WOLF CREEK
NUCLEAR OPERATING CORPORATION

Clay C. Warren
Vice President Operations Support

APR 25 2001

CO 01-0022

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Mail Station P1-137
Washington, D. C. 20555

Subject: Docket No. 50-482: Annual Radiological Environmental Operating Report

Gentlemen:

Enclosed is the Annual Radiological Environmental Operating Report which is being submitted pursuant to Wolf Creek Generating Station (WCGS) Facility Technical Specification 5.6.2. This report covers operation of WCGS for the period of January 1, 2000 to December 31, 2000.

If you should have any questions regarding this submittal, please contact me at (620) 364-4048, or Tony Harris at (620) 364-4038.

Very truly yours,

Clay C. Warren

CCW/rlr

Enclosure

cc: J. N. Donohew (NRC), w/e
W. D. Johnson (NRC), w/e
E. W. Merschoff (NRC), w/e
Senior Resident Inspector (NRC), w/e

C001

WOLF CREEK NUCLEAR OPERATING CORPORATION

WOLF CREEK GENERATING STATION

2000 ANNUAL RADIOLOGICAL

ENVIRONMENTAL OPERATING REPORT

APRIL 10, 2001

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

INTRODUCTION

The 2000 Annual Radiological Environmental Operating Report for Wolf Creek Generating Station (WCGS) covers the period from January 1 through December 31, 2000. WCGS is located in Coffey County, Kansas, approximately five miles northeast of Burlington, Kansas.

Fuel loading commenced at WCGS on March 12, 1985. The operational phase of the Radiological Environmental Monitoring Program (REMP) began with initial criticality on May 22, 1985 and the first detectable quantities of radioactivity were reported in plant effluents in June 1985.

This report contains a description of the REMP conducted by Wolf Creek Nuclear Operating Corporation (WCNOC), results of sample analyses, a discussion of monitoring program results, a description of revisions to and deviations from the program, and the results of Interlaboratory Comparison Programs. Individual sample results and a summary of results in the Nuclear Regulatory Commission (NRC) Branch Technical Position specified format are included as appendices.

Plant-related activation, corrosion or fission products were not detected during 2000 in airborne particulate and radioiodine filters, ground water, drinking water, broadleaf vegetation, crops, terrestrial vegetation or soil.

Activation, corrosion or fission products attributable to plant operation were detected during 2000 in surface water, shoreline sediment, fish, bottom sediment and aquatic vegetation samples.

Nuclides detected in REMP samples were below applicable NRC reporting levels.

I. PROGRAM DESCRIPTION

Radiological environmental samples were collected according to the schedule in WCGS procedure AP 07B-004, *Offsite Dose Calculation Manual (Radiological Environmental Monitoring Program)*. Samples were collected by the WCGS Environmental Management group and were analyzed by Teledyne Brown Engineering, Inc. or Environmental, Inc. Environmental TLDs were processed by Detroit Edison at the Enrico Fermi 2 plant. Table 1 lists sampling pathways and frequencies of sampling and analysis. Table 2 lists each sample location's distance and direction from the plant. Samples in addition to those required by the WCGS Offsite Dose Calculation Manual (ODCM) were also obtained.

The following is a description of the sampling and analysis program by individual pathways.

A. Airborne Pathway

Low volume air sampling pumps collected particulate and radioiodine samples on 47 mm glass fiber filters and charcoal canisters, respectively. The filters and charcoal canisters were changed out weekly, labeled, and shipped to Teledyne Brown Engineering, Inc. or Environmental, Inc. for analysis. The volume of air sampled was calculated from the average of initial and final flow rates and the total time of collection. Each pump was equipped with a time totalizer that was checked weekly against the elapsed time.

Gross beta analysis of the air particulate samples was performed after a nominal 72 hour period to allow the radon and thoron daughter products to decay.

Weekly air particulate filters were combined into quarterly composites for each location and analyzed for gamma emitting isotopes.

Charcoal canisters were routinely counted in groups of five to determine the presence or absence of I-131. Positive indication of I-131 would have resulted in analysis of each individual charcoal canister.

Air samples were collected from six locations. These locations included the three sectors with the highest ground level deposition constants (D/Q), the community of New Strawn (indicator location 32), and a control location at Hartford (location 40). Indicator locations 2, 3 and 37 were sampled the first six months of the year and indicator locations 2, 18 and 37 were sampled the last six months of the year. Distances and directions to sampling locations from the plant are listed in Table 2, nearby locations are shown in Figure 1 and distant locations are shown in Figure 5.

B. Direct Radiation Pathway

Panasonic UD-814-AQ TLDs were used at 47 locations during the sample year. The TLDs consist of one lithium-borate element and three calcium sulfate elements in a plastic case.

TLDs were typically positioned roughly 3 to 4 feet above the ground in plastic thermostat boxes. The thermostat boxes protect the TLDs from the elements and tampering. Two TLDs were placed at each designated location. Nearby TLD sample locations are illustrated in Figure 2 and distant locations are shown in Figure 5. Table 2 provides the distance and direction of each location from the plant. Control locations were 39 (Beto Junction) and 40 (Hartford).

C. Waterborne Pathway

All water samples were analyzed to determine whether gamma emitters were present. In addition to gamma isotopic analysis, radiochemical analysis for I-131 was performed on drinking water and ground water samples. Gross beta analysis was also performed on drinking water samples. Tritium analysis was performed monthly by liquid scintillation for surface water and quarterly for drinking water. Tritium analysis was also performed quarterly on ground water samples. Water sampling locations are listed in Table 2 and are shown in Figures 3 and 5.

Grab samples were obtained monthly from three surface water locations. Surface water was sampled from the outfall of John Redmond Reservoir (JRR) as a control (location MUSH) and from the discharge cove (DC) of Wolf Creek Lake as an indicator location. The spillway (SP) of Wolf Creek Lake was also sampled periodically as an indicator location.

Ground water samples were collected quarterly from four locations. Location B-12 is hydrologically upgradient from the site and is used as a control location. Three additional samples, C-10, C-49 and D-65, were obtained from wells hydrologically downgradient from the site as indicator samples. Duplicate samples were obtained from location C-49 and were labeled L-49. These duplicate samples served as a laboratory quality check.

Drinking water was sampled at the water treatment facilities for the towns of Burlington (control location BW-15) and LeRoy (indicator location LW-40). The Burlington facility is located upstream and the LeRoy facility is located downstream of the confluence of the discharge from Wolf Creek Lake and the Neosho River. Composite samples were obtained monthly from automatic samplers at each location that collected about 10 ml of drinking water each hour.

Shoreline sediments were sampled semiannually for gamma analysis at the Wolf Creek Lake discharge cove (DC) indicator location and at the control location (JRR). The Make-up Water Discharge Structure (MUDS) and the Environmental Education Area (EEA) indicator locations were also sampled.

D. Ingestion Pathway

Because no sampling locations that produce milk for human consumption were identified within five miles of the plant, milk was not collected during the sample year.

Fish were sampled semiannually from the tail waters of JRR (control, Figure 4) and from Wolf Creek Lake (indicator, Figure 4) for gamma isotopic analysis. Several species of gamefish and roughfish were sampled. Gamma isotopic analysis was performed on boneless meat portions of the fish. Fish were also analyzed for tritium.

Broadleaf vegetation samples were collected monthly when available during the growing season from four gardens. Three indicator (E-1, F-1 and G-1) gardens (Figure 4) and a control (S-4) garden (Figure 5) were sampled. Gamma isotopic analyses were performed on all samples.

Two crop samples were obtained from two indicator locations (NR-D1 and NR-D2) downstream of the confluence of Wolf Creek and the Neosho River and two control samples (NR-U1) were obtained upstream. One indicator sample (NR-D2) and the control samples were irrigated with water from the Neosho River. Gamma isotopic analysis was performed on each sample. Indicator locations are identified on Figure 5 and the control location is identified on Figure 4.

E. Special Samples (not required by AP 07B-004)

Bottom sediment samples were collected semiannually for gamma analysis at the Wolf Creek Lake discharge cove (DC) indicator location and the control location (JRR). These samples were collected as part of a cooperative sampling effort with the Kansas Department of Health and Environment (KDHE). The sample locations are identified on Figure 3.

Aquatic vegetation was collected for gamma analysis from indicator locations at the Wolf Creek Lake discharge cove (DC), the discharge cove alternate location (DC ALT), the MUDS and the EEA. These samples were collected as part of a cooperative sampling effort with the KDHE. The sample locations are identified on Figure 3.

Terrestrial vegetation was sampled from indicator locations MUDS and EEA for gamma isotopic analyses. These samples were collected as part of a cooperative sampling effort with the KDHE. The sample locations are identified on Figure 4.

Soil was sampled from indicator locations MUDS and EEA for gamma isotopic analyses. These samples were collected as part of a cooperative sampling effort with the KDHE. The sample locations are identified on Figure 4.

Sampling locations listed in this section are outlined in Table 2.

II. DISCUSSION OF RESULTS

Analysis results for all pathways are summarized in Appendix B using the format described in Radiological Assessment Branch Technical Position, Revision 1, November 1979 (NRC Generic Letter 79-065). Results for individual samples are listed in Appendix C.

In this section, results are discussed by pathway and analysis type. Monitoring results are compared with control data, preoperational values, sources of radioactivity, and effluent releases when applicable. Trends or seasonal effects are discussed. Associated counting uncertainties for detected activity values contained in Tables 3 through 18 are shown in Appendix C.

A. Airborne Pathway

Results of the weekly gross beta analysis are summarized in Table 3. In addition, Figure 6 graphically illustrates weekly gross beta results for the sample year. Figure 7 represents the historical smoothed averages of indicator and control gross beta data.

Figures 6 and 7 demonstrate how closely the indicator and control locations tracked together. Figure 7 reveals a seasonal cyclic trend in which gross beta values peak in the winter months (December or January) and decrease to a low point in the spring months (May or June). Figure 8 represents monthly precipitation averages for Burlington, Kansas. When Figure 8 is compared to Figure 7, an inverse relationship is observed, i.e., the greater the precipitation the lower the gross beta activity. This relationship is expected since water shields the naturally occurring radiation coming from the ground and dilutes the concentrations of naturally occurring radionuclides in the soil.

The gross beta results of 2000 were compared to pre-operational monitoring results of 1983 and 1984. The weekly gross beta analyses range for 1983 and 1984 was 0.0064 to 0.084 pCi/m^3. The 2000 weekly gross beta analyses range for indicator locations was 0.012 to 0.063 pCi/m^3, which was lower than the 1983 and 1984 pre-operational range. Additionally, the annual mean for indicator locations for 2000 (0.027 pCi/m^3) was lower that the annual mean for 1983 (0.032 pCi/m^3) and 1984 (0.028 pCi/m^3).

Results of the quarterly gamma analysis of air particulate filter composite analyses are summarized in Table 4. Naturally occurring Be-7 activity was detected as was the case during pre-operational monitoring. In 1984, the range for Be-7 detected activity was 0.024 to 0.211 pCi/m^3 for indicator locations, and the annual mean for indicator locations was 0.069 pCi/m^3. In 2000, the range for Be-7 detected activity was 0.042 to 0.130 pCi/m^3 for indicator locations, and the annual mean for indicator locations was 0.069 pCi/m^3.

I-131 activity was not detected in the weekly analysis of charcoal filters.

No effects of plant operation were seen via the airborne pathway for the year, and no unusual trends were noted.

B. Direct Radiation Pathway

Quarterly gamma exposures measured at each location are shown in Tables 5 and 6. Measured values have been converted to a standard 90-day quarter.

The annual mean of all indicator locations in 2000 was 0.214 mR/day and the annual mean for the control locations was 0.197 mR/day. These results are similar to the pre-operational results for 1981. In 1981, the annual mean of all indicator locations was 0.21 mR/day and annual mean for the control locations was 0.19 mR/day.

In 2000, the indicator location with the highest annual mean (0.346 mR/day) was location 47. Location 47 was also the indicator location in 1999 with the highest annual mean (0.330 mR/day). The close proximity of location 47 to the Radwaste Building was likely the reason direct radiation levels were higher at this location.

Results from TLDs located near the plant (less than approximately three miles) which would be most affected by changes in plant operation were combined into quarterly averages. These nearsite averages, using locations 1, 2, 7-14, 18, 26-30, 37 and 38, are compared to control location results (locations 39 and 40) in Figure 9. In addition, variation of the nearsite averages from the control location results is displayed graphically in Figure 10. These figures also include preoperational data for comparison. The nearsite TLD locations have historically trended higher than the control locations both prior to and after WCGS became operational.

C. Waterborne Pathway

(1) Surface Water

Tritium, attributable to WCGS operation, was detected in all surface water samples collected from Wolf Creek Lake during 2000. According to the Radioactive Effluent Controls Program, a total of 1,563.9 curies of liquid tritium was released during the year. Measured concentrations are shown in Table 7. An adult drinking 2 liters per day of surface water collected from the Wolf Creek Lake discharge cove, using the annual mean of detected tritium activity (15,205 pCi/liter), would receive a committed effective dose equivalent of 0.694 mRem per year. An adult drinking 2 liters per day of surface water collected from the Wolf Creek Lake discharge cove, using the highest detected tritium activity (28,600 pCi/liter), would receive a committed effective dose equivalent of 1.306 mRem per year. (According to the National Council on Radiation Protection and Measurements [NCRP Report No. 94], the estimated total effective dose equivalent rate for a member of the population in the United States from various sources of natural background radiation is 300 mRem per year.) Figure 11 illustrates smoothed tritium data for location DC from startup in May 1985 through 2000. The cumulative curies of liquid tritium released to Wolf Creek Lake is illustrated in Figure 12.

During 2000, the annual mean for detected tritium activity at the discharge cove was 15,205 pCi/liter. It can be seen in Figure 11 that monthly surface water tritium concentrations have trended upward since plant startup. This is expected until the average tritium concentration of the lake reaches equilibrium.

It should be noted that the discharge cove sample collected during September was taken approximately 14 hours after a permitted release was made under the Radioactive Effluents Release Program. The curies of liquid tritium discharged during the month of September was approximately three times the amount released during August. The discharge cove is co-sampled with the KDHE. The KDHE also experienced an elevated detected tritium activity for this sample. The KDHE sample result was 28,800 ± 666 pCi/liter which was comparable to the WCGS sample result of 28,600 ± 500 pCi/liter. The detected tritium activity in October surface water obtained from the discharge cove returned to the expected lower value (16,740 pCi/liter).

Tritium activity was not detected in samples obtained from the control location (MUSH).

During pre-operational environmental radiological monitoring, measured radiological activity was not detected in surface water samples.

Tritium was the only activity detected in surface water samples and no unusual trends were noted.

(2) Ground Water

During 2000, radioactivity was not detected in ground water samples obtained from indicator sample locations. One control location sample had naturally occurring K-40 activity detected (18.7 pCi/l). Activity due to plant operation was not evident in ground water samples and no unusual trends were noted. Ground water analysis results are listed in Table 8.

(3) Drinking Water

Results of drinking water radiological analyses are summarized in Table 9. Figure 13 illustrates the historical drinking water gross beta data and how closely the gross beta results compared for the indicator and control locations.

Gross beta activity was detected in all drinking water samples. The annual mean of the control location gross beta activity (5.8 pCi/liter) was higher than the annual mean of the indicator location (5.6 pCi/liter). The 2000 annual means for gross beta activity were lower than those of the pre-operational monitoring year of 1984. In 1984, the annual mean of the control location gross beta activity was 6.4 pCi/liter, and the annual mean of the indicator location gross beta activity was 7.5 pCi/liter.

Tritium activity was not detected in any drinking water samples, and radionuclides were not detected by the I-131 and gamma isotopic analyses.

Activity due to plant operation was not evident in drinking water samples during 2000, and no unusual trends were noted.

(4) Shoreline Sediment

Shoreline sediment analysis results are summarized in Table 10. Naturally occurring nuclides (K-40, Ra-226 and Th-228) were detected in shoreline sediment samples. One sample from an indicator location (EEA) had naturally occurring Be-7 activity detected. These concentrations were comparable to pre-operational sample results.

Co-60 activity (51.7 pCi/kg) was detected in a sample obtained from the Wolf Creek Lake discharge cove. Co-60 activity was attributable to plant operation and has been identified in plant effluents. Co-60 activity was not detected in pre-operational environmental monitoring and was not detected in samples collected from control location JRR during 2000.

Cs-137 activity (66.8 and 264 pCi/kg) was detected in samples obtained from indicator locations DC and EEA. The detected Cs-137 activity was primarily due to fallout; however, a portion of the detected activity was likely due to plant operation since Cs-134 activity was detected at the DC in 1994, and Cs-137 activity has been identified in plant effluents. (The presence of Cs-134 is expected if the occurrence of Cs-137 is related to plant operation. Since Cs-134 has a shorter half-life than Cs-137 [2 years versus 30 years], it is not expected to be found when the presence of Cs-137 is due to fallout.) The Cs-137 concentrations measured were below concentrations measured pre-operationally. The pre-operational range for Cs-137 detected activity at location DC was 224 pCi/kg to 437 pCi/kg. This can be seen in Figure 14 which plots both pre-operational and operational concentrations of Cs-137 in shoreline sediment samples from the discharge cove location.

Figure 14 illustrates that Cs-137 activity was detected pre-operationally and is routinely detected at the discharge cove. A logarithmic trendline indicates that the level of Cs-137 activity detected in the discharge cove is trending downward. Figure 14 also illustrates Cs-137 detected activity at the JRR control sample location. A logarithmic trendline indicates that the level of Cs-137 activity detected at JRR is also trending downward.

D. Ingestion Pathway

(1) Milk

Milk was not collected during the sample year since no indicator locations within five miles of the plant were identified during the Land Use Census.

(2) Fish

Analysis results are illustrated in Table 12. Naturally occurring K-40 activity was detected in all fish samples and was within the range seen during the pre-operational monitoring period.

During 2000, fish were also analyzed for tritium. All fish samples taken from Wolf Creek Lake had tritium activity detected (8,293 pCi/kg annual mean). Those results are illustrated in Figure 15. The detected tritium activity was attributable to plant operation. An adult consuming 21 kilograms of fish, at the maximum measured tritium concentration for 2000 (10,362 pCi/kg), would receive a committed effective dose equivalent of 0.014 mRem. (According to the National Council on Radiation Protection and Measurements [NCRP Report No. 94], the estimated total effective dose equivalent rate for a member of the population in the United States from various sources of natural background radiation is 300 mRem per year.) Figure 15 also illustrates the correlation of detected tritium activity in Wolf Creek Lake fish and detected tritium activity in discharge cove surface water samples.

Tritium activity was also detected in three control samples collected from JRR. The annual mean was 90 pCi/kg and the range was from 68 to 109 pCi/kg.

No other radionuclides were detected in fish during the year and no unusual trends were noted.

(3) Broadleaf Vegetation

Gamma analyses of broadleaf vegetation samples during 2000 detected naturally occurring gamma emitters Be-7 and K-40. Be-7 and K-40 activity was also detected pre-operationally. No other radionuclides were detected and no unusual trends were noted. Activity attributable to plant operation was not detected. Table 13 shows the results of 2000 analyses.

(4) Crop Samples

In addition to broadleaf vegetation, crop samples were collected. Two control samples were obtained from cropland upstream of the confluence of Wolf Creek and the Neosho River, and two indicator samples were obtained downstream. The control sample location was irrigated with Neosho River water. One indicator sample location was irrigated with Neosho River water. Gamma analysis detected naturally occurring K-40 to be present in all of the samples, with no nuclides detected due to plant operation. Results of crop analyses are summarized in Table 14. No unusual trends were noted.

E. Samples Not Required By AP 07B-004

(1) Bottom Sediment

Table 15 shows gamma emitters detected in bottom sediment samples. Naturally occurring nuclides detected include Be-7, K-40, Ra-226, and Th-228.

Co-60 activity (549 and 606 pCi/kg) was detected in both samples obtained from the Wolf Creek Lake discharge cove. Co-60 activity was attributable to plant operation and has been identified in plant effluents. Co-60 activity was not detected in pre-operational environmental monitoring and was not detected in samples collected from control location JRR during 2000.

Cs-134 activity (98.4 pCi/kg) was detected in one sample obtained from the Wolf Creek Lake discharge cove. Cs-134 activity was attributable to plant operation and has been identified in plant effluents. Cs-134 activity was not detected in pre-operational environmental monitoring and was not detected in samples collected from control location JRR during 2000.

Cs-137 activity (305 and 351 pCi/kg) was detected in both indicator samples obtained from the Wolf Creek Lake discharge cove. A portion of this activity is due to fallout and a portion of this activity is likely plant-related since Cs-134 activity was also detected. It should be noted that Cs-134 activity has been previously detected in Wolf Creek Lake discharge cove bottom sediment samples. The presence of Cs-134 is expected if the occurrence of Cs-137 is attributed to a newly produced fission product. Cs-137 activity was detected in pre-operational samples, and the results for 2000 indicator bottom sediment samples were within the pre-operational range. (Cs-137 activity detected in 1981 and 1982 was in the range of 79 to 950 pCi/kg.) Cs-137 activity has been identified in plant effluents. Cs-137 activity (161 and 94.7 pCi/kg) was also detected in the control location samples.

Figure 16 plots the Cs-137 detected activity from the discharge cove indicator location and JRR control location bottom sediment samples. The linear trendlines indicate that as expected, Cs-137 detected activity at the discharge cove location is increasing over time and the Cs-137 detected activity at the JRR control location has been decreasing.

No other radionuclides were detected in bottom sediment samples and no unusual trends were noted.

(2) Aquatic Vegetation

Table 16 lists gamma emitters detected in aquatic vegetation samples. The five samples were obtained from indicator locations. Naturally occurring Be-7, K-40, Ra-226 and Th-228 were detected in samples collected in 2000 and were also detected during pre-operational monitoring.

Co-58 activity (19.7 pCi/kg) was detected in an algae sample obtained from the Wolf Creek Lake discharge cove. This activity was attributed to plant operation and has been identified as expected in plant effluents. Co-58 was not detected during pre-operational monitoring.

Co-60 activity was detected in two algae samples (DC and MUDS) and an American Lotus sample obtained from the DC Alt location. This activity was attributed to plant operation and has been identified as expected in plant effluents. Co-60 activity was not detected during pre-operational monitoring.

Cs-134 activity (44.4 pCi/kg) was detected in an algae sample collected from the Wolf Creek Lake discharge cove. This activity was attributed to plant operation. Cs-134 activity has been identified in plant effluents and was not identified in pre-operational environmental monitoring.

Cs-137 activity was detected in four of the five aquatic vegetation samples. This activity was attributed to a combination of plant operation and fallout. (Cs-134 activity was detected in samples obtained during 1998 and in 2000.) Cs-137 activity has been identified in plant effluents and was also identified in pre-operational environmental monitoring.

No other radionuclides were detected in aquatic vegetation samples, and no unusual trends were noted.

(3) Terrestrial Vegetation

Grass samples were obtained from the EEA and MUDS. Both indicator samples had naturally occurring Be-7 and K-40 activity detected. No other radionuclides were detected. Table 17 reflects gamma emitters detected in terrestrial vegetation samples. No unusual trends were identified.

(4) Soil

Soil samples were obtained from indicator locations EEA and MUDS. A control soil sample was not obtained. Naturally occurring K-40, Ra-226 and Th-228 activity was detected. Cs-137 (168 pCi/kg) activity was detected in one soil sample obtained from the EEA. The Cs-137 activity was attributable to fallout since the levels were below the pre-operational range (255 to 2,160 pCi/kg). Table 18 lists the activity detected in soil samples. No unusual trends were identified.

III. ANNUAL LAND USE CENSUS RESULTS

Summary

The annual Land Use Census of rural residents within five miles of the WCGS was completed for 2000. No changes were required in the REMP in either the broadleaf vegetation sample locations or milk sample locations. Once again, milk sample locations were not identified. The two broadleaf vegetation locations with the highest calculated annual average D/Q rankings remain the G1.6-QURD1384 and F1.8-14RD1730 locations. The ODCM (AP 07B-004) specifies that an "alternate location may be used to provide continued monitoring." The third-ranked garden was at location E1.8-QULA1485, and it was again chosen as an alternate sampling location. The residents at G1.6-QURD1384, F1.8-14RD1730, and E1.8-QULA1485 have agreed in the past to allow sampling from their respective gardens. The results and notable changes are summarized and illustrated in Tables 19 and 20.

Background

Section 5.2, Attachment A, of the ODCM procedure (AP 07B-004), directs that "a Land Use Census shall be conducted annually during the growing season to identify the nearest (1) milk animal, (2) residence, and (3) garden of greater than 500 square feet producing broadleaf vegetation in each of the 16 meteorological sections within five miles of the WCGS site" and "the results of the Land Use Census shall be included in the Annual Radiological Environmental Operating Report."

Table 5-1, Attachment A, of the ODCM (AP 07B-004) requires that broadleaf vegetation samples be collected from "two indicator locations with the highest calculated annual average D/Q."

Table 5-1, Attachment A, of the ODCM (AP 07B-004) also requires that milk samples be collected from "three indicator locations within 5 miles of the site having the highest dose potential."

Methodology

Surveys were sent to the rural residents within five miles of WCGS during the second week of July 2000. A follow-up mailing was sent to residents who did not respond. The survey excluded the residents of New Strawn, Burlington and a trailer park just north of Burlington. These locations were excluded due to the large number of households and the low likelihood that information gained from these residences would affect the locations chosen for REMP sampling. Of the 172 surveys mailed to the rural residents, 156 were returned by mail or completed by conversing with the residents. Sixteen surveys were partially completed with information obtained by driving by the locations.

Results

Table 19 reflects the nearest residences, milk animals and broadleaf gardens. Table 20 lists the changes as compared to the 1999 Land Use Census results for milk animals and gardens producing broadleaf vegetation.

Changes in the nearest residence occurred in three sectors (J, N and P), and no milk locations were identified. Six location changes were noted for the nearest garden producing broadleaf vegetation.

IV. PROGRAM REVISIONS/CHANGES

Laboratory Change

Performance Improvement Request (PIR) 2000-2541 was generated 09-12-2000 to document missed LLDs for Ba-140 on July surface water samples. Through the PIR evaluation, it was concluded that vendor lab performance was declining and another lab should be contracted to perform REMP sample analysis. Environmental, Inc. (Northbrook, IL) was selected based upon information gained from other nuclear power plants, information from Wolf Creek Chemistry department, discussions with the Wolf Creek Supplier Quality department and competitive pricing for services. A requisition was created to generate a purchase order to Environmental, Inc. for radiological analysis services for the REMP. On October 24, 2000, WCGS started sending REMP samples to Environmental, Inc. for radiological analysis.

Air Sample Location Changes

Two changes occurred during the year regarding air sample locations. Based upon the results of Engineering Calculation AN-99-027 [Calculation of Relative Deposition per Unit Area (D/Q)] and Change Notice AN-99-027-000-CN-001 discussed in section VIII, the following changes were made:

- 06-16-2000: Air sample location #18 was added to the program
- 07-12-2000: Air sample location #3 was deleted from the program

The deletion of air sample location #3 also resolved the dust loading concern described in Performance Improvement Request 2000-0666.

