APS

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102-05469-SAB/TNW/CJJ
April 25, 2006

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

Dear Sir:

Subject: **Palo Verde Nuclear Generating Station (PVNGS)**
Units 1, 2 and 3
Docket Nos. STN 50-528/529/530
Annual Radiological Environmental Operating Report 2005

In accordance with PVNGS Technical Specification (TS) 5.6.2, enclosed please find the Annual Radiological Environmental Operating Report for 2005.

No commitments are being made to the NRC in this letter. If you have any questions, please contact Thomas N. Weber at (623) 393-5764.

Sincerely,

[signature]

SAB/TNW/CJJ/ca

Enclosure

cc: B. S. Mallett
M. B. Fields
G. G. Warnick
A. V. Godwin

IE25

ENCLOSURE

Annual Radiological Environmental Operating Report 2005

PALO VERDE

NUCLEAR GENERATING STATION

ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT 2005

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

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Date: 04/14/2006 18:16:00
Reason: I am approving this document
Location: PVNGS

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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 2005, the following categories of samples were collected by APS:

- Broad leaf vegetation
- Groundwater
- 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 Reservoir, two (2) 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. There were no measurable radiological impacts on the environment due to PVNGS operations in 2005.

(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. The REMP is performed in accordance with the federal requirements to provide a complete environmental monitoring program for nuclear reactors, and with concern for maintaining the quality of the local environment. The program complies with the requirements of 10 CFR 50, Appendix I, PVNGS Technical Specifications, and with the guidance provided by the US Nuclear Regulatory Commission (USNRC) in their Radiological Assessment Branch Technical Position on Environmental Monitoring, Revision 1, November 1979.

This report contains the measurements and findings for 2005. All references are specifically identified in Section 12.

The objectives of the REMP are as follows: 1) to determine baseline radiation levels in the environs prior to plant operation and to compare the findings with measurements obtained during reactor operations; 2) to monitor potential critical pathways of radio-effluent to the public; and 3) to determine radiological impacts on the environment caused by the operation of PVNGS.

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).

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, which began in 1979. APS and vendors continued the program into the operational phase.

2.1. 2005 PVNGS Radiological Environmental Monitoring Program

The assessment program consists of routine measurements of background 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. Sample analyses were performed by APS at the PVNGS Central Chemistry Laboratory.

Background gamma radiation measurements were performed by APS using TLDs at *forty-nine* (49) locations near PVNGS.

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 2005

- One (1) new air sample station was placed at a new school in May
- The control (goat) milk location changed in July due to unavailability of samples at the previous location.
- One (goat) milk indicator location changed in July due to unavailability of samples at the previous location.

Refer to Table 2.1 for a description of all current sample locations (except TLDs).

2.3. REMP Deviations/Abnormal Events Summary

During calendar year 2005, there were three (3) deviations/abnormal events with regard to the monitoring program. Refer to Table 2.3 for more detail and any corrective actions taken.

- Air samples were invalidated from Sites #29 and #35 for gross beta the week of 1/4-1/11.
- Air samples were invalidated from Site #17A for gross beta and radioiodine the week of 10/4-10/11.
- The WRF Influent I-131 concentration exceeded 100 pCi/liter on one (1) occasion.

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 (b)	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	NW9	McArthur residence
47	vegetation	ESE4	McCoy residence
48	drinking water	SW1	Berryman residence
49	drinking water	N2	Chowanec residence
51	milk	NE4	Painter residence-goats
52	vegetation	NNE2	Branch residence
53*	milk	ENE24 (b)	Barber residence-goats (until July), replaced by Adams residence (NE36)
54	milk	NNE2 (b)	Branch residence-goats (until July), replaced by Hernandez residence (NNE4)
55	drinking water (supplemental)	SW3	Gavette residence
57	groundwater	ONSITE	Well 27ddc
58	groundwater	ONSITE	Well 34abb
59	surface water	ONSITE	Evaporation Pond #1
60	surface water	ONSITE	Reservoir
62*	vegetation	ENE26	Duncan Family Farms
63	surface water	ONSITE	Evaporation Pond #2

NOTES:

* Designates a control site

(a) Distances and direction are from the center-line of Unit 2 containment and rounded to the nearest mile
(b) Denotes a change in location or a new sample location

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

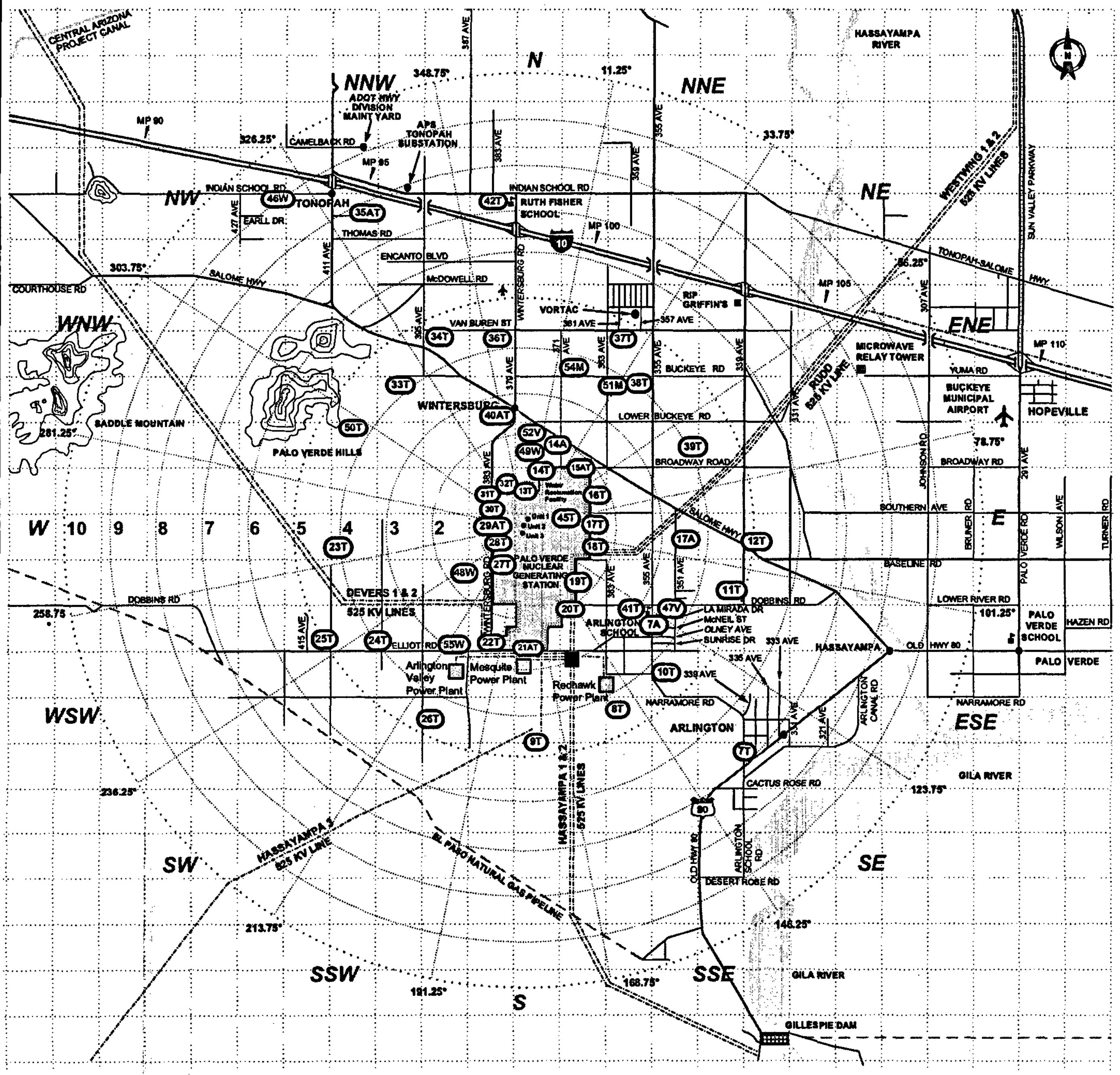
SAMPLE SITE #	*AIR PARTICULATE*	*MILK*	*AIRBORNE RADIOIODINE*	*VEGETATION*	*GROUND WATER*	*DRINKING WATER*	*SURFACE WATER*
4	W		W				
6A	W		W				
7A	W		W				
14A	W		W				
15	W		W				
17A	W		W				
21	W		W				
29	W		W				
35	W		W				
40	W		W				
46						W	
47				M/AA			
48						W	
49						W	
51		M/AA	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

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

TABLE 2.3 SUMMARIES OF REMP DEVIATIONS/ABNORMAL EVENTS

Deviation/Abnormal Event	Actions taken
1. Air sample results from Sites #29 and #35 for gross beta were invalidated the week of 1-11-05. Results were abnormally low when compared to other samples collected during the same period.	1. The technician who obtained the samples stated that the samples had become wet from rain, which could have affected the results. The samples were invalidated due to the high RSD% (24%). Subsequent sample results were normal. No additional actions are necessary.
2. Air sample results from Site #17A for gross beta and radioiodine were invalidated due to pump inoperability the week of 10-11-05.	2. The air sample pump was not running when the technician arrived at the sample location, although the ETM had power. The actual sample volume could not be determined. Equipment was replaced and subsequent samples were valid. No additional actions are necessary.
3. The WRF Influent I-131 concentration exceeded 100 pCi/liter (actual value was 158 pCi/liter the week of May 31) on one occasion.	3. Phoenix sewage effluent is the supply for this water and is known to contain radiopharmaceutical I-131. The Arizona Radiation Regulatory Agency is notified when this source of water exceeds an I-131 concentration of 100 pCi/liter (the threshold is exceeded on an infrequent basis). This is considered a courtesy notification (not regulatory) and no further action is required.

FIGURE 2.1



KEY TO MAP

Sample Site ①
A Air
V Vegetation
W Water
T TLD
M Milk

School
Airstrip

REMP SAMPLE SITES
0-10 MILES

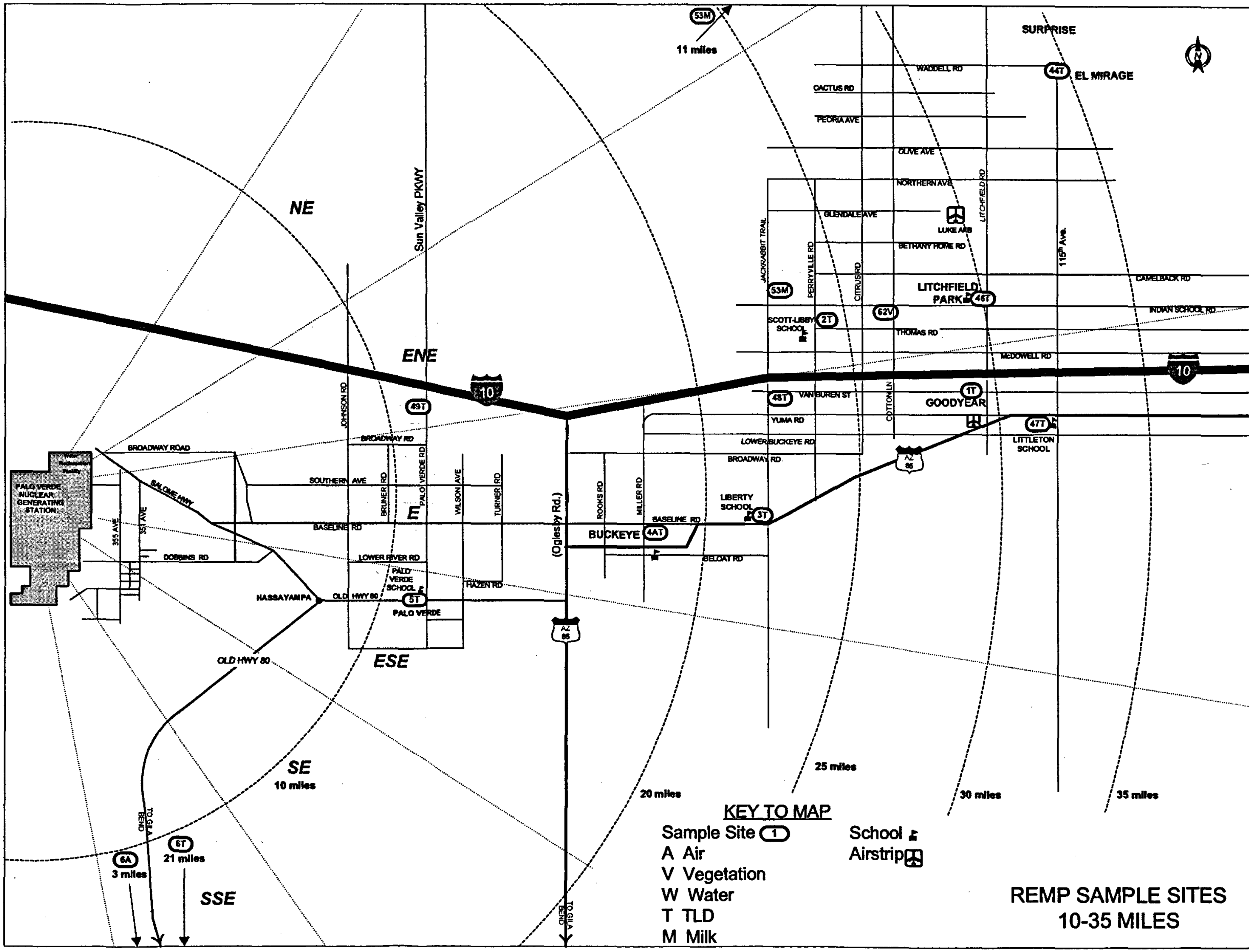

53M
11 miles
SURPRISE
WADDELL RD
44T
EL MIRAGE
CACTUS RD
PEORIA AVE
OLIVE AVE
NORTHERN AVE
GLENDALE AVE
LUKE AFB
LITCHFIELD RD
BETHANY HOME RD
115th Ave.
CAMELBACK RD
JACKRABBIT TRAIL
PERRYVILLE RD
CITRUS RD
53M
LITCHFIELD PARK
46T
62V
INDIAN SCHOOL RD
SCOTT-LIBBY SCHOOL
2T
THOMAS RD
MCDOWELL RD
10
NE
Sun Valley PKWY
ENE
10
49T
48T
VAN BUREN ST
1T
GOODYEAR
YUMA RD
COTTON LN
47T
LITTLETON SCHOOL
LOWER BUCKEYE RD
BROADWAY RD
AZ 85
JOHNSON RD
BROADWAY RD
BROADWAY ROAD
PALO VERDE NUCLEAR GENERATING STATION
SALOME HWY
SOUTHERN AVE
BRUNER RD
PALO VERDE RD
WILSON AVE
TURNER RD
E
(Oglesby Rd.)
ROOKS RD
MILLER RD
LIBERTY SCHOOL
3T
BASELINE RD
BASELINE RD
BUCKEYE
4AT
355 AVE
35 AVE
DOBBINS RD
LOWER RIVER RD
BELOAT RD
PALO VERDE SCHOOL
HAZEN RD
HASSAYAMPA
OLD HWY 80
5T
PALO VERDE
AZ 85
OLD HWY 80
ESE
SE
10 miles
20 miles
25 miles
30 miles
35 miles
TO GILA BEND
6A
3 miles
6T
21 miles
SSE
TO GILA BEND
KEY TO MAP
Sample Site 1
A Air
V Vegetation
W Water
T TLD
M Milk
School
Airstrip
REMP SAMPLE SITES
10-35 MILES

FIGURE 2.2

3. Sample Collection Program

APS personnel using PVNGS procedures collected all samples.

