD	NA	<LLD	NA	0
	Co-58	15	<LLD	NA	<LLD	NA	0
	Co-60	15	<LLD	NA	<LLD	NA	0
	Zn-65	30	<LLD	NA	<LLD	NA	0
	Zr-95	30	<LLD	NA	<LLD	NA	0
	Nb-95	15	<LLD	NA	<LLD	NA	0
	I-131	15	<LLD	NA	<LLD	NA	0
	Cs-134	15	<LLD	NA	<LLD	NA	0
	Cs-137	18	<LLD	NA	<LLD	NA	0
	Ba-140	60	<LLD	NA	<LLD	NA	0
	La-140	15	<LLD	NA	<LLD	NA	0
	Gamma Spec. – 27						
Milk (pCi/liter)	I-131	1	<LLD	NA	<LLD	<LLD	0
			<LLD	NA	<LLD	<LLD	
	Cs-134	15	<LLD	NA	<LLD	<LLD	0
			<LLD	NA	<LLD	<LLD	
	Cs-137	18	<LLD	NA	<LLD	<LLD	0
			<LLD	NA	<LLD	<LLD	
	Ba-140	60	<LLD	NA	<LLD	<LLD	0
	La-140	15	<LLD	NA	<LLD	<LLD	0

	Gamma Spec. - 30						
	Mn-54	15	<LLD	NA	<LLD	NA	0
	Fe-59	30	<LLD	NA	<LLD	NA	0
	Co-58	15	<LLD	NA	<LLD	NA	0
	Co-60	15	<LLD	NA	<LLD	NA	0
	Zn-65	30	<LLD	NA	<LLD	NA	0
	Zr-95	30	<LLD	NA	<LLD	NA	0
	Nb-95	15	<LLD	NA	<LLD	NA	0
Surface Water (pCi/liter)	I-131	15	21 (7/35)	Site #59	42 (1/4)	NA	0
			14 - 42	Onsite 180°	42 - 42		
	Cs-134	15	<LLD	NA	<LLD	NA	0
	Cs-137	18	<LLD	NA	<LLD	NA	0
	Ba-140	60	<LLD	NA	<LLD	NA	0
	La-140	15	<LLD	NA	<LLD	NA	0
	H-3 - 20	3000	891 (28/35)	Site #59	1910 (4/4)	NA	0
			422 - 2640	Onsite 180°	1396 - 2640		

(a) Mean and range based upon detectable measurements only. Fraction of detectable measurements at specified locations is indicated in parentheses. (f)

NOTE: Miscellaneous samples that are not listed on Tables 2.1 and 9.1 (not ODCM required) are not included on this table.

12. References

1. Pre-Operational Radiological Monitoring Program, Summary Report 1979-1985
2. 1985-2013 Annual Radiological Environmental Operating Reports, Palo Verde Nuclear Generating Station
3. Palo Verde Nuclear Generating Station Technical Specifications and Technical Reference Manual
4. Offsite Dose Calculation Manual, Revision 26, PVNGS Units 1, 2, and 3
5. Regulatory Guide 4.1, Programs for Monitoring Radioactivity in the Environs of Nuclear Power Plants
6. Regulatory Guide 4.8, Environmental Technical Specifications for Nuclear Power Plants
7. NRC Radiological Assessment Branch Technical Position on Environmental Monitoring, Revision 1, November 1979 (Incorporated into NUREG-1301)
8. NEI 07-07, Nuclear Energy Institute, Industry Ground Water Protection Initiative – Final Guidance Document, August 2007

Appendix A

aps

A subsidiary of Pinnacle West Capital Corporation

ID #: 218-03843
DATE: 15 April 2015
TO: File
Sta. #
Ext. #

Company Correspondence

FROM: Joshua McDowell
Sta. # 7397
Ext. # 82-5482

McDowell, Joshua (Z08270)

Digitally signed by McDowell, Joshua (Z08270)
DN: cn=McDowell, Joshua (Z08270)
Date: 2015.04.15 16:50:52 -07'00'

SUBJECT: Correction to Annual Radiological Environmental Operating Report for 2012
Palo Verde Nuclear Generating Station – Units 1, 2, and 3

REFERENCES:
1. PVNGS "Annual Radiological Environmental Operating Report for 2012"
2. PVNGS "Annual Radiological Environmental Operating Report for 2014"

Dear Sir or Madam:

In accordance with Palo Verde Nuclear Generating Station (PVNGS) Technical Specification (TS) 5.6.2, PVNGS submitted the Annual Radiological Environmental Operating Report (AREOR) for 2012 via Reference 1. It was discovered that WRF Centrifuge Waste Sludge samples for December 11 and 18, 2012, entered into the REMP database, were not included in the 2012 AREOR. Additionally, the Air Sample Data for sample period December 25-31, 2012, entered into the REMP database, were not included in the 2012 or 2013 AREOR.