V. PROGRAM DEVIATIONS

Direct Radiation

Location 12: During the fourth quarter of 2000, the TLDs at this location disappeared while in the field. The immediate area was searched and a new TLD box was installed. Due to the missing TLDs, results are not available for this location for the fourth quarter. (Performance Improvement Request 2001-0245)

Analyses in Which the ODCM Lower Limit of Detection Was Not Achieved

Sample Date	*Count Date*	*Type*	*Location*	*Nuclide*	*Result*	*Required LLD*	*Units*
05-03-00	06-24-00	Drinking Water	LW40	Ba-140	40	15	pCi/l
05-03-00	06-24-00	Drinking Water	BW15	Ba-140	30	15	pCi/l
Performance Improvement Request 2000-1788: According to Teledyne Brown Engineering, Inc. the contributing factor to the missed LLDs was an equipment problem which delayed the analysis of the samples. To prevent recurrence, replacement equipment was installed.							

Sample Date	*Count Date*	*Type*	*Location*	*Nuclide*	*Result*	*Required LLD*	*Units*
07-26-00	08-14-00	Surface Water	MUSH	Ba-140	49.5	15	pCi/l
07-26-00	08-14-00	Surface Water	DC	Ba-140	41.3	15	pCi/l
07-26-00	08-14-00	Surface Water	SP	Ba-140	60	15	pCi/l
08-17-00	08-31-00	Surface Water	DC	Ba-140	18.6	15	pCi/l
08-17-00	08-31-00	Surface Water	SP	Ba-140	23.6	15	pCi/l
08-17-00	08-31-00	Ground Water	B12	Ba-140	25.4	15	pCi/l
08-17-00	08-31-00	Ground Water	C49	Ba-140	36.7	15	pCi/l
08-17-00	08-31-00	Ground Water	D65	Ba-140	28.3	15	pCi/l
08-17-00	08-31-00	Ground Water	L49	Ba-140	26.6	15	pCi/l
Performance Improvement Request 2000-2541: According to a letter from Teledyne Brown Engineering, Inc., "Due to a spectroscopy equipment malfunction and a delay in the installation of replacement equipment, the water samples were delayed in processing by the gamma spectroscopy department." To prevent recurrence, two Canberra Genie 2000 systems were purchased along with new gamma detectors.							

Sample Date	*Count Date*	*Type*	*Location*	*Nuclide*	*Result*	*Required LLD*	*Units*
09-21-00	12-13-00	Surface Water	MUSH	Fe-59	32.5	30	pCi/l
09-21-00	12-13-00	Surface Water	MUSH	Zr-95	19.1	15	pCi/l
09-21-00	12-13-00	Surface Water	MUSH	Ba-140	1500	15	pCi/l
09-21-00	12-13-00	Surface Water	DC	Ba-140	925	15	pCi/l
Performance Improvement Request 2000-2541: Per the Teledyne Brown Engineering Report of Analysis, several required gamma detection limits were exceeded due to a delay in counting. To prevent recurrence, samples are now sent to a different lab.							

Sample Date	*Date Samples were received by Env., Inc.*	*Type*	*Location*	*Nuclide*	*Required LLD*	*Units*
09-27-00	02-07-01	Corn	NRU1	I-131	60	pCi/kg, wet
09-27-00	02-07-01	Soybeans	NRU1	I-131	60	pCi/kg, wet
10-04-00	02-07-01	Soybeans	NRD2	I-131	60	pCi/kg, wet
10-04-00	02-07-01	Soybeans	NRD1	I-131	60	pCi/kg, wet
Performance Improvement Request 2000-2541: These samples were originally submitted to Teledyne Brown Engineering, Inc. for analysis; however, Teledyne was unable to perform the analysis. The samples were returned to Wolf Creek. The samples were then forwarded on to Environmental, Inc. Due to the long delay between sampling and counting dates, the I-131 LLDs could not be met.						

VI. INTERLABORATORY COMPARISON PROGRAM RESULTS

During 2000, Teledyne Brown Engineering, Inc. and Environmental, Inc. were under contract to perform radiological analysis of environmental samples for WCNOC. Both labs participated in the Environmental Resource Associates (ERA) Proficiency Testing Program. Teledyne Brown Engineering, Inc. also participated in the Analytics Cross Check Comparison Program.

Table 21 is a summary of the Teledyne Brown Engineering, Inc. ERA proficiency testing results. The table lists the date/medium, nuclide, the known value reported by ERA, the measured value reported by Teledyne Brown Engineering, expected deviation known, control limits, warning limits and performance evaluation. A letter of explanation has been included which describes the circumstances regarding the "not acceptable" results of evaluated performance.

Table 22 is a summary of the Teledyne Brown Engineering, Inc. Analytics comparison program results. The table lists sample date, sample medium, nuclide, the measured results reported by Teledyne Brown Engineering, the known results reported by Analytics and the ratio of Teledyne Brown Engineering to the Analytics results.

Table 23 is a summary of statistical results of performance testing of TLDs processed at Enrico Fermi 2 by Detroit Edison, which participated in the National Voluntary Laboratory Accreditation Program.

Appendix A is the Interlaboratory Comparison Program Results for Environmental, Inc. TLD intercomparison results, in-house spikes, blanks, duplicates and mixed analyte performance evaluation program results are also contained in Appendix A.

Appendix D is an evaluation of Teledyne Brown Engineering, Inc. Interlaboratory Comparison Results. Appendix D also compares similar sample analysis results between the Kansas Department of Health and Environment and Wolf Creek Generating Station.

VII. COMPARISON TO THE RADIOACTIVE EFFLUENTS RELEASE PROGRAM

As described in the sections discussing radioisotopes found in the surface water from Wolf Creek Lake, dose that may be received as a result of tritium released from WCGS is consistent with the theoretical doses calculated by the Radioactive Effluent Release Program.

Figure 17 indicates that the dose to a man resulting from drinking surface water from Wolf Creek Lake was within a reasonable expected value. Dose for the surface water was determined using the December tritium activity detected for each calendar year at the discharge cove. Released tritium maximum organ dose (mRem) values were obtained from Annual Radioactive Effluent Release Reports and are not cumulative (i.e., the values reflected are the totals for the respective years).

The tritium dose values are being compared on a qualitative basis. It is not expected that the annual doses, as calculated in the Radioactive Effluent Release Report, would compare directly to those calculated from the REMP. The Radioactive Effluent Release Report provides a 'snap shot' of potential dose resulting from the year's release. The REMP data indicate the accumulated result of releasing tritium into the cooling lake since the start of plant operation.

VIII. REVIEW OF UPDATED RELATIVE DEPOSITIONS PER UNIT AREA (D/Q)S

Two recommendation Performance Improvement Requests were initiated as a result of Self-Assessment 1998-036, "REMP Air Sample Station Locations." Performance Improvement Request 1998-3887 recommended that D/Q calculations be performed on sample locations (air and garden), using the recent wind direction frequency data. Performance Improvement Request 1998-3888 recommended that D/Q calculations be completed periodically to ensure that sample locations are satisfactory and that at least a three-year rolling average be used for meteorological data.

Engineering Calculation AN-99-027 [Calculation of Relative Deposition per Unit Area (D/Q)] was completed 12-09-1999. The calculation used wind direction frequency data collected between 1991 and 1997. It provided updated information for ranking sample locations based upon D/Qs. Change Notice AN-99-027-000-CN-001 was generated to extend the calculated D/Q values to 8000 meters so that gardens could also be evaluated, to clarify the impact of stability class and to recommend that the wind frequency information be updated every three years and the associated D/Q calculations be evaluated at that time. The change notice was completed 03-24-2000.

Based upon the results of AN-99-027 and its associated change notice, D/Qs have changed since the initial air sample locations were chosen. As such, air sample location #18 was added to the REMP and air sample location #3 was deleted from the REMP.

The broadleaf vegetation sample locations were reviewed using the AN-99-027 information and no changes were necessary to garden locations. The 1999 Land Use Census was revised accordingly.

The ODCM (AP 07B-004) was revised to reflect the air sample location changes and procedure AI 07B-005 (Radiological Environmental Monitoring Program Implementation) was revised to add a requirement that periodic reviews be conducted of meteorological data to ensure D/Qs remain correct.

TABLE 1

2000 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM DESCRIPTION
(SAMPLE COLLECTION REQUIRED BY ODCM)

EXPOSURE PATHWAY/ SAMPLE	NUMBER OF SAMPLES AND SAMPLE LOCATIONS	SAMPLING AND COLLECTION FREQUENCY	TYPE AND FREQUENCY OF ANALYSIS
AIRBORNE	**(See Figures 1 & 5)**		
Radioiodine and Particulates	Samples from five locations	Continuous sampler operation with sample collection weekly, or more frequently if required, by dust loading.	Analyze radioiodine canister weekly for I-131
	Samples from locations near the site boundary in three sectors having the highest calculated annual average D/Q (Locations 2, 18, and 37 on Figure 1)		Analyze particulate filter weekly for gross beta activity; perform quarterly gamma isotopic analysis composite (by location)
	Sample from the vicinity of a community having the highest calculated annual average D/Q (Location 32 on Figure 1, New Strawn)		
	Sample from a control location 10-20 miles distant in a low D/Q sector (Location 40 on Figure 5)		

TABLE 1 (Cont.)

EXPOSURE PATHWAY/ SAMPLE	NUMBER OF SAMPLES AND SAMPLE LOCATIONS	SAMPLING AND COLLECTION FREQUENCY	TYPE AND FREQUENCY OF ANALYSIS
DIRECT RADIATION	**(See Figures 2 & 5)**		
	40 routine monitoring stations with two or more dosimeters measuring dose continuously, placed as follows: An inner ring of stations, one in each meteorological sector 0-3 mile range from the site (Locations 1, 7-9, 11-13, 18, 26, 27, 29-31, 37, 38 and 47 on Figure 2). An outer ring of stations, one in each meteorological sector in the 3-5 mile range from the site (Locations 4-6, 15-17, 19-25, and 33-36 on Figure 2). Five sectors [A, B, D, G, and L] contain an additional station (Locations 2, 3, 10, 14 and 28). The balance of the stations to be placed in special interest areas such as population centers (Locations 23 and 32), nearby residences	Quarterly	Gamma dose quarterly

TABLE 1 (Cont.)

EXPOSURE PATHWAY/ SAMPLE	NUMBER OF SAMPLES AND SAMPLE LOCATIONS	SAMPLING AND COLLECTION FREQUENCY	TYPE AND FREQUENCY OF ANALYSIS
DIRECT RADIATION (cont.)	(many locations are near a residence), schools (Location 23), and in one or two areas to serve as control stations 10-20 miles distant from the site (Locations 39 and 40 on Figure 5).		
WATERBORNE	(See Figure 3)		
Surface	One sample upstream (Location MUSH on Figure 3) and one sample downstream (Location DC on Figure 3).	Monthly grab sample	Monthly gamma isotopic analysis and composite for tritium analysis quarterly
Ground	Samples from one or two sources only if likely to be affected. Indicator samples at locations hydrologically downgradient of the site (Locations C-10, C-49, and D-65 on Figure 3); Control sample at a location hydrologically upgradient of the site (Location B-12 on Figure 3).	Quarterly grab sample	Quarterly gamma isotopic and tritium analysis

TABLE 1 (Cont.)

EXPOSURE PATHWAY/ SAMPLE	NUMBER OF SAMPLES AND SAMPLE LOCATIONS	SAMPLING AND COLLECTION FREQUENCY	TYPE AND FREQUENCY OF ANALYSIS
WATERBORNE (cont.)			
Drinking	Sample of municipal water supply at an indicator location downstream of the site (Location LW-40 on Figure 5); control sample from location upstream of the site (Location BW-15 on Figure 3).	Monthly Composite	Monthly gamma isotopic analysis and gross beta analysis of composite sample. Quarterly tritium analysis of composites.
Shoreline sediment	One sample from the vicinity of Wolf Creek Lake discharge cove; control sample from John Redmond Reservoir (Locations DC and JRR respectively on Figure 3).	Semiannually	Semiannual gamma isotopic analysis
INGESTION	(See Figures 4 & 5)		
Milk	Samples from milking animals at three indicator locations within five miles of the site having the highest dose potential (currently there are no locations producing milk for human consumption within five miles of the site); one sample from a control location greater than 10 miles from the site if indicator locations are sampled.	Semimonthly April to November; monthly December-March	Gamma isotopic analysis and I-131 analysis of each sample

TABLE 1 (Cont.)

EXPOSURE PATHWAY/ SAMPLE	NUMBER OF SAMPLES AND SAMPLE LOCATIONS	SAMPLING AND COLLECTION FREQUENCY	TYPE AND FREQUENCY OF ANALYSIS
INGESTION (cont.)			
Fish	Indicator samples of 1-3 recreationally important species from Wolf Creek Lake; control samples of similar species from John Redmond Reservoir spillway (Figure 4).	Semiannually	Gamma isotopic analysis on edible portions
Broadleaf Vegetation	Samples of available broadleaf vegetation from two indicator locations with highest calculated annual average D/Q (Locations G-1 and F-1 and alternate location E-1); sample of similar broadleaf vegetation from a control location greater than 10 miles from the site in a low D/Q sector (Location S-4 on Figure 5).	Monthly when available	Gamma isotopic analysis on edible portions
Irrigated Crops	Sample of crops irrigated with water from the Neosho River downstream of the Neosho River - Wolf Creek confluence (Location NR-D1 and NR-D2 on Figure 5).	At time of harvest	Gamma isotopic analysis on edible portions

TABLE 2

SAMPLE LOCATION NUMBERS, DISTANCES (Miles) AND DIRECTIONS

Location Number	Distance/ Direction	Location Number	Distance/ Direction	Location Number	Distance/ Direction
Air Particulates and Radioiodines					
2	2.7/N				
3	3.0/NNE				
18	3.0/SSE				
32	3.2/WNW				
37	2.1/NNW				
40	>15.0/WNW				
TLDs					
1	1.4/N	17	3.6/SE	33	3.7/WNW
2	2.7/N	18	3.0/SSE	34	4.0/NW
3	3.0/NNE	19	4.0/SSE	35	4.6/NNW
4	4.0/NNE	20	3.3/S	36	4.2/N
5	4.0/NE	21	3.8/S	37	2.1/NNW
6	4.4/ENE	22	4.1/SSW	38	1.2/NW
7	1.9/NE	23	4.5/SW	39	13.0/N
8	1.6/NNE	24	4.1/WSW	40	>15.0/WNW
9	2.0/ENE	25	3.6/W	41	0.8/NNW
10	2.4/ENE	26	2.6/WSW	42	0.8/SSE
11	1.6/E	27	2.1/SW	43	0.8/WNW
12	1.8/ESE	28	2.8/SW	44	3.0/NNW
13	1.5/SE	29	2.6/SSW	45	1.6/WNW
14	2.6/SE	30	2.2/W	46	1.5/WNW
15	4.5/ESE	31	3.0/WNW	47	0.16/S
16	4.2/E	32	3.2/WNW		
Ground water		Drinking water		Surface water	
B-12	2.2/NNE	BW-15	3.9/SW	MUSH	3.6/W
C-10	2.8/W	LW-40	>10.0/SSE	DC	0.6/WNW
C-49/L-49	2.9/SW			SP	2.9/S
D-65	3.9/S				
Milk		Broadleaf vegetation		Irrigated Crops	
No samples collected		F-1	1.8/ESE	NR-U1	4.2/SW
		G-1	1.6/SE	NR-D1	9.2/S
		E-1	1.8/E	NR-D2	>10.0/S
		S-4	>15.0/WNW		
Fish		Shoreline Soil		Aquatic Vegetation/Algae	
WCL	0.6/WNW	DC	0.6/WNW	DC	0.6/WNW
JRR	4.0/W	JRR	4.0/W	DC ALT	1.5/NW
		EEA	3.0/NNW	EEA	3.0/NNW
		MUDS	1.5/WNW	MUDS	1.5/WNW
Terrestrial Vegetation & Soil				Bottom Sediment	
EEA	3.0/NNW			DC	0.6/WNW
MUDS	1.5/WNW			JRR	4.0/W

TABLE 3
Airborne Particulate Gross Beta Analyses
pCi/cubic meter (analysis counting uncertainties reported in Appendix C)

Date		Location					
Beginning	Ending	2	3	18	32	37	40 (Control)
01/05/2000	01/13/2000	0.020	0.021		0.020	0.023	0.022
01/13/2000	01/19/2000	0.043	0.042		0.043	0.042	0.047
01/19/2000	01/26/2000	0.028	0.031		0.034	0.029	0.030
01/26/2000	02/02/2000	0.027	0.034		0.033	0.033	0.033
02/02/2000	02/09/2000	0.038	0.047		0.039	0.037	0.041
02/09/2000	02/16/2000	0.040	0.046		0.040	0.043	0.043
02/16/2000	02/23/2000	0.026	0.020		0.024	0.025	0.024
02/23/2000	03/01/2000	0.020	0.018		0.020	0.021	0.020
03/01/2000	03/08/2000	0.016	0.019		0.023	0.021	0.020
03/08/2000	03/15/2000	0.022	0.018		0.020	0.025	0.019
03/15/2000	03/22/2000	0.018	0.020		0.022	0.023	0.018
03/22/2000	03/30/2000	0.021	0.018		0.018	0.021	0.018
03/30/2000	04/05/2000	0.024	0.020		0.024	0.023	0.020
04/05/2000	04/12/2000	0.023	0.022		0.022	0.023	0.022
04/12/2000	04/19/2000	0.020	0.019		0.017	0.017	0.020
04/19/2000	04/26/2000	0.021	0.019		0.020	0.019	0.020
04/26/2000	05/03/2000	0.024	0.020		0.022	0.021	0.024
05/03/2000	05/10/2000	0.019	0.018		0.019	0.018	0.020
05/10/2000	05/17/2000	0.019	0.019		0.025	0.023	0.025
05/17/2000	05/24/2000	0.021	0.019		0.019	0.019	0.019
05/24/2000	05/31/2000	0.024	0.020		0.019	0.024	0.020
05/31/2000	06/08/2000	0.017	0.015		0.014	0.014	0.014
06/08/2000	06/15/2000	0.017	0.014		0.017	0.016	0.016
06/15/2000	06/21/2000	0.012	0.013	0.014	0.016	0.013	0.012
06/21/2000	06/28/2000	0.018	0.016	0.018	0.017	0.017	0.017
06/28/2000	07/05/2000	0.018	0.017	0.019	0.019	0.022	0.017
07/05/2000	07/12/2000	0.027	0.028	0.027	0.027	0.026	0.023
07/12/2000	07/19/2000	0.030		0.030	0.028	0.031	0.029
07/19/2000	07/26/2000	0.025		0.018	0.023	0.021	0.022
07/26/2000	08/02/2000	0.034		0.025	0.029	0.028	0.024
08/02/2000	08/09/2000	0.027		0.027	0.029	0.034	0.032
08/09/2000	08/16/2000	0.030		0.023	0.029	0.029	0.026
08/16/2000	08/23/2000	0.033		0.027	0.031	0.028	0.031
08/23/2000	08/30/2000	0.029		0.029	0.032	0.032	0.028
08/30/2000	09/06/2000	0.030		0.028	0.028	0.032	0.027
09/06/2000	09/13/2000	0.021		0.023	0.025	0.024	0.027
09/13/2000	09/20/2000	0.027		0.024	0.031	0.029	0.025
09/20/2000	09/27/2000	0.016		0.016	0.019	0.016	0.019
09/27/2000	10/04/2000	0.030		0.031	0.035	0.033	0.031
10/04/2000	10/11/2000	0.025		0.022	0.023	0.024	0.025
10/11/2000	10/18/2000	0.033		0.034	0.034	0.034	0.034
10/18/2000	10/25/2000	0.053		0.047	0.054	0.050	0.046
10/25/2000	11/01/2000	0.023		0.022	0.025	0.024	0.020
11/01/2000	11/09/2000	0.022		0.021	0.021	0.022	0.020
11/09/2000	11/15/2000	0.031		0.029	0.037	0.035	0.028
11/15/2000	11/21/2000	0.030		0.027	0.035	0.033	0.031
11/21/2000	11/29/2000	0.052		0.045	0.052	0.047	0.043
11/29/2000	12/06/2000	0.023		0.019	0.022	0.019	0.020
12/06/2000	12/14/2000	0.036		0.037	0.037	0.035	0.037
12/14/2000	12/20/2000	0.041		0.046	0.043	0.040	0.042
12/20/2000	12/27/2000	0.038		0.038	0.042	0.040	0.035
12/27/2000	01/03/2001	0.063		0.054	0.063	0.059	0.057

TABLE 4
Airborne Particulate Quarterly Composite Gamma Isotopic Analyses
pCi/cubic meter (analysis counting uncertainties reported in Appendix C)

Location	Quarter	Be-7
2	1	0.0420
3	1	0.0610
32	1	0.0734
37	1	0.0674
40	1	0.0697
2	2	0.0622
3	2	0.0697
32	2	0.0749
37	2	0.0611
40	2	0.0604
2	3	0.11
18	3	0.06
32	3	0.08
37	3	0.13
40	3	0.10
2	4	0.06
18	4	0.05
32	4	0.06
37	4	0.05
40	4	0.04

TABLE 5
First and Second Quarter TLD Results
(mR/90 day qtr)

First Quarter			
Location	Days	90 Day Average	2 std dev
1	97.9	17.6	0.9
2	97.8	16.5	0.5
3	98.0	16.7	2.0
4	98.0	17.0	3.1
5	98.0	15.1	1.2
6	98.0	14.9	1.3
7	98.0	15.0	1.0
8	98.0	15.2	1.5
9	98.0	14.5	0.9
10	98.0	15.9	0.9
11	98.0	16.6	1.6
12	98.0	15.3	1.9
13	98.0	16.1	2.2
14	98.0	14.8	1.0
15	98.0	16.3	0.8
16	98.0	16.9	2.5
17	98.0	16.0	1.0
18	98.0	16.9	2.6
19	98.8	16.8	0.5
20	98.8	15.2	0.7
21	98.7	13.8	1.2
22	98.7	19.2	2.8
23	97.9	17.3	2.7
24	97.9	16.6	2.6
25	97.9	14.4	2.3
26	97.8	15.5	2.1
27	97.8	18.1	5.1
28	97.8	15.0	2.7
29	97.8	14.2	0.7
30	97.8	17.7	1.1
31	97.8	17.4	4.7
32	97.2	16.4	1.2
33	97.2	17.6	1.6
34	97.9	18.9	4.2
35	97.8	16.0	0.5
36	97.8	17.9	0.9
37	97.8	16.2	2.3
38	97.8	17.9	1.7
39	97.0	15.6	1.0
40	97.0	15.4	3.6
41	97.9	17.0	3.6
42	97.9	11.5	1.1
43	97.9	11.2	0.8
44	97.9	18.0	0.9
45	97.8	17.3	0.9
46	97.8	17.4	1.3
47	97.9	26.7	1.5

Second Quarter			
Location	Days	90 Day Average	2 std dev
1	85.0	21.9	1.4
2	85.1	19.9	1.1
3	85.0	20.4	1.2
4	85.0	21.3	1.5
5	85.0	19.7	1.9
6	85.1	19.1	0.7
7	85.0	19.3	1.7
8	85.0	21.3	1.9
9	85.0	18.8	1.1
10	85.0	20.7	0.9
11	85.0	22.7	3.6
12	85.0	20.9	1.4
13	85.0	21.4	0.9
14	85.0	21.1	1.4
15	85.0	20.9	1.5
16	85.0	20.8	1.6
17	85.0	19.9	0.7
18	85.0	20.7	1.1
19	84.3	21.9	1.3
20	84.3	19.6	2.5
21	84.3	18.7	1.1
22	84.1	21.5	1.1
23	84.1	20.4	1.0
24	84.1	21.0	1.7
25	84.1	17.8	0.9
26	84.1	19.5	1.6
27	84.1	20.9	1.4
28	84.1	18.5	0.7
29	84.1	17.3	1.9
30	84.1	21.3	1.2
31	84.1	19.6	0.8
32	84.8	19.7	1.6
33	84.8	21.3	0.9
34	84.1	21.4	1.7
35	85.1	20.1	1.6
36	85.1	20.4	1.5
37	85.1	19.3	1.0
38	85.1	22.2	1.1
39	85.0	20.0	1.7
40	84.9	17.6	1.6
41	84.9	21.1	1.4
42	85.0	15.1	1.1
43	85.0	14.0	0.7
44	85.1	20.3	1.4
45	84.1	22.0	1.3
46	84.1	20.0	0.9
47	85.0	34.0	2.6

TABLE 6
Third and Fourth Quarter TLD Results
(mR/90 day qtr)

Third Quarter			
Location	Days	90 Day Average	2 std dev
1	79.1	19.7	1.1
2	81.8	18.1	1.1
3	81.8	18.4	1.1
4	81.8	19.8	1.5
5	81.8	17.5	1.6
6	81.7	17.4	1.4
7	79.0	17.4	1.3
8	79.0	20.2	0.9
9	79.1	17.7	1.0
10	81.8	18.3	2.0
11	79.1	20.1	1.4
12	79.1	19.6	0.9
13	79.1	20.1	1.1
14	79.0	19.1	0.7
15	81.7	19.6	1.3
16	81.7	19.0	1.6
17	81.7	18.8	0.9
18	81.8	19.6	0.7
19	78.9	21.3	2.1
20	78.9	19.3	1.0
21	78.9	16.7	1.8
22	79.1	18.4	1.8
23	79.1	19.4	1.5
24	79.1	22.4	1.5
25	79.0	15.2	1.8
26	79.1	18.0	0.9
27	79.1	19.8	0.7
28	79.1	17.5	0.8
29	79.1	16.3	1.0
30	79.0	20.3	0.9
31	79.1	18.6	1.2
32	79.1	17.9	0.5
33	79.0	21.4	0.8
34	79.0	21.1	1.9
35	78.9	19.6	1.2
36	78.9	19.5	1.2
37	79.1	18.5	1.3
38	79.1	21.2	1.0
39	79.0	18.1	1.3
40	79.0	16.6	1.1
41	79.1	20.4	1.1
42	79.1	13.2	0.7
43	79.1	13.0	0.7
44	79.0	20.1	2.9
45	79.1	22.2	3.3
46	79.1	18.9	1.0
47	79.1	27.2	3.3

Fourth Quarter			
Location	Days	90 Day Average	2 std dev
1	111.1	21.3	1.3
2	107.2	20.4	1.2
3	109.0	21.9	2.4
4	109.0	21.9	1.2
5	109.0	20.8	0.8
6	109.0	19.9	0.5
7	111.8	19.3	1.2
8	111.8	23.4	1.5
9	111.8	19.4	0.8
10	109.0	22.2	3.1
11	111.8	23.6	4.4
12	UNK	UNK	UNK
13	111.8	20.9	1.0
14	111.8	22.0	3.7
15	109.0	22.4	2.8
16	109.0	23.2	1.5
17	109.0	20.7	0.5
18	107.2	23.8	4.0
19	111.1	21.0	2.2
20	111.1	20.0	1.7
21	111.1	18.4	1.0
22	110.1	21.1	1.1
23	111.1	20.2	0.8
24	111.1	19.5	2.0
25	111.1	17.2	1.7
26	111.1	20.1	0.8
27	111.1	21.3	1.8
28	111.1	18.8	0.8
29	111.0	17.9	1.3
30	111.2	21.1	0.8
31	110.1	20.8	1.3
32	110.1	20.7	0.7
33	111.2	22.3	1.3
34	110.2	22.7	1.7
35	110.2	22.2	1.0
36	110.2	21.6	0.8
37	109.9	20.8	2.0
38	109.9	24.2	2.7
39	112.1	20.3	3.1
40	110.2	18.3	2.2
41	111.1	22.0	1.0
42	111.8	16.7	3.0
43	111.8	16.6	3.1
44	110.0	20.4	1.7
45	112.0	20.9	0.9
46	111.1	22.8	5.3
47	111.7	36.9	4.2

TABLE 7
Surface Water Radiological Analyses
pCi/liter (analysis counting uncertainties reported in Appendix C)

Location	Date	H-3
DC	01/20/2000	11000
SP	01/20/2000	11000
DC	02/17/2000	11000
SP	02/17/2000	12000
DC	03/23/2000	12000
SP	03/23/2000	11000
DC	04/20/2000	13000
SP	04/20/2000	14000
DC	05/18/2000	13000
SP	05/18/2000	14000
DC	06/15/2000	13000
SP	06/15/2000	13000
DC	07/26/2000	17357
SP	07/26/2000	14293
DC	08/17/2000	16000
SP	08/17/2000	14000
DC	09/21/2000	28600
DC	10/19/2000	16740
DC	11/16/2000	15578
DC	12/29/2000	15189

TABLE 8
Ground Water Radiological Analyses
pCi/liter (analysis counting uncertainties reported in Appendix C)

Location	Date	K-40
B-12	05/18/2000	18.7

TABLE 9
Drinking Water Radiological Analyses
pCi/liter (analysis counting uncertainties reported in Appendix C)

Location	Start Date	Gr-B
LW40	01/05/2000	6.6
BW15	01/05/2000	5.7
LW40	02/02/2000	5.7
BW15	02/02/2000	5.4
LW40	03/01/2000	5.2
BW15	03/01/2000	5.4
LW40	04/06/2000	5.2
BW15	04/06/2000	6.2
LW40	05/03/2000	4.6
BW15	05/03/2000	4.6
LW40	06/09/2000	5.2
BW15	06/09/2000	5.4
LW40	07/05/2000	5.9
BW15	07/05/2000	7.5
LW40	08/04/2000	7.8
BW15	08/04/2000	6.3
LW40	09/06/2000	7.5
BW15	09/06/2000	8.5
BW15	10/04/2000	5.3
LW40	10/04/2000	5.9
BW15	11/01/2000	4.8
LW40	11/01/2000	2.4
BW15	12/06/2000	5.0
LW40	12/06/2000	5.4

TABLE 10
Shoreline Sediment Radiological Analyses
pCi/kg, dry (analysis counting uncertainties reported in Appendix C)

Location	Date	Be-7	K-40	Co-60	Cs-137	Ra-226	Th-228
DC	04/18/2000		11800			2760	1330
JRR	04/25/2000		9610			4520	1910
EEA	06/14/2000	868	12000		264	2320	1110
MUDS	06/12/2000		9580			3190	1340
DC	11/14/2000		9466	51.7	66.8		
JRR	11/14/2000		11831				

TABLE 11
Milk Radiological Analyses
pCi/liter (analysis counting uncertainties reported in Appendix C)

Milk was not collected during 2000.