3.1. Water

Weekly samples were collected from the Reservoir, Evaporation Pond #1, Evaporation Pond #2, and four (4) residence wells. Samples were collected in one-gallon containers and 500 ml glass bottles. One liter from each weekly one-gallon sample was added to a monthly composite, which is preserved with nitric acid (HNO_3). The composite samples were then analyzed for gamma emitting radionuclides. Residence wells were also analyzed for gross beta activity. Weekly grab samples in glass bottles were composited quarterly and analyzed for tritium.

Quarterly grab samples were collected from 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 nine (9) sites on a weekly basis. In May, a tenth air sample station was installed at a new school. 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. Samples were collected using 1 liter containers.

Scale/sludge was removed from cooling tower louvers and circulating water/plant cooling water piping and analyzed for gamma emitting radionuclides.

Cooling tower sludge was analyzed for gamma emitting radionuclides.

Bottom sediment/sludge samples were obtained from Evaporation Pond #1, Evaporation Pond #2, and Sedimentation Basin #2 and analyzed for gamma emitting radionuclides.

Sediment samples were collected 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.

4.4. 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 15-17 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.

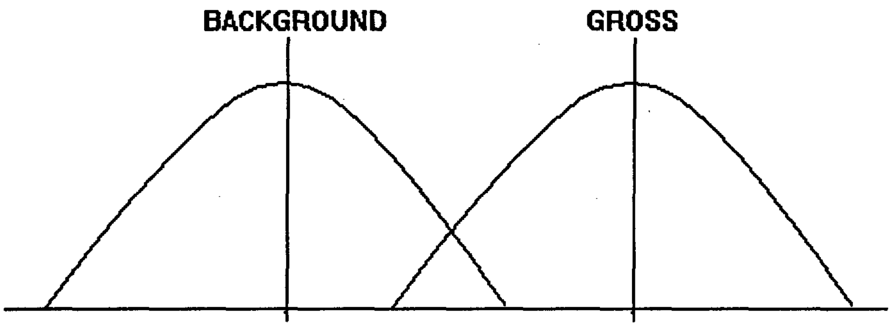
Occasionally, the PVNGS ODCM *a priori* LLDs may not be achieved as a result of:

- 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	

NOTES:

* 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.

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	

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.

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

Table 6.3 TYPICAL MDA VALUES

ANALYSIS/ NUCLIDE	WATER (pCi/liter)	MILK (pCi/liter)	AIRBORNE PARTICULATE or GAS (pCi/m^3)	VEGETATION (pCi/kg, wet)
Gross Beta	3		0.004	
H-3	250			
Mn-54	13			
Fe-59	25			
Co-58	11			
Co-60	13			
Zn-65	28			
Zr-95	20			
Nb-95	12			
I-131	10 [a]	1	0.05 [b]	45
Cs-134	10	1	0.02 [b]	50
Cs-137	11	1	0.02 [b]	70
Ba-140	40	3		
La-140	14	1		

NOTES:

a - low level I-131 is not required since there is no drinking water pathway
b - Based on 433 m^3 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 2005, 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.

All crosscheck results reported in 2005 were within the established acceptance criteria.

TABLE 7.1 INTERLABORATORY COMPARISON RESULTS

Sample Type	Analysis Type	Nuclide	Known Value	PVNGS Value	1 sigma Error	Resolution *	Ratio	Accept/Reject
Water	Mixed Gamma	I-131	93.8	103	7	15	1.10	Accept
	E4645-111	Ce-141	101.2	110	14	8	1.09	Accept
		Cr-51	330	330	31	11	1.00	Accept
		Cs-134	104	90	6	15	0.87	Accept
		Cs-137	206	210	14	15	1.02	Accept
		Co-58	5.8	<MDA	NA	NA	NA	Accept
		Mn-54	136	148	13	11	1.09	Accept
		Fe-59	69.7	85	12	7	1.22	Accept
		Zn-65	169	173	15	12	1.02	Accept
		Co-60	158	164	8	21	1.04	Accept
	Tritium	H-3	9100	7690	265	29	0.84	Accept
	E4649-111							
	Gross Beta	gbeta	214	219	3	73	1.03	Accept
	E4644-111							
Air	Gross Beta	gbeta	128	158	2.1	75	1.24	Accept
	E4646-111							
	Iodine Cart	I-131	92.2	91	5.3	17	0.99	Accept
	E4647-111							
	Mixed Gamma	Ce-141	81.8	89	4.4	20	1.09	Accept
	E4648-111	Cr-51	268	270	18.5	15	1.01	Accept
		Cs-134	84.2	76	4.9	16	0.90	Accept
		Cs-137	167	182	11.5	16	1.09	Accept
		Co-58	4.7	4.0	1.5	3	0.85	Accept
		Mn-54	111	125	8.4	15	1.13	Accept
		Fe-59	56.6	61	5.6	11	1.08	Accept
		Zn-65	137	163	11	15	1.19	Accept
		Co-60	128	139	7	20	1.08	Accept
Milk	Mixed Gamma	I-131	81	80	3	27	0.99	Accept
	E4805-111	Ce-141	47.8	51	6	9	1.07	Accept
		Cr-51	41.2	36	13	3	0.87	Accept
		Cs-134	18.6	16	2	8	0.86	Accept
		Cs-137	40.4	43	6	7	1.06	Accept
		Co-58	16.5	16	3	5	0.97	Accept
		Mn-54	32.5	35	5	7	1.08	Accept
		Fe-59	17.6	15	4	4	0.85	Accept
		Zn-65	32.8	30	7	4	0.91	Accept
		Co-60	23.7	25	3	8	1.05	Accept

TABLE 7.1 INTERLABORATORY COMPARISON RESULTS

Sample Type	Analysis Type	Nuclide	Known Value	PVNGS Value	1 sigma Error	Resolution *	Ratio	Accept/Reject
Water	Mixed Gamma	I-131	53.1	57	5	11	1.07	Accept
	E4796-111	Ce-141	165	166	9	18	1.01	Accept
		Cr-51	142	168	22	8	1.18	Accept
		Cs-134	64.3	58	4	15	0.90	Accept
		Cs-137	139	143	9	16	1.03	Accept
		Co-58	57.1	57	5	11	1.00	Accept
		Mn-54	112	123	8	15	1.10	Accept
		Fe-59	60.6	58	7	8	0.96	Accept
		Zn-65	113	124	9	14	1.09	Accept
		Co-60	81.4	85	5	17	1.04	Accept
	Tritium	H-3	13200	11600	285	41	0.88	Accept
	E4800-111							
	Gross Beta	gbeta	175	199	3	66	1.14	Accept
	E4795-111							
Air	Gross Beta	gbeta	174	211	2.4	88	1.21	Accept
	E4797-111							
	Iodine Cart	I-131	73.7	79	4.5	18	1.07	Accept
	E4798-111							
	Mixed Gamma	Ce-141	186	191	9	21	1.09	Accept
	E4799-111	Cr-51	160	162	20	8	1.08	Accept
		Cs-134	72.4	68	5	14	0.85	Accept
		Cs-137	157	166	11	15	1.13	Accept
		Co-58	64.2	75	6	13	1.10	Accept
		Mn-54	126	143	10	14	1.19	Accept
		Fe-59	68.3	76	8	10	1.28	Accept
		Zn-65	128	156	11	14	1.18	Accept
		Co-60	91.6	99	6	17	1.10	Accept

* calculated from PVNGS value/1 sigma error value

Acceptance Criteria [1]

Resolution	Ratio
<4	
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, Inspection Procedure 84750, "Radioactive Waste Treatment, And Effluent And Environmental Monitoring"

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 2005 are presented in the following sections. Assessment of pre-operational and operational data revealed no changes to environmental radiation levels. There were no measurable radiological impacts on the environment due to PVNGS operations in 2005.

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 0.015 to 0.066 pCi/m^3. The associated counting error ranged from 0.001 to 0.004 pCi/m^3. Mean quarterly activity is 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. The findings are consistent with pre-operational baseline and previous operational results. The results are summarized in Table 11.1.

Table 8.3 displays the results of gamma spectroscopy on the quarterly composites. No Cs-134 or Cs-137 was observed.

8.2. Airborne Radioiodine

Tables 8.4 and 8.5 present the quarterly radioiodine results. No airborne radioiodine was observed in any of the 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 5.0 pCi/liter (Gavette residence, June composite).

8.6. Groundwater

Groundwater samples were analyzed 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 Reservoir and Evaporation Ponds were analyzed for tritium and gamma emitting radionuclides. The Reservoir contains processed sewage water from the City of Phoenix and is approximately 80 acres in size. The two Evaporation Ponds receive mostly circulating water from main turbine condenser cooling and are about 250 acres each. Results are presented in Table 8.10. I-131 was observed in Evaporation Pond # 1 in three (3) monthly composite samples (7-19 pCi/liter) and one (1) of the Reservoir monthly composite samples (13 pCi/liter). I-131 is a result of radiopharmaceutical I-131 in the Phoenix sewage effluent.

Tritium was routinely observed in Evaporation Ponds 1 and 2. The highest concentration in Evaporation Pond #1 was 2038 pCi/liter and the highest concentration in Evaporation Pond #2 was 1763 pCi/liter. Tritium was not identified in the Reservoir. The tritium identified in the Evaporation Ponds has been attributed to plant gaseous effluent releases and secondary plant liquid releases.

WRF influent (Phoenix sewage effluent) 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 highest I-131 concentration was 158 pCi/liter (week of May 31st). The Arizona Radiation Regulatory Agency was contacted each week that this concentration exceeded 100 pCi/liter (one time in 2005). 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 waters from site runoff and was dry for most of the year. Tritium was detected in nine (9) samples ranging from 387 to 958 pCi/liter. The tritium in this basin has been attributed to plant gaseous effluent releases and secondary plant liquid releases.

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 in the WRF waste centrifuge sludge is consistent with historical values and, as previously discussed, is due to radiopharmaceuticals in the WRF influent. I-131 was present in all forty-nine (49) samples ranging from 342 to 2121 pCi/kg.

In-111 was also identified in the sludge in twelve (12) samples. The highest concentration was 86 pCi/kg. It was previously established that In-111 is in use in the Phoenix area as a radiopharmaceutical. Results for WRF centrifuge waste sludge can be found in Table 8.11.

8.8.2. Evaporation Ponds #1 and #2 sediment

A set of ten (10) Evaporation Pond sediment samples indicated low levels of Cs-137 in three (3) samples from Evaporation Pond #2 . The concentrations were consistent with historical values. Sample results can be found in Table 8.11.

8.8.3. Cooling Tower sludge/scale

Sludge/scale originating from the Unit cooling towers, piping, and/or circulating water canals was disposed of in the WRF sludge landfill during 2005. Sample results can be found in Table 8.11.

8.8.4. Sedimentation Basin #2 sediment

Sediment samples were collected from Sedimentation Basin #2, when there was no water present, and analyzed for gamma emitting radionuclides. No gamma emitting radionuclides were detected in any of the samples. Sample results can be found in Table 8.11.

8.9. Data Trends

Figures 8.1-8.5 present data in graphical format. Historical data are displayed for comparison where practical.