These missing deviations were added to the amended page of Reference 2. The amended page was included as an appendix at the end of Reference 2, the 2014 subject report. These deviations were documented through Corrective Action Program document CRDR 4616525.

TABLE 8.11 SLUDGE/SEDIMENT

ODCM required samples denoted by *
units are pCi/kg, wet

SAMPLE LOCATION	DATE COLLECTED	I-131	Cs-134	Cs-137	In-111
WRF CENTRIFUGE WASTE SLUDGE	14-Aug-12	322 ± 182	<143	<153	
	21-Aug-12	568 ± 172	<108	<168	
	28-Aug-12	893 ± 208	<148	<165	
	4-Sep-12	832 ± 192	<121	<171	
	11-Sep-12	920 ± 229	<147	<107	
	18-Sep-12	725 ± 191	<141	<167	
	25-Sep-12	655 ± 164	<129	<99	
	2-Oct-12	810 ± 236	<113	<176	
	9-Oct-12	593 ± 151	<131	<170	
	16-Oct-12	OOS			
	23-Oct-12	162 ± 147	<40	<18	
	30-Oct-12	246 ± 148	<148	<130	
	6-Nov-12	536 ± 197	<149	<30	
	13-Nov-12	450 ± 190	<123	<162	
	19-Nov-12	630 ± 162	<119	<80	
	27-Nov-12	531 ± 200	<140	<178	
	4-Dec-12	6521 ± 171	<138	<130	
	11-Dec-12	726 ± 221	<144	<141	
	18-Dec-12	1002 ± 267	<84	<177	
	24-Dec-12	1244 ± 241	<117	<86	
	31-Dec-12	1079 ± 232	<101	<47	
SEDIMENTATION BASIN #2					

TABLE 8.2 PARTICULATE GROSS BETA IN AIR 3rd - 4th QUARTER

ODCM required samples denoted by *

units are pCi/m^3

3rd Quarter

Week #	START DATE	STOP DATE	Site 4	Site 6A* (control)	Site 7A	Site 14A*	Site 15*	Site 17A	Site 21	Site 29*	Site 35	Site 40*	Mean	RSD (%)
27	26-Jun-12	2-Jul-12	0.033	0.033	0.037	0.033	0.036	0.035	0.033	0.033	0.033	0.032	0.034	4.8
28	2-Jul-12	10-Jul-12	0.038	0.034	0.035	0.036	0.036	0.039	0.029	0.035	0.034	0.033	0.035	7.9
29	10-Jul-12	17-Jul-12	0.029	0.033	0.031	0.030	0.031	0.034	0.027	0.031	0.035	0.031	0.031	7.5
30	17-Jul-12	24-Jul-12	0.038	0.036	0.034	0.036	0.037	0.039	0.033	0.034	0.034	0.035	0.036	5.5
31	24-Jul-12	30-Jul-12	0.033	0.029	0.034	0.031	0.034	0.032	0.031	0.033	0.034	0.032	0.032	5.1
32	30-Jul-12	7-Aug-12	0.041	0.033	0.041	0.042	0.045	0.045	0.037	0.036	0.043	0.040	0.040	9.7
33	7-Aug-12	14-Aug-12	0.044	0.046	0.045	0.044	0.045	0.044	0.037	0.044	0.042	0.042	0.043	5.9
34	14-Aug-12	21-Aug-12	0.027	0.025	0.027	0.028	0.030	0.028	0.026	0.027	0.029	0.028	0.028	5.2
35	21-Aug-12	28-Aug-12	0.025	0.026	0.027	0.025	0.025	0.025	0.024	0.023	0.025	0.025	0.025	4.2
36	28-Aug-12	4-Sep-12	0.037	0.036	0.038	0.038	0.038	0.038	0.033	0.039	0.040	0.039	0.038	5.2
37	4-Sep-12	11-Sep-12	0.031	0.035	0.034	0.033	0.034	0.036	0.029	0.034	0.033	0.032	0.033	6.1
38	11-Sep-12	18-Sep-12	0.042	0.045	0.040	0.043	0.044	0.043	0.035	0.041	0.040	0.043	0.042	6.8
39	18-Sep-12	25-Sep-12	0.066	0.069	0.067	0.062	0.069	0.067	0.064	0.067	0.064	0.067	0.066	3.4
Mean			0.037	0.037	0.038	0.037	0.039	0.039	0.034	0.037	0.037	0.037	0.037	3.8