TABLE 12
Fish Radiological Analyses
pCi/kg, wet (analysis counting uncertainties reported in Appendix C)

Species	Location	Date	K-40	H-3
WHITE CRAPPIE	JRR	04/25/2000	3390	
COMMON CARP	JRR	04/25/2000	3750	
LM BASS	JRR	04/25/2000	2980	
CHANNEL CATFISH	JRR	04/25/2000	3390	
WIPER	WCL	04/18/2000	3640	7700
SM BUFFALO	WCL	04/18/2000	2790	7100
CHANNEL CATFISH	WCL	04/18/2000	3240	7000
WHITE BASS	WCL	04/18/2000	1990	6300
LM BASS	WCL	04/18/2000	3420	6400
LM BASS	JRR	11/07/2000	3204	109
COMMON CARP	JRR	11/07/2000	3249	94
SM BUFFALO	JRR	11/07/2000	2341	68
COMMON CARP	WCL	11/14/2000	3759	10362
WHITE BASS	WCL	11/14/2000	3505	9775
LM BASS	WCL	11/14/2000	3443	9749
WIPER	WCL	11/14/2000	4362	10247

TABLE 13
Broadleaf Vegetation Radiological Analyses
pCi/kg, wet (analysis counting uncertainties reported in Appendix C)

Type	Location	Date	Be-7	K-40
CABBAGE	S-4	05/24/2000	184	3710
HORSERADISH LEAVES	F-1	06/08/2000		4770
LETTUCE	E-1	06/28/2000	479	3890
CABBAGE	G-1	06/28/2000	378	2690
CABBAGE	S-4	06/28/2000	1170	4080
SQUASH LEAVES	E-1	07/26/2000	1530	3530
COLLARD GREENS	G-1	07/26/2000	375	5480
HORSERADISH LEAVES	F-1	07/26/2000	623	4730
CABBAGE	S-4	07/26/2000	1030	5610
SQUASH LEAVES	G-1	08/23/2000	2080	5870

TABLE 14
Crop Radiological Analyses
pCi/kg, wet (analysis counting uncertainties reported in Appendix C)

Type	Location	Date	K-40
CORN (irrigated)	NR-U1	09/27/2000	3967
SOYBEANS (irrigated)	NR-U1	09/27/2000	16853
SOYBEANS (irrigated)	NR-D2	10/04/2000	17678
SOYBEANS (not irrigated)	NR-D1	10/04/2000	18012

TABLE 15
Bottom Sediment Radiological Analyses
pCi/kg, dry (analysis counting uncertainties reported in Appendix C)

Location	Date	Be-7	K-40	Co-60	Cs-134	Cs-137	Ra-226	Th-228
DC	04/18/2000		11100	549		305	2570	1290
JRR	04/25/2000	1040	15000			161	1700	1240
DC	11/14/2000		14662	606	98.4	351		
JRR	11/14/2000		13210			94.7		

TABLE 16
Aquatic Vegetation Radiological Analyses
pCi/kg, wet (analysis counting uncertainties reported in Appendix C)

Location	Type	Date	Be-7	K-40	Co-58	Co-60	Cs-134	Cs-137	Ra-226	Th-228
DC	ALGAE	04/18/2000	1110	5190	19.7	154	44.4	94.5	1560	655
MUDS	ALGAE	06/12/2000	478	5250		11.4		10.9	453	263
EEA	WATER PRIMROSE	06/14/2000	456	4770				69.1	541	314
DC ALT	PONDWEED	09/13/2000		1952						
DC ALT	AMERICAN LOTUS	09/13/2000		1744		6.2		6.0		

TABLE 17
Terrestrial Vegetation Radiological Analyses
pCi/kg, wet (analysis counting uncertainties reported in Appendix C)

Type	Location	Date	Be-7	K-40
GRASS	MUDS	06/12/2000	1400	4290
GRASS	EEA	06/12/2000	357	4270

TABLE 18
Soil Radiological Analyses
pCi/kg, dry (analysis counting uncertainties reported in Appendix C)

Location	Date	K-40	Cs-137	Ra-226	Th-228
EEA	06/12/2000	12100	168	2650	1170
MUDS	06/12/2000	9720		2880	1580

TABLE 19
2000 Land Use Census Data

Location of Nearest:

Sector	Residence	Milk Animal	Broadleaf Garden
A	A2.6-17TE1520	None	A4.9-OXRD1940
B	B3.1-QURD1712	None	B3.1-QURD1712
C	C1.9-16RD1655	None	C1.9-16RD1655
D	D2.1-QULA1571	None	D2.1-QULA1571
E	E1.8-QULA1485	None	E1.8-QULA1485
F	F1.6-14RD1711	None	F1.8-14RD1730
G	G1.6-QURD1384	None	G1.6-QURD1384
H	H3.1-12RD1711	None	H4.85-10RD1698
J	J3.7-11RD1540	None	J3.8-11RD1535
K	K2.6-12LA1439	None	K3.8-11RD1499
L	L2.4-NARD1339	None	L2.6-NARD1309
M	M1.8-NARD1441	None	M3-13LA1290
N	N2.1-15RD1350	None	N3.1-HW751434
P	P2.8-HW751534	None	P4.8-HIDR348
Q	Q1.4-NALA1574	None	None
R	R4.4-NARD1891	None	None

Locations are identified based upon the following protocol:
EXAMPLE: A1.4-16RD1525

First letter is based upon sector, thus "A" designates this residence is in sector A.

The number immediately following the first letter designates the distance (in miles) from the powerblock.

The characters following the dash represent a unique identifier based upon location address.

The example is in sector A, 1.4 miles from the plant, at 1525 16th Road.

TABLE 20
Comparison of 1999 and 2000 Land Use Census Milk and Garden Data

SECTOR	1999 MILKING ANIMALS	2000 MILKING ANIMALS	1999 CLOSEST GARDEN PRODUCING BROADLEAF VEGETATION	2000 CLOSEST GARDEN PRODUCING BROADLEAF VEGETATION	D/Q RANKING
A	none	none	none	A4.9-OXRD1940	5
B	none	none	B3.6-QURD1755	B3.1-QURD1712	6
C	none	none	C3.6-RERD1675	C1.9-16RD1655	4
D	none	none	D2.1-QULA1571	D2.1-QULA1571	10
E	none	none	E1.8-QULA1485	E1.8-QULA1485	3
F	none	none	F1.8-14RD1730	F1.8-14RD1730	2
G	none	none	G1.6-QURD1384	G1.6-QURD1384	1
H	none	none	H4.85-10RD1698	H4.85-10RD1698	12
J	none	none	J3.8-11RD1535	J3.8-11RD1535	13
K	none	none	K4.1-NARD1120	K3.8-11RD1499	11
L	none	none	L2.6-NARD1309	L2.6-NARD1309	7
M	none	none	M2.4-14RD1321	M3-13LA1290	8
N	none	none	N3.1-HW751434	N3.1-HW751434	9
P	none	none	P2.8-HW751534	P4.8-HIDR348	14
Q	none	none	Q3.2-17RD1310	none	
R	none	none	none	none	

NOTE: Underlined entries indicate changes from the 1999 Land Use Census.

TABLE 21
Teledyne Brown Engineering, Inc.
Interlaboratory Comparison Results

TELEDYNE
BROWN ENGINEERING, INC.
A Teledyne Technologies Company
2508 Quality Lane
Knoxville, TN 37931-3133
Phone: (865) 690-6819
Fax: (865) 690-6187

March 23, 2001

Ms. Teresa Rice
Wolf Creek Nuclear Operating Corporation
PO Box 411
Burlington, KS 66839

Dear Ms. Rice,

The purpose of this letter is to transmit the Intercomparison data for the year 2000. This includes all the available evaluation data for Environmental Resource Associates (ERA) and Analytics Inc. There were unacceptable delays in making this data available to our clients. This was due to the analysis being performed in the former Westwood, New Jersey laboratory, and the reports being generated in both Westwood, and our Knoxville, Tennessee lab. The samples were delayed in being analyzed during the closure of the Westwood Laboratory during the year 2000. The problem was compounded as these results were delayed in being transmitted to the respective evaluation firm.

Some results outside the acceptable range are presented in the attached tables that indicate an investigation and associated corrective action would have been appropriate. This has always been our quality assurance policy, and this continues in our new facility. It should be noted that no investigation is continuing for these types of results obtained in the Westwood facility. This is primarily due to the fact that most sources of these types of errors are a result of equipment malfunction or analyst technique. Since these two variables have been addressed with the relocation, we are unable to properly investigate these conditions from our new facility.

We apologize for the delay in transmittal of this information. We are hopeful that any negative impact to your project is minimal. Teledyne Brown Engineering wishes to thank you for your patience with us during our more difficult than anticipated laboratory relocation. Please contact me with questions or requests for additional information.

Sincerely,

Martin R. Keller

Martin R. Keller
Quality Assurance Manager
Teledyne Brown Engineering

TABLE 21 (Cont.)
Teledyne Brown Engineering, Inc.
ERA Statistical Summary Proficiency Testing (PT) Program - 2000

Date/ Medium	Nuclide	ERA Known Value (a) (pCi/l)	TBE Result (b) (pCi/l)	Expected Dev. Known (c) (pCi/l)	Control Limits (d) (pCi/l)	Warning Limits (e) (pCi/l)	Performance Evaluation (f)
02/26/00 Water	U-Nat	53.0	61.3	5.3	44.0-62.0	46.9-59.1	CE
02/26/00 Water	Ra-226	4.05	3.67	0.608	3.00-5.10	3.35-4.75	A
02/26/00 Water	Ra-228	2.29	1.33	0.573	1.31-3.27	1.63-2.95	CE
02/26/00 Water	Gr-A	71.8	14.0	18.0	40.9-103	51.1-92.5	NA
02/26/00 Water	Gr-B	194	34.0	29.1	144-244	160-228	NA
02/26/00 Water	Sr-89	16.4	15.7	5.00	7.70-25.1	10.6-22.2	A
02/26/00 Water	Sr-90	28.9	29.0	5.00	20.2-37.6	23.1-34.7	A
02/26/00 Water	Co-60	64.4	68.3	5.00	55.7-73.1	58.6-70.2	A
02/26/00 Water	Cs-134	12.3	12.0	5.00	3.60-21.0	6.53-18.1	A
02/26/00 Water	Cs-137	72.2	76.3	5.00	63.5-80.9	66.4-78.0	A
02/24/00 Water	Gr-A	25.4	14.0	6.35	14.5-36.3	18.1-32.7	NA
02/24/00 Water	Gr-B	42.1	34.0	5.00	33.4-50.8	36.3-47.9	CE
02/25/00 Water	Ba-133	98.2	91.7	9.82	81.5-115	86.9-110	A
02/25/00 Water	Co-60	99.6	101	5.00	90.9-108	93.8-105	A
02/25/00 Water	Cs-134	49.2	48.0	5.00	40.5-57.9	43.4-55.0	A
02/25/00 Water	Cs-137	209	76.3	10.4	191-227	197-221	NA
02/25/00 Water	Zn-65	313	<1	31.3	260-367	277-349	NA
05/18/00 Water	Sr-89	22.5	18.3	5.00	13.8-31.2	16.7-28.3	A
05/18/00 Water	Sr-90	9.60	8.33	5.00	0.900-18.3	3.83-15.4	A
02/10/00 Water	Gr-A	58.4	83.6	14.6	33.3-83.5	41.5-75.3	NA
02/10/00 Water	Gr-B	16.8	15.4	5.00	8.1-25.5	11.0-22.6	A
05/23/00 Water	I-131	19.9	2.03	3.00	14.7-25.1	16.4-23.4	NA
02/24/00 Water	U-Nat	6.07	5.77	3.00	0.87-11.3	2.61-9.53	A
02/24/00 Water	Ra-226	8.26	7.20	1.24	6.11-10.4	6.83-9.69	A

TABLE 21 (Cont.)
Teledyne Brown Engineering, Inc.
ERA Statistical Summary Proficiency Testing (PT) Program - 2000

Date/ Medium	Nuclide	ERA Known Value (a) (pCi/l)	TBE Result (b) (pCi/l)	Expected Dev. Known (c) (pCi/l)	Control Limits (d) (pCi/l)	Warning Limits (e) (pCi/l)	Performance Evaluation (f)
02/24/00 Water	Ra-228	2.25	2.37	0.56	1.28-3.22	1.60-2.90	A
03/01/00 Water	H-3	23800	22300	12380	21100-26500	21000-26500	A
09/2000 Water	Ra-226	13.0	9.70	1.15	7.41-18.6	9.25-16.8	A
09/2000 Water	U-Nat	63.4	57.0	4.44	52.6-74.2	56.1-70.7	A
09/2000 Water	Ra-228	2.83	2.99	6.34	2.21-3.77	2.47-3.51	A
09/2000 Water	Ra-228	13.0	10.0	3.25	7.41-16.8	9.25-16.8	A
09/2000 Water	Sr-90	26.2	28.6	1.40	17.5-34.9	20.4-32.0	A
09/2000 Water	Gr-A	7.17	6.90	1.11	DL-15.9	1.40-12.9	A
09/2000 Water	Gr-B	87.5	88.8	9.76	70.2-105	76.0-99.0	A
09/2000 Water	H-3	8320	8740	174	6910-9730	7360-9280	A

Footnotes:

a) The ERA Known Value is equal to 100% of the parameter present in the standard as determined by gravimetric and/or volumetric measurements made during standard preparation.

b) Average ± 1 sigma.

c) Established per the guidelines contained in the EPA's National Standards for Water Proficiency Testing Criteria Document, December 1998, as applicable.

d) Established per the guidelines contained in the EPA's National Standards for Water Proficiency Testing Criteria Document, December 1998, as applicable.

e) Established per the guidelines contained in the EPA's National Standards for Water Proficiency Testing Criteria Document, December 1998, as applicable.

f) A = Acceptable (reported result falls within the warning limits)
NA = Not Acceptable (reported result falls outside of the control limits)
CE = Check for error (reported result falls within the control limits and outside of the warning limits)

TABLE 22
Teledyne Brown Engineering, Inc.
Analytics Cross Check Comparison Program - 2000

Sample Date	Medium	Nuclide	Teledyne Brown Engineering Result (a)	Analytics Result	Ratio (b)
03-20-00	Milk	I-131	18 ± 1	20 ± 1	0.90
		Cr-51	381 ± 38	387 ± 19	0.98
		Cs-134	132 ± 13	143 ± 7	0.92
		Cs-137	128 ± 13	114 ± 6	1.12
		Co-58	89 ± 9	79 ± 4	1.13
		Mn-54	195 ± 20	176 ± 9	1.11
		Fe-59	161 ± 16	144 ± 7	1.12
		Zn-65	171 ± 17	165 ± 8	1.04
		Co-60	179 ± 18	176 ± 9	1.02
03-20-00	Milk	Sr-89	13 ± 3	25 ± 1	0.52(c)
		Sr-90	16 ± 1	19 ± 1	0.84
06-19-00	Air Filter	Ce-141	143 ± 8	132 ± 7	1.08
		Cr-51	229 ± 17	198 ± 10	1.16
		Cs-134	74 ± 4	81 ± 4	0.91
		Cs-137	143 ± 8	115 ± 6	1.24
		Co-58	89 ± 5	77 ± 4	1.16
		Mn-54	102 ± 6	84 ± 4	1.21
		Fe-59	98 ± 6	75 ± 4	1.31
		Zn-65	188 ± 11	139 ± 7	1.35
		Co-60	113 ± 7	104 ± 5	1.09
06-19-00	Cartridge	I-131	106 ± 6	88 ± 4	1.20
06-19-00	Air Filter	Sr-90	88 ± 5	96 ± 5	0.92
06-19-00	Air Filter	Gr-A	103 ± 6	93 ± 5	1.11
		Gr-B	210 ± 6	193 ± 10	1.09
09-18-00	Milk	I-131	97 ± 10	87 ± 4	1.11
		Ce-141	83 ± 8	77 ± 4	1.08
		Cr-51	323 ± 40	304 ± 15	1.06
		Cs-134	98 ± 10	102 ± 5	0.96
		Cs-137	117 ± 12	107 ± 5	1.09
		Co-58	64 ± 6	60 ± 3	1.07
		Mn-54	99 ± 10	88 ± 4	1.13
		Fe-59	132 ± 13	119 ± 6	1.11
		Zn-65	218 ± 22	196 ± 10	1.11
		Co-60	209 ± 21	197 ± 10	1.06
09-18-00	Milk	Sr-89	14 ± 1	15 ± 1	0.93
		Sr-90	18 ± 1	14 ± 1	1.29

Footnotes:

a) Teledyne Results - counting uncertainty is two standard deviations. Units are pCi/liter for milk. For gamma results, if two standard deviations are less than 10%, then a 10% counting uncertainty is reported. Units are total pCi for air particulate filters.

b) Ratio of Teledyne Brown Engineering, Inc. to Analytics results

c) Caused by incorrect rinsing of the strontium extraction column. Additional training was conducted and was documented in the analyst's training file. Subsequent tests on two milk samples spiked with Sr-89 produced correct results.

TABLE 23
Dosimetry Performance Testing Results

NATIONAL VOLUNTARY LABORATORY ACCREDITATION PROGRAM
PERSONNEL DOSIMETRY PERFORMANCE TESTING
SUMMARY OF STATISTICAL RESULTS

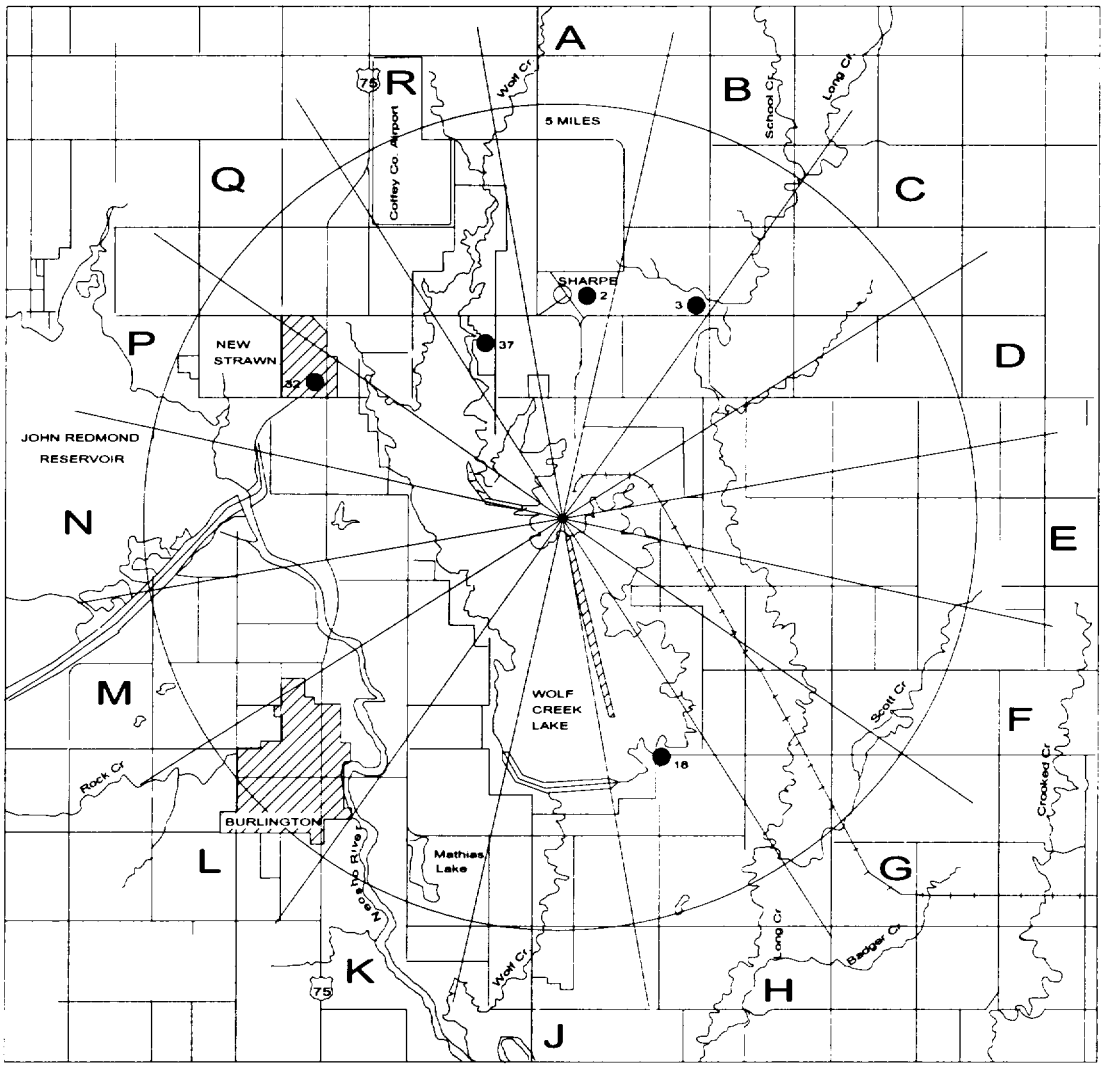
PROCESSOR NAME: DETROIT EDISON COMPANY
PROCESSOR CODE: 100529 B
DOSIMETER DESCRIPTION: PANASONIC UD-802AS/ISA 820
TEST RESULTS FOR QUARTER: 200004
TESTING STATUS: RENEWAL
TYPE OF DOSIMETER WHOLEBODY
REPORT PRINTED: 11 January 2001

CATEGORY	SHALLOW DEPTH B	S	|B| + S	L	DEEP DEPTH B	S	|B| + S	L
01	NO TEST				0.026	0.049	0.074	0.30
02	NO TEST				-0.087	0.107	0.195	0.30
3A	0.051	0.077	0.128	0.50	0.069	0.101	0.170	0.50
3B								
04	NO TEST				-0.033	0.065	0.098	0.50
5A					NO TEST			
5B					NO TEST			
5C	0.019	0.169	0.189	0.50	NO TEST			
06	0.075	0.223	0.298	0.50	-0.014	0.112	0.125	0.50
07	-0.010	0.123	0.133	0.50	-0.015	0.059	0.074	0.50
08-TOTAL	NO TEST				-0.037	0.041	0.077	0.50
08-NEUTRON	NO TEST				-0.032	0.102	0.134	0.50
09								

B = Bias
S = Standard Deviation
L = Limit

The laboratory successfully completed ANSI N13.11(1993)/NVLAP testing in categories I, II, III(A), IV, V(C), VI, VII and VIII.