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

ODCM required samples denoted by *

units are pCi/m^3

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 (%)
1st Quarter														
1	27-Dec-04	4-Jan-05	0.027	0.030	N/A	0.024	0.026	0.025	0.026	0.025	0.023	0.024	0.026	8.1
2	4-Jan-05	11-Jan-05	0.024	0.026	N/A	0.020	0.025	0.022	0.021	invalid [a]	invalid [a]	0.019	0.022	11.8
3	11-Jan-05	18-Jan-05	0.029	0.029	N/A	0.026	0.031	0.027	0.028	0.029	0.027	0.025	0.028	6.6
4	18-Jan-05	25-Jan-05	0.048	0.046	N/A	0.048	0.046	0.037	0.042	0.040	0.046	0.046	0.044	8.6
5	25-Jan-05	1-Feb-05	0.027	0.028	N/A	0.027	0.028	0.028	0.024	0.027	0.026	0.025	0.027	5.3
6	1-Feb-05	8-Feb-05	0.034	0.033	N/A	0.036	0.034	0.033	0.030	0.031	0.035	0.034	0.033	5.6
7	8-Feb-05	14-Feb-05	0.021	0.020	N/A	0.022	0.022	0.019	0.022	0.021	0.020	0.019	0.021	5.9
8	14-Feb-05	22-Feb-05	0.023	0.024	N/A	0.020	0.022	0.021	0.020	0.022	0.021	0.020	0.021	6.6
9	22-Feb-05	1-Mar-05	0.018	0.016	N/A	0.017	0.017	0.015	0.017	0.018	0.016	0.016	0.017	6.0
10	1-Mar-05	8-Mar-05	0.023	0.021	N/A	0.023	0.021	0.021	0.020	0.021	0.022	0.023	0.022	5.2
11	8-Mar-05	15-Mar-05	0.041	0.040	N/A	0.032	0.038	0.040	0.035	0.040	0.040	0.037	0.038	7.8
12	15-Mar-05	22-Mar-05	0.028	0.026	N/A	0.023	0.025	0.025	0.024	0.025	0.025	0.026	0.025	5.5
13	22-Mar-05	29-Mar-05	0.019	0.018	N/A	0.017	0.017	0.018	0.017	0.018	0.017	0.017	0.018	4.1
Mean			0.028	0.027	N/A	0.026	0.027	0.025	0.025	0.026	0.027	0.025	0.026	3.7
2nd Quarter														
Week #	**START DATE**	**STOP DATE**	**Site 4**	**Site 6A***	**Site 7A**	**Site 14A***	**Site 15***	**Site 17A**	**Site 21**	**Site 29***	**Site 35**	**Site 40***	**Mean**	**RSD (%)**
14	29-Mar-05	5-Apr-05	0.015	0.022	N/A	0.020	0.023	0.023	0.022	0.019	0.021	0.020	0.021	12.2
15	5-Apr-05	11-Apr-05	0.023	0.025	N/A	0.021	0.021	0.025	0.022	0.023	0.021	0.020	0.022	8.1
16	11-Apr-05	18-Apr-05	0.039	0.036	N/A	0.036	0.035	0.039	0.032	0.034	0.034	0.033	0.035	6.9
17	18-Apr-05	26-Apr-05	0.025	0.027	N/A	0.023	0.025	0.020	0.025	0.023	0.025	0.022	0.024	8.7
18	26-Apr-05	3-May-05	0.022	0.019	N/A	0.020	0.021	0.022	0.020	0.018	0.022	0.020	0.020	7.0
19	3-May-05	10-May-05	0.022	0.021	N/A	0.023	0.022	0.019	0.020	0.025	0.022	0.020	0.022	8.4
20	10-May-05	17-May-05	0.029	0.028	N/A	0.023	0.026	0.026	0.025	0.027	0.026	0.026	0.026	6.5
21	17-May-05	24-May-05	0.031	0.035	0.033	0.031	0.030	0.032	0.030	0.034	0.031	0.028	0.032	6.6
22	24-May-05	31-May-05	0.032	0.033	0.031	0.031	0.033	0.031	0.034	0.034	0.031	0.034	0.032	4.2
23	31-May-05	7-Jun-05	0.035	0.036	0.034	0.031	0.034	0.035	0.033	0.035	0.034	0.033	0.034	4.2
24	7-Jun-05	14-Jun-05	0.029	0.024	0.025	0.028	0.027	0.027	0.026	0.025	0.025	0.027	0.026	6.0
25	14-Jun-05	21-Jun-05	0.031	0.034	0.031	0.030	0.030	0.035	0.032	0.031	0.031	0.028	0.031	6.4
26	21-Jun-05	28-Jun-05	0.025	0.037	0.037	0.026	0.038	0.035	0.035	0.036	0.040	0.036	0.035	14.4
Mean			0.028	0.029	N/A	0.026	0.028	0.028	0.027	0.028	0.028	0.027	0.028	2.9

[a] sample invalidated due to low value and high system RSD % (24.4)- technician stated the sample was wet from rain

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

ODCM required samples denoted by *

units are pCi/m^3

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 (%)
3rd Quarter														
27	28-Jun-05	5-Jul-05	0.030	0.029	0.029	0.028	0.030	0.027	0.026	0.030	0.026	0.027	0.028	5.7
28	5-Jul-05	12-Jul-05	0.027	0.032	0.029	0.030	0.028	0.030	0.034	0.026	0.033	0.031	0.030	8.6
29	12-Jul-05	19-Jul-05	0.037	0.034	0.037	0.036	0.039	0.037	0.038	0.042	0.036	0.035	0.037	6.0
30	19-Jul-05	26-Jul-05	0.025	0.026	0.026	0.025	0.027	0.025	0.027	0.025	0.026	0.027	0.026	3.4
31	26-Jul-05	2-Aug-05	0.023	0.020	0.023	0.022	0.023	0.023	0.021	0.022	0.022	0.022	0.022	4.5
32	2-Aug-05	9-Aug-05	0.029	0.029	0.027	0.028	0.029	0.028	0.028	0.028	0.028	0.026	0.028	3.4
33	9-Aug-05	16-Aug-05	0.027	0.026	0.027	0.027	0.030	0.030	0.028	0.028	0.028	0.030	0.028	5.2
34	16-Aug-05	23-Aug-05	0.030	0.031	0.030	0.032	0.033	0.032	0.030	0.034	0.033	0.032	0.032	4.5
35	23-Aug-05	30-Aug-05	0.027	0.025	0.026	0.028	0.029	0.028	0.025	0.027	0.026	0.026	0.027	5.0
36	30-Aug-05	6-Sep-05	0.039	0.038	0.038	0.035	0.036	0.035	0.036	0.039	0.034	0.034	0.036	5.4
37	6-Sep-05	13-Sep-05	0.033	0.032	0.033	0.032	0.038	0.033	0.033	0.034	0.033	0.031	0.033	5.6
38	13-Sep-05	19-Sep-05	0.034	0.033	0.034	0.030	0.034	0.034	0.032	0.035	0.031	0.033	0.033	4.7
39	19-Sep-05	27-Sep-05	0.038	0.040	0.033	0.035	0.037	0.034	0.035	0.036	0.034	0.034	0.036	6.1
Mean			0.031	0.030	0.030	0.030	0.032	0.030	0.030	0.031	0.030	0.030	0.030	2.0
4th Quarter														
40	27-Sep-05	4-Oct-05	0.038	0.043	0.037	0.037	0.040	0.039	0.038	0.038	0.037	0.038	0.039	4.8
41	4-Oct-05	11-Oct-05	0.033	0.032	0.026	0.032	0.030	invalid [a]	0.031	0.035	0.033	0.032	0.032	7.9
42	11-Oct-05	19-Oct-05	0.041	0.038	0.037	0.038	0.035	0.041	0.034	0.034	0.036	0.034	0.037	7.3
43	19-Oct-05	25-Oct-05	0.035	0.036	0.035	0.034	0.034	0.040	0.040	0.038	0.037	0.034	0.036	6.5
44	25-Oct-05	1-Nov-05	0.046	0.046	0.044	0.044	0.046	0.044	0.044	0.046	0.045	0.043	0.045	2.5
45	1-Nov-05	8-Nov-05	0.054	0.055	0.053	0.053	0.052	0.054	0.049	0.054	0.048	0.051	0.052	4.4
46	8-Nov-05	15-Nov-05	0.037	0.037	0.034	0.034	0.035	0.033	0.036	0.036	0.035	0.035	0.035	3.7
47	15-Nov-05	22-Nov-05	0.031	0.033	0.031	0.030	0.033	0.030	0.032	0.034	0.032	0.029	0.032	5.0
48	22-Nov-05	29-Nov-05	0.042	0.043	0.040	0.039	0.038	0.036	0.041	0.041	0.040	0.040	0.040	5.0
49	29-Nov-05	6-Dec-05	0.029	0.034	0.029	0.028	0.031	0.026	0.029	0.030	0.027	0.028	0.029	7.7
50	6-Dec-05	13-Dec-05	0.056	0.060	0.052	0.050	0.050	0.051	0.051	0.051	0.048	0.048	0.052	7.1
51	13-Dec-05	20-Dec-05	0.066	0.070	0.062	0.057	0.059	0.058	0.060	0.063	0.060	0.060	0.062	6.4
52	20-Dec-05	27-Dec-05	0.051	0.054	0.046	0.043	0.042	0.042	0.043	0.047	0.041	0.036	0.045	11.7
Mean			0.043	0.045	0.040	0.040	0.040	0.041	0.041	0.042	0.040	0.039	0.041	4.1
Annual Average			***0.032***	***0.033***	***0.035***	***0.030***	***0.032***	***0.031***	***0.031***	***0.032***	***0.031***	***0.030***	***0.032***	***4.2***

a Sample invalidated due to equipment malfunction that prevented accurate volume determination (pump not running, ETM running)

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*
29-Mar-05	Cs-134	<0.0016	<0.0013	N/A	<0.0022	<0.0032	<0.0011	<0.0032	<0.0021	<0.0033	<0.0018
	Cs-137	<0.0024	<0.0035	N/A	<0.0026	<0.0035	<0.0022	<0.0030	<0.0024	<0.0042	<0.0012
28-Jun-05	Cs-134	<0.0017	<0.0030	N/A	<0.0023	<0.0019	<0.0038	<0.0022	<0.0041	<0.0025	<0.0037
	Cs-137	<0.0025	<0.0036	N/A	<0.0036	<0.0018	<0.0042	<0.0021	<0.0038	<0.0026	<0.0028
27-Sep-05	Cs-134	<0.0021	<0.0040	<0.0019	<0.0034	<0.0021	<0.0049	<0.0017	<0.0029	<0.0021	<0.0033
	Cs-137	<0.0020	<0.0036	<0.0025	<0.0011	<0.0019	<0.0042	<0.0024	<0.0036	<0.0021	<0.0042
27-Dec-05	Cs-134	<0.0030	<0.0041	<0.0025	<0.0038	<0.0027	<0.0031	<0.0020	<0.0029	<0.0019	<0.0038
	Cs-137	<0.0053	<0.0039	<0.0031	<0.0036	<0.0020	<0.0033	<0.0015	<0.0036	<0.0025	<0.0030

TABLE 8.4 RADIOIODINE IN AIR 1st - 2nd QUARTER

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	(control) Site 6A*	Site 7A	Site 14A*	0.07 Site 15*	Site 17A	Site 21	Site 29*	Site 35	Site 40*
1	27-Dec-04	4-Jan-05	<0.027	<0.057	N/A	<0.032	<0.025	<0.038	<0.028	<0.036	<0.027	<0.039
2	4-Jan-05	11-Jan-05	<0.035	<0.042	N/A	<0.044	<0.029	<0.065	<0.045	<0.051	<0.042	<0.034
3	11-Jan-05	18-Jan-05	<0.035	<0.042	N/A	<0.048	<0.058	<0.052	<0.028	<0.051	<0.030	<0.068
4	18-Jan-05	25-Jan-05	<0.031	<0.036	N/A	<0.039	<0.038	<0.034	<0.034	<0.026	<0.047	<0.033
5	25-Jan-05	1-Feb-05	<0.025	<0.058	N/A	<0.054	<0.033	<0.032	<0.026	<0.033	<0.026	<0.033
6	1-Feb-05	8-Feb-05	<0.044	<0.050	N/A	<0.015	<0.047	<0.051	<0.044	<0.015	<0.042	<0.053
7	8-Feb-05	14-Feb-05	<0.057	<0.035	N/A	<0.039	<0.035	<0.049	<0.052	<0.039	<0.038	<0.049
8	14-Feb-05	22-Feb-05	<0.029	<0.043	N/A	<0.048	<0.052	<0.037	<0.043	<0.057	<0.027	<0.032
9	22-Feb-05	1-Mar-05	<0.041	<0.054	N/A	<0.055	<0.054	<0.042	<0.032	<0.042	<0.054	<0.042
10	1-Mar-05	8-Mar-05	<0.035	<0.052	N/A	<0.035	<0.051	<0.053	<0.069	<0.053	<0.046	<0.059
11	8-Mar-05	15-Mar-05	<0.033	<0.058	N/A	<0.049	<0.031	<0.052	<0.041	<0.064	<0.031	<0.060
12	15-Mar-05	22-Mar-05	<0.057	<0.034	N/A	<0.056	<0.042	<0.044	<0.032	<0.012	<0.036	<0.012
13	22-Mar-05	29-Mar-05	<0.040	<0.057	N/A	<0.028	<0.048	<0.035	<0.065	<0.037	<0.057	<0.034

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*
14	29-Mar-05	5-Apr-05	<0.034	<0.035	N/A	<0.035	<0.024	<0.037	<0.036	<0.033	<0.028	<0.039
15	5-Apr-05	11-Apr-05	<0.041	<0.050	N/A	<0.060	<0.031	<0.068	<0.045	<0.065	<0.033	<0.050
16	11-Apr-05	18-Apr-05	<0.047	<0.055	N/A	<0.028	<0.060	<0.061	<0.048	<0.049	<0.047	<0.048
17	18-Apr-05	26-Apr-05	<0.033	<0.037	N/A	<0.038	<0.029	<0.052	<0.020	<0.037	<0.027	<0.044
18	26-Apr-05	3-May-05	<0.043	<0.060	N/A	<0.037	<0.042	<0.035	<0.049	<0.033	<0.043	<0.041
19	3-May-05	10-May-05	<0.061	<0.028	N/A	<0.012	<0.035	<0.054	<0.033	<0.045	<0.038	<0.049
20	10-May-05	17-May-05	<0.031	<0.049	N/A	<0.049	<0.035	<0.012	<0.036	<0.045	<0.031	<0.035
21	17-May-05	24-May-05	<0.035	<0.052	<0.032	<0.043	<0.012	<0.032	<0.035	<0.035	<0.062	<0.047
22	24-May-05	31-May-05	<0.041	<0.068	<0.034	<0.037	<0.025	<0.055	<0.035	<0.054	<0.031	<0.041
23	31-May-05	7-Jun-05	<0.037	<0.048	<0.054	<0.031	<0.055	<0.036	<0.055	<0.034	<0.043	<0.029
24	7-Jun-05	14-Jun-05	<0.036	<0.062	<0.056	<0.037	<0.060	<0.035	<0.066	<0.051	<0.035	<0.033
25	14-Jun-05	21-Jun-05	<0.038	<0.056	<0.055	<0.035	<0.051	<0.036	<0.067	<0.045	<0.044	<0.069
26	21-Jun-05	28-Jun-05	<0.040	<0.013	<0.045	<0.039	<0.044	<0.045	<0.046	<0.037	<0.036	<0.030