4th Quarter

Week #	START DATE	STOP DATE	Site 4	Site 6A* (control)	Site 7A	Site 14A*	Site 15*	Site 17A	Site 21	Site 29*	Site 35	Site 40*	Mean	RSD (%)
40	25-Sep-12	2-Oct-12	0.057	0.059	0.051	0.058	0.064	0.052	0.052	0.064	0.060	0.060	0.058	7.8
41	2-Oct-12	9-Oct-12	0.064	0.053	0.064	0.051	0.067	0.067	0.056	0.059	0.057	0.058	0.060	9.8
42	9-Oct-12	16-Oct-12	0.030	0.034	0.039	0.038	0.039	0.037	0.035	0.034	0.038	0.035	0.036	7.9
43	16-Oct-12	25-Oct-12	0.042	0.041	0.040	0.043	0.045	0.046	0.038	0.046	0.041	0.043	0.043	6.2
44	25-Oct-12	30-Oct-12	0.045	0.045	0.048	0.045	0.044	0.044	0.042	0.047	0.043	0.041	0.044	4.9
45	30-Oct-12	6-Nov-12	0.066	0.067	0.062	0.062	0.064	0.061	0.052	0.059	0.064	0.045	0.060	11.3
46	6-Nov-12	13-Nov-12	0.034	0.037	0.036	0.034	0.034	0.040	0.032	0.036	0.033	0.034	0.035	6.2
47	13-Nov-12	19-Nov-12	0.061	0.063	0.061	0.055	0.058	0.055	0.045	0.058	0.054	0.059	0.057	9.0
48	19-Nov-12	27-Nov-12	0.050	0.061	0.056	0.051	0.051	0.054	0.047	0.055	0.049	0.054	0.053	7.7
49	27-Nov-12	4-Dec-12	0.050	0.047	0.048	0.050	0.050	0.051	0.045	0.045	0.046	0.045	0.048	5.3
50	4-Dec-12	11-Dec-12	0.047	0.051	0.044	0.041	0.042	0.043	0.037	0.038	0.040	0.040	0.042	10.4
51	11-Dec-12	18-Dec-12	0.023	0.021	0.023	0.022	0.022	0.024	0.020	0.023	0.021	0.022	0.022	4.9
52	18-Dec-12	25-Dec-12	0.045	0.047	0.046	0.042	0.044	0.045	0.038	0.042	0.040	0.039	0.043	7.0
53	25-Dec-12	31-Dec-12	0.030	0.031	0.032	0.030	0.028	0.031	0.030	0.033	0.025	0.031	0.030	7.357