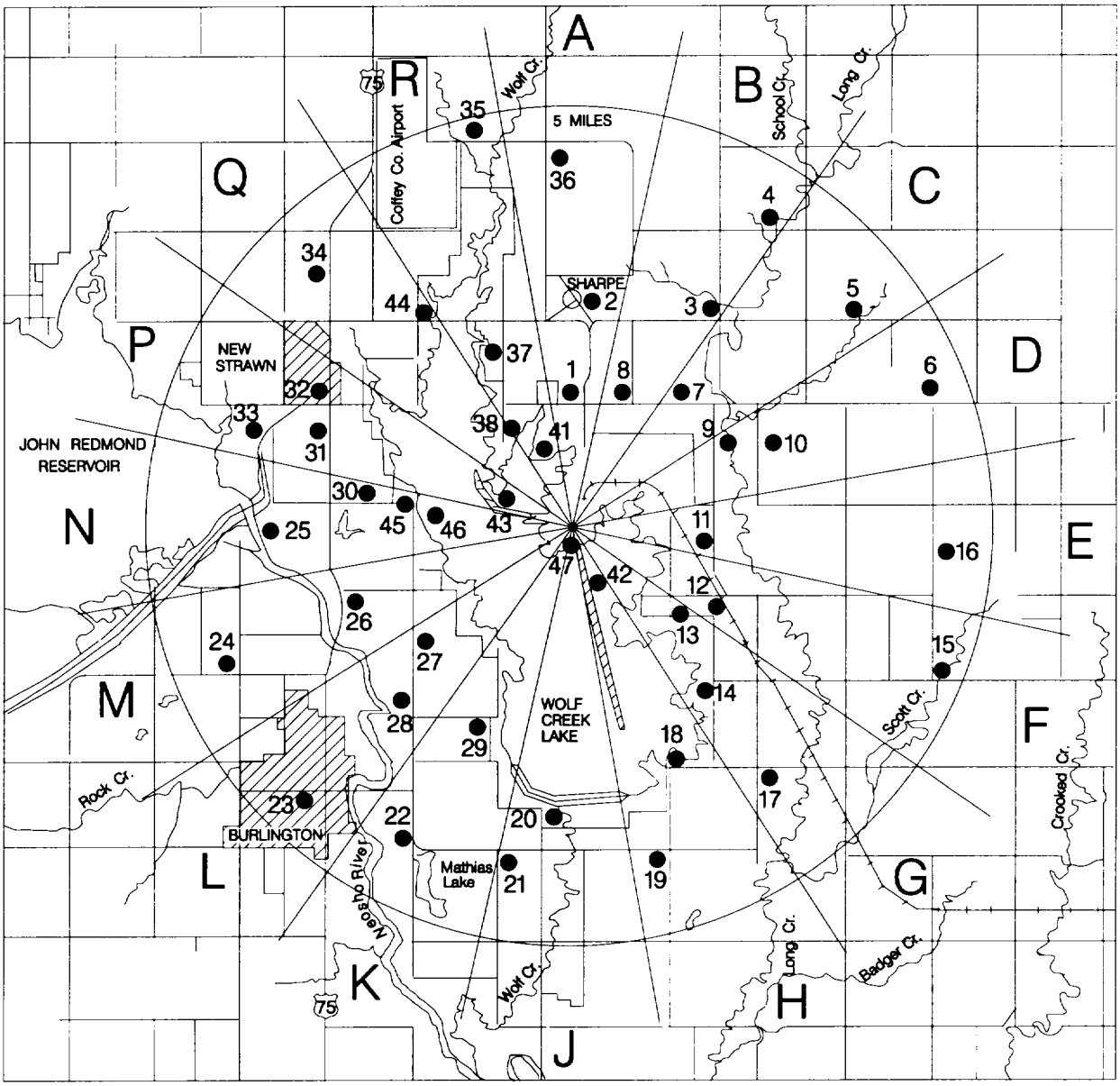
FIGURE 1



AIRBORNE PATHWAY SAMPLING LOCATIONS

● = AIRBORNE PARTICULATE AND RADIOIODINE

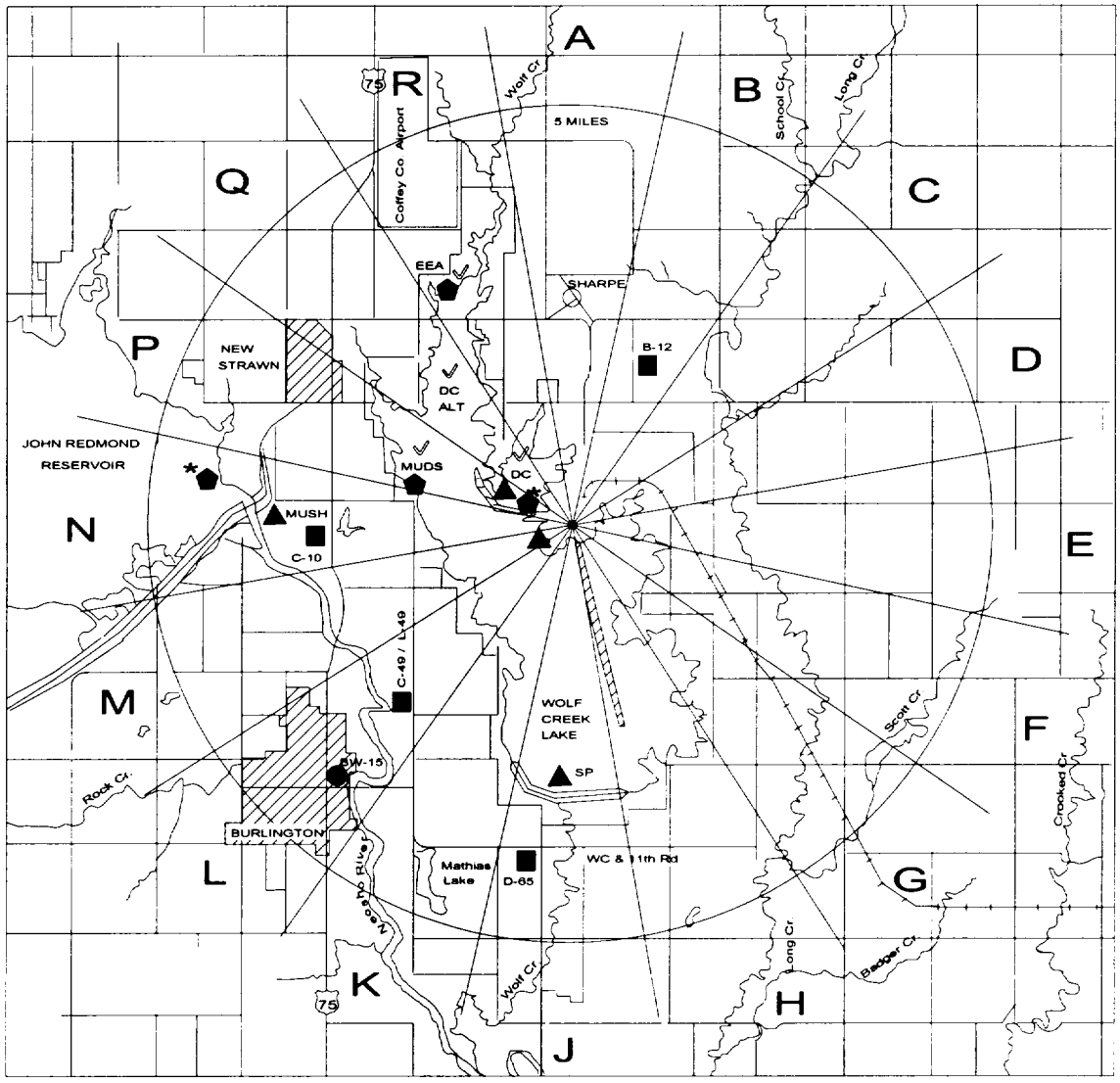
FIGURE 2



DIRECT RADIATION PATHWAY SAMPLING LOCATIONS

● = TLD LOCATIONS

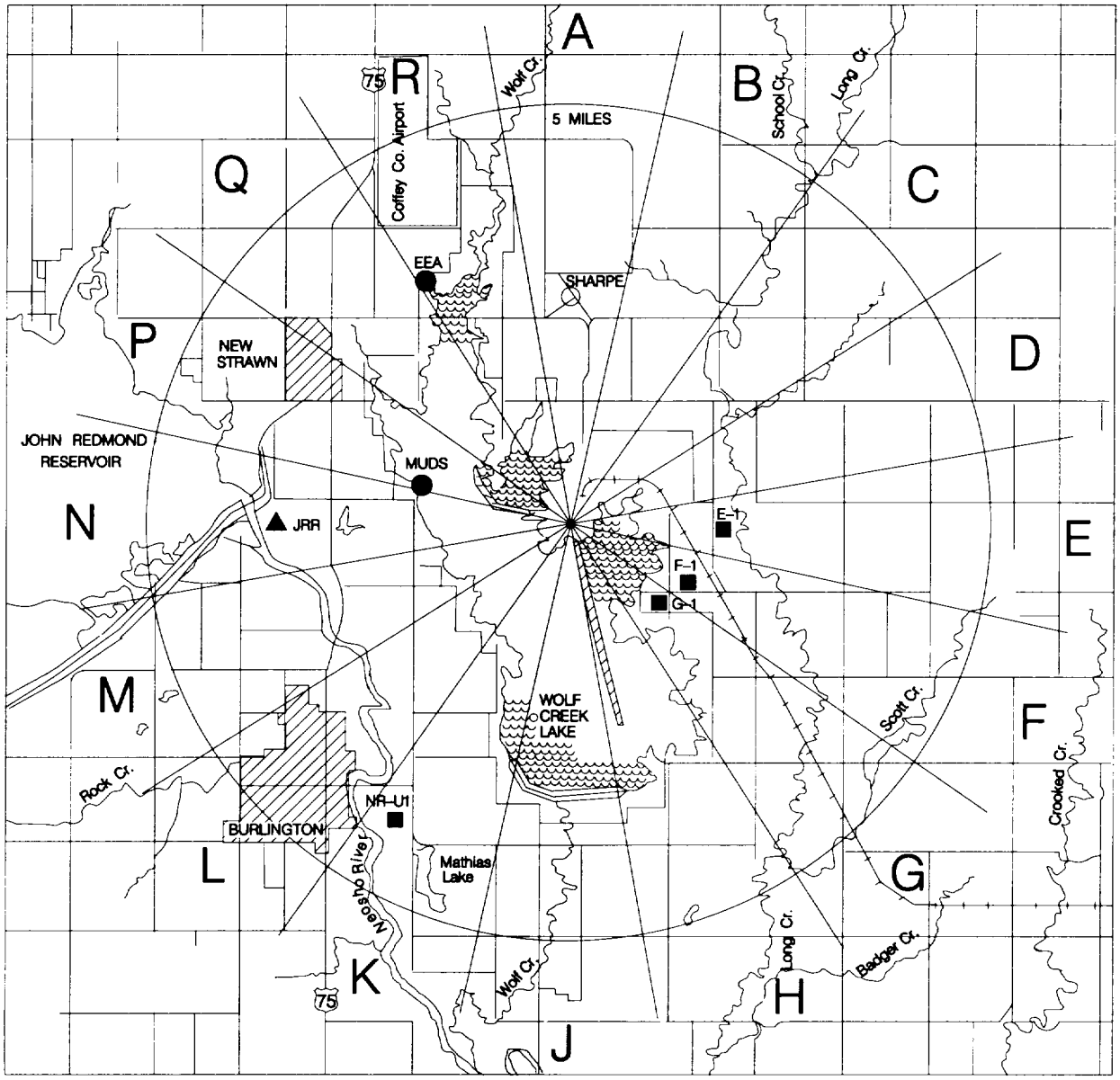
FIGURE 3



WATERBORNE PATHWAY SAMPLING LOCATIONS

- ● = DRINKING WATER
- ▲ = SURFACE WATER
- ■ = GROUND WATER
- ⬟ = SHORELINE SEDIMENT
- ★ = BOTTOM SEDIMENT
- ✓ = AQUATIC VEGETATION / ALGAE

FIGURE 4



INGESTION PATHWAY SAMPLING LOCATIONS

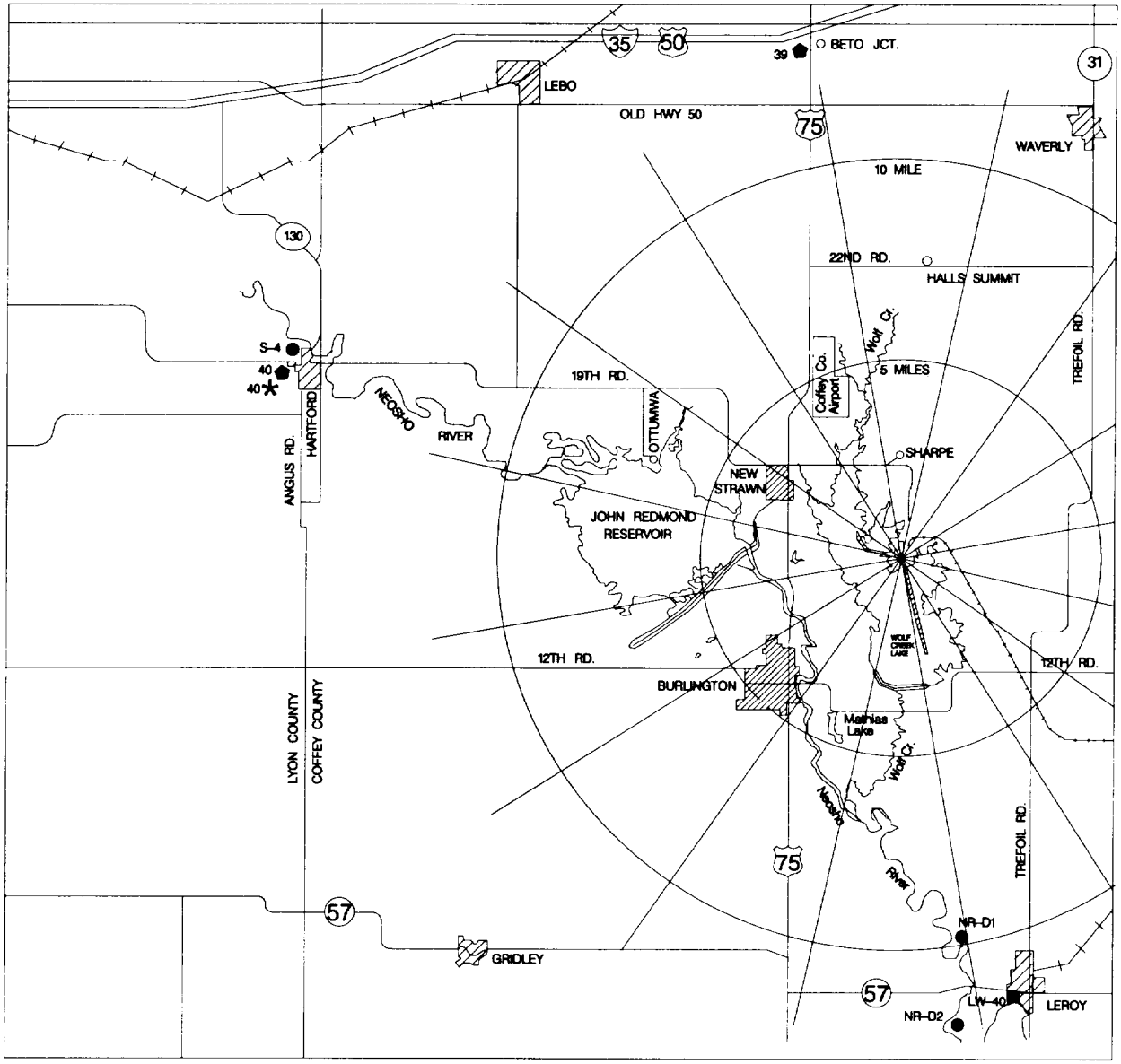
▲ = FISH (JRR)

■ = BROADLEAF VEGETATION / IRRIGATED CROPS

= FISH (WCL)

● = TERRESTRIAL VEGETATION AND SOIL

FIGURE 5



DISTANT SAMPLING LOCATIONS

⬟ = TLD

■ = DRINKING WATER

★ = AIRBORNE PARTICULATE & RADIOIODINE

● = BROADLEAF VEGETATION/ IRRIGATED CROPS

FIGURE 6

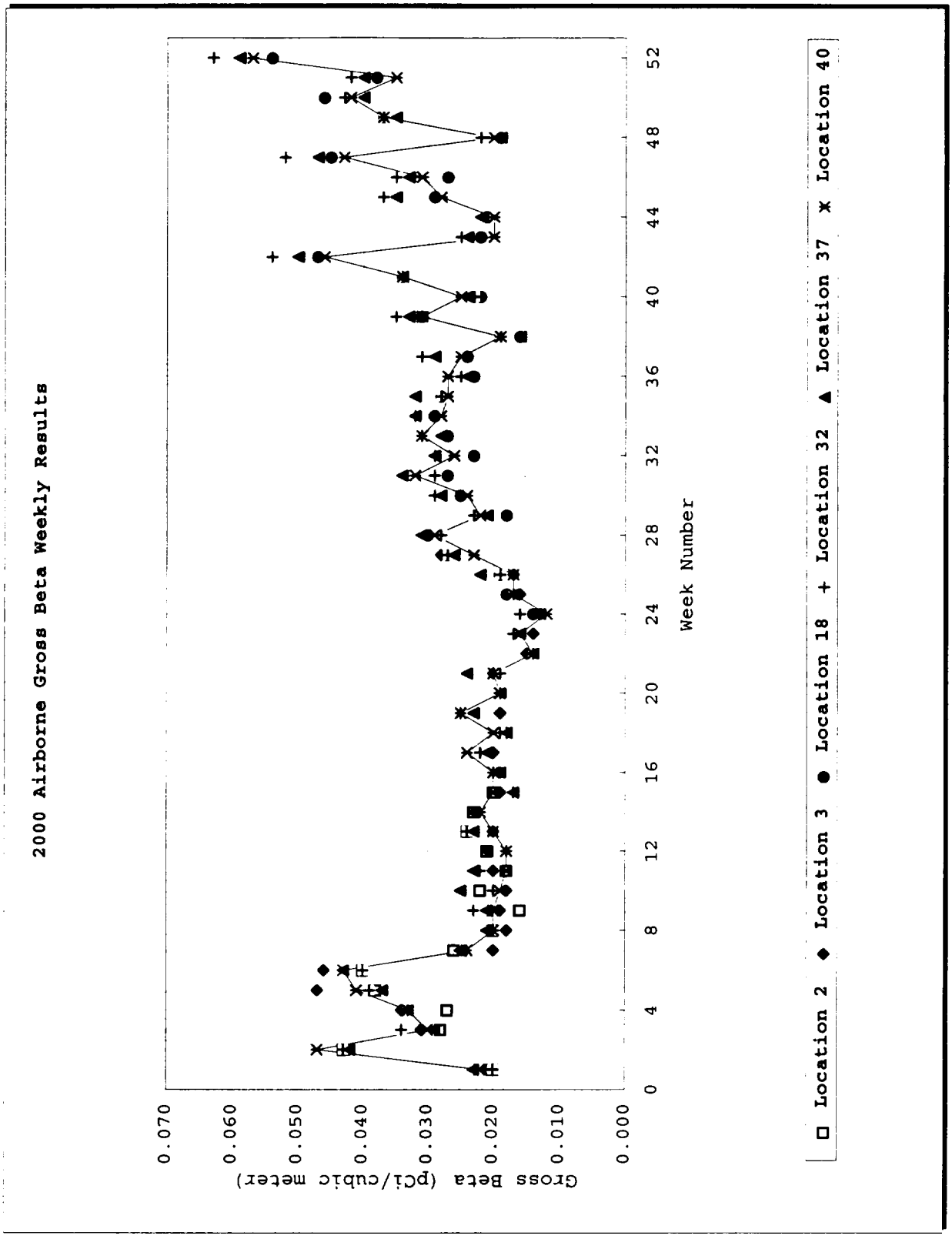

2000 Airborne Gross Beta Weekly Results
Gross Beta (pCi/cubic meter)
0.070
0.060
0.050
0.040
0.030
0.020
0.010
0.000
0
4
8
12
16
20
24
28
32
36
40
44
48
52
Week Number
Location 2
Location 3
Location 18
Location 32
Location 37
Location 40

FIGURE 7

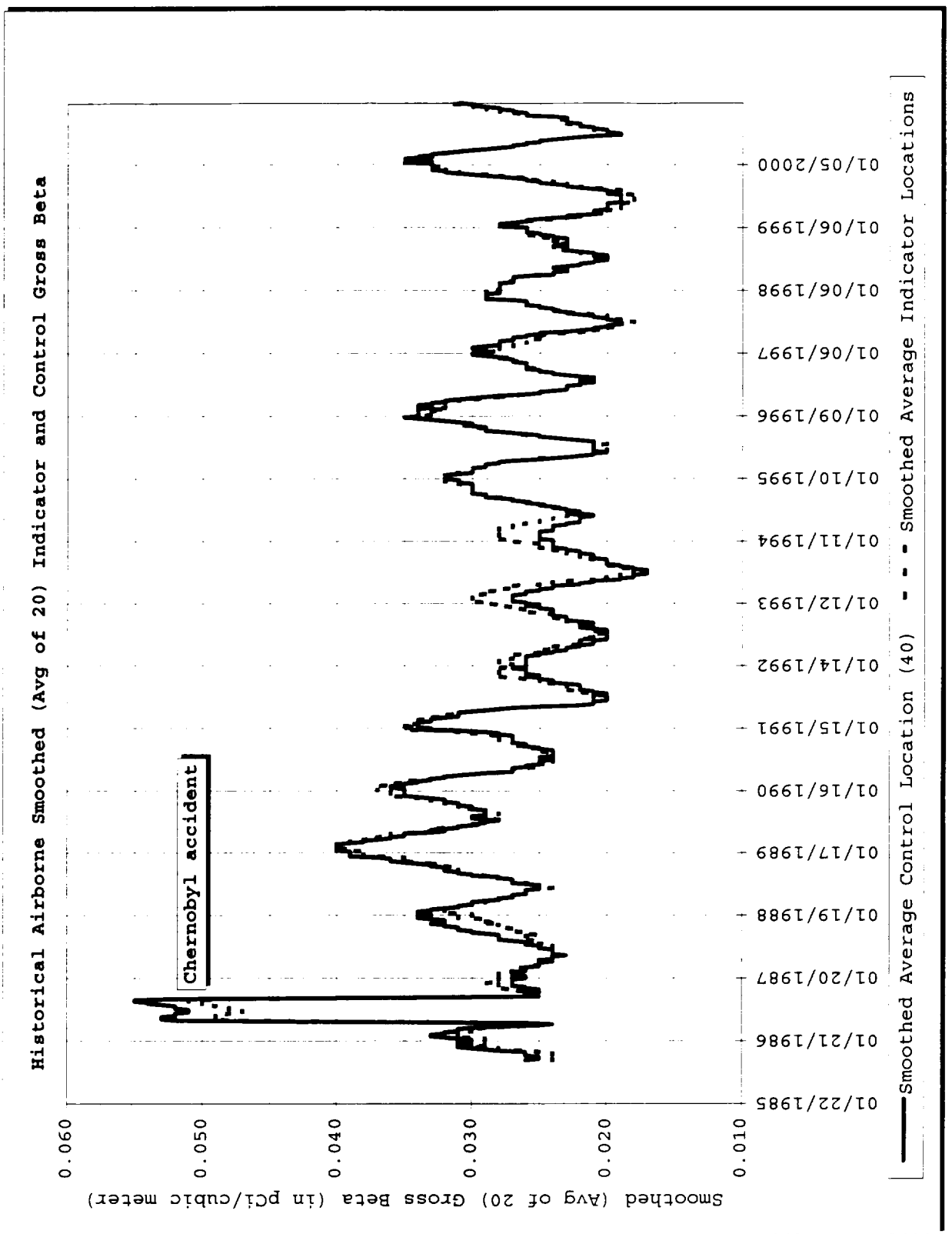

Historical Airborne Smoothed (Avg of 20) Indicator and Control Gross Beta
Smoothed (Avg of 20) Gross Beta (in pCi/cubic meter)
0.060
0.050
0.040
0.030
0.020
0.010
Chernobyl accident
01/22/1985
01/21/1986
01/20/1987
01/19/1988
01/17/1989
01/16/1990
01/15/1991
01/14/1992
01/12/1993
01/11/1994
01/10/1995
01/09/1996
01/06/1997
01/06/1998
01/06/1999
01/05/2000
Smoothed Average Control Location (40)
Smoothed Average Indicator Locations

FIGURE 8

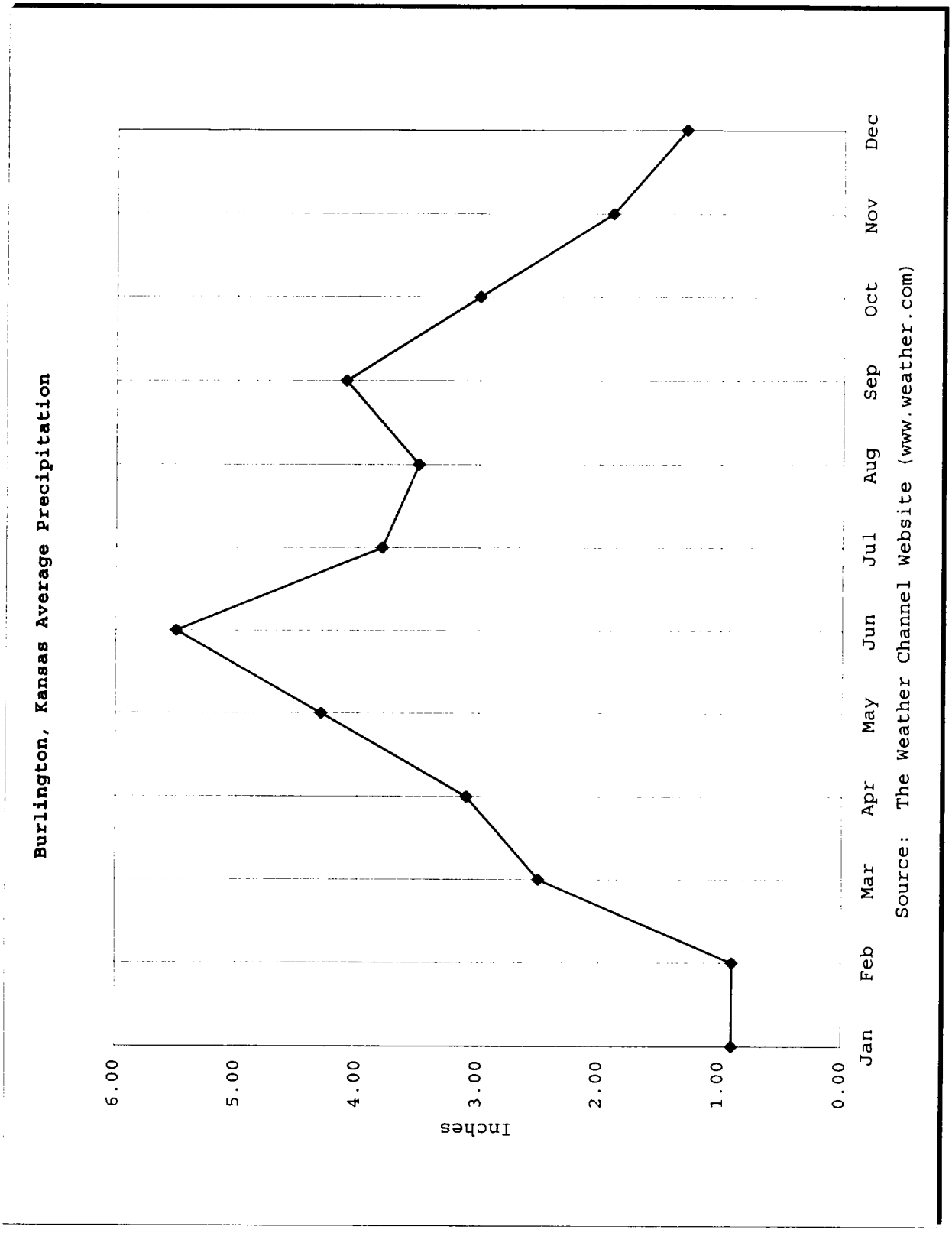

Burlington, Kansas Average Precipitation
Inches
6.00
5.00
4.00
3.00
2.00
1.00
0.00
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Source: The Weather Channel Website (www.weather.com)