TABLE 8.5 RADIOIODINE IN AIR 3rd - 4th QUARTER

ODCM required samples denoted by *

units are pCi/m^3

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*
3rd Quarter												
27	28-Jun-05	5-Jul-05	<0.039	<0.048	<0.058	<0.029	<0.059	<0.041	<0.053	<0.042	<0.053	<0.031
28	5-Jul-05	12-Jul-05	<0.042	<0.055	<0.054	<0.020	<0.060	<0.036	<0.034	<0.024	<0.057	<0.033
29	12-Jul-05	19-Jul-05	<0.036	<0.055	<0.066	<0.040	<0.035	<0.033	<0.051	<0.032	<0.068	<0.031
30	19-Jul-05	26-Jul-05	<0.048	<0.026	<0.033	<0.020	<0.042	<0.026	<0.054	<0.023	<0.034	<0.034
31	26-Jul-05	2-Aug-05	<0.033	<0.047	<0.048	<0.042	<0.042	<0.020	<0.033	<0.042	<0.022	<0.028
32	2-Aug-05	9-Aug-05	<0.032	<0.036	<0.033	<0.027	<0.034	<0.032	<0.039	<0.034	<0.030	<0.040
33	9-Aug-05	16-Aug-05	<0.031	<0.049	<0.034	<0.033	<0.049	<0.022	<0.042	<0.031	<0.034	<0.034
34	16-Aug-05	23-Aug-05	<0.026	<0.031	<0.033	<0.036	<0.030	<0.029	<0.031	<0.032	<0.037	<0.032
35	23-Aug-05	30-Aug-05	<0.057	<0.034	<0.055	<0.041	<0.034	<0.035	<0.033	<0.030	<0.034	<0.028
36	30-Aug-05	6-Sep-05	<0.031	<0.050	<0.041	<0.029	<0.033	<0.038	<0.033	<0.043	<0.033	<0.037
37	6-Sep-05	13-Sep-05	<0.043	<0.033	<0.053	<0.037	<0.053	<0.019	<0.059	<0.038	<0.061	<0.036
38	13-Sep-05	19-Sep-05	<0.040	<0.063	<0.049	<0.015	<0.049	<0.063	<0.049	<0.049	<0.040	<0.050
39	19-Sep-05	27-Sep-05	<0.051	<0.043	<0.043	<0.045	<0.053	<0.030	<0.062	<0.034	<0.044	<0.054
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	27-Sep-05	4-Oct-05	<0.030	<0.048	<0.046	<0.035	<0.032	<0.052	<0.035	<0.050	<0.033	<0.069
41	4-Oct-05	11-Oct-05	<0.043	<0.041	<0.048	<0.033	<0.037	invalid [a]	<0.039	<0.037	<0.049	<0.031
42	11-Oct-05	19-Oct-05	<0.031	<0.037	<0.036	<0.030	<0.037	<0.038	<0.048	<0.032	<0.011	<0.032
43	19-Oct-05	25-Oct-05	<0.049	<0.068	<0.063	<0.040	<0.039	<0.035	<0.064	<0.045	<0.049	<0.040
44	25-Oct-05	1-Nov-05	<0.013	<0.040	<0.032	<0.033	<0.042	<0.026	<0.012	<0.029	<0.033	<0.028
45	1-Nov-05	8-Nov-05	<0.028	<0.042	<0.054	<0.031	<0.044	<0.039	<0.050	<0.040	<0.057	<0.033
46	8-Nov-05	15-Nov-05	<0.044	<0.058	<0.053	<0.030	<0.060	<0.032	<0.034	<0.032	<0.055	<0.030
47	15-Nov-05	22-Nov-05	<0.031	<0.035	<0.052	<0.027	<0.036	<0.030	<0.059	<0.028	<0.055	<0.034
48	22-Nov-05	29-Nov-05	<0.043	<0.056	<0.052	<0.035	<0.043	<0.040	<0.042	<0.031	<0.012	<0.042
49	29-Nov-05	6-Dec-05	<0.027	<0.050	<0.032	<0.035	<0.034	<0.023	<0.058	<0.036	<0.046	<0.029
50	6-Dec-05	13-Dec-05	<0.058	<0.044	<0.044	<0.044	<0.056	<0.044	<0.055	<0.042	<0.045	<0.052
51	13-Dec-05	20-Dec-05	<0.036	<0.037	<0.013	<0.039	<0.058	<0.033	<0.014	<0.036	<0.057	<0.034
52	20-Dec-05	27-Dec-05	<0.070	<0.023	<0.050	<0.035	<0.057	<0.030	<0.048	<0.055	<0.035	<0.050

a Sample invalidated due to equipment malfunction that prevented accurate volume determination (pump not running, ETM running)

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
BRANCH RESIDENCE (Site #52)*		NO SAMPLES AVAILABLE			
DUNCAN FAMILY FARMS (Site #62)*	green cabbage	14-Jan-05	<39	<49	<60
	red cabbage	14-Jan-05	<50	<58	<54
	savoy	14-Jan-05	<38	<33	<78
	green cabbage	15-Feb-05	<35	<38	<12
	red cabbage	15-Feb-05	<41	<50	<76
	red cabbage	11-Mar-05	<52	<54	<57
	green cabbage	11-Mar-05	<46	<38	<63
	green cabbage	13-Apr-05	<53	<38	<49
	savoy	13-Apr-05	<48	<47	<51
	red cabbage	13-Apr-05	<40	<45	<58
	green cabbage	19-May-05	<36	<25	<42
	green cabbage	10-Nov-05	<49	<55	<80
	savoy	10-Nov-05	<39	<40	<37
	red cabbage	10-Nov-05	<41	<44	<42
	green cabbage	15-Dec-05	<49	<50	<72
	savoy	15-Dec-05	<51	<43	<57
	red cabbage	15-Dec-05	<39	<53	<58
MCCOY RESIDENCE (Site #47)*		NO SAMPLES AVAILABLE			

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
PAINTER GOATS (Site #51)*	NO SAMPLES AVAILABLE					
BARBER/ADAMS GOATS (Site #53)*	14-Jan-05	<1	<1	<1	<3	<1
	15-Feb-05	<1	<1	<1	<3	<1
	11-Mar-05	<1	<1	<1	<3	<1
	19-Apr-05	<1	<1	<1	<3	<1
	15-Jul-05	<1	<1	<1	<3	<1
	19-Aug-05	<1	<1	<1	<3	<1
	16-Sep-05	<1	<1	<1	<3	<1
	14-Oct-05	<1	<1	<1	<3	<1
	18-Nov-05	<1	<1	<1	<3	<1
HERNANDEZ GOATS (Site #54)	19-Aug-05	<1	<1	<1	<3	<1
	23-Sep-05	<1	<1	<1	<3	<1
	14-Oct-05	<1	<1	<1	<3	<1
	16-Dec-05	<1	<1	<1	<3	<1

Adams replaced Barber effective 7-15-05
Hernandez replaced Branch effective 7-15-05

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 H-3	<4.0 Gross Beta
	25-Jan-05	<12	<11	<16	<11	<23	<10	<20	<9	<9	<9	<31	<14		<3.3
	22-Feb-05	<10	<10	<24	<11	<24	<13	<21	<10	<10	<12	<35	<15		<2.9
	29-Mar-05	<11	<9	<19	<12	<28	<13	<19	<10	<10	<12	<30	<14	<262	<3.1
	26-Apr-05	<14	<12	<22	<14	<30	<12	<17	<10	<10	<13	<32	<15		<2.7
BERRYMAN	31-May-05	<13	<12	<24	<11	<27	<13	<20	<11	<12	<11	<42	<15		<3.3
RESIDENCE	28-Jun-05	<11	<12	<21	<12	<29	<12	<22	<11	<11	<12	<42	<13	<272	4.8 ± 1.8
(SITE #48)*	26-Jul-05	<13	<12	<23	<12	<27	<13	<21	<12	<12	<12	<40	<15		4.2 ± 1.9
	30-Aug-05	<14	<11	<29	<10	<30	<14	<22	<12	<13	<14	<42	<12		3.9 ± 1.8
	27-Sep-05	<10	<9	<19	<12	<27	<11	<18	<9	<8	<10	<35	<15	<283	<2.8
	25-Oct-05	<13	<11	<26	<11	<30	<12	<23	<10	<10	<11	<39	<14		<3.0
	29-Nov-05	<12	<11	<25	<15	<25	<13	<23	<13	<11	<11	<43	<12		<2.7
	27-Dec-05	<13	<14	<25	<15	<30	<12	<23	<12	<12	<15	<41	<12	<252	3.2 ± 1.8
	25-Jan-05	<12	<11	<25	<13	<29	<12	<20	<11	<11	<12	<41	<12		<2.7
	22-Feb-05	<12	<12	<27	<13	<30	<12	<21	<12	<12	<11	<39	<10		4.0 ± 1.6
	29-Mar-05	<11	<10	<21	<14	<26	<11	<19	<9	<9	<10	<36	<13	<266	<2.4
	26-Apr-05	<10	<10	<26	<15	<24	<14	<18	<8	<11	<9	<37	<14		3.6 ± 1.5
GAVETTE	31-May-05	<13	<11	<27	<10	<29	<13	<21	<10	<12	<12	<39	<13		<2.7
RESIDENCE	28-Jun-05	<14	<12	<27	<15	<25	<15	<22	<12	<13	<14	<40	<14	<270	5.0 ± 1.4
(SITE #55)	26-Jul-05	<11	<8	<23	<8	<26	<11	<16	<10	<11	<12	<35	<15		2.9 ± 1.5
	30-Aug-05	<14	<12	<23	<12	<30	<12	<17	<11	<10	<13	<42	<14		4.0 ± 1.4
	27-Sep-05	<13	<11	<25	<10	<30	<13	<19	<11	<10	<13	<38	<12	<281	3.9 ± 1.5
	25-Oct-05	<15	<13	<25	<13	<29	<15	<22	<11	<12	<13	<48	<11		4.1 ± 1.6
	29-Nov-05	<9	<9	<20	<10	<18	<10	<16	<8	<9	<10	<30	<15		3.7 ± 1.5
	27-Dec-05	<12	<12	<20	<14	<26	<14	<18	<10	<11	<14	<35	<15	<252	4.5 ± 1.5

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 H-3	<4.0 Gross Beta
	25-Jan-05	<10	<11	<22	<14	<24	<10	<21	<11	<10	<12	<39	<15		<2.6
	22-Feb-05	<9	<13	<27	<12	<28	<13	<19	<11	<12	<12	<44	<15		2.3 ± 1.4
	29-Mar-05	<12	<13	<26	<13	<29	<13	<19	<12	<12	<13	<43	<12	<264	3.1 ± 1.5
	26-Apr-05	<13	<12	<26	<14	<27	<13	<22	<11	<13	<12	<42	<15		4.0 ± 1.4
McARTHUR	31-May-05	<11	<11	<23	<13	<25	<14	<18	<11	<10	<11	<39	<11		<2.5
RESIDENCE	28-Jun-05	<12	<11	<23	<13	<30	<12	<19	<11	<11	<13	<42	<12	<271	3.8 ± 1.3
(SITE #46)*	26-Jul-05	<12	<10	<24	<12	<30	<13	<20	<12	<11	<12	<39	<12		2.7 ± 1.4
	30-Aug-05	<14	<12	<29	<13	<30	<12	<22	<10	<10	<13	<40	<12		4.2 ± 1.4
	27-Sep-05	<13	<13	<26	<15	<29	<15	<20	<12	<11	<13	<45	<14	<283	3.2 ± 1.4
	25-Oct-05	<14	<13	<24	<12	<30	<14	<21	<11	<11	<14	<41	<10		3.0 ± 1.5
	29-Nov-05	<12	<10	<20	<15	<28	<13	<20	<12	<10	<13	<42	<10		3.4 ± 1.4
	27-Dec-05	<13	<12	<30	<13	<24	<13	<16	<12	<11	<13	<43	<13	<251	3.0 ± 1.4
	25-Jan-05	<12	<10	<25	<12	<26	<14	<16	<12	<12	<13	<38	<15		<2.5
	22-Feb-05	<9	<13	<18	<15	<30	<12	<19	<9	<10	<11	<32	<11		<2.2
	29-Mar-05	<11	<10	<24	<15	<24	<12	<22	<10	<11	<12	<40	<14	<262	<2.3
	26-Apr-05	<12	<11	<29	<15	<30	<12	<22	<10	<12	<14	<37	<11		<2.0
CHOWANEC	31-May-05	<15	<12	<29	<14	<29	<12	<25	<13	<11	<14	<44	<12		<2.5
RESIDENCE	28-Jun-05	<11	<9	<20	<14	<24	<12	<19	<9	<11	<10	<34	<15	<270	2.2 ± 1.2
(SITE #49) *	26-Jul-05	<13	<13	<28	<14	<30	<14	<23	<13	<12	<12	<41	<15		<2.1
	30-Aug-05	<10	<11	<23	<12	<22	<11	<20	<11	<10	<11	<42	<14		<1.9
	27-Sep-05	<9	<12	<30	<13	<23	<13	<20	<12	<11	<12	<40	<12	<270	<2.1
	25-Oct-05	<9	<10	<19	<15	<21	<11	<17	<8	<10	<10	<36	<13		<2.3
	29-Nov-05	<13	<9	<25	<12	<23	<10	<18	<9	<9	<10	<40	<15		<2.1
	27-Dec-05	<11	<10	<22	<14	<20	<12	<18	<10	<10	<9	<40	<15	<252	<2.1