TABLE 8.5 RADIOIODINE IN AIR 3rd - 4th QUARTER

ODCM required samples denoted by *
units are pCi/m³

3rd Quarter

Week #	START DATE	STOP DATE	Site 4	(control) Site 6A*	Site 7A	Site 14A*	required LLD <0.070 Site 15*	Site 17A	Site 21	Site 29*	Site 35	Site 40*
27	26-Jun-12	2-Jul-12	<0.029	<0.059	<0.057	<0.031	<0.052	<0.031	<0.064	<0.038	<0.068	<0.023
28	2-Jul-12	10-Jul-12	<0.034	<0.039	<0.044	<0.023	<0.048	<0.028	<0.032	<0.027	<0.051	<0.022
29	10-Jul-12	17-Jul-12	<0.049	<0.055	<0.050	<0.056	<0.051	<0.033	<0.055	<0.047	<0.031	<0.066
30	17-Jul-12	24-Jul-12	<0.019	<0.051	<0.064	<0.036	<0.061	<0.028	<0.055	<0.025	<0.064	<0.032
31	24-Jul-12	30-Jul-12	<0.034	<0.049	<0.041	<0.034	<0.050	<0.021	<0.057	<0.031	<0.039	<0.026
32	30-Jul-12	7-Aug-12	<0.052	<0.049	<0.038	<0.044	<0.052	<0.037	<0.037	<0.023	<0.056	<0.035
33	7-Aug-12	14-Aug-12	<0.039	<0.066	<0.046	<0.029	<0.057	<0.029	<0.057	<0.035	<0.070	<0.027
34	14-Aug-12	21-Aug-12	<0.064	<0.024	<0.065	<0.027	<0.056	<0.033	<0.070	<0.024	<0.064	<0.049
35	21-Aug-12	28-Aug-12	<0.055	<0.030	<0.036	<0.032	<0.049	<0.026	<0.045	<0.024	<0.070	<0.021
36	28-Aug-12	4-Sep-12	<0.045	<0.056	<0.055	<0.018	<0.058	<0.044	<0.032	<0.043	<0.021	<0.043
37	4-Sep-12	11-Sep-12	<0.037	<0.033	<0.048	<0.020	<0.069	<0.026	<0.060	<0.029	<0.069	<0.041
38	11-Sep-12	18-Sep-12	<0.046	<0.069	<0.057	<0.036	<0.051	<0.062	<0.056	<0.052	<0.021	<0.046
39	18-Sep-12	25-Sep-12	<0.042	<0.038	<0.069	<0.023	<0.070	<0.030	<0.057	<0.021	<0.050	<0.033

4th Quarter

Week #	START DATE	STOP DATE	Site 4	(control) Site 6A*	Site 7A	Site 14A*	required LLD <0.070 Site 15*	Site 17A	Site 21	Site 29*	Site 35	Site 40*
40	25-Sep-12	2-Oct-12	<0.026	<0.054	<0.053	<0.027	<0.022	<0.032	<0.047	<0.025	<0.064	<0.026
41	2-Oct-12	9-Oct-12	<0.037	<0.053	<0.066	<0.020	<0.068	<0.008	<0.062	<0.043	<0.055	<0.030
42	9-Oct-12	16-Oct-12	<0.030	<0.054	<0.045	<0.040	<0.062	<0.027	<0.068	<0.030	<0.061	<0.033
43	16-Oct-12	25-Oct-12	<0.022	<0.061	<0.030	<0.037	<0.021	<0.067	<0.034	<0.058	<0.029	<0.067
44	25-Oct-12	30-Oct-12	<0.032	<0.036	<0.052	<0.040	<0.036	<0.040	<0.044	<0.037	<0.046	<0.030
45	30-Oct-12	6-Nov-12	<0.031	<0.048	<0.066	<0.019	<0.061	<0.027	<0.043	<0.031	<0.055	<0.024
46	6-Nov-12	13-Nov-12	<0.014	<0.046	<0.025	<0.061	<0.025	<0.025	<0.019	<0.069	<0.028	<0.054
47	13-Nov-12	19-Nov-12	<0.038	<0.036	<0.037	<0.029	<0.036	<0.028	<0.037	<0.038	<0.036	<0.039
48	19-Nov-12	27-Nov-12	<0.031	<0.046	<0.047	<0.065	<0.059	<0.012	<0.052	<0.064	<0.049	<0.026
49	27-Nov-12	4-Dec-12	<0.037	<0.052	<0.070	<0.020	<0.061	<0.040	<0.036	<0.025	<0.060	<0.026
50	4-Dec-12	11-Dec-12	<0.034	<0.058	<0.052	<0.025	<0.033	<0.065	<0.056	<0.026	<0.064	<0.028
51	11-Dec-12	18-Dec-12	<0.034	<0.047	<0.020	<0.025	<0.062	<0.037	<0.066	<0.036	<0.069	<0.037
52	18-Dec-12	25-Dec-12	<0.043	<0.068	<0.058	<0.067	<0.042	<0.063	<0.045	<0.060	<0.058	<0.009
523	25-Dec-12	31-Dec-12	<0.021	<0.039	<0.048	<0.035	<0.063	<0.041	<0.058	<0.027	<0.065	<0.023