FIGURE 9

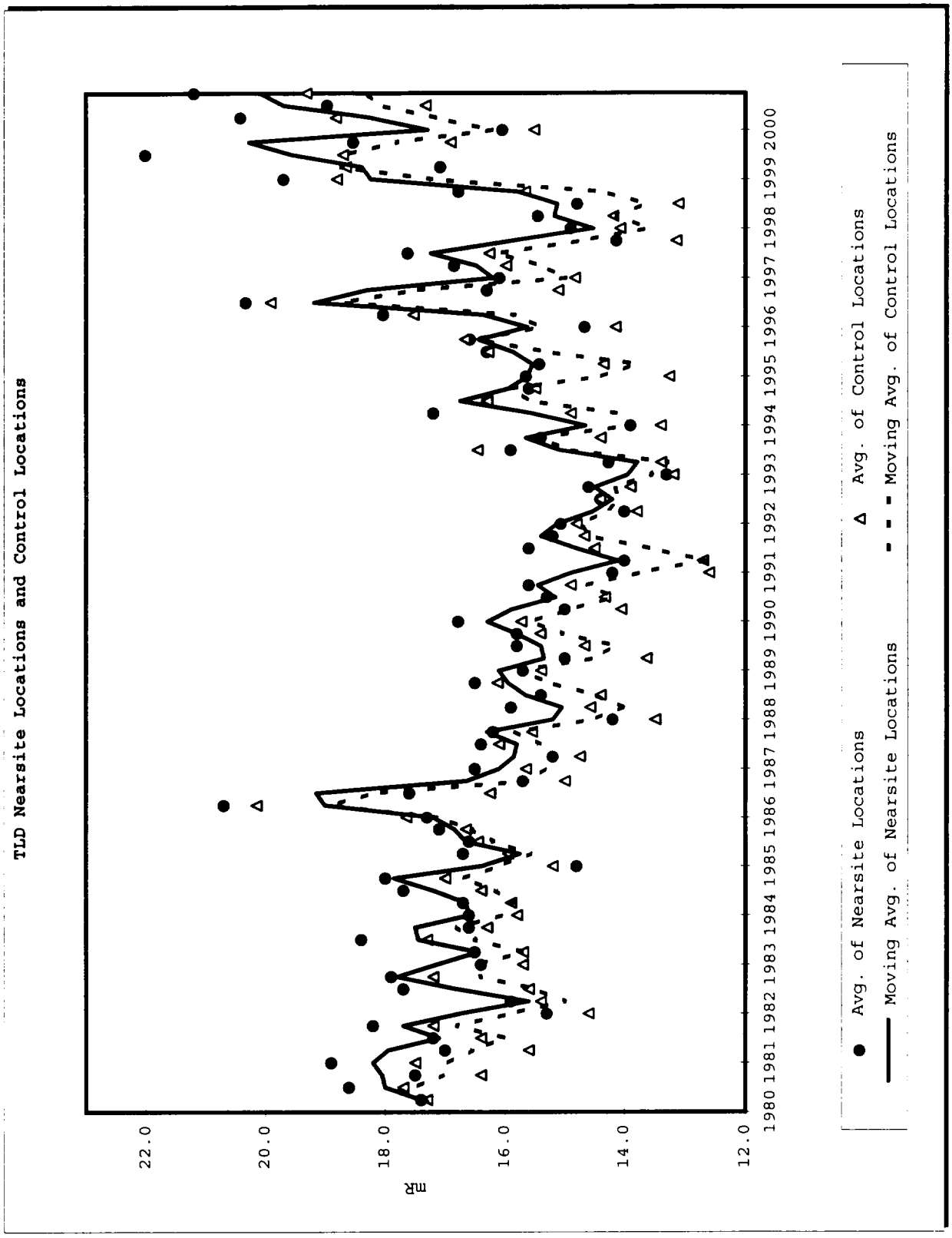

TLD Nearsite Locations and Control Locations
mR
22.0
20.0
18.0
16.0
14.0
12.0
1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000
Avg. of Nearsite Locations
Moving Avg. of Nearsite Locations
Avg. of Control Locations
Moving Avg. of Control Locations

FIGURE 10

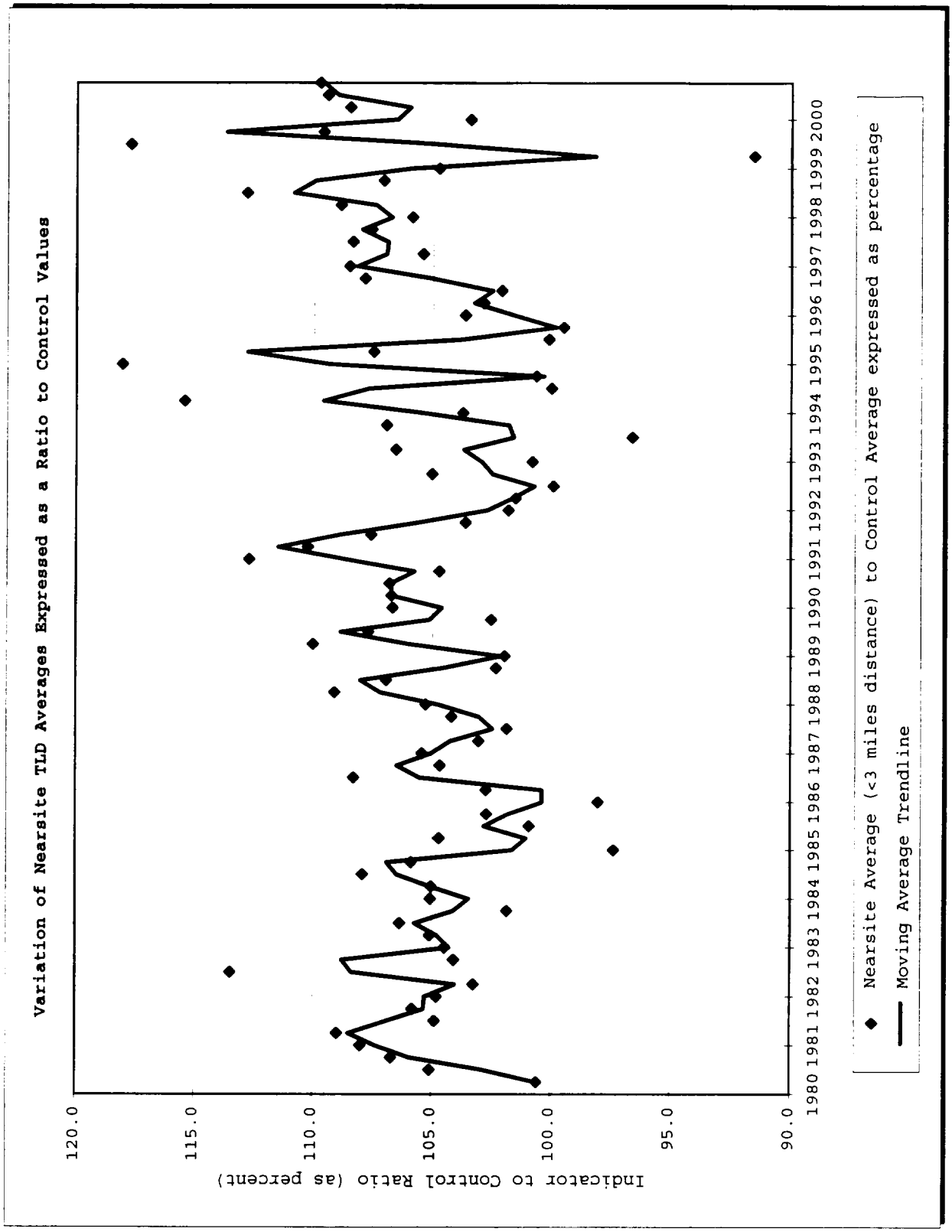

Variation of Nearsite TLD Averages Expressed as a Ratio to Control Values
Indicator to Control Ratio (as percent)
120.0
115.0
110.0
105.0
100.0
95.0
90.0
1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000
Nearsite Average (<3 miles distance) to Control Average expressed as percentage
Moving Average Trendline

FIGURE 11

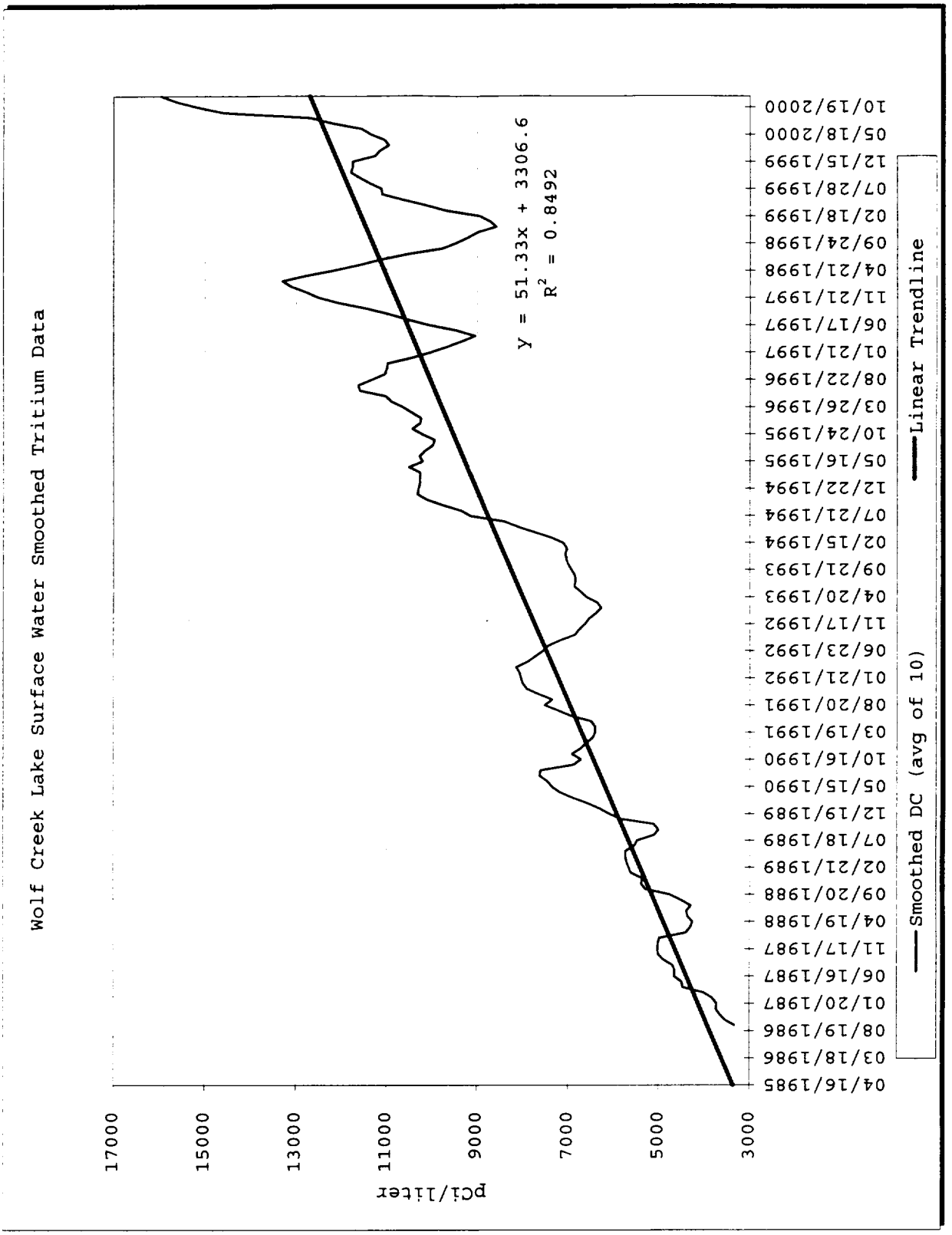

Wolf Creek Lake Surface Water Smoothed Tritium Data
y = 51.33x + 3306.6
R² = 0.8492
pCi/liter
17000
15000
13000
11000
9000
7000
5000
3000
04/16/1985
03/18/1986
08/19/1986
01/20/1987
06/16/1987
11/17/1987
04/19/1988
09/20/1988
02/21/1989
07/18/1989
12/19/1989
05/15/1990
10/16/1990
03/19/1991
08/20/1991
01/21/1992
06/23/1992
11/17/1992
04/20/1993
09/21/1993
02/15/1994
07/21/1994
12/22/1994
05/16/1995
10/24/1995
03/26/1996
08/22/1996
01/21/1997
06/17/1997
11/21/1997
04/21/1998
09/24/1998
02/18/1999
07/28/1999
12/15/1999
05/18/2000
10/19/2000
Smoothed DC (avg of 10)
Linear Trendline

FIGURE 12

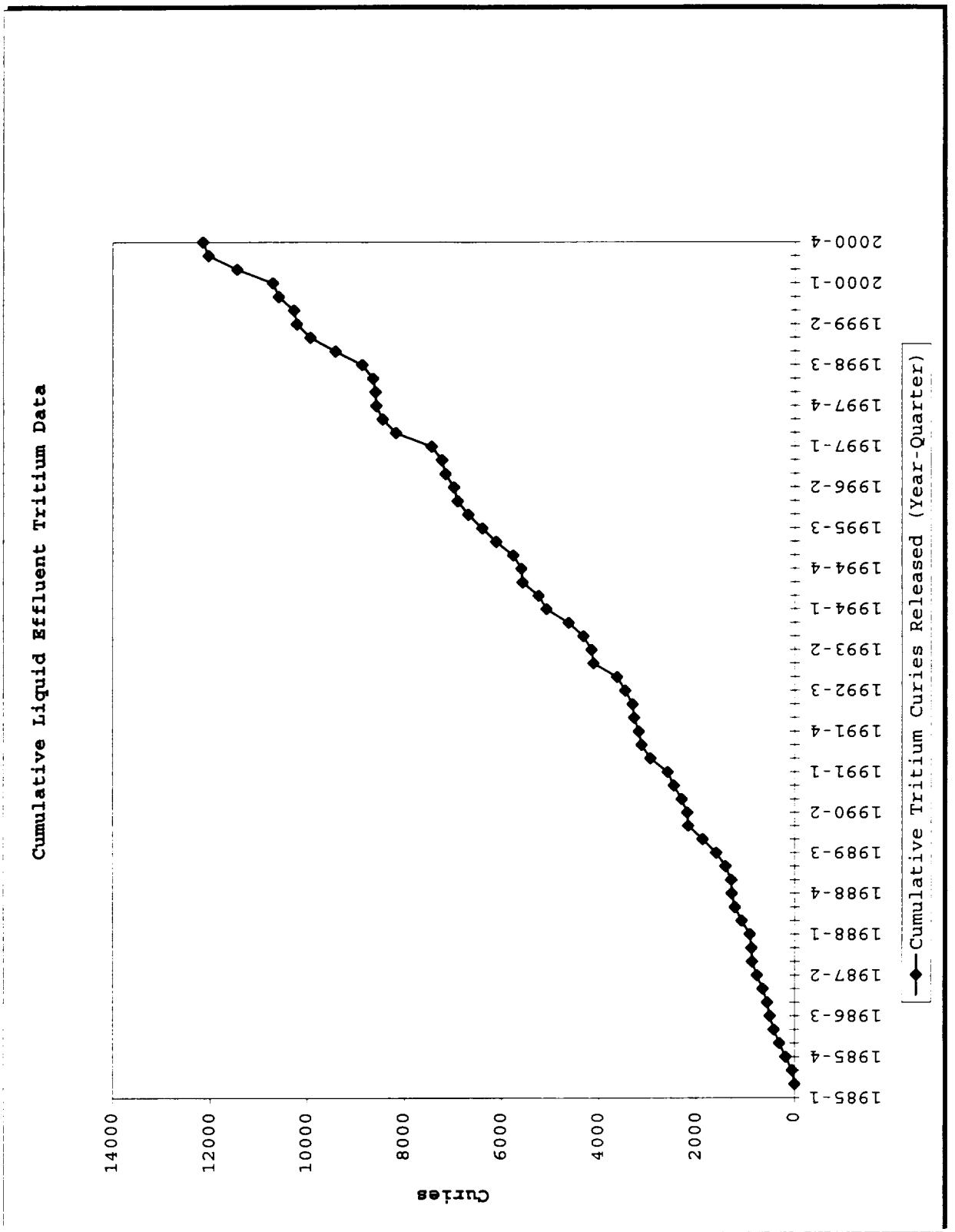

Cumulative Liquid Effluent Tritium Data
Curies
14000
12000
10000
8000
6000
4000
2000
0
1985-1
1985-4
1986-3
1987-2
1988-1
1988-4
1989-3
1990-2
1991-1
1991-4
1992-3
1993-2
1994-1
1994-4
1995-3
1996-2
1997-1
1997-4
1998-3
1999-2
2000-1
2000-4
Cumulative Tritium Curies Released (Year-Quarter)

FIGURE 13

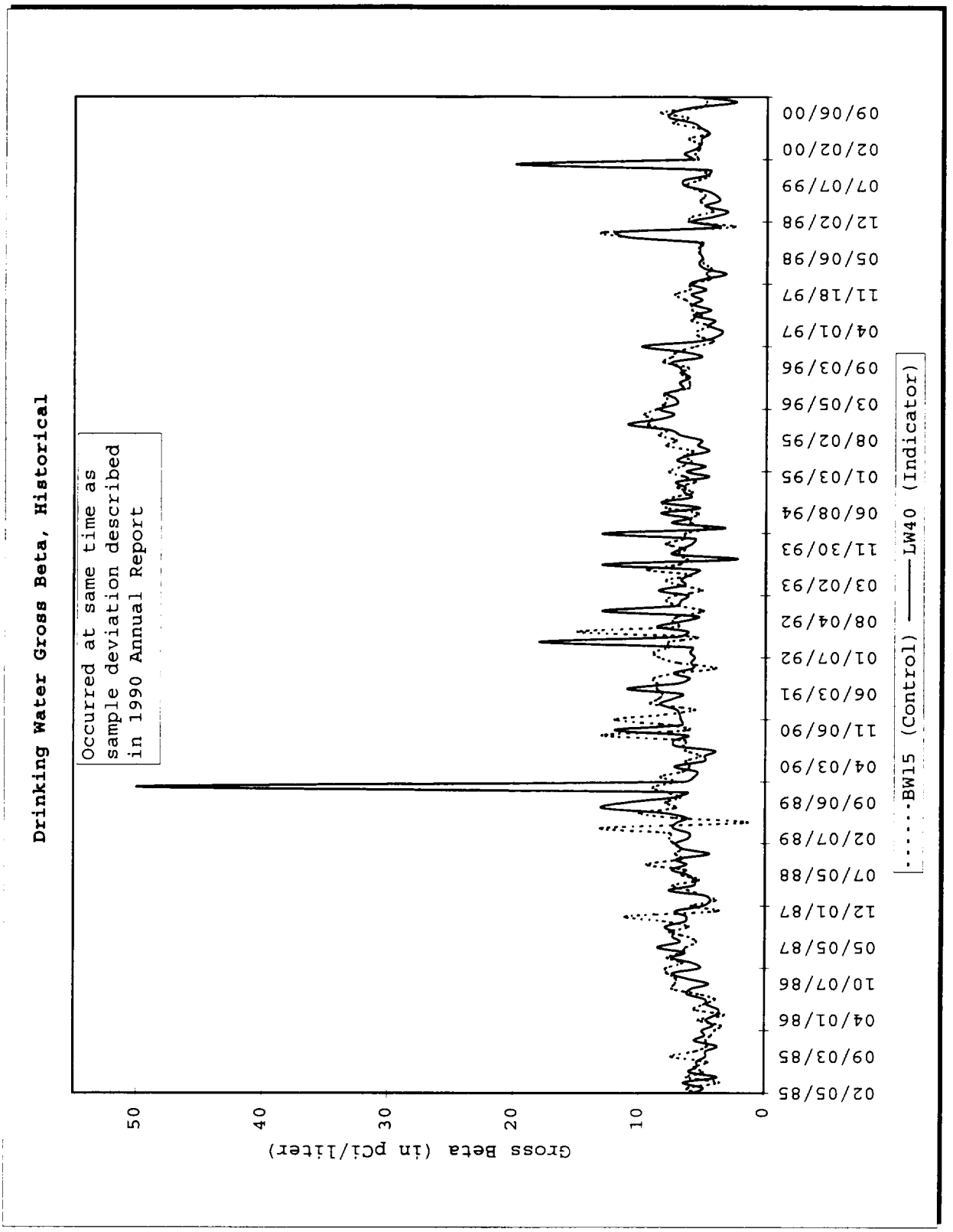

Drinking Water Gross Beta, Historical
Occurred at same time as sample deviation described in 1990 Annual Report
Gross Beta (in pCi/liter)
0
10
20
30
40
50
02/05/85
09/03/85
04/01/86
10/07/86
05/05/87
12/01/87
07/05/88
02/07/89
09/06/89
04/03/90
11/06/90
06/03/91
01/07/92
08/04/92
03/02/93
11/30/93
06/08/94
01/03/95
08/02/95
03/05/96
09/03/96
04/01/97
11/18/97
05/06/98
12/02/98
07/07/99
02/02/00
09/06/00
BW15 (Control)
LW40 (Indicator)

FIGURE 14

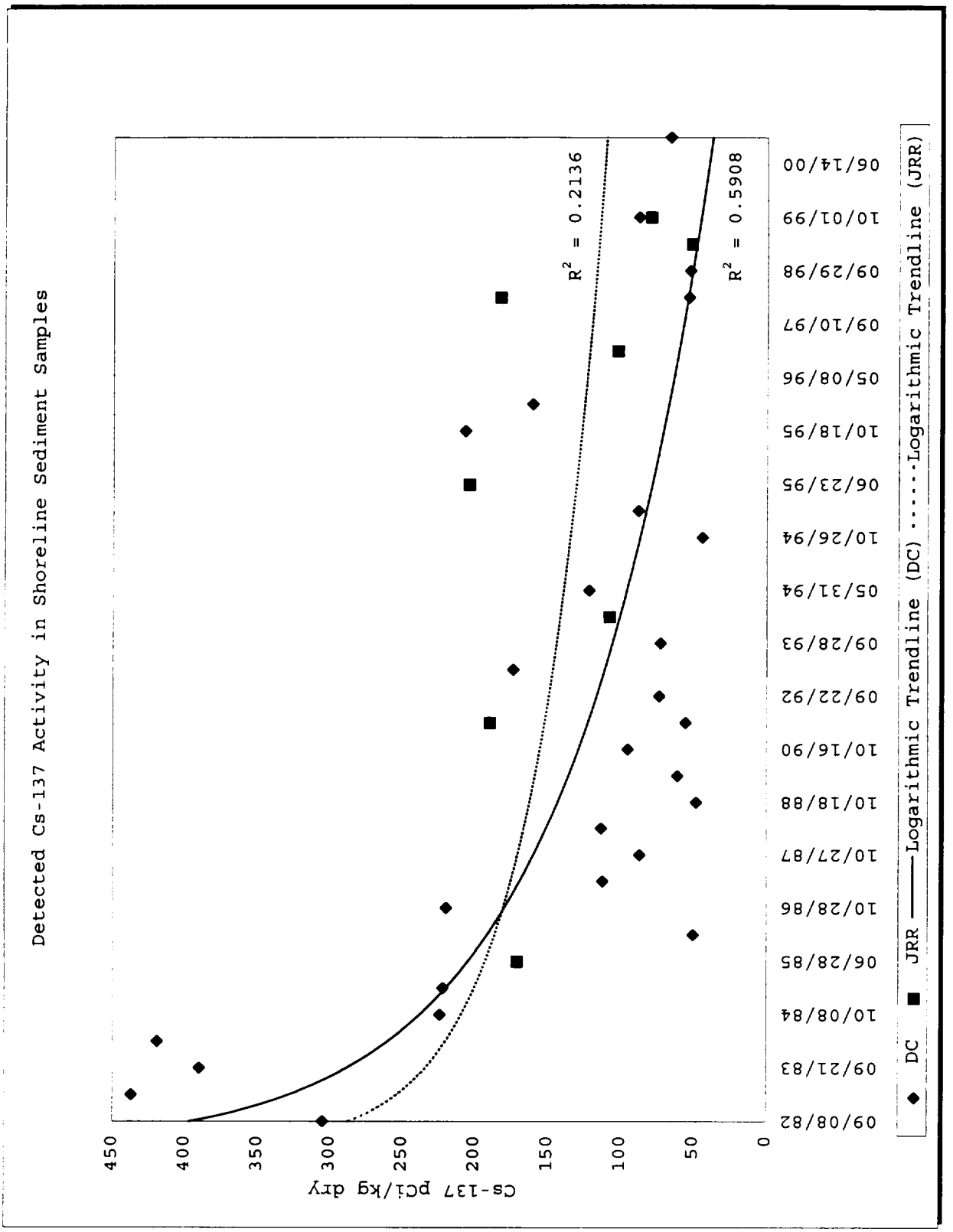

Detected Cs-137 Activity in Shoreline Sediment Samples
Cs-137 pCi/kg dry
450
400
350
300
250
200
150
100
50
0
09/08/82
09/21/83
10/08/84
06/28/85
10/28/86
10/27/87
10/18/88
10/16/90
09/22/92
09/28/93
05/31/94
10/26/94
06/23/95
10/18/95
05/08/96
09/10/97
09/29/98
10/01/99
06/14/00
R2 = 0.2136
R2 = 0.5908
DC
JRR
Logarithmic Trendline (DC)
Logarithmic Trendline (JRR)