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 H-3
WELL 27ddc (Site #57)*	25-Jan-05	<12	<12	<25	<14	<25	<13	<21	<13	<11	<13	<44	<15	<262
	26-Apr-05	<13	<12	<28	<14	<30	<14	<20	<13	<12	<13	<41	<15	<266
	26-Jul-05	<12	<9	<26	<15	<23	<13	<17	<10	<11	<12	<38	<15	<275
	25-Oct-05	<12	<12	<20	<9	<27	<15	<19	<12	<11	<12	<44	<14	<263
WELL 34abb (Site #58)*	25-Jan-05	<14	<12	<27	<14	<30	<14	<22	<13	<12	<13	<52	<14	<269
	26-Apr-05	<12	<10	<21	<12	<29	<13	<22	<11	<10	<11	<37	<15	<272
	26-Jul-05	<12	<12	<19	<11	<26	<15	<22	<12	<10	<14	<48	<13	<276
	25-Oct-05	<11	<10	<19	<11	<22	<11	<16	<10	<8	<11	<32	<15	<264

TABLE 8.10 SURFACE 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	<3000 H-3
RESERVOIR (Site #60) *	25-Jan-05	<13	<10	<20	<14	<19	<10	<17	<10	<9	<10	<31	<13	
	22-Feb-05	<13	<10	<26	<11	<23	<10	<18	<12	<10	<11	<36	<13	
	29-Mar-05	<12	<13	<29	<15	<30	<13	<24	<15	<12	<13	<45	<15	<263
	26-Apr-05	<13	<14	<29	<15	<27	<13	<20	<15	<12	<14	<45	<12	
	31-May-05	<13	<13	<24	<15	<30	<14	<21	<15	<13	<12	<48	<13	
	28-Jun-05	<9	<10	<23	<9	<24	<12	<19	13 ± 7	<9	<10	<25	<13	<273
	26-Jul-05	<11	<11	<20	<13	<27	<10	<15	<11	<8	<11	<29	<12	
	30-Aug-05	<11	<12	<25	<15	<22	<13	<21	<14	<12	<12	<43	<12	
	27-Sep-05	<11	<11	<26	<14	<29	<14	<21	<13	<11	<13	<45	<13	<280
	25-Oct-05	<10	<9	<18	<10	<18	<12	<18	<10	<9	<11	<30	<13	
	29-Nov-05	<8	<9	<16	<11	<21	<10	<15	<11	<8	<10	<36	<11	
	27-Dec-05	<10	<8	<22	<15	<22	<11	<19	<11	<10	<10	<34	<11	<251
EVAP POND 1 (Site #59) *	25-Jan-05	<12	<11	<27	<12	<30	<13	<20	<14	<11	<13	<44	<11	
	22-Feb-05	<11	<8	<27	<15	<23	<11	<18	8 ± 10	<11	<13	<37	<15	
	29-Mar-05	<8	<8	<22	<9	<24	<9	<13	7 ± 6	<9	<8	<25	<14	1120 ± 155
	26-Apr-05	<9	<8	<17	<12	<18	<8	<15	<9	<7	<10	<28	<11	
	31-May-05	<11	<13	<28	<15	<29	<14	<27	<11	<13	<15	<42	<13	
	28-Jun-05	<12	<11	<21	<13	<30	<13	<16	<8	<9	<12	<29	<13	1209 ± 155
	26-Jul-05	<12	<10	<18	<13	<30	<12	<17	<9	<10	<11	<33	<9	
	30-Aug-05	<13	<14	<27	<12	<29	<13	<19	<10	<10	<11	<37	<15	
	27-Sep-05	<14	<12	<23	<15	<30	<14	<20	19 ± 10	<10	<15	<43	<12	1601 ± 159
	25-Oct-05	<14	<13	<29	<15	<30	<14	<24	<13	<12	<14	<42	<9	
	29-Nov-05	<12	<10	<26	<11	<30	<13	<19	<11	<11	<12	<38	<13	
	27-Dec-05	<14	<12	<30	<14	<28	<13	<21	<13	<11	<13	<40	<11	2038 ± 158
EVAP POND 2 (Site #63) *	25-Jan-05	<9	<9	<21	<10	<23	<10	<18	<8	<8	<11	<30	<10	
	22-Feb-05	<11	<11	<22	<14	<29	<12	<19	<10	<11	<12	<36	<11	
	29-Mar-05	<12	<12	<26	<13	<30	<11	<23	<13	<12	<15	<43	<12	1633 ± 155
	26-Apr-05	<12	<10	<25	<15	<27	<11	<19	<9	<9	<13	<41	<12	
	31-May-05	<10	<11	<21	<12	<30	<10	<16	<9	<10	<12	<31	<13	
	28-Jun-05	<12	<11	<29	<14	<30	<12	<22	<12	<11	<14	<40	<11	1736 ± 159
	26-Jul-05	<12	<10	<24	<15	<30	<11	<20	<12	<11	<14	<38	<9	
	30-Aug-05	<11	<10	<24	<12	<30	<10	<16	<10	<9	<11	<35	<10	
	27-Sep-05	<12	<11	<23	<13	<30	<12	<21	<11	<11	<13	<33	<11	1687 ± 163
	25-Oct-05	<12	<10	<24	<12	<30	<12	<18	<10	<10	<15	<41	<15	
	29-Nov-05	<13	<11	<25	<14	<30	<12	<21	<13	<11	<14	<45	<13	
	27-Dec-05	<13	<12	<28	<15	<30	<13	<20	<14	<12	<14	<46	<15	1763 ± 154

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	H-3
WRF INFLUENT	4-Jan-05	<8	<7	<21	<12	<18	<10	<15	<9	<9	<9	<30	<15	
	11-Jan-05	<11	<12	<26	<15	<26	<12	<20	<12	<12	<12	<37	<13	
	18-Jan-05	<12	<12	<22	<15	<27	<11	<17	28 ± 12	<11	<13	<35	<11	
	25-Jan-05	<10	<14	<22	<15	<27	<15	<22	45 ± 12	<11	<13	<43	<12	<282
	1-Feb-05	<12	<12	<25	<14	<26	<13	<19	24 ± 11	<11	<12	<41	<14	
	8-Feb-05	<11	<13	<23	<14	<26	<11	<18	12 ± 9	<8	<11	<41	<15	
	15-Feb-05	<11	<14	<28	<13	<30	<11	<25	39 ± 12	<13	<14	<45	<9	
	22-Feb-05	<13	<14	<26	<15	<28	<11	<18	56 ± 12	<9	<14	<42	<12	
	1-Mar-05	<14	<12	<28	<13	<29	<14	<20	43 ± 16	<13	<15	<43	<13	<269
	8-Mar-05	<11	<9	<25	<13	<30	<12	<21	61 ± 14	<11	<12	<41	<13	
	15-Mar-05	<14	<12	<28	<14	<29	<14	<26	29 ± 15	<12	<12	<44	<15	
	22-Mar-05	<15	<12	<20	<9	<24	<14	<21	30 ± 10	<10	<13	<32	<13	
	29-Mar-05	<12	<11	<24	<15	<30	<12	<20	44 ± 13	<10	<12	<38	<14	<271
	5-Apr-05	<10	<10	<19	<9	<23	<10	<20	46 ± 13	<10	<10	<39	<15	
	12-Apr-05	<12	<10	<23	<15	<29	<10	<23	95 ± 18	<12	<13	<34	<14	
	18-Apr-05	<14	<14	<19	<11	<29	<15	<18	42 ± 13	<10	<13	<38	<14	<277
	3-May-05	<14	<12	<27	<14	<30	<12	<23	40 ± 13	<10	<14	<41	<10	
	10-May-05	<11	<9	<22	<11	<22	<11	<19	58 ± 12	<10	<11	<30	<15	
	17-May-05	<13	<13	<29	<15	<28	<12	<20	54 ± 15	<13	<15	<42	<13	
	24-May-05	<13	<14	<27	<13	<30	<12	<20	20 ± 14	<12	<12	<40	<14	
	31-May-05	<11	<12	<24	<15	<27	<13	<19	158 ± 23	<10	<12	<40	<12	<276
	7-Jun-05	<12	<12	<24	<15	<22	<12	<22	33 ± 11	<11	<14	<41	<13	
	14-Jun-05	<10	<11	<21	<10	<25	<11	<16	79 ± 15	<10	<11	<34	<13	
	21-Jun-05	<12	<9	<29	<15	<30	<12	<17	26 ± 11	<9	<12	<42	<11	
	28-Jun-05	<12	<12	<26	<11	<27	<15	<23	30 ± 11	<13	<13	<43	<14	<275
	5-Jul-05	<13	<10	<28	<13	<26	<11	<18	31 ± 11	<11	<12	<38	<13	
	12-Jul-05	<13	<13	<24	<14	<30	<11	<23	48 ± 14	<13	<13	<48	<14	
	19-Jul-05	<12	<14	<27	<14	<29	<14	<23	22 ± 11	<12	<14	<43	<15	
	26-Jul-05	<14	<11	<26	<12	<29	<13	<20	38 ± 12	<11	<12	<37	<10	<284
	2-Aug-05	<11	<9	<22	<14	<28	<12	<19	10 ± 9	<11	<12	<32	<13	

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	H-3
WRF INFLUENT (continued)	9-Aug-05	<12	<11	<23	<14	<27	<11	<20	12 ± 8	<9	<14	<35	<15	
	16-Aug-05	<11	<12	<22	<14	<29	<12	<22	15 ± 9	<12	<14	<45	<12	
	23-Aug-05	<12	<11	<26	<14	<24	<11	<20	41 ± 12	<9	<11	<31	<15	
	30-Aug-05	<12	<11	<19	<10	<30	<12	<18	43 ± 13	<12	<12	<36	<11	<293
	6-Sep-05	<9	<9	<18	<11	<26	<11	<19	25 ± 10	<9	<13	<31	<14	
	13-Sep-05	<11	<11	<17	<15	<27	<9	<16	25 ± 10	<11	<14	<44	<14	
	20-Sep-05	<10	<10	<24	<11	<30	<11	<20	39 ± 11	<10	<11	<38	<12	
	27-Sep-05	<13	<11	<25	<13	<30	<11	<21	11 ± 13	<9	<12	<39	<11	<288
	4-Oct-05	<9	<10	<29	<11	<26	<11	<18	18 ± 9	<9	<11	<34	<15	
	10-Oct-05	<13	<13	<27	<11	<25	<13	<19	21 ± 12	<11	<10	<47	<15	
	25-Oct-05	<13	<10	<26	<14	<30	<12	<21	<15	<10	<14	<38	<9	<282
	1-Nov-05	<12	<11	<25	<14	<30	<13	<16	42 ± 11	<9	<12	<41	<11	
	8-Nov-05	<10	<10	<23	<12	<30	<11	<21	31 ± 11	<11	<12	<40	<15	
	15-Nov-05	<11	<12	<22	<9	<23	<10	<13	29 ± 8	<9	<10	<31	<15	
	29-Nov-05	<12	<10	<21	<11	<30	<12	<24	34 ± 12	<11	<12	<41	<13	<259
	6-Dec-05	<14	<11	<22	<10	<30	<12	<22	34 ± 15	<12	<14	<42	<13	
	13-Dec-05													
	20-Dec-05	<12	<12	<23	<13	<30	<10	<19	23 ± 9	<11	<12	<41	<14	
	27-Dec-05	<15	<9	<28	<15	<27	<13	<22	36 ± 11	<9	<13	<37	<15	<261
SEDIMENT. BASIN #2	4-Jan-05	<9	<10	<16	<12	<20	<10	<20	<8	<10	<11	<33	<15	<278
	11-Jan-05	<11	<10	<19	<11	<28	<10	<19	<7	<9	<10	<29	<15	<293
	18-Jan-05	<11	<9	<16	<13	<22	<10	<19	<10	<9	<10	<37	<15	<278
	25-Jan-05	<13	<9	<26	<15	<22	<12	<20	<11	<12	<14	<42	<13	<283
	1-Feb-05	<12	<12	<30	<12	<27	<14	<21	<10	<10	<13	<44	<9	<287
	8-Feb-05	<11	<10	<25	<11	<30	<14	<25	<14	<11	<13	<50	<12	<283
	14-Feb-05	<11	<12	<25	<12	<26	<12	<18	<10	<10	<12	<40	<14	<288
	22-Feb-05	<12	<10	<27	<14	<24	<12	<20	<11	<11	<14	<34	<15	878 ± 175
	1-Mar-05	<12	<10	<28	<14	<29	<13	<20	<8	<11	<10	<31	<13	621 ± 185
	8-Mar-05	<10	<9	<22	<13	<22	<10	<14	<8	<9	<11	<33	<12	907 ± 188
	15-Mar-05	<15	<13	<23	<11	<29	<13	<21	<12	<14	<14	<46	<13	849 ± 184
	22-Mar-05	<12	<12	<24	<14	<29	<8	<18	<7	<9	<12	<29	<13	857 ± 184
	29-Mar-05	<13	<10	<22	<11	<30	<10	<21	<10	<10	<11	<39	<12	873 ± 180
	5-Apr-05	<10	<11	<24	<9	<21	<9	<19	<8	<9	<12	<42	<15	958 ± 183
	11-Apr-05	<10	<9	<19	<9	<20	<10	<18	<8	<7	<10	<29	<15	861 ± 187
	16-Aug-05	<10	<11	<25	<15	<27	<12	<20	<10	<10	<13	<39	<14	<292
	19-Oct-05	<15	<13	<23	<15	<28	<15	<24	<14	<13	<13	<45	<13	387 ± 165

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	4-Jan-05	706 ± 103	<24	<26	
	11-Jan-05	550 ± 77	<18	<16	
	18-Jan-05	514 ± 79	<17	<21	
	25-Jan-05	545 ± 85	<32	<40	
	1-Feb-05	759 ± 106	<34	<38	21 ± 22
	8-Feb-05	664 ± 95	<30	<37	39 ± 25
	15-Feb-05	618 ± 93	<18	<26	
	22-Feb-05	1219 ± 153	<24	<30	
	1-Mar-05	861 ± 115	<16	<24	
	8-Mar-05	978 ± 131	<27	<20	
	15-Mar-05	1444 ± 179	<24	<20	
	22-Mar-05	872 ± 107	<15	<24	
	29-Mar-05	722 ± 93	<23	<17	
	5-Apr-05	807 ± 101	<25	<25	
	12-Apr-05	746 ± 104	<21	<20	
	18-Apr-05	1368 ± 167	<25	<28	
	3-May-05	753 ± 94	<24	<21	
	10-May-05	590 ± 78	<21	<23	27 ± 16
	17-May-05	536 ± 80	<25	<34	49 ± 20
	24-May-05	599 ± 94	<25	<25	
	31-May-05	687 ± 88	<18	<25	
	7-Jun-05	2121 ± 246	<27	<28	
	14-Jun-05	1634 ± 180	<21	<19	
	21-Jun-05	1110 ± 142	<29	<27	
	28-Jun-05	739 ± 93	<22	<22	20 ± 21
	5-Jul-05	838 ± 113	<16	<24	68 ± 23
	12-Jul-05	612 ± 93	<9	<36	24 ± 27
	19-Jul-05	1372 ± 158	<28	<29	
	26-Jul-05	1122 ± 142	<21	<21	35 ± 22
	2-Aug-05	681 ± 96	<25	<27	77 ± 24
	9-Aug-05	360 ± 54	<22	<25	
	16-Aug-05	467 ± 76	<20	<26	
	23-Aug-05	342 ± 51	<18	<23	
	30-Aug-05	848 ± 104	<19	<23	
	6-Sep-05	1155 ± 145	<23	<26	
	13-Sep-05	1006 ± 120	<23	<21	47 ± 22
	19-Sep-05	911 ± 120	<15	<26	
	27-Sep-05	789 ± 109	<16	<28	
	4-Oct-05	800 ± 111	<20	<19	
	11-Oct-05	898 ± 120	<21	<30	
	18-Oct-05	660 ± 95	<22	<25	
	1-Nov-05	563 ± 75	<18	<26	
	8-Nov-05	1843 ± 204	<26	<20	86 ± 31
	14-Nov-05	1558 ± 209	<36	<40	
	29-Nov-05	1623 ± 194	<26	<28	
	6-Dec-05	795 ± 99	<22	<20	37 ± 27
	13-Dec-05	699 ± 94	<19	<21	
	20-Dec-05	770 ± 113	<26	<38	
	27-Dec-05	1008± 134	<26	<22	

TABLE 8.11 SLUDGE/SEDIMENT

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

SAMPLE LOCATION	DATE COLLECTED	Cs-134	Cs-137
(N)	16-Nov-05	<15	<17
(E)		<10	<18
EVAP POND 1 (S)		<15	<15
(W)		<12	<18
(C)		<15	<18
(N)	16-Nov-05	<11	19 ± 15
(E)		<15	29 ± 13
EVAP POND 2 (S)		<12	<18
(W)		<14	17 ± 11
(C)		<13	<18
SED. BASIN #2 (E)	2-Dec-05	<40	<56
SED. BASIN #2 (N)	2-Dec-05	<40	<79

COOLING TOWER SLUDGE/SCALE

UNIT CYCLE	APPROXIMATE VOLUME (yd^3)	ISOTOPE	ACTIVITY RANGE (uCi/ml)	SAMPLE TYPE	FRACTION OF SAMPLES ABOVE MDA
U3R10	30	n/a	<MDA	louver scale/sludge	none
U2R11	150	Co-60	<MDA to 1.07E-06	louver scale/sludge	25 of 26
U3R11	155	Co-60 Cs-137	6.72E-07 to 1.32E-06 <MDA to 8.86E-08	tower sludge	24 of 24 7 of 24
U2R12	907	Co-60 Cs-137	3.72E-07 to 1.16E-06 <MDA to 1.48E-07	tower/canal sludge	32 of 32 30 of 32

FIGURE 8.1 HISTORICAL GROSS BETA IN AIR (WEEKLY SYSTEM AVERAGES)

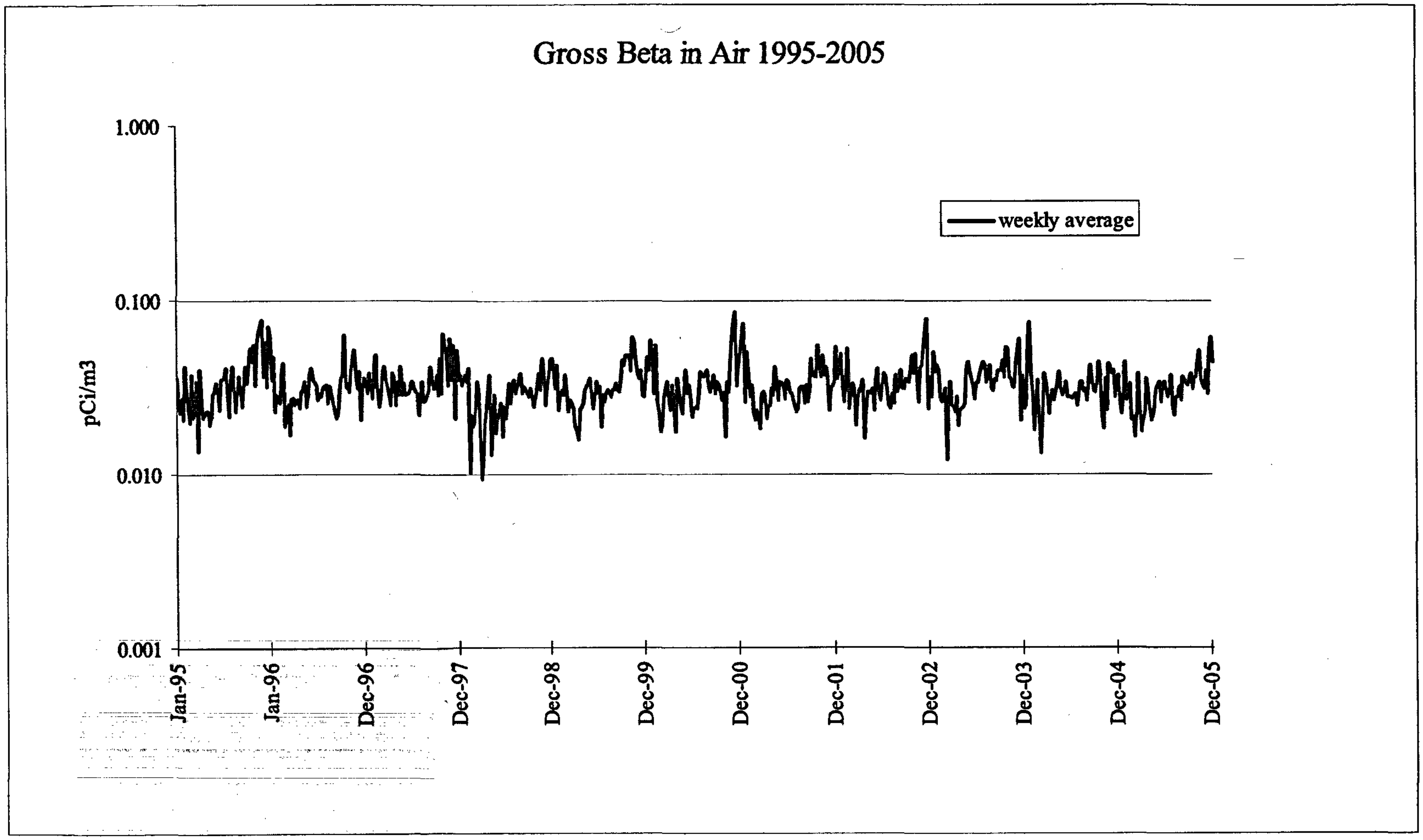


FIGURE 8.2 HISTORICAL GROSS BETA IN AIR (ANNUAL SITE TO SITE COMPARISONS) COMPARED TO PRE-OP

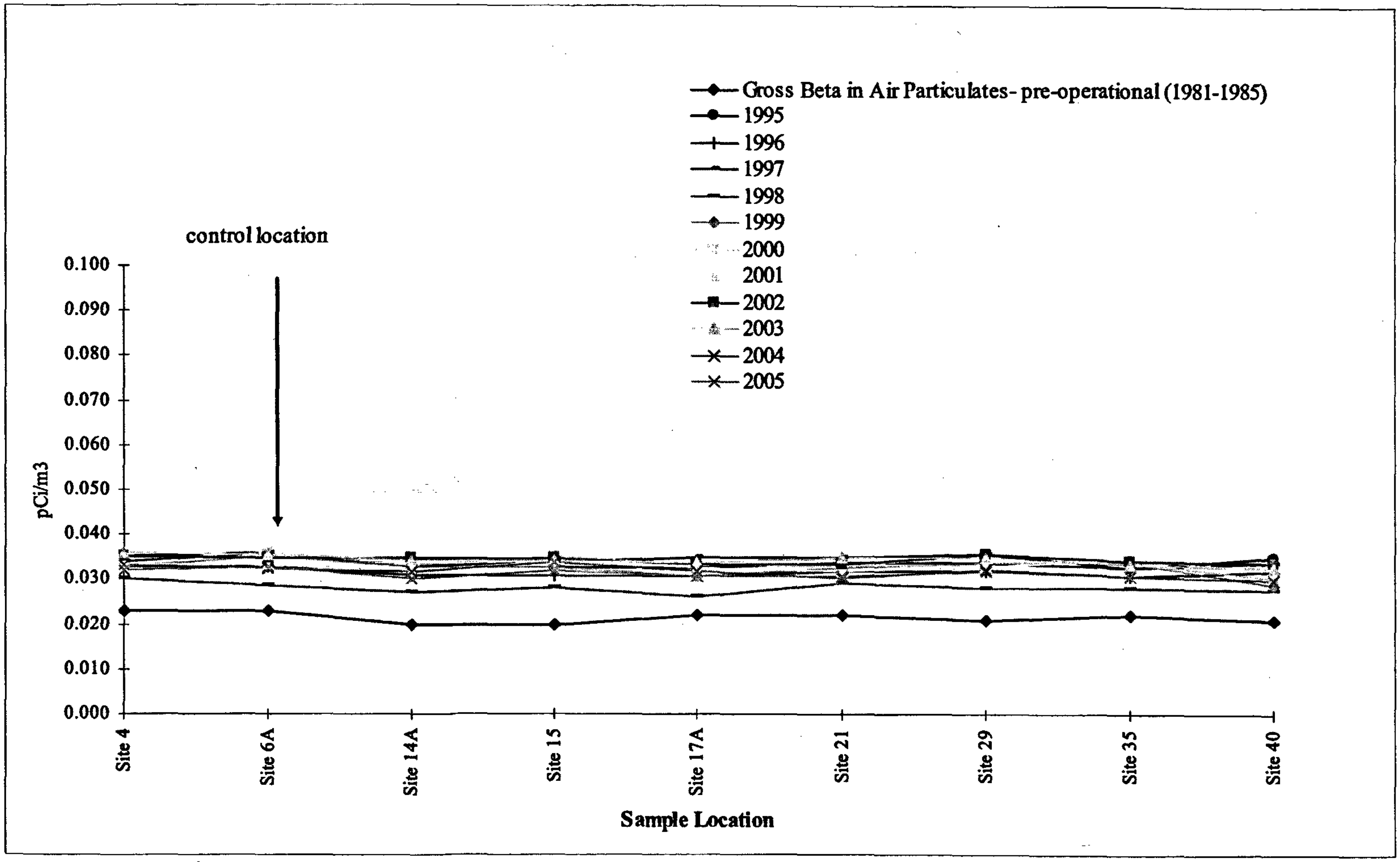
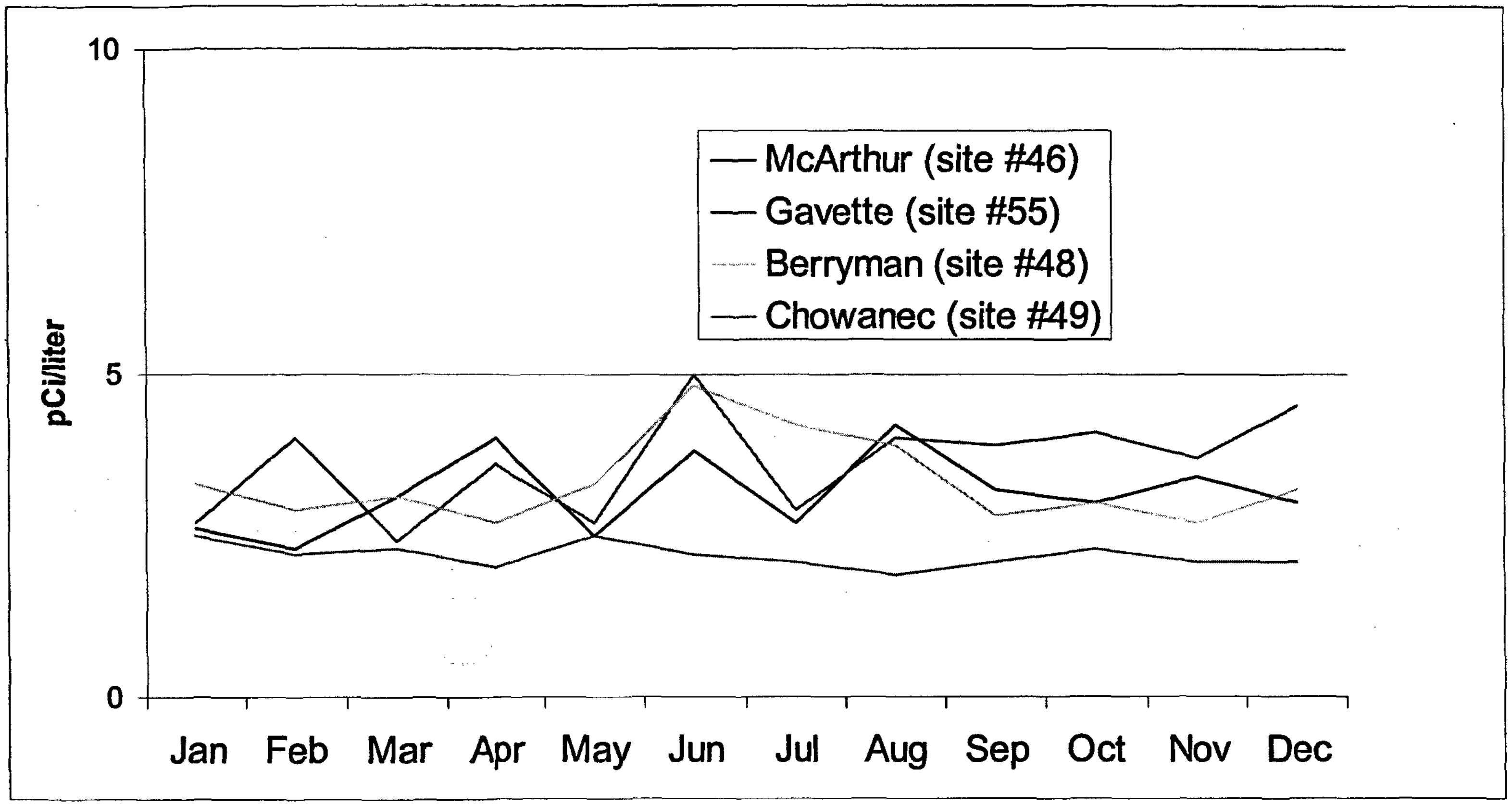