FIGURE 15

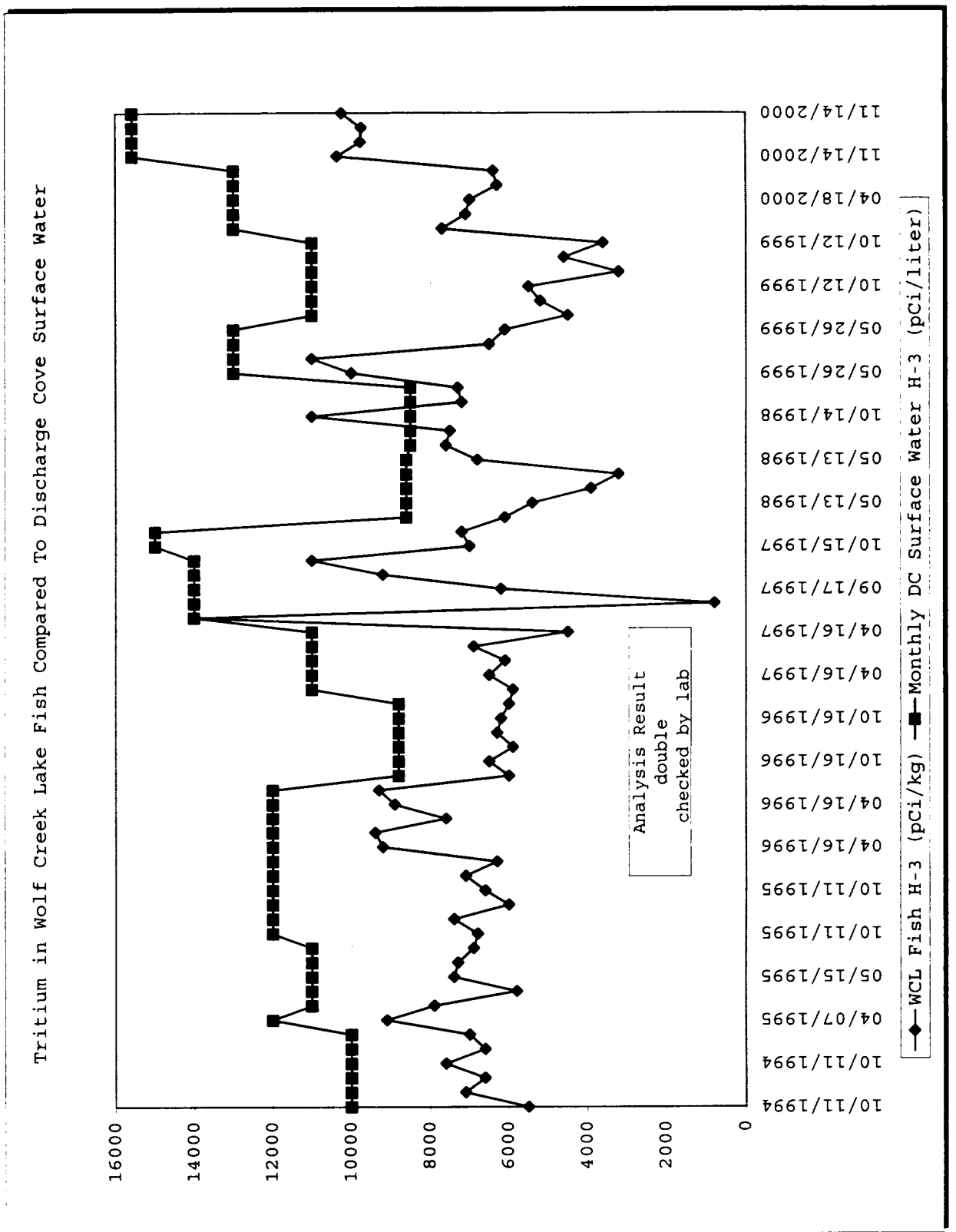

Tritium in Wolf Creek Lake Fish Compared To Discharge Cove Surface Water
16000
14000
12000
10000
8000
6000
4000
2000
0
10/11/1994
10/11/1994
04/07/1995
05/15/1995
10/11/1995
10/11/1995
04/16/1996
04/16/1996
04/16/1996
10/16/1996
10/16/1996
04/16/1997
04/16/1997
09/17/1997
10/15/1997
05/13/1998
05/13/1998
10/14/1998
05/26/1999
05/26/1999
10/12/1999
10/12/1999
04/18/2000
11/14/2000
11/14/2000
Analysis Result
double
checked by lab
WCL Fish H-3 (pCi/kg)
Monthly DC Surface Water H-3 (pCi/liter)

FIGURE 16

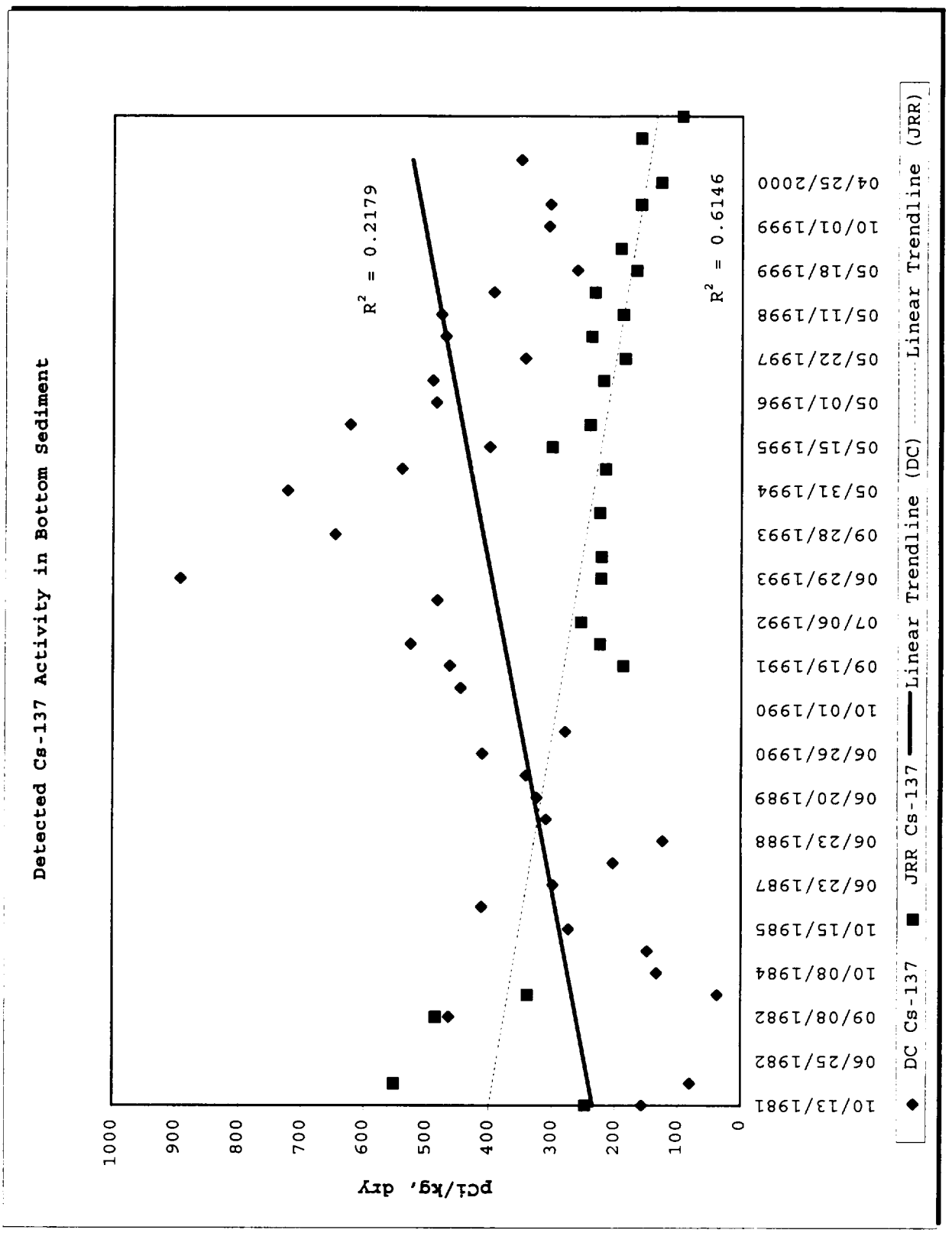
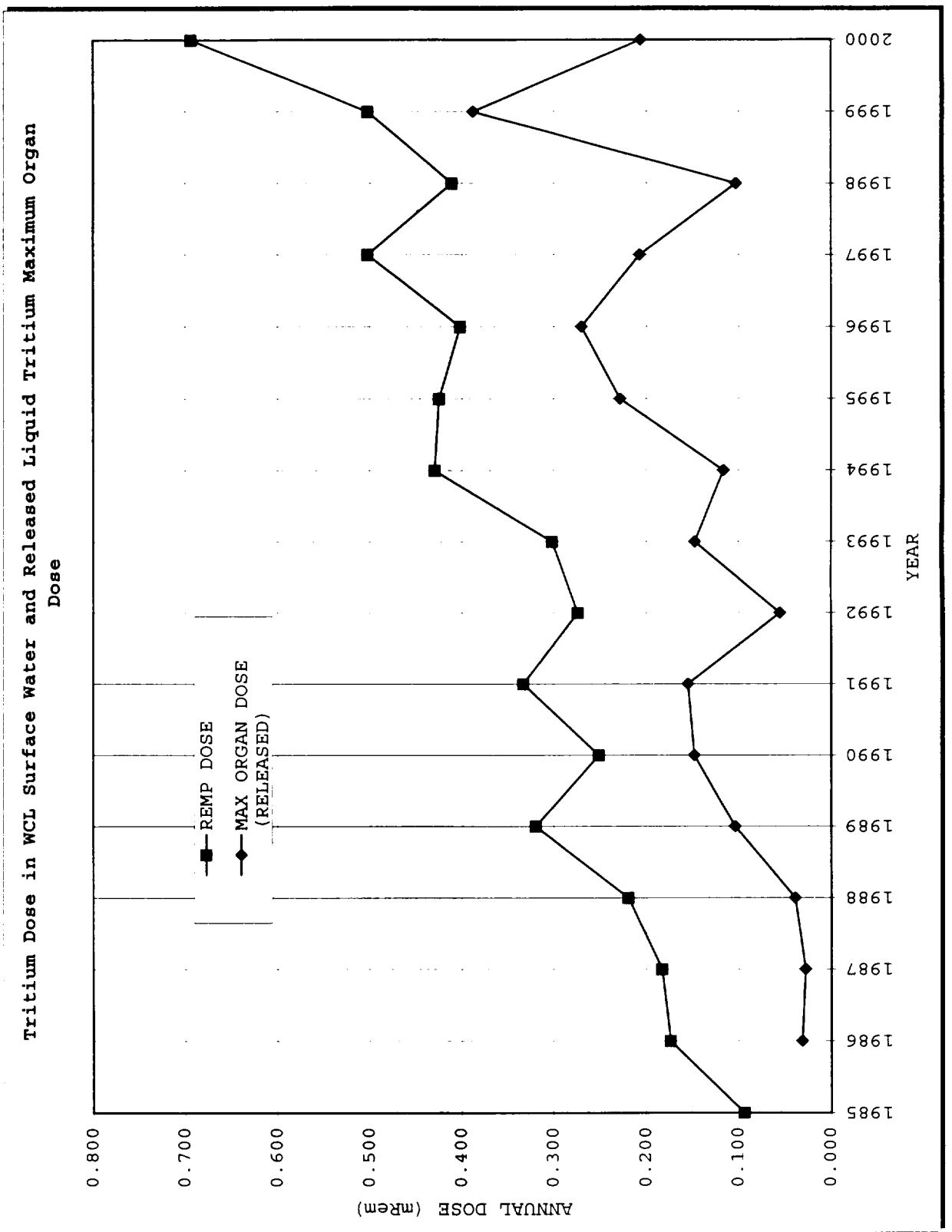

Detected Cs-137 Activity in Bottom Sediment
pCi/kg, dry
1000
900
800
700
600
500
400
300
200
100
0
10/13/1981
06/25/1982
09/08/1982
10/08/1984
10/15/1985
06/23/1987
06/23/1988
06/20/1989
06/26/1990
10/01/1990
09/19/1991
07/06/1992
06/29/1993
09/28/1993
05/31/1994
05/15/1995
05/01/1996
05/22/1997
05/11/1998
05/18/1999
10/01/1999
04/25/2000
R^2 = 0.2179
R^2 = 0.6146
DC Cs-137
JRR Cs-137
Linear Trendline (DC)
Linear Trendline (JRR)

FIGURE 17


Tritium Dose in WCL Surface Water and Released Liquid Tritium Maximum Organ Dose
REMP DOSE
MAX ORGAN DOSE (RELEASED)
ANNUAL DOSE (mRem)
0.800
0.700
0.600
0.500
0.400
0.300
0.200
0.100
0.000
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
YEAR

Environmental, Inc.
Midwest Laboratory
an Allegheny Technologies Co.

700 Landwehr Road • Northbrook, IL 60062-2310
(847) 564-0700 fax (847) 564-4517

APPENDIX A

INTERLABORATORY COMPARISON PROGRAM RESULTS

NOTE: Environmental, Inc., Midwest Laboratory participates in intercomparison studies administered by Environmental Resources Associates, and serves as a replacement for studies conducted previously by the U.S. EPA Environmental Monitoring Systems Laboratory, Las Vegas, Nevada. Results are reported in Appendix A. TLD Intercomparison results, in-house spikes, blanks, duplicates and mixed analyte performance evaluation program results are also reported. Appendix A is updated four times a year; the complete Appendix is included in March, June, September and December monthly progress reports only.

January, 2000 through December, 2000

Appendix A

Interlaboratory Comparison Program Results

Environmental, Inc., Midwest Laboratory, formerly Teledyne Brown Engineering Environmental Services Midwest Laboratory has participated in interlaboratory comparison (crosscheck) programs since the formulation of it's quality control program in December 1971. These programs are operated by agencies which supply environmental type samples (e.g., milk or water) containing concentrations of radionuclides known to the issuing agency but not to participant laboratories. The purpose of such a program is to provide an independent check on a laboratory's analytical procedures and to alert it of any possible problems.

Participant laboratories measure the concentration of specified radionuclides and report them to the issuing agency. Several months later, the agency reports the known values to the participant laboratories and specifies control limits. Results consistently higher or lower than the known values or outside the control limits indicate a need to check the instruments or procedures used.

The results in Table A-1 were obtained through participation in the environmental sample crosscheck program for milk, water and air filters during the past twelve months. Data for previous years is available upon request.

This program was conducted by the U.S. Environmental Protection Agency Office of Research and Development National Exposure Research Laboratory Characterization Research Division-Las Vegas, Nevada.

The results in Table A-2 were obtained for Thermoluminescent Dosimeters (TLDs), via various International Intercomparisons of Environmental Dosimeters under the sponsorships listed in Table A-2. Results of crosscheck testing with Teledyne Brown Engineering are also listed.

Table A-3 lists results of the analyses on in-house "spiked" samples for the past twelve months. All samples are prepared using NIST traceable sources. Data for previous years available upon request.

Table A-4 lists results of the analyses on in-house "blank" samples for the past twelve months. Data for previous years available upon request.

Table A-5 list results of the in-house "duplicate" program for the past twelve months. Acceptance is based on the difference of the results being less than the sum of the errors. Data for previous years available upon request.

The results in Table A-6 were obtained through participation in the Mixed Analyte Performance Evaluation Program.

The results in Table A-7 were obtained through participation in the Environmental Measurement Laboratory Quality Assessment Program.

Attachment A lists acceptance criteria for "spiked" samples.

Out-of-limit results are explained directly below the result.

ATTACHMENT A

ACCEPTANCE CRITERIA FOR "SPIKED" SAMPLES

LABORATORY PRECISION: ONE STANDARD DEVIATION VALUES FOR VARIOUS ANALYSES[a]

Analysis	Level	One Standard Deviation for single determinations
Gamma Emitters	5 to 100 pCi/liter or kg >100 pCi/liter or kg	5.0 pCi/liter 5% of known value
Strontium-89[b]	5 to 50 pCi/liter or kg >50 pCi/liter or kg	5.0 pCi/liter 10% of known value
Strontium-90[b]	2 to 30 pCi/liter or kg >30 pCi/liter or kg	5.0 pCi/liter 10% of known value
Potassium-40	>0.1 g/liter or kg	5% of known value
Gross alpha	≤20 pCi/liter >20 pCi/liter	5.0 pCi/liter 25% of known value
Gross beta	≤100 pCi/liter >100 pCi/liter	5.0 pCi/liter 5% of known value
Tritium	≤4,000 pCi/liter >4,000 pCi/liter	1s = (pCi/liter) = $169.85 \times (\text{known})^{0.0933}$ 10% of known value
Radium-226,-228	<0.1 pCi/liter	15% of known value
Plutonium	0.1 pCi/liter, gram, or sample	10% of known value
Iodine-131, Iodine-129[b]	≤55 pCi/liter >55 pCi/liter	6.0 pCi/liter 10% of known value
Uranium-238, Nickel-63[b] Technetium-99[b]	≤35 pCi/liter >35 pCi/liter	6.0 pCi/liter 15% of known value
Iron-55[b]	50 to 100 pCi/liter >100 pCi/liter	10 pCi/liter 10% of known value
Others[b]	–	20% of known value

[a] From EPA publication, "Environmental Radioactivity Laboratory Intercomparison Studies Program, Fiscal Year, 1981-1982, EPA-600/4-81-004.

[b] Laboratory limit.

Table A-1. Interlaboratory Comparison Crosscheck program, Environmental Resource Associates (ERA)[a].

Lab Code	Sample Type	Date Collected	Analysis	Concentration in pCi/L[b] Laboratory results ±2 Sigma[c]	ERA Result[d] 1s, N=1	Control Limits
STW-863	WATER	Jan, 2000	Gr. Alpha	39.3 ± 5.2	25.4 ± 6.4	14.5 - 36.3
The analysis was repeated and recalculated with Am-241 efficiency; result of reanalysis 29.32 ± 5.79 pCi/L. Internal spike program results do not indicate a problem.						
STW-863	WATER	Jan, 2000	Gr. Beta	40.7 ± 1.2	42.1 ± 4.2	33.4 - 50.8
STW-866	WATER	Jan, 2000	Sr-89	17.1 ± 2.2	22.5 ± 5.0	13.8 - 31.2
STW-866	WATER	Jan, 2000	Sr-90	8.1 ± 0.6	9.6 ± 5.0	0.9 - 18.3
STW-868	WATER	Feb, 2000	Ra-226	7.6 ± 0.5	8.3 ± 1.2	6.1 - 10.4
STW-868	WATER	Feb, 2000	Ra-228	5.6 ± 1.0	2.3 ± 0.6	1.3 - 3.2
Result of reanalysis: 6.34 ± 0.94. Activity confirmed by gamma spectroscopy (6.00 ± 1.42 pCi/L).						
STW-868	WATER	Feb, 2000	Uranium	5.4 ± 0.2	6.1 ± 3.0	0.9 - 11.3
STW-869	WATER	Mar, 2000	H-3	23,500.0 ± 306.0	23,800.0 ± 2,380.0	19,800.0 - 27,800.0
STW-867	WATER	Mar, 2000	Gr. Alpha	83.6 ± 5.8	58.4 ± 5.8	33.3 - 83.5
Results were recalculated with Am-241 efficiency; 57.80 ± 5.73 pCi/L. Refer to STW-863.						
STW-867	WATER	Mar, 2000	Gr. Beta	15.4 ± 0.9	16.8 ± 1.7	8.1 - 25.5
STW-876	WATER	Mar, 2000	I-131	18.7 ± 0.6	19.9 ± 2.0	18.1 - 28.5
STW-877	WATER	Apr, 2000	Gr. Alpha	52.3 ± 2.3	54.0 ± 13.5	30.8 - 77.2
STW-877	WATER	Apr, 2000	Ra-226	17.5 ± 1.1	18.6 ± 2.8	13.8 - 23.4
STW-877	WATER	Apr, 2000	Ra-228	3.7 ± 0.4	3.6 ± 0.9	2.0 - 5.1
STW-878	WATER	Apr, 2000	Co-60	19.2 ± 0.6	16.9 ± 5.0	8.2 - 25.6
STW-878	WATER	Apr, 2000	Cs-134	81.0 ± 1.3	86.4 ± 5.0	77.7 - 95.1
STW-878	WATER	Apr, 2000	Cs-137	119.0 ± 2.6	123.0 ± 6.2	112.0 - 134.0
STW-878	WATER	Apr, 2000	Gr. Beta	276.0 ± 9.6	289.0 ± 43.4	214.0 - 364.0
STW-878	WATER	Apr, 2000	Sr-89	32.3 ± 3.3	50.7 ± 5.0	42.0 - 59.4
STW-878	WATER	Apr, 2000	Sr-90	11.3 ± 1.0	32.8 ± 5.0	24.1 - 41.5
An error was found in calculation. Result of recalculation: Sr-89, 55.5± 7.2 pCi/L / Sr-90, 30.7 ± 3.0 pCi/L. Results of reanalysis: Sr-89, 47.4 ± 14.5 pCi/L / Sr-90, 33.0 ± 1.35 pCi/L. Both results are within limits.						
STW-879	WATER	Jun, 2000	Ba-133	22.4 ± 2.1	25.5 ± 5.0	16.8 - 34.2
STW-879	WATER	Jun, 2000	Co-60	69.9 ± 3.7	65.6 ± 5.0	56.9 - 74.3
STW-879	WATER	Jun, 2000	Cs-134	13.5 ± 0.8	13.8 ± 5.0	5.1 - 22.5
STW-879	WATER	Jun, 2000	Cs-137	232.0 ± 7.8	238.0 ± 11.9	217.0 - 259.0
STW-879	WATER	Jun, 2000	Zn-65	50.9 ± 3.8	54.6 ± 5.5	45.3 - 63.9
STW-880	WATER	Jun, 2000	Ra-226	2.8 ± 0.2	3.0 ± 0.5	2.2 - 3.8
STW-880	WATER	Jun, 2000	Ra-228	10.0 ± 0.9	13.0 ± 3.3	7.4 - 18.6
STW-880	WATER	Jun, 2000	Uranium	57.0 ± 4.4	63.4 ± 6.3	52.6 - 74.2
STW-883	WATER	Jul, 2000	Gr. Alpha	6.9 ± 1.1	7.2 ± 5.0	0.0 - 15.9
STW-883	WATER	Jul, 2000	Gr. Beta	88.8 ± 9.8	87.5 ± 10.0	70.2 - 105.0
STW-884	WATER	Aug, 2000	H-3	8,740.0 ± 174.0	8,320.0 ± 832.0	6,910.0 - 9,730.0
STW-891	WATER	Sep, 2000	Ra-226	17.9 ± 1.3	18.9 ± 2.8	14.0 - 23.8
STW-891	WATER	Sep, 2000	Ra-228	5.7 ± 0.5	6.2 ± 1.6	3.5 - 8.8

Table A-1. Interlaboratory Comparison Crosscheck program, Environmental Resource Associates (ERA)[a].

Lab Code	Sample Type	Date Collected	Analysis	Concentration in pCi/L[b] Laboratory results ±2 Sigma[c]	ERA Result[d] 1s, N=1	Control Limits
STW-891	WATER	Sep, 2000	Uranium	10.3 ± 0.1	11.9 ± 3.0	6.7 - 17.1
STW-892	WATER	Oct, 2000	I-131	16.9 ± 0.3	15.9 ± 1.6	10.7 - 21.1
STW-892	WATER	Oct, 2000	I-131(g)	17.1 ± 5.4	15.9 ± 1.6	10.7 - 21.1
STW-893	WATER	Oct, 2000	Gr. Alpha	66.3 ± 5.3	74.4 ± 18.6	42.2 - 107.0
STW-893	WATER	Oct, 2000	Ra-226	10.1 ± 1.0	10.5 ± 1.6	7.8 - 13.2
STW-893	WATER	Oct, 2000	Ra-228	21.2 ± 0.5	19.4 ± 4.9	11.0 - 27.8
STW-893	WATER	Oct, 2000	Uranium	41.4 ± 1.9	44.5 ± 4.5	36.8 - 52.2
STW-894	WATER	Oct, 2000	Co-60	93.4 ± 1.6	91.1 ± 5.0	82.4 - 99.8
STW-894	WATER	Oct, 2000	Cs-134	54.8 ± 0.3	59.8 ± 5.0	51.1 - 68.5
STW-894	WATER	Oct, 2000	Cs-137	45.5 ± 2.3	45.0 ± 5.0	36.3 - 53.7
STW-894	WATER	Oct, 2000	Cs-137	45.5 ± 2.3	45.0 ± 5.0	36.3 - 53.7
STW-894	WATER	Oct, 2000	Gr. Beta	209.0 ± 7.9	256.0 ± 38.4	189.0 - 323.0
STW-894	WATER	Oct, 2000	Sr-89	32.8 ± 3.0	41.3 ± 5.0	32.6 - 50.0
STW-894	WATER	Oct, 2000	Sr-90	16.0 ± 2.4	18.0 ± 5.0	9.3 - 26.7
STW-895	WATER	Nov, 2000	Gr. Alpha	50.3 ± 2.6	60.3 ± 15.1	34.4 - 86.2
STW-895	WATER	Nov, 2000	Gr. Beta	28.6 ± 1.3	25.5 ± 5.0	16.8 - 34.2
STW-896	WATER	Nov, 2000	Ba-133	78.0 ± 2.0	82.2 ± 8.2	68.0 - 96.4
STW-896	WATER	Nov, 2000	Co-60	30.8 ± 1.7	27.8 ± 5.0	19.1 - 36.5
STW-896	WATER	Nov, 2000	Cs-134	67.2 ± 3.3	76.0 ± 5.0	67.3 - 84.7
The mean value for Cs-134 of all participating laboratories was 70.7 pCi/L. Other gamma emitters are within limits, the counting efficiency is not suspect. Library values were reviewed and found to be correct.						
STW-896	WATER	Nov, 2000	Cs-137	109.0 ± 1.0	106.0 ± 5.3	96.8 - 115.0
STW-896	WATER	Nov, 2000	Zn-65	81.5 ± 7.4	79.0 ± 7.9	65.3 - 92.7

[a] Results obtained by Environmental, Inc., Midwest Laboratory as a participant in the environmental samples crosscheck program operated by Environmental Resources Associates (ERA).

[b] All results are in pCi/L, except for elemental potassium (K) data in milk, which are in mg/L; air filter samples, which are in pCi/Filter.

[c] Unless otherwise indicated, the laboratory results are given as the mean ± 2 standard deviations for three determinations.

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

Table A-2. Crosscheck program results; Thermoluminescent Dosimeters. (TLDs).

Lab Code	TLD Type	Date	Measurement	mR: Laboratory results ± 2 Sigma	mR: Known Value	mR: Average ± 2 Sigma (All Participants)
Environmental, Inc.						
1999-1	LiF-100 Chips	Mar, 1999	Reader 1, #1	14.5 ± 0.5	15.4	-
1999-1	LiF-100 Chips	Mar, 1999	Reader 1, #2	29.3 ± 1.0	31.8	-
1999-1	LiF-100 Chips	Mar, 1999	Reader 1, #3	60.0 ± 0.2	59.1	-
Environmental, Inc.						
1999-2	$CaSO_4$: Dy Cards	Mar, 1999	Reader 1, #1	18.3 ± 0.5	15.4	-
1999-2	$CaSO_4$: Dy Cards	Mar, 1999	Reader 1, #2	35.9 ± 1.3	31.8	-
1999-2	$CaSO_4$: Dy Cards	Mar, 1999	Reader 1, #3	66.5 ± 4.4	59.1	-
Chips and Cards were irradiated by Teledyne Brown Engineering, Westwood, New Jersey, in March, 1999.						
Environmental, Inc.						
2000-1	LiF-100 Chips	Mar, 2000	Reader 1, #1	14.4 ± 0.2	17.8	-
2000-1	LiF-100 Chips	Mar, 2000	Reader 1, #2	32.4 ± 0.1	35.5	-
2000-1	LiF-100 Chips	Mar, 2000	Reader 1, #3	61.8 ± 0.9	62.2	-
Environmental, Inc.						
2000-2	$CaSO_4$: Dy Cards	Mar, 2000	Reader 1, #1	21.3 ± 0.3	17.8	-
2000-2	$CaSO_4$: Dy Cards	Mar, 2000	Reader 1, #2	40.1 ± 1.9	35.5	-
2000-2	$CaSO_4$: Dy Cards	Mar, 2000	Reader 1, #3	69.9 ± 3.5	62.2	-
Chips and Cards were irradiated by Teledyne Brown Engineering, Westwood, New Jersey, in March, 2000.						

Table A-3. In-house "spike" samples.