FIGURE 8.3 GROSS BETA IN DRINKING WATER



NOTES: MDA values plotted as activity (e.g. <2.3 is plotted as 2.3)

FIGURE 8.4 EVAPORATION POND TRITIUM ACTIVITY

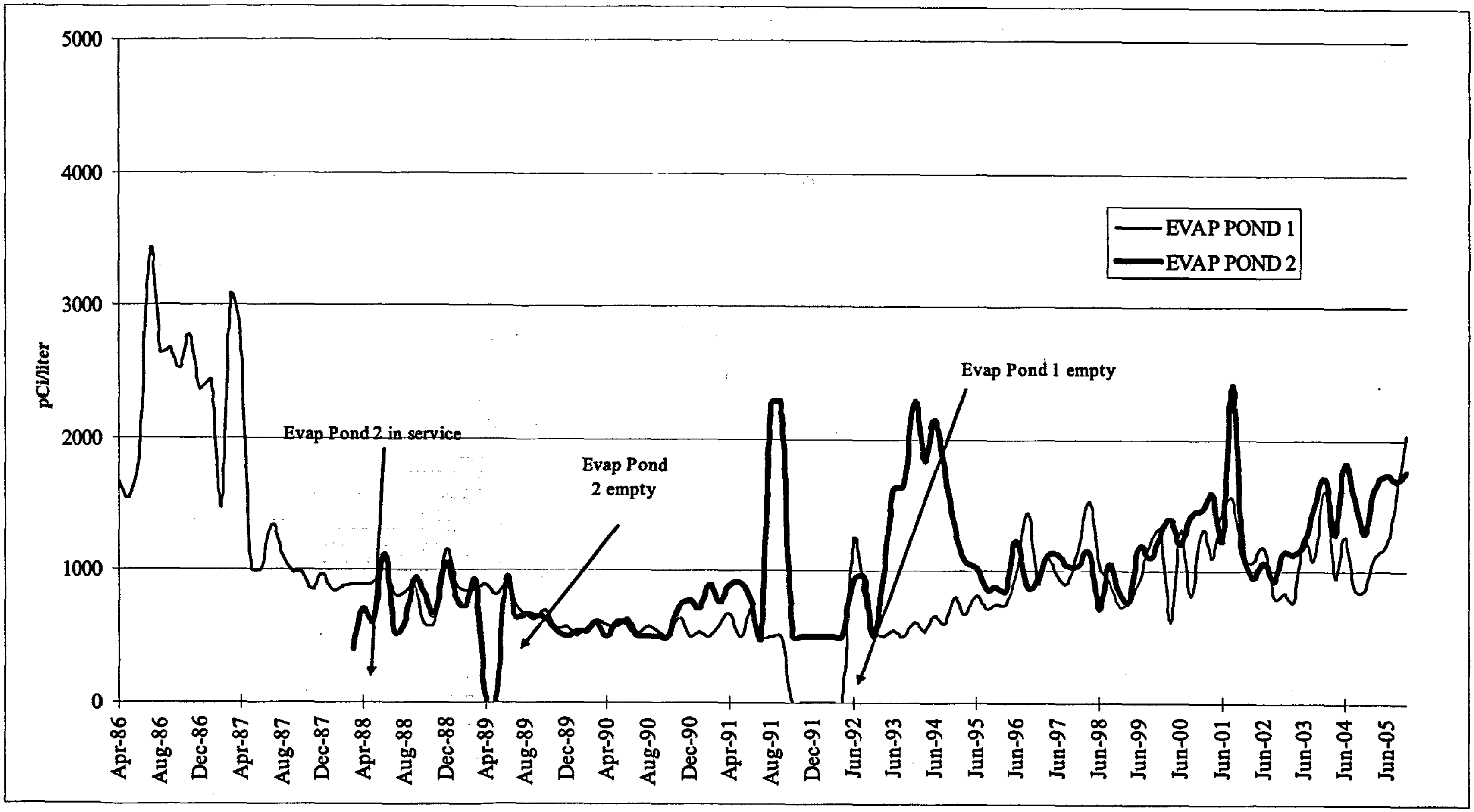
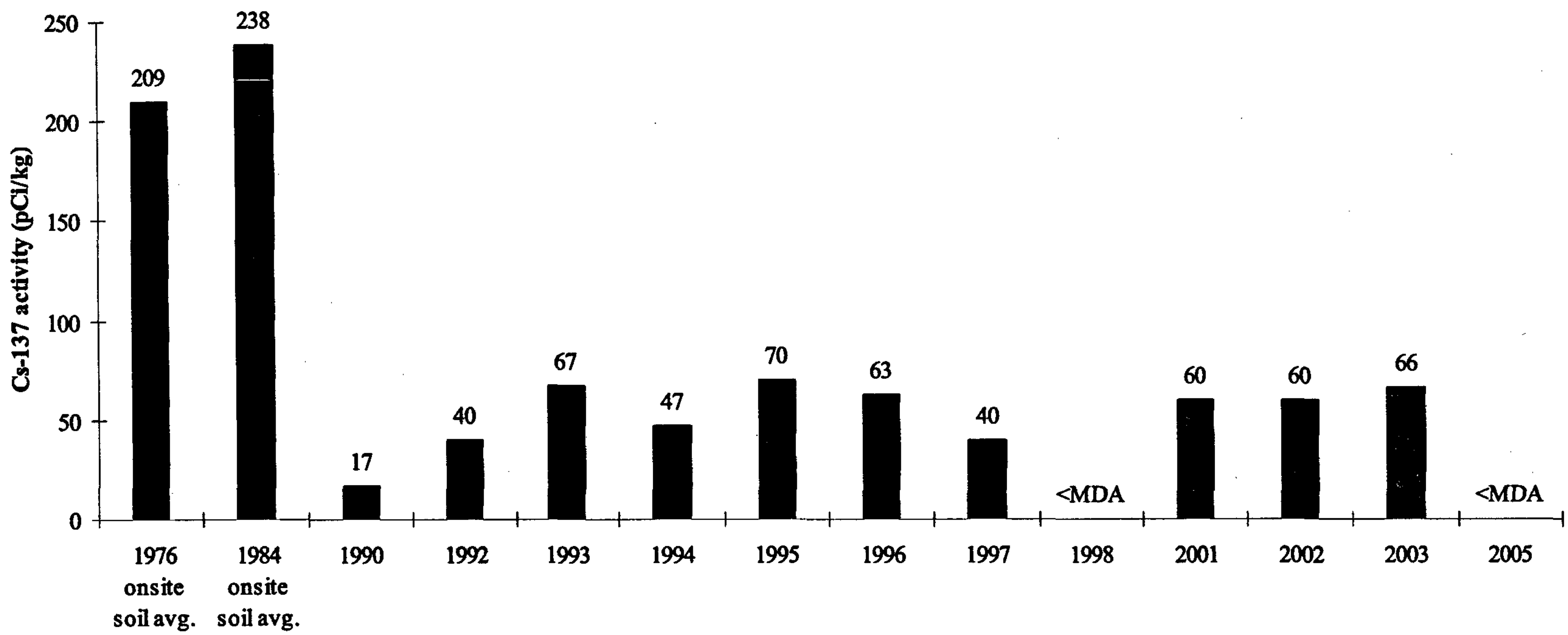


FIGURE 8.5 SEDIMENTATION BASIN #2 Cs-137



(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 forty-nine 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 2005 are presented in Table 9.2. Historical environmental gamma radiation results for 1985 through 2005 are presented in graphical form on Figure 9.1 (excluding transit control TLD #45).

Figure 9.2 depicts the environmental TLD results from 2005 as compared to the pre-operational TLD results (excluding sites #41, #43, and #46-50 as they were either deleted or had no pre-op TLD at these locations 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	N3	Wintersburg
41	ESE3	Arlington School
42	N8	Ruth Fisher School

TABLE 9.1 TLD SITE LOCATIONS

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

TLD SITE	LOCATION	LOCATION DESCRIPTION
44*	ENE35	El Mirage
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 2005 ENVIRONMENTAL TLD RESULTS

Units are mrem/std qtr

TLD Site #	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Average
1	23.4	24.2	25.2	23.6	24.1
2	21.7	21.3	22.0	22.3	21.8
3	22.1	22.6	24.1	23.4	23.1
4	21.2	22.1	23.1	22.9	22.3
5	20.5	20.8	22.1	22.1	21.4
6 (control)	24.7	25.5	25.9	25.8	25.5
7	24.5	24.7	25.7	24.7	24.9
8	21.3	23.3	24.2	22.3	22.8
9	26.1	26.7	26.8	27.7	26.8
10	22.1	23.7	24.1	23.0	23.2
11	23.9	23.8	25.1	23.9	24.2
12	22.0	22.4	24.1	23.3	23.0
13	24.3	24.0	25.1	24.6	24.5
14	23.9	24.9	26.0	24.3	24.8
15	22.5	24.1	23.3	22.9	23.2
16	20.8	22.8	21.9	22.4	22.0
17	24.2	23.8	25.6	24.0	24.4
18	23.1	23.0	22.8	22.0	22.7
19	24.0	24.8	25.3	25.2	24.8
20	23.0	23.4	24.2	24.5	23.8
21	24.4	24.2	26.2	25.3	25.0
22	24.5	25.9	26.8	25.4	25.7
23	21.5	22.3	22.2	22.3	22.1
24	21.1	20.9	22.8	22.3	21.8
25	21.3	22.1	23.4	21.9	22.2
26	25.6	26.7	28.3	26.4	26.8
27	26.0	25.9	28.9	26.9	26.9
28	23.4	25.7	27.0	26.1	25.6
29	23.7	24.3	24.3	23.7	24.0
30	24.7	26.4	26.3	25.4	25.7
31	21.4	22.9	23.8	22.4	22.6
32	23.6	25.3	25.8	24.1	24.7
33	24.5	26.3	25.4	24.6	25.2
34	27.0	27.4	27.7	26.6	27.2
35	28.6	31.2	31.5	30.3	30.4
36	23.7	24.2	25.8	25.2	24.7
37	23.3	22.1	23.8	22.5	22.9
38	26.7	27.1	28.0	26.5	27.1
39	23.0	24.2	24.1	23.4	23.7
40	24.4	24.6	25.0	24.2	24.6
41	22.5	23.4	23.8	22.1	23.0
42	25.5	26.0	27.0	26.1	26.2
44 (control)	19.0	20.4	20.4	18.8	19.7
45 (transit control)	5.6	5.8	5.7	5.1	5.6
46	26.8	27.5	27.0	26.2	26.9
47	21.5	22.4	23.1	23.0	22.5
48	23.4	23.9	24.8	22.9	23.8
49	22.5	22.3	23.4	22.4	22.7
50	18.2	19.0	19.4	18.5	18.8

FIGURE 9.1 NETWORK ENVIRONMENTAL TLD EXPOSURE RATES

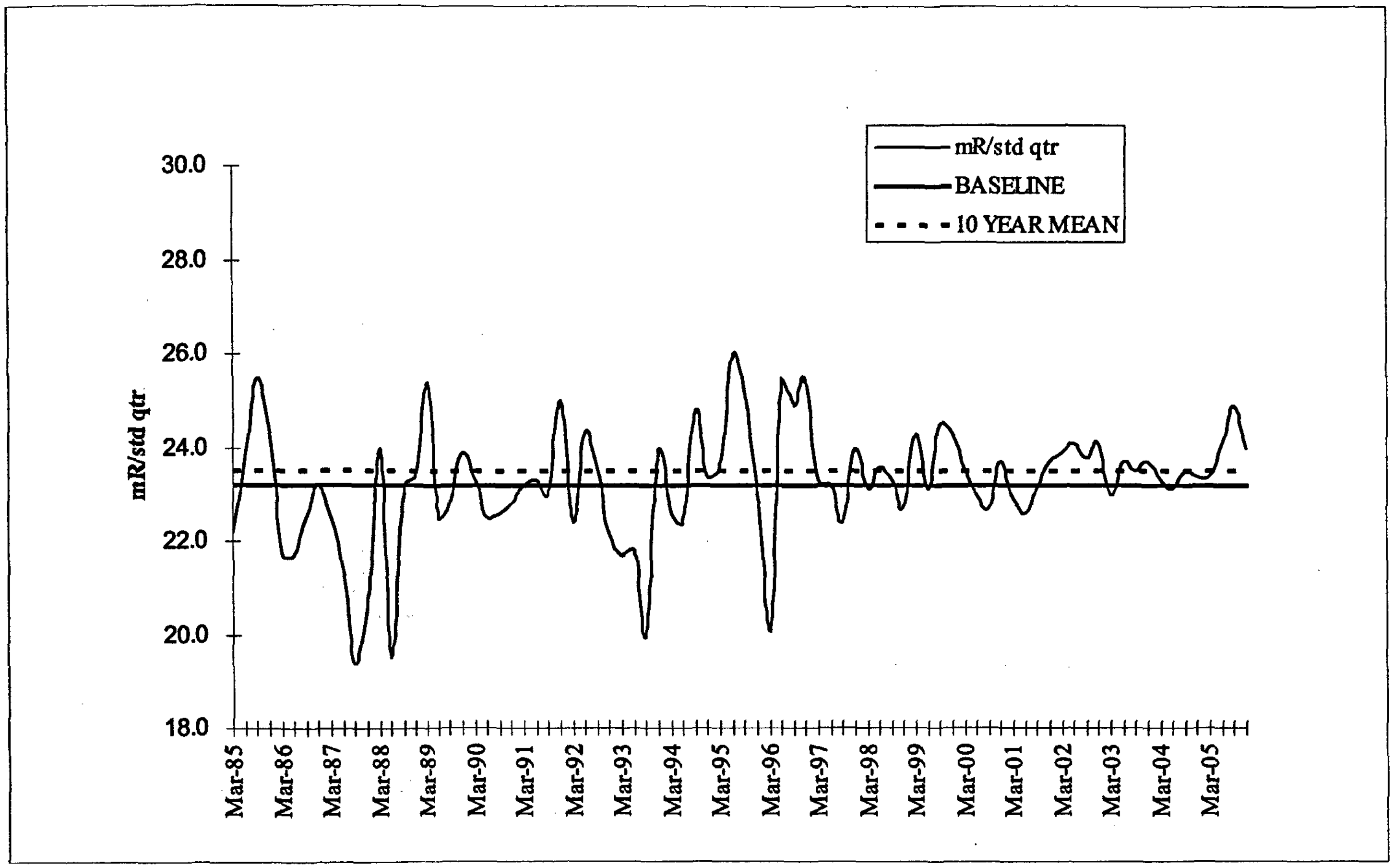
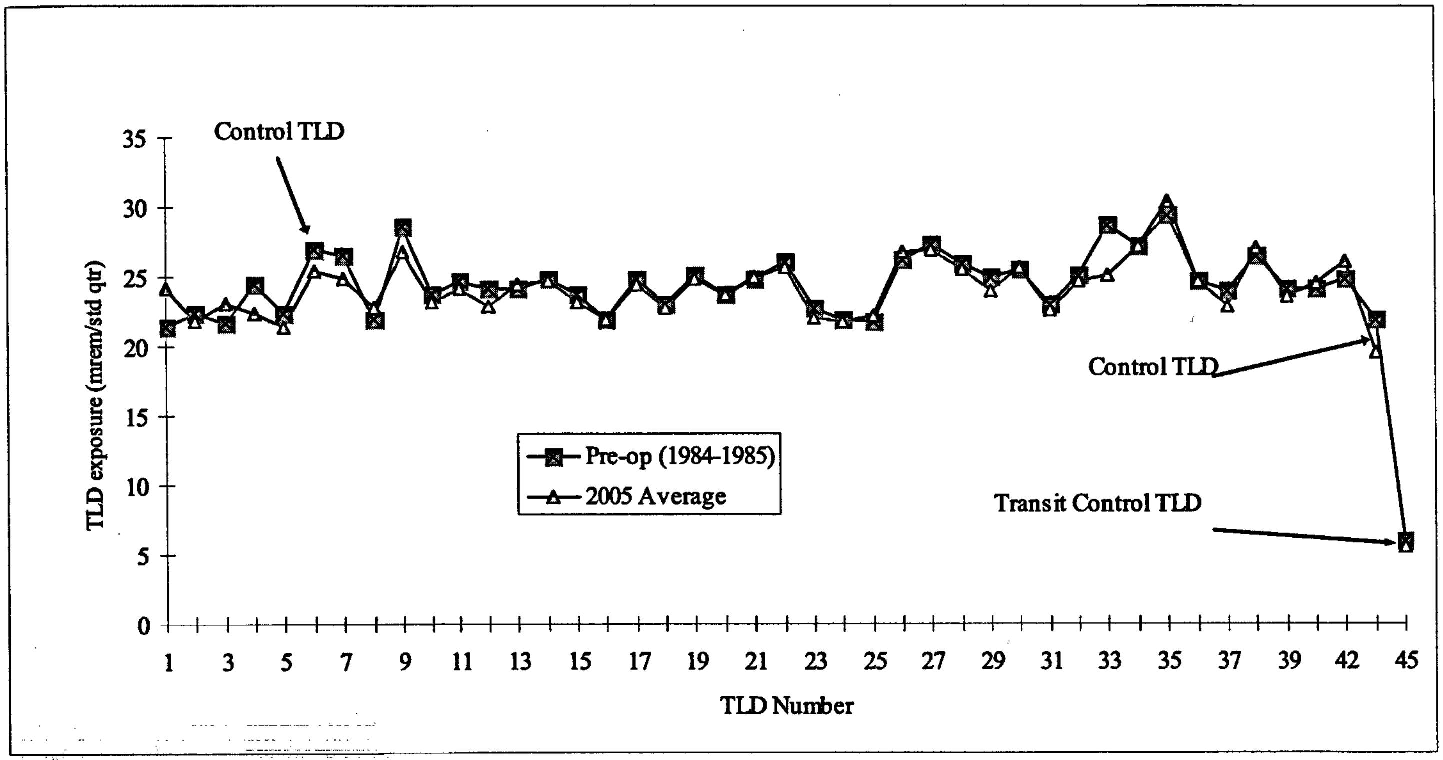


FIGURE 9.2 ENVIRONMENTAL TLD COMPARISON - PRE-OPERATIONAL VS 2005



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
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 within five miles of Unit 2 containment in May-June 2005.

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

<u>Nearest Resident</u>

There were two (2) changes in nearest resident status. Dose calculations indicated the highest dose to be 0.167 mrem.

<u>Milk Animal</u>

There were no changes in nearest milk animal (goat) status. Dose calculations indicated the highest dose to be 0.360 mrem. However, two (2) sample locations, one control and one indicator location, changed due to unavailability of samples.

<u>Vegetable Gardens</u>

There were two (2) changes in nearest garden status (two former gardens are no longer there). Dose calculations indicated the highest dose to be 0.335 mrem.

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

TABLE 10.1 2005 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 2004
N	1.55	**NONE**	NONE	Resident 4.78E-02	**Garden**
NNE	1.52	2.05	2.05	Resident 7.99E-02 Garden 2.87E-01 Milk 3.60E-01	
NE	2.16	NONE	3.91	Resident 1.15E-01 Milk 3.30E-01	
ENE	2.67	4.72	4.84	Resident 6.61E-02 Garden 1.28E-01 Milk 1.46E-01	
E	2.81	NONE	NONE	Resident 7.39E-02	
ESE	**1.95**	3.85	NONE	Resident 1.67E-01 Garden 3.35E-01	**Resident**
SE	4.10	NONE	NONE	Resident 7.81E-02	
SSE	NONE	NONE	NONE	NA	
S	NONE	NONE	NONE	NA	
SSW	NONE	NONE	NONE	NA	
SW	1.39	NONE	NONE	Resident 1.45E-01	
WSW	0.75	NONE	NONE	Resident 1.27E-01	
W	0.70	NONE	NONE	Resident 9.37E-02	
WNW	2.67	NONE	NONE	Resident 2.02E-02	
NW	**0.93**	NONE	NONE	Resident 5.71E-02	**Resident**
NNW	1.30	**NONE**	NONE	Resident 4.66E-02	**Garden**

COMMENTS:

Dose calculations were performed using the GASPAR code and 2004 meteorological data and source term. Dose reported for each location is the total for all three PVNGS Units and is the highest individual dose identified (organ, bone, total body, or skin).

11. Summary and Conclusions

The conclusions are based on a review of the radio assay results and background gamma radiation measurements for the 2005 calendar year. Where possible, the data were compared to pre-operational sample data.

All sample results for 2005 are presented in Tables 8.1-8.11 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 concentrations identified on occasion in the Evaporation Ponds, WRF Influent, WRF Centrifuge sludge, and Reservoir 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 gaseous effluent releases and secondary plant releases. These concentrations are consistent with historical values.

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

There were no measurable radiological impacts on the environment due to PVNGS operations in 2005.

TABLE 11.1

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM ANNUAL SUMMARY

Palo Verde Nuclear Generating Station
Maricopa County, Arizona

Docket Nos. STN 50-528/529/530
Calendar Year 2005

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 Mean (f)[a] Range	Location with Highest Annual Mean: Name Distance and Direction	Location with Highest Annual Mean: Mean (f)[a] Range	Control Locations Mean (f)[a] Range	Number of Nonroutine Reported Measurements
Direct Radiation (mrem/std. qtr.)	TLD - 196	NA	24.2 (184/184) 18.2 – 31.5	Site #35 8 miles 335°	30.4 (4/4) 28.6 – 31.5	22.6 (8/8) 18.8 - 25.9	0
Air Particulates (pCi/m^3)	Gross Beta – 497	0.010	0.032 (445/445) 0.015 - 0.066	Site #7A 3 miles 60°	0.035 (32/32) 0.023 - 0.062	0.033 (52/52) 0.016 - 0.070	0
	Gamma Spec. Composite- 38						
	Cs-134	0.05	<LLD	NA	<LLD	<LLD	0
	Cs-137	0.06	<LLD	NA	<LLD	<LLD	0
Air Radioiodine (pCi/m^3)	Gamma Spec. - 499						
	I-131	0.07	<LLD	NA	<LLD	<LLD	0
Broadleaf Vegetation (pCi/Kg-wet)	Gamma Spec. - 17						
	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

TABLE 11.1

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM ANNUAL SUMMARY

Palo Verde Nuclear Generating Station
Maricopa County, Arizona

Docket Nos. STN 50-528/529/530
Calendar Year 2005

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 Mean (f)[a] Range	Location with Highest Annual Mean: Name Distance and Direction	Location with Highest Annual Mean: Mean (f)[a] Range	Control Locations Mean (f)[a] Range	Number of Nonroutine Reported Measurements
Groundwater (pCi/liter) -continued-	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
Drinking Water (pCi/liter)	Gross Beta – 48	4.0	3.6 (24/48) 2.2 – 5.0	Site #55 3 miles 220°	4.0 (9/12) 2.9 – 5.0	NA	0
	H-3 – 16	2000	<LLD	NA	<LLD	NA	0
	Gamma Spec. – 48						
	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

TABLE 11.1

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM ANNUAL SUMMARY

Palo Verde Nuclear Generating Station
Maricopa County, Arizona

Docket Nos. STN 50-528/529/530
Calendar Year 2005

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 Mean (f)[a] Range	Location with Highest Annual Mean: Name Distance and Direction	Location with Highest Annual Mean: Mean (f)[a] Range	Control Locations Mean (f)[a] Range	Number of Nonroutine Reported Measurements
	Gamma Spec. – 13						
Milk (pCi/liter)	I-131	1.0	<LLD	NA	<LLD	<LLD	0
	Cs-134	15	<LLD	NA	<LLD	<LLD	0
	Cs-137	18	<LLD	NA	<LLD	<LLD	0
	Ba-140	60	<LLD	NA	<LLD	<LLD	0
	La-140	15	<LLD	NA	<LLD	<LLD	0
	Gamma Spec. - 36						
Surface 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	12 (4/36) 7 - 19	Site #60 Onsite 67°	13 (1/12) 13 - 13	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

TABLE 11.1

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM ANNUAL SUMMARY

Palo Verde Nuclear Generating Station
Maricopa County, Arizona

Docket Nos. STN 50-528/529/530
Calendar Year 2005

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 Mean (f)[a] Range	Location with Highest Annual Mean: Name Distance and Direction	Location with Highest Annual Mean: Mean (f)[a] Range	Control Locations Mean (f)[a] Range	Number of Nonroutine Reported Measurements
Surface Water (pCi/liter) -continued-	H-3 - 12	3000	1598 (8/12) 1120 - 2038	Site #63 Onsite 180°	1705 (4/4) 1633 - 1763	NA	0

(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. 1985-2004 Annual Radiological Environmental Operating Reports, Palo Verde Nuclear Generating Station.
3. Palo Verde Nuclear Generating Station Technical Specifications and Technical Reference Manual (TRM).
4. Offsite Dose Calculation Manual, PVNGS Units 1, 2, and 3.
5. Regulatory Guide 4.8, Environmental Technical Specifications for Nuclear Power Plants.
6. NRC Radiological Assessment Branch Technical Position on Environmental Monitoring, Revision 1, November 1979.