Lab Code	Sample Type	Date Collected	Analysis	Concentration in pCi/L[a] Laboratory results 2s, n=1[b]	Known Activity	Control[c] Limits
SPW-271	WATER	Jan, 2000	Ra-226	14.81 ± 0.44	13.76	9.63 - 17.89
SPW-271	WATER	Jan, 2000	Ra-228	16.97 ± 2.12	14.68	10.28 - 19.08
SPW-272	WATER	Jan, 2000	Gr. Alpha	44.35 ± 1.95	41.14	20.57 - 61.71
SPW-272	WATER	Jan, 2000	Gr. Beta	31.19 ± 5.02	29.50	19.50 - 39.50
SPW-756	WATER	Jan, 2000	H-3	56339.00 ± 666.00	57667.00	46133.60 - 69200.40
SPW-480	WATER	Jan, 2000	Co-60	32.33 ± 2.87	28.36	18.36 - 38.36
SPW-480	WATER	Jan, 2000	Cs-137	35.58 ± 4.20	36.83	26.83 - 46.83
SPMI-482	MILK	Jan, 2000	Sr-90	16.93 ± 1.07	14.10	4.10 - 24.10
SPAP-484	AIR FILTER	Jan, 2000	Cs-137	1.84 ± 0.01	1.72	1.03 - 2.41
SPW-917	WATER	Feb, 2000	Gr. Alpha	16.59 ± 1.90	41.10	20.55 - 61.65
An insufficient amount of Am-241 spike was available for an accurate test.						
SPW-917	WATER	Feb, 2000	Gr. Beta	32.61 ± 2.06	29.43	19.43 - 39.43
SPW-918	WATER	Feb, 2000	Ra-226	21.15 ± 0.49	20.68	14.48 - 26.88
SPW-918	WATER	Feb, 2000	Ra-228	14.24 ± 1.64	14.51	10.16 - 18.86
SPVE-1262	VEGETATION	Mar, 2000	I-131(g)	1.17 ± 0.07	1.12	0.67 - 1.57
SPCH-1264	CHARCOAL CANISTER	Mar, 2000	I-131(g)	0.56 ± 0.02	0.53	0.32 - 0.74
SPMI-1274	MILK	Mar, 2000	I-131	47.02 ± 3.36	48.00	36.00 - 60.00
SPW-1301	WATER	Mar, 2000	I-131	66.03 ± 1.06	76.84	61.47 - 92.21
SPW-1301	WATER	Mar, 2000	I-131(g)	80.31 ± 6.28	76.84	66.84 - 86.84
SPW-1477	WATER	Mar, 2000	Gr. Alpha	32.09 ± 1.82	41.13	20.57 - 61.70
SPW-1477	WATER	Mar, 2000	Gr. Beta	29.20 ± 1.56	29.38	19.38 - 39.38
SPW-1478	WATER	Mar, 2000	Ra-226	21.78 ± 0.47	20.69	14.48 - 26.90
SPW-1478	WATER	Mar, 2000	Ra-228	14.41 ± 1.70	14.39	10.07 - 18.71
SPMI-2275	MILK	Apr, 2000	Cs-134	33.53 ± 2.82	32.12	22.12 - 42.12
SPMI-2275	MILK	Apr, 2000	Cs-137	36.38 ± 4.94	36.66	26.66 - 46.66
SPMI-2275	MILK	Apr, 2000	I-131	46.06 ± 0.82	55.50	44.40 - 66.60
SPW-2277	WATER	Apr, 2000	Ra-226	20.51 ± 0.44	20.68	14.48 - 26.88
SPW-2278	WATER	Apr, 2000	Gr. Alpha	40.22 ± 2.50	38.44	19.22 - 57.66
SPW-2278	WATER	Apr, 2000	Gr. Beta	32.63 ± 1.81	29.30	19.30 - 39.30
SPW-2278	WATER	Apr, 2000	Ra-228	14.91 ± 1.70	14.25	9.98 - 18.53
SPW-2279	WATER	Apr, 2000	Co-60	37.12 ± 3.86	34.54	24.54 - 44.54
SPW-2279	WATER	Apr, 2000	Cs-134	34.70 ± 3.32	32.12	22.12 - 42.12
SPW-2279	WATER	Apr, 2000	Cs-137	39.60 ± 5.12	36.66	26.66 - 46.66
SPW-2279	WATER	Apr, 2000	I-131	49.92 ± 0.67	55.50	44.40 - 66.60
SPW-2279	WATER	Apr, 2000	I-131(g)	60.63 ± 6.58	55.50	45.50 - 65.50
SPW-2281	WATER	Apr, 2000	H-3	58829.00 ± 682.00	56996.00	45596.80 - 68395.20
SPAP-3097	AIR FILTER	Apr, 2000	Cs-137	1.81 ± 0.02	1.71	1.03 - 2.39
SPW-3093	WATER	May, 2000	I-131	83.39 ± 1.06	85.38	68.30 - 102.46
SPW-3094	WATER	May, 2000	Ra-226	20.86 ± 0.42	20.68	14.48 - 26.88
SPW-3094	WATER	May, 2000	Ra-228	14.17 ± 1.59	14.12	9.88 - 18.36
SPW-3095	WATER	May, 2000	Gr. Alpha	38.99 ± 2.09	38.44	19.22 - 57.66

Table A-3. In-house "spike" samples.

Lab Code	Sample Type	Date Collected	Analysis	Concentration in pCi/L[a] Laboratory results 2s, n=1[b]	Known Activity	Control[c] Limits
SPW-3095	WATER	May, 2000	Gr. Beta	30.65 ± 1.53	29.30	19.30 - 39.30
SPAP-274	AIR FILTER	May, 2000	Gr. Beta	5.08 ± 0.03	5.97	-4.03 - 15.97
SPMI-3138	MILK	May, 2000	I-131	85.08 ± 1.05	85.38	68.30 - 102.46
SPF-3180	FISH	May, 2000	Cs-134	0.52 ± 0.02	0.50	0.30 - 0.70
SPF-3180	FISH	May, 2000	Cs-137	0.65 ± 0.04	0.59	0.35 - 0.82
SPAP-3902	AIR FILTER	Jun, 2000	Gr. Beta	5.81 ± 0.03	5.35	-4.65 - 15.35
SPF-5182	FISH	Jun, 2000	Cs-134	0.60 ± 0.04	0.59	0.35 - 0.83
SPF-5182	FISH	Jun, 2000	Cs-137	0.60 ± 0.05	0.58	0.35 - 0.81
SPW-3911	WATER	Jun, 2000	Ra-226	23.73 ± 0.85	20.68	14.48 - 26.88
SPW-3911	WATER	Jun, 2000	Ra-228	20.43 ± 1.77	20.75	14.53 - 26.98
SPW-3910	WATER	Jun, 2000	Gr. Alpha	38.28 ± 2.12	38.44	19.22 - 57.66
SPW-3910	WATER	Jun, 2000	Gr. Beta	35.14 ± 1.74	29.22	19.22 - 39.22
SPW-4342	WATER	Jun, 2000	Sr-89	73.70 ± 4.77	81.00	64.80 - 97.20
SPW-4342	WATER	Jun, 2000	Sr-90	58.13 ± 2.17	55.90	44.72 - 67.08
SPW-4687	WATER	Jul, 2000	Ra-226	21.07 ± 0.56	20.68	14.48 - 26.88
SPW-4687	WATER	Jul, 2000	Ra-228	16.35 ± 1.70	20.75	14.53 - 26.98
SPW-4688	WATER	Jul, 2000	H-3	56205.00 ± 663.00	56228.00	44982.40 - 67473.60
SPAP-4807	AIR FILTER	Jul, 2000	Gr. Beta	6.07 ± 0.02	5.96	-4.04 - 15.96
SPAP-4809	AIR FILTER	Jul, 2000	Cs-137	1.82 ± 0.02	1.71	1.03 - 2.39
SPMI-4856	MILK	Jul, 2000	Cs-134	33.24 ± 3.74	29.56	19.56 - 39.56
SPMI-4856	MILK	Jul, 2000	Cs-137	39.80 ± 6.77	36.45	26.45 - 46.45
SPMI-4856	MILK	Jul, 2000	Sr-89	46.35 ± 5.10	56.34	45.07 - 67.61
SPMI-4856	MILK	Jul, 2000	Sr-90	70.47 ± 2.06	69.73	55.78 - 83.68
SPW-5372	WATER	Jul, 2000	Co-60	33.31 ± 4.61	33.24	23.24 - 43.24
SPW-5372	WATER	Jul, 2000	Cs-134	59.70 ± 4.57	58.26	48.26 - 68.26
SPW-5372	WATER	Jul, 2000	Cs-137	40.00 ± 5.58	36.42	26.42 - 46.42
SPW-4686	WATER	Aug, 2000	Gr. Alpha	34.12 ± 1.71	38.43	19.22 - 57.65
SPW-4686	WATER	Aug, 2000	Gr. Beta	35.42 ± 1.51	29.21	19.21 - 39.21
SPW-5564	WATER	Aug, 2000	Sr-89	62.97 ± 4.73	67.61	54.09 - 81.13
SPW-5564	WATER	Aug, 2000	Sr-90	65.40 ± 2.47	55.70	44.56 - 66.84
SPW-5792	WATER	Aug, 2000	Ra-226	12.82 ± 0.30	13.79	9.65 - 17.93
SPW-5792	WATER	Aug, 2000	Ra-228	15.00 ± 1.21	13.69	9.58 - 17.80
SPW-6631	WATER	Sep, 2000	Ra-228	22.20 ± 2.20	20.32	14.22 - 26.42
SPW-6632	WATER	Sep, 2000	Ra-226	13.58 ± 0.29	13.79	9.65 - 17.93
SPW-6632	WATER	Sep, 2000	Ra-228	18.84 ± 2.59	20.32	14.22 - 26.42
SPW-6633	WATER	Sep, 2000	Fe-55	1757.00 ± 674.00	1852.00	1481.60 - 2222.40
SPW-5791	WATER	Sep, 2000	Gr. Alpha	52.28 ± 9.41	69.00	34.50 - 103.50
SPW-5791	WATER	Sep, 2000	Gr. Beta	34.60 ± 4.71	29.10	19.10 - 39.10
SPW-6630	WATER	Sep, 2000	Gr. Alpha	71.54 ± 7.15	69.14	34.57 - 103.71
SPW-6630	WATER	Sep, 2000	Gr. Beta	37.78 ± 1.62	29.04	19.04 - 39.04
SPW-7744	WATER	Oct, 2000	Ra-226	12.36 ± 0.25	13.79	9.65 - 17.93

Table A-3. In-house "spike" samples.

Lab Code	Sample Type	Date Collected	Analysis	Concentration in pCi/L[a] Laboratory results 2s, n=1[b]	Known Activity	Control[c] Limits
SPW-7744	WATER	Oct, 2000	Ra-228	10.37 ± 1.15	13.40	9.38 - 17.42
SPW-7745	WATER	Oct, 2000	H-3	54650.00 ± 643.00	55391.00	44312.80 - 66469.20
SPAP-7764	AIR FILTER	Oct, 2000	Gr. Beta	6.14 ± 0.03	5.91	-4.09 - 15.91
SPAP-7766	AIR FILTER	Oct, 2000	Cs-137	1.84 ± 0.01	1.69	1.01 - 2.37
SPMI-8347	MILK	Oct, 2000	Cs-134	29.18 ± 6.51	26.83	16.83 - 36.83
SPMI-8347	MILK	Oct, 2000	Cs-134	29.37 ± 3.63	26.83	16.83 - 36.83
SPMI-8347	MILK	Oct, 2000	Cs-137	39.04 ± 8.76	36.20	26.20 - 46.20
SPMI-8347	MILK	Oct, 2000	Cs-137	34.89 ± 5.71	36.20	26.20 - 46.20
SPF-8349	FISH	Oct, 2000	Cs-134	0.56 ± 0.02	0.54	0.32 - 0.75
SPF-8349	FISH	Oct, 2000	Cs-137	0.92 ± 0.04	0.87	0.52 - 1.22
SPW-8369	WATER	Oct, 2000	Co-60	32.49 ± 1.86	32.19	22.19 - 42.19
SPW-8369	WATER	Oct, 2000	Cs-134	55.87 ± 1.71	53.66	43.66 - 63.66
SPW-8369	WATER	Oct, 2000	Cs-137	36.46 ± 2.73	36.21	26.21 - 46.21
SPW-7743	WATER	Oct, 2000	Gr. Alpha	51.28 ± 2.28	69.10	34.55 - 103.65
SPW-7743	WATER	Oct, 2000	Gr. Beta	36.86 ± 1.66	29.00	19.00 - 39.00
SPW-9101	WATER	Nov, 2000	Ra-226	14.35 ± 0.24	13.79	9.65 - 17.93
SPW-9101	WATER	Nov, 2000	Ra-228	22.14 ± 1.56	20.09	14.06 - 26.12
SPW-9102	WATER	Dec, 2000	Gr. Alpha	77.76 ± 3.02	69.14	34.57 - 103.71
SPW-9102	WATER	Dec, 2000	Gr. Beta	36.71 ± 1.65	28.99	18.99 - 38.99
SPW-9726	WATER	Dec, 2000	Gr. Alpha	43.03 ± 2.18	69.14	34.57 - 103.71
SPW-9726	WATER	Dec, 2000	Gr. Beta	32.17 ± 1.55	28.89	18.89 - 38.89
SPW-9727	WATER	Dec, 2000	Ra-226	13.35 ± 0.29	13.79	9.65 - 17.93
SPW-9727	WATER	Dec, 2000	Ra-228	15.44 ± 1.23	19.75	13.83 - 25.68
SPCH-10228	CHARCOAL CANISTER	Dec, 2000	Ba-133	1.80 ± 0.05	2.11	1.26 - 2.95

[a] All results are in pCi/L, except for elemental potassium (K) in milk, which are in mg/L.; air filter samples, which are in pCi/Filter; and food products, which are in mg/kg.

[b] All samples are the results of single determinations.

[c] Control limits are based on Attachment A, page A2 of this report.

NOTE: For fish, Jello is used for the spike matrix. For vegetation, Sawdust is used for the spike matrix.

Table A-4. In-house "blank" samples.

Lab Code	Sample Type	Sample Date	Analysis	Concentration pCi/L[a]. Laboratory results (4.66 Sigma) LLD	Laboratory results (4.66 Sigma) Activity[b]	Acceptance Criteria (4.66 Sigma)
SPW-270	WATER	Jan 2000	Gr. Alpha	< 0.50	0.52 ± 0.41	< 1.0
SPW-270	WATER	Jan 2000	Gr. Beta	< 1.50	-0.34 ± 1.11	< 3.2
SPW-270	WATER	Jan 2000	Ra-226		0.06 ± 0.01	< 1.0
SPW-270	WATER	Jan 2000	Ra-228	< 0.94	0.14 ± 0.45	< 2.0
SPW-447	WATER	Jan 2000	H-3	< 184.00	-54.70 ± 88.60	< 200.0
SPW-481	WATER	Jan 2000	Co-60	< 2.42		< 10.0
SPW-481	WATER	Jan 2000	Cs-134	< 3.99		< 10.0
SPW-481	WATER	Jan 2000	Cs-137	< 2.90		< 10.0
SPMI-483	MILK	Jan 2000	Cs-137	< 2.73		< 10.0
SPMI-483	MILK	Jan 2000	Sr-90		1.03 ± 0.40	< 1.0
Low level of Sr-90 concentration in milk (1-5 pCi/L) is not unusual.						
SPAP-485	AIR FILTER	Jan 2000	Cs-137	< 1.64		< 100.0
SPW-919	WATER	Feb 2000	Gr. Alpha	< 0.80	0.56 ± 0.61	< 1.0
SPW-919	WATER	Feb 2000	Gr. Beta	< 1.65	0.11 ± 1.16	< 3.2
SPW-919	WATER	Feb 2000	Ra-226	< 0.02	0.02 ± 0.01	< 1.0
SPW-919	WATER	Feb 2000	Ra-228	< 0.60	0.02 ± 0.01	< 2.0
SPVE-1263	VEGETATION	Mar 2000	Cs-134	< 11.48		< 100.0
SPVE-1263	VEGETATION	Mar 2000	Cs-137	< 24.82		< 100.0
SPCH-1265	CHARCOAL CANISTER	Mar 2000	I-131(g)	< 7.00		< 9.6
SPMI-1292	MILK	Mar 2000	I-131	< 0.32	0.05 ± 0.18	< 0.5
SPMI-1292	MILK	Mar 2000	I-131(g)	< 4.60		< 20.0
SPW-1302	WATER	Mar 2000	I-131	< 0.30	0.01 ± 0.14	< 0.5
SPW-1479	WATER	Mar 2000	Gr. Alpha	< 0.84	-0.32 ± 0.53	< 1.0
SPW-1479	WATER	Mar 2000	Gr. Beta	< 1.86	-1.39 ± 1.19	< 3.2
SPW-1479	WATER	Mar 2000	Ra-226	< 0.01	0.06 ± 0.01	< 1.0
SPW-1479	WATER	Mar 2000	Ra-228	< 1.00	1.17 ± 0.60	< 2.0
SPMI-2276	MILK	Apr 2000	Cs-134	< 4.20		< 10.0
SPMI-2276	MILK	Apr 2000	Cs-137	< 3.33		< 10.0
SPMI-2276	MILK	Apr 2000	I-131	< 0.50	0.32 ± 0.30	< 0.5
SPW-2280	WATER	Apr 2000	Co-60	< 2.78		< 10.0
SPW-2280	WATER	Apr 2000	Cs-134	< 3.56		< 10.0

Table A-4. In-house "blank" samples.

Lab Code	Sample Type	Sample Date	Analysis	Concentration pCi/L[a]. Laboratory results (4.66 Sigma) LLD	Laboratory results (4.66 Sigma) Activity[b]	Acceptance Criteria (4.66 Sigma)
SPW-2280	WATER	Apr 2000	Cs-137	< 2.81		< 10.0
SPW-2280	WATER	Apr 2000	Gr. Alpha	< 0.60	0.55 ± 0.45	< 1.0
SPW-2280	WATER	Apr 2000	Gr. Beta	< 1.66	0.62 ± 1.11	< 3.2
SPW-2280	WATER	Apr 2000	I-131	< 0.29	-0.16 ± 0.19	< 0.5
SPW-2280	WATER	Apr 2000	I-131(g)	< 3.42		< 20.0
SPW-2280	WATER	Apr 2000	Ra-226		0.03 ± 0.01	< 1.0
SPW-2280	WATER	Apr 2000	Ra-228	< 0.87	0.65 ± 0.47	< 2.0
SPW-2282	WATER	Apr 2000	H-3	< 151.60	-5.40 ± 74.90	< 200.0
SPAP-3098	AIR FILTER	Apr 2000	Cs-137	< 1.37		< 100.0
SPW-3096	WATER	May 2000	Gr. Alpha	< 0.68		< 1.0
SPW-3096	WATER	May 2000	Gr. Beta	< 1.62		< 3.2
SPW-3096	WATER	May 2000	Ra-226		0.05 ± 0.01	< 1.0
SPW-3096	WATER	May 2000	Ra-228	< 0.90	0.05 ± 0.01	< 2.0
SPAP-273	AIR FILTER	May 2000	Gr. Beta	< 0.54	0.90 ± 0.32	< 3.2
SPMI-3139	MILK	May 2000	I-131	< 0.33		< 0.5
SPF-3181	FISH	May 2000	Cs-134	< 3.02		< 100.0
SPF-3181	FISH	May 2000	Cs-137	< 4.99		< 100.0
SPAP-3903	AIR FILTER	Jun 2000	Gr. Beta	< 0.48		< 3.2
SPW-3912	WATER	Jun 2000	Gr. Alpha	< 0.35	0.28 ± 0.28	< 1.0
SPW-3912	WATER	Jun 2000	Gr. Beta	< 1.22	0.54 ± 0.86	< 3.2
SPW-3912	WATER	Jun 2000	Ra-226		0.04 ± 0.02	< 1.0
SPW-3912	WATER	Jun 2000	Ra-228	< 0.65		< 2.0
SPMI-4343	MILK	Jun 2000	Sr-89	< 0.73		< 5.0
SPMI-4343	MILK	Jun 2000	Sr-90	< 0.56		< 1.0
SPW-4689	WATER	Jul 2000	Ra-226		0.03 ± 0.01	< 1.0
SPW-4689	WATER	Jul 2000	Ra-228	< 0.93	1.11 ± 0.55	< 2.0
SPW-4690	WATER	Jul 2000	H-3	< 178.00	18.57 ± 89.13	< 200.0
SPW-4808	WATER	Jul 2000	Gr. Alpha	< 0.45		< 1.0
SPAP-4810	AIR FILTER	Jul 2000	Cs-137	< 2.18		< 100.0
SPMI-4857	MILK	Jul 2000	Cs-137	< 6.13		< 10.0
SPMI-4857	MILK	Jul 2000	I-131(g)	< 7.19		< 20.0

Table A-4. In-house "blank" samples.

Lab Code	Sample Type	Sample Date	Analysis	Concentration pCi/L[a]. Laboratory results (4.66 Sigma) LLD	Activity[b]	Acceptance Criteria (4.66 Sigma)
SPMI-4857	MILK	Jul 2000	Sr-89	< 0.66		< 5.0
SPMI-4857	MILK	Jul 2000	Sr-90		1.15 ± 0.32	< 1.0
Low level of Sr-90 concentration in milk (1-5 pCi/L) is not unusual.						
SPF-5183	FISH	Jul 2000	Cs-134	< 17.71		< 100.0
SPF-5183	FISH	Jul 2000	Cs-137	< 12.81		< 100.0
SPW-4689	WATER	Jul 2000	Gr. Alpha	< 0.50		< 1.0
SPW-4689	WATER	Jul 2000	Gr. Beta	< 1.20		< 3.2
SPW-5373	WATER	Jul 2000	Co-60	< 5.20		< 10.0
SPW-5373	WATER	Jul 2000	Cs-134	< 4.80		< 10.0
SPW-5373	WATER	Jul 2000	Cs-137	< 4.00		< 10.0
SPW-5565	WATER	Aug 2000	Sr-89	< 1.56	-0.64 ± 1.11	< 5.0
SPW-5565	WATER	Aug 2000	Sr-90	< 0.59	0.17 ± 0.30	< 1.0
SPW-5793	WATER	Aug 2000	Gr. Alpha	< 0.51	0.02 ± 0.36	< 1.0
SPW-5793	WATER	Aug 2000	Ra-226		0.05 ± 0.02	< 1.0
SPW-5793	WATER	Aug 2000	Ra-228	< 0.95	0.26 ± 0.47	< 2.0
SPW-5793	WATER	Aug 2000	Gr. Beta	< 1.40	-0.13 ± 1.01	< 3.2
SPW-6634	WATER	Sep 2000	Fe-55	< 617.00	-105.90 ± 453.40	< 1000.0
SPW-6634	WATER	Sep 2000	Ra-226	< 0.01	0.03 ± 0.01	< 1.0
SPW-6634	WATER	Sep 2000	Ra-228	< 0.99	0.36 ± 0.51	< 2.0
SPW-6634	WATER	Sep 2000	Gr. Alpha	< 0.67	-0.22 ± 0.45	< 1.0
SPW-6634	WATER	Sep 2000	Gr. Beta	< 1.60	-0.20 ± 1.12	< 3.2
SPSO-10595	SOIL	Oct 2000	Cs-134	< 16.87		< 100.0
SPSO-10595	SOIL	Oct 2000	Cs-137	< 9.40		< 100.0
SPW-7746	WATER	Oct 2000	Ra-226	< 0.03	0.04 ± 0.02	< 1.0
SPW-7746	WATER	Oct 2000	Ra-228	< 1.08	0.00 ± 0.87	< 2.0
SPW-7747	WATER	Oct 2000	H-3	< 158.00	-38.00 ± 77.00	< 200.0
SPAP-7765	AIR FILTER	Oct 2000	Gr. Beta	< 0.64	0.00 ± 0.00	< 3.2
SPAP-7767	AIR FILTER	Oct 2000	Co-60	< 0.19		< 100.0
SPAP-7767	AIR FILTER	Oct 2000	Cs-134	< 0.32		< 100.0
SPAP-7767	AIR FILTER	Oct 2000	Cs-137	< 2.32		< 100.0
SPMI-8348	MILK	Oct 2000	Cs-134	< 3.35		< 10.0
SPMI-8348	MILK	Oct 2000	Cs-137	< 3.07		< 10.0

Table A-4. In-house "blank" samples.

Lab Code	Sample Type	Sample Date	Analysis	Concentration pCi/L[a]. Laboratory results (4.66 Sigma) LLD	Activity[b]	Acceptance Criteria (4.66 Sigma)
SPF-8350	FISH	Oct 2000	Cs-134	< 10.26		< 100.0
SPF-8350	FISH	Oct 2000	Cs-137	< 10.51		< 100.0
SPW-8370	WATER	Oct 2000	Co-60	< 4.67		< 10.0
SPW-8370	WATER	Oct 2000	Cs-134	< 5.28		< 10.0
SPW-8370	WATER	Oct 2000	Cs-137	< 4.93		< 10.0
SPW-7746	WATER	Oct 2000	Gr. Alpha	< 0.46	0.06 ± 0.33	< 1.0
SPW-7746	WATER	Oct 2000	Gr. Beta	< 1.24	0.00 ± 0.87	< 3.2
SPW-9103	WATER	Nov 2000	Ra-226	< 0.01	0.02 ± 0.01	< 1.0
SPW-9103	WATER	Nov 2000	Ra-228	< 1.00	0.14 ± 0.48	< 2.0
SPW-9729	WATER	Dec 2000	Gr. Alpha	< 0.46	0.23 ± 0.36	< 1.0
SPW-9729	WATER	Dec 2000	Gr. Beta	< 1.33	-0.46 ± 0.98	< 3.2
SPW-9729	WATER	Dec 2000	Ra-226	< 0.02	0.05 ± 0.01	< 1.0
SPW-9729	WATER	Dec 2000	Ra-228	< 0.70	0.22 ± 0.35	< 2.0
SPW-9103	WATER	Dec 2000	Gr. Alpha	< 0.51	-0.11 ± 0.37	< 1.0
SPW-9103	WATER	Dec 2000	Gr. Beta	< 1.21	0.55 ± 0.91	< 3.2
SPCH-10583	CHARCOAL CANISTER	Dec 2000	I-131(g)	< 1.49		< 9.6

[a] Liquid sample results are reported in pCi/Liter, air filter sample results are in pCi/filter, charcoal sample results are in pCi/charcoal, and solid sample results are in pCi/kilogram.
[b] The activity reported is the net activity result.

Table A-5. In-house "duplicate" samples.

Lab Codes	Sample Date	Analysis	Concentration in pCi/L[a] First Result	Second Result	Averaged Result
CF-23, 24	Jan, 2000	Gr. Beta	13.05 ± 0.39	12.46 ± 0.36	12.75 ± 0.26
CF-23, 24	Jan, 2000	K-40	13.00 ± 0.90	11.73 ± 0.79	12.36 ± 0.60
CF-23, 24	Jan, 2000	Sr-90	0.01 ± 0.00	0.01 ± 0.00	0.01 ± 0.00
WW-65, 66	Jan, 2000	Co-60	-0.53 ± 1.62	0.44 ± 2.11	-0.04 ± 1.33
WW-65, 66	Jan, 2000	Cs-137	-2.13 ± 1.70	0.41 ± 2.35	-0.86 ± 1.45
WW-65, 66	Jan, 2000	H-3	131.62 ± 84.13	182.81 ± 86.33	157.22 ± 60.27
WW-686, 687	Jan, 2000	Gr. Beta	4.76 ± 1.22	4.59 ± 1.27	4.67 ± 0.88
AP-1204, 1205	Jan, 2000	Be-7	0.19 ± 0.09	0.10 ± 0.07	0.14 ± 0.06
SW-68, 69	Jan, 2000	K-40 (FP)	1.30 ± 0.13	1.30 ± 0.13	1.30 ± 0.09
MI-277, 278	Jan, 2000	I-131	-0.08 ± 0.27	-0.00 ± 0.26	-0.04 ± 0.19
MI-277, 278	Jan, 2000	K-40	1,664.70 ± 113.20	1,431.30 ± 90.30	1,548.00 ± 72.40
MI-277, 278	Jan, 2000	Sr-90	0.63 ± 0.42	0.51 ± 0.40	0.57 ± 0.29
SW-728, 729	Jan, 2000	Co-60	0.39 ± 1.79	1.04 ± 1.53	0.72 ± 1.18
SW-728, 729	Jan, 2000	Cs-137	-0.67 ± 1.86	1.22 ± 1.38	0.27 ± 1.16
SW-403, 404	Jan, 2000	H-3	795.21 ± 109.04	857.22 ± 111.09	826.22 ± 77.83
SWT-437, 438	Jan, 2000	Gr. Beta	1.73 ± 0.57	2.60 ± 0.58	2.16 ± 0.41
PW-637, 638	Jan, 2000	Co-60	4.90 ± 2.92	-2.56 ± 2.80	1.17 ± 2.02
PW-637, 638	Jan, 2000	Cs-137	2.73 ± 2.51	-1.68 ± 2.71	0.53 ± 1.85
PW-637, 638	Jan, 2000	Gr. Beta	1.67 ± 1.31	4.00 ± 1.59	2.83 ± 1.03
SW-587, 588	Jan, 2000	Co-60	-1.24 ± 1.86	-0.27 ± 1.79	-0.76 ± 1.29
SW-587, 588	Jan, 2000	Cs-137	1.35 ± 1.94	0.23 ± 1.80	0.79 ± 1.32
SW-587, 588	Jan, 2000	Gr. Beta	3.80 ± 1.56	6.76 ± 1.75	5.28 ± 1.17
SW-611, 612	Jan, 2000	H-3	2,229.26 ± 158.61	2,115.19 ± 155.80	2,172.23 ± 111.16
SW-459, 460	Feb, 2000	Gr. Beta	2.15 ± 0.94	2.79 ± 0.94	2.47 ± 0.66
WW-774, 775	Feb, 2000	Co-60	4.26 ± 3.48	1.61 ± 4.46	2.93 ± 2.83
WW-774, 775	Feb, 2000	Cs-137	-1.19 ± 3.78	2.37 ± 4.65	0.59 ± 2.99
WW-774, 775	Feb, 2000	H-3	2,841.35 ± 174.48	2,566.76 ± 168.19	2,704.05 ± 121.17
SW-707, 708	Feb, 2000	Gr. Alpha	2.20 ± 1.73	0.16 ± 1.29	1.18 ± 1.08
SW-707, 708	Feb, 2000	Gr. Beta	7.90 ± 1.70	7.70 ± 1.70	7.80 ± 1.20
SW-707, 708	Feb, 2000	H-3	117.00 ± 92.00	69.00 ± 90.00	93.00 ± 64.35
CW-854, 855	Feb, 2000	Gr. Beta	2.13 ± 1.36	1.34 ± 1.25	1.74 ± 0.93
SW-881, 882	Feb, 2000	H-3	1,794.91 ± 145.81	1,762.31 ± 144.95	1,778.61 ± 102.80
SW-959, 960	Feb, 2000	Gr. Alpha	1.04 ± 1.00	0.92 ± 0.67	0.98 ± 0.60
SW-959, 960	Feb, 2000	Gr. Beta	1.24 ± 0.89	1.79 ± 0.90	1.51 ± 0.63
PW-1055, 1056	Feb, 2000	Co-60	-0.72 ± 3.18	1.73 ± 1.89	0.51 ± 1.85
PW-1055, 1056	Feb, 2000	Cs-137	0.55 ± 2.81	0.90 ± 1.86	0.72 ± 1.69
PW-1055, 1056	Feb, 2000	Gr. Beta	2.40 ± 1.52	2.20 ± 1.50	2.30 ± 1.07

Table A-5. In-house "duplicate" samples.

Lab Codes	Sample Date	Analysis	Concentration in pCi/L[a] First Result	Second Result	Averaged Result
MI-1079, 1080	Mar, 2000	Calcium	0.79 ± 0.08	0.78 ± 0.08	0.79 ± 0.06
MI-1079, 1080	Mar, 2000	K-40	1,229.00 ± 138.00	1,387.00 ± 162.00	1,308.00 ± 106.40
MI-1079, 1080	Mar, 2000	Sr-90	0.90 ± 0.40	1.70 ± 0.50	1.30 ± 0.32
CW-1156, 1157	Mar, 2000	H-3	1,994.51 ± 143.09	2,012.54 ± 143.55	2,003.53 ± 101.34
SW-1967, 1968	Mar, 2000	Gr. Beta	11.96 ± 1.31	12.57 ± 1.31	12.27 ± 0.93
SW-2468, 2469	Mar, 2000	Sr-90	0.93 ± 0.45	0.50 ± 0.29	0.72 ± 0.27
WW-1402, 1403	Mar, 2000	H-3	93.34 ± 97.05	60.63 ± 95.75	76.98 ± 68.17
LW-1269, 1270	Mar, 2000	Gr. Beta	1.97 ± 0.57	3.22 ± 0.69	2.60 ± 0.45
AP-,	Mar, 2000	Be-7	0.06 ± 0.01	0.07 ± 0.01	0.07 ± 0.01
MI-1541, 1542	Mar, 2000	K-40	1,380.00 ± 122.00	1,476.00 ± 158.00	1,428.00 ± 99.81
CW-1571, 1572	Mar, 2000	Gr. Beta	2.29 ± 1.48	1.35 ± 1.27	1.82 ± 0.98
CW-1693, 1694	Mar, 2000	Gr. Beta	0.56 ± 1.18	1.91 ± 1.49	1.24 ± 0.95
SWT-,	Mar, 2000	Gr. Beta	2.36 ± 0.65	2.01 ± 0.57	2.19 ± 0.43
WW-1916, 1917	Mar, 2000	H-3	25.37 ± 90.21	3.90 ± 89.27	14.63 ± 63.46
AP-2155, 2156	Mar, 2000	Be-7	0.07 ± 0.01	0.07 ± 0.01	0.07 ± 0.01
SWU-2547, 2548	Mar, 2000	Sr-90	0.57 ± 0.24	0.55 ± 0.24	0.56 ± 0.17
CW-1798, 1799	Mar, 2000	Gr. Beta	2.73 ± 1.85	0.76 ± 1.71	1.75 ± 1.26
AP-2176, 2177	Mar, 2000	Be-7	0.06 ± 0.01	0.08 ± 0.02	0.07 ± 0.01
WW-2046, 2047	Mar, 2000	H-3	221.85 ± 101.64	185.19 ± 100.24	203.52 ± 71.38
SW-1967, 1968	Apr, 2000	K-40	9.20 ± 0.90	9.10 ± 0.90	9.15 ± 0.64
SW-2241, 2242	Apr, 2000	Gr. Alpha	2.49 ± 1.44	3.15 ± 1.53	2.82 ± 1.05
SW-2241, 2242	Apr, 2000	Gr. Beta	8.37 ± 1.36	7.20 ± 1.29	7.79 ± 0.94
WW-,	Apr, 2000	Gr. Beta	4.20 ± 0.64	4.68 ± 0.73	4.44 ± 0.49
WW-2711, 2712	Apr, 2000	Cs-137	-0.76 ± 2.19	1.43 ± 3.63	0.34 ± 2.12
WW-2711, 2712	Apr, 2000	H-3	3,877.05 ± 192.54	3,951.88 ± 193.99	3,914.46 ± 136.66
WW-2511, 2512	Apr, 2000	H-3	108.10 ± 79.80	127.80 ± 80.70	117.95 ± 56.75
SO-2435, 2436	Apr, 2000	K-40	4.73 ± 0.38	4.83 ± 0.53	4.78 ± 0.33
SS-2669, 2670	Apr, 2000	K-40	8.60 ± 0.55	9.18 ± 0.45	8.89 ± 0.36
SWU-2732, 2733	Apr, 2000	Gr. Beta	3.33 ± 0.68	3.19 ± 0.69	3.26 ± 0.48
PW-2605, 2606	Apr, 2000	Co-60	0.36 ± 1.10	1.05 ± 2.03	0.71 ± 1.16
PW-2605, 2606	Apr, 2000	Cs-137	-0.07 ± 0.93	-0.98 ± 2.37	-0.53 ± 1.27
PW-2605, 2606	Apr, 2000	Gr. Beta	1.51 ± 1.31	2.91 ± 1.39	2.21 ± 0.96
WW-2711, 2712	Apr, 2000	H-3	3,877.00 ± 192.50	3,951.90 ± 194.00	3,914.45 ± 136.65
WW-2711, 2712	Apr, 2000	Co-60	0.97 ± 1.93	0.82 ± 3.64	0.90 ± 2.06
BS-3212, 3213	Apr, 2000	Gr. Beta	7.90 ± 1.97	7.57 ± 1.88	7.74 ± 1.36
SW-,	May, 2000	K-40	1.30 ± 0.13	1.20 ± 0.12	1.25 ± 0.09
MI-2810, 2811	May, 2000	K-40	1,285.00 ± 111.00	1,338.00 ± 127.00	1,311.50 ± 84.34

Table A-5. In-house "duplicate" samples.

Lab Codes	Sample Date	Analysis	Concentration in pCi/L[a] First Result	Second Result	Averaged Result
SW-3003, 3004	May, 2000	Gr. Beta	5.06 ± 0.73	5.27 ± 0.73	5.17 ± 0.52
F-2831, 2832	May, 2000	Co-60	0.01 ± 0.01	0.00 ± 0.01	0.01 ± 0.01
F-2831, 2832	May, 2000	Cs-137	-0.00 ± 0.01	0.00 ± 0.01	0.00 ± 0.01
WW-3128, 3129	May, 2000	Gr. Beta	5.41 ± 1.35	4.43 ± 1.22	4.92 ± 0.91
BS-3411, 3412	May, 2000	Co-60	-0.00 ± 0.01	0.01 ± 0.01	0.00 ± 0.01
BS-3411, 3412	May, 2000	Cs-137	0.01 ± 0.01	0.00 ± 0.01	0.00 ± 0.00
F-3436, 3437	May, 2000	Co-60	0.01 ± 0.01	0.00 ± 0.01	0.01 ± 0.00
F-3436, 3437	May, 2000	Cs-137	0.00 ± 0.01	-0.00 ± 0.00	-0.00 ± 0.00
F-2978, 2979	May, 2000	K-40	2.72 ± 0.26	2.14 ± 0.30	2.43 ± 0.20
SS-3482, 3483	May, 2000	Cs-137	0.11 ± 0.03	0.12 ± 0.03	0.12 ± 0.02
SS-3482, 3483	May, 2000	K-40	11.26 ± 0.57	11.37 ± 0.54	11.32 ± 0.39
BS-3458, 3459	May, 2000	Co-60	0.01 ± 0.01	0.02 ± 0.01	0.01 ± 0.01
BS-3458, 3459	May, 2000	Cs-137	0.04 ± 0.01	0.03 ± 0.02	0.03 ± 0.01
MI-3510, 3511	May, 2000	Co-60	0.48 ± 3.05	-0.80 ± 2.74	-0.16 ± 2.05
MI-3510, 3511	May, 2000	Cs-137	1.17 ± 2.96	0.38 ± 2.60	0.77 ± 1.97
MI-3510, 3511	May, 2000	I-131	-0.06 ± 0.25	-0.04 ± 0.24	-0.05 ± 0.17
SO-3629, 3630	May, 2000	Cs-137	0.23 ± 0.03	0.20 ± 0.03	0.22 ± 0.02
SO-3629, 3630	May, 2000	Gr. Beta	20.49 ± 2.82	19.14 ± 2.73	19.82 ± 1.96
SO-3629, 3630	May, 2000	K-40	13.03 ± 0.61	12.25 ± 0.57	12.64 ± 0.42
SW-3904, 3905	May, 2000	Gr. Beta	6.27 ± 1.83	7.02 ± 1.90	6.65 ± 1.32
SW-3904, 3905	May, 2000	Co-60	-0.65 ± 1.54	1.32 ± 1.77	0.33 ± 1.17
SW-3904, 3905	May, 2000	Cs-137	0.19 ± 1.22	-0.16 ± 1.15	0.01 ± 0.84
SW-3904, 3905	May, 2000	Gr. Beta	6.27 ± 1.83	7.02 ± 1.90	6.64 ± 1.32
SP-3833, 3834	May, 2000	Gr. Alpha	4.19 ± 1.34	3.22 ± 1.20	3.71 ± 0.90
MI-3105, 3106	May, 2000	K-40	1,460.00 ± 173.00	1,452.00 ± 110.00	1,456.00 ± 102.50
VE-3191, 3192	May, 2000	Be-7	0.42 ± 0.23	0.39 ± 0.16	0.40 ± 0.14
VE-3191, 3192	May, 2000	Gr. Alpha	0.15 ± 0.06	0.28 ± 0.07	0.22 ± 0.05
VE-3191, 3192	May, 2000	Gr. Beta	3.76 ± 0.13	3.88 ± 0.14	3.82 ± 0.10
VE-3191, 3192	May, 2000	K-40	3.58 ± 0.43	3.47 ± 0.72	3.53 ± 0.42
MI-3718, 3719	May, 2000	K-40	1,447.00 ± 165.00	1,444.00 ± 177.00	1,445.50 ± 120.99
DW-3770, 3771	May, 2000	Gr. Beta	5.92 ± 1.32	4.54 ± 1.10	5.23 ± 0.86
MI-3653, 3654	Jun, 2000	K-40	1,407.00 ± 170.00	1,388.00 ± 102.00	1,397.50 ± 99.13
SW-4614, 4615	Jun, 2000	Sr-90	0.50 ± 0.27	0.55 ± 0.27	0.53 ± 0.19
WW-3883, 3884	Jun, 2000	H-3	4,401.80 ± 204.60	4,298.00 ± 202.70	4,349.90 ± 144.00
WW-3883, 3884	Jun, 2000	Co-60	0.91 ± 3.01	-0.28 ± 1.52	0.32 ± 1.69
WW-3883, 3884	Jun, 2000	Cs-137	0.49 ± 2.16	0.66 ± 1.82	0.57 ± 1.41
WW-3883, 3884	Jun, 2000	H-3	4,401.78 ± 204.63	4,297.96 ± 202.67	4,349.87 ± 144.00

Table A-5. In-house "duplicate" samples.

Lab Codes	Sample Date	Analysis	Concentration in pCi/L[a] First Result	Second Result	Averaged Result
BS-3980, 3981	Jun, 2000	Cs-137	0.07 ± 0.02	0.08 ± 0.02	0.08 ± 0.01
BS-3980, 3981	Jun, 2000	Cs-137	0.06 ± 0.02	0.07 ± 0.02	0.07 ± 0.01
BS-3980, 3981	Jun, 2000	K-40	1,458.60 ± 69.40	1,421.90 ± 52.20	1,440.25 ± 43.42
VE-4065, 4066	Jun, 2000	K-40	6.37 ± 0.54	6.34 ± 0.51	6.36 ± 0.37
WW-4252, 4253	Jun, 2000	H-3	705.40 ± 114.10	718.90 ± 114.60	712.15 ± 80.86
TSWU-4283, 4284	Jun, 2000	Gr. Beta	3.24 ± 0.63	3.11 ± 0.62	3.18 ± 0.44
F-4438, 4439	Jun, 2000	Gr. Beta	2.25 ± 0.06	2.13 ± 0.06	2.19 ± 0.04
SW-4459, 4460	Jun, 2000	H-3	532.20 ± 108.10	670.50 ± 112.90	601.35 ± 78.15
WW-4480, 4481	Jun, 2000	H-3	601.50 ± 99.50	573.10 ± 108.50	587.30 ± 73.61
SW-4375, 4376	Jun, 2000	Gr. Beta	4.53 ± 1.59	4.43 ± 1.54	4.48 ± 1.11
SW-4375, 4376	Jun, 2000	Cs-137	-0.09 ± 1.61	-0.43 ± 1.39	-0.26 ± 1.06
AP-,	Jun, 2000	Be-7	0.06 ± 0.02	0.07 ± 0.01	0.07 ± 0.01
AP-4712, 4713	Jun, 2000	Be-7	0.07 ± 0.02	0.09 ± 0.02	0.08 ± 0.01
SW-4537, 4538	Jun, 2000	H-3	584.10 ± 108.80	599.20 ± 109.30	591.65 ± 77.11
SL-4636, 4637	Jul, 2000	Be-7	0.93 ± 0.18	0.56 ± 0.12	0.75 ± 0.11
SL-4636, 4637	Jul, 2000	Gr. Beta	2.41 ± 0.32	2.69 ± 0.32	2.55 ± 0.23
SL-4636, 4637	Jul, 2000	K-40	1.25 ± 0.24	1.13 ± 0.30	1.19 ± 0.19
SL-4636, 4637	Jul, 2000	Sr-90	0.04 ± 0.02	0.05 ± 0.03	0.05 ± 0.02
G-4667, 4668	Jul, 2000	Be-7	0.93 ± 0.20	0.98 ± 0.31	0.96 ± 0.18
G-4667, 4668	Jul, 2000	Gr. Beta	6.16 ± 0.13	6.68 ± 0.14	6.42 ± 0.10
G-4667, 4668	Jul, 2000	K-40	7.72 ± 0.51	8.43 ± 0.83	8.08 ± 0.49
WW-4818, 4819	Jul, 2000	H-3	13.30 ± 77.10	29.70 ± 77.90	21.50 ± 54.80
MI-4839, 4840	Jul, 2000	K-40	1,313.00 ± 173.00	1,398.00 ± 161.00	1,355.50 ± 118.16
MI-4949, 4950	Jul, 2000	K-40	1,307.00 ± 56.00	1,346.00 ± 58.00	1,326.50 ± 40.31
LW-4991, 4992	Jul, 2000	Gr. Beta	2.78 ± 0.66	2.22 ± 0.55	2.50 ± 0.43
MI-4903, 4904	Jul, 2000	K-40	1,383.10 ± 193.20	1,328.00 ± 153.10	1,355.55 ± 123.25
MI-4881, 4882	Jul, 2000	K-40	1,538.40 ± 103.00	1,438.00 ± 125.30	1,488.20 ± 81.10
MI-4881, 4882	Jul, 2000	Sr-90	1.01 ± 0.37	1.38 ± 0.42	1.19 ± 0.28
G-5388, 5389	Jul, 2000	Be-7	1.64 ± 0.16	1.52 ± 0.21	1.58 ± 0.13
G-5388, 5389	Jul, 2000	K-40	5.51 ± 0.33	5.86 ± 0.49	5.69 ± 0.30
G-5388, 5389	Jul, 2000	Gr. Beta	5.64 ± 0.15	5.81 ± 0.15	5.73 ± 0.11
SWU-5473, 5474	Jul, 2000	Gr. Beta	3.50 ± 0.67	3.17 ± 0.61	3.34 ± 0.45
SW-5410, 5411	Jul, 2000	Gr. Beta	1.95 ± 0.81	1.89 ± 1.04	1.92 ± 0.66
PW-5550, 5551	Jul, 2000	Gr. Beta	0.71 ± 1.15	2.50 ± 1.49	1.61 ± 0.94
WW-5623, 5624	Jul, 2000	H-3	22,713.90 ± 429.00	22,265.50 ± 424.90	22,489.70 ± 301.90
MI-5529, 5530	Aug, 2000	K-40	1,396.80 ± 103.80	1,278.20 ± 117.50	1,337.50 ± 78.39
VE-,	Aug, 2000	K-40	1.66 ± 0.32	1.93 ± 0.33	1.80 ± 0.23

Table A-5. In-house "duplicate" samples.

Lab Codes	Sample Date	Analysis	Concentration in pCi/L[a] First Result	Second Result	Averaged Result
MI-5808, 5809	Aug, 2000	K-40	1,261.90 ± 124.40	1,234.40 ± 152.80	1,248.15 ± 98.52
CW-6514, 6515	Aug, 2000	Gr. Beta	1.42 ± 0.37	1.44 ± 0.41	1.43 ± 0.28
MI-5933, 5934	Aug, 2000	Calcium	0.88 ± 0.09	0.89 ± 0.09	0.89 ± 0.06
MI-5933, 5934	Aug, 2000	Sr-90	3.29 ± 0.51	1.72 ± 0.47	2.51 ± 0.35
VE-6002, 6003	Aug, 2000	Sr-90	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00
VE-6002, 6003	Aug, 2000	K-40	1.44 ± 0.23	1.78 ± 0.18	1.61 ± 0.14
PW-6209, 6210	Aug, 2000	H-3	528.20 ± 112.70	578.50 ± 114.50	553.35 ± 80.33
SW-6291, 6292	Aug, 2000	Gr. Beta	4.14 ± 1.58	1.95 ± 1.32	3.05 ± 1.03
WW-6312, 6313	Aug, 2000	H-3	7,804.20 ± 262.70	7,221.70 ± 253.80	7,512.95 ± 182.64
WW-5981, 5982	Aug, 2000	Gr. Beta	4.85 ± 0.78	5.87 ± 0.79	5.36 ± 0.56
PW-6341, 6342	Aug, 2000	Gr. Beta	2.45 ± 1.42	2.63 ± 1.37	2.54 ± 0.99
CW-6514, 6515	Aug, 2000	H-3	5,600.10 ± 226.80	5,434.30 ± 223.90	5,517.20 ± 159.35
MI-6409, 6410	Sep, 2000	I-131	-0.04 ± 0.23	0.19 ± 0.24	0.08 ± 0.17
MI-6409, 6410	Sep, 2000	K-40	1,367.80 ± 111.40	1,368.60 ± 107.50	1,368.20 ± 77.41
MI-6409, 6410	Sep, 2000	Sr-90	1.19 ± 0.35	0.80 ± 0.30	1.00 ± 0.23
MI-6542, 6543	Sep, 2000	K-40	1,298.00 ± 140.10	1,470.60 ± 139.70	1,384.30 ± 98.92
MI-6450, 6451	Sep, 2000	K-40	1,237.20 ± 102.10	1,328.10 ± 108.30	1,282.65 ± 74.42
MI-7102, 7103	Sep, 2000	I-131	-0.11 ± 0.23	-0.02 ± 0.25	-0.07 ± 0.17
MI-7102, 7103	Sep, 2000	K-40	1,473.10 ± 101.40	1,400.70 ± 168.60	1,436.90 ± 98.37
SWT-7262, 7263	Sep, 2000	Gr. Beta	3.45 ± 0.66	2.32 ± 0.57	2.89 ± 0.44
SWU-7283, 7284	Sep, 2000	Gr. Beta	2.75 ± 0.55	2.87 ± 0.56	2.81 ± 0.39
SWU-7283, 7284	Sep, 2000	H-3	197.76 ± 94.07	172.31 ± 93.00	185.04 ± 66.14
SW-7081, 7082	Sep, 2000	H-3	89.32 ± 92.99	42.38 ± 90.37	65.85 ± 64.83
AP-7685, 7686	Sep, 2000	Be-7	0.07 ± 0.01	0.07 ± 0.01	0.07 ± 0.01
AP-7706, 7707	Sep, 2000	Be-7	0.06 ± 0.01	0.05 ± 0.01	0.05 ± 0.01
SW-7482, 7483	Sep, 2000	Gr. Beta	5.31 ± 1.75	6.70 ± 1.85	6.01 ± 1.27
SP-7347, 7348	Sep, 2000	Gr. Alpha	6.12 ± 1.54	5.68 ± 1.49	5.90 ± 1.07
SW-7436, 7437	Sep, 2000	H-3	40.60 ± 79.90	72.00 ± 81.40	56.30 ± 57.03
CW-7748, 7749	Sep, 2000	Gr. Alpha	0.47 ± 0.28	0.65 ± 0.36	0.56 ± 0.23
CW-7748, 7749	Sep, 2000	Gr. Beta	2.35 ± 0.39	2.02 ± 0.38	2.19 ± 0.27
SL-7304, 7305	Oct, 2000	Gr. Beta	2.94 ± 0.23	2.90 ± 0.23	2.92 ± 0.17
SL-7304, 7305	Oct, 2000	K-40	1.14 ± 0.36	1.73 ± 0.58	1.44 ± 0.34
BS-7369, 7370	Oct, 2000	Cs-137	10.79 ± 4.96	20.04 ± 9.40	15.41 ± 5.31
SO-7950, 7951	Oct, 2000	Ac-228	0.66 ± 0.10	0.77 ± 0.10	0.72 ± 0.07
SO-7950, 7951	Oct, 2000	Bi-214	0.42 ± 0.06	0.57 ± 0.07	0.49 ± 0.05
SO-7950, 7951	Oct, 2000	Cs-137	0.20 ± 0.31	0.21 ± 0.04	0.20 ± 0.16
SO-7950, 7951	Oct, 2000	Gr. Beta	29.22 ± 1.98	28.02 ± 1.98	28.62 ± 1.40

Table A-5. In-house "duplicate" samples.

Lab Codes	Sample Date	Analysis	Concentration in pCi/L[a] First Result	Second Result	Averaged Result
SO-7950, 7951	Oct, 2000	K-40	21.36 ± 0.93	21.77 ± 0.89	21.56 ± 0.64
SO-7950, 7951	Oct, 2000	Pb-212	0.72 ± 0.12	0.92 ± 0.12	0.82 ± 0.09
SO-7950, 7951	Oct, 2000	Ra-226	1.21 ± 0.33	1.30 ± 0.31	1.26 ± 0.22
SO-7950, 7951	Oct, 2000	Tl-208	0.21 ± 0.04	0.25 ± 0.03	0.23 ± 0.02
VE-7554, 7555	Oct, 2000	Gr. Beta	0.73 ± 0.02	0.74 ± 0.02	0.74 ± 0.01
MI-7622, 7623	Oct, 2000	K-40	1,505.90 ± 142.70	1,453.60 ± 172.00	1,479.75 ± 111.74
F-8219, 8220	Oct, 2000	K-40	2.94 ± 0.22	3.39 ± 0.38	3.16 ± 0.22
WW-7844, 7845	Oct, 2000	H-3	-68.13 ± 74.09	84.23 ± 81.38	8.05 ± 55.03
WW-8240, 8241	Oct, 2000	Gr. Beta	0.35 ± 1.89	1.61 ± 2.28	0.98 ± 1.48
WW-8240, 8241	Oct, 2000	H-3	72.46 ± 92.95	38.87 ± 91.51	55.66 ± 65.22
BS-8170, 8171	Oct, 2000	Gr. Beta	11.96 ± 2.55	11.30 ± 2.39	11.63 ± 1.75
BS-8170, 8171	Oct, 2000	K-40	8.36 ± 0.46	8.76 ± 0.47	8.56 ± 0.33
MI-8085, 8086	Oct, 2000	Calcium	0.94	0.94	0.94
MI-8085, 8086	Oct, 2000	Sr-90	1.04 ± 0.35	0.75 ± 0.31	0.90 ± 0.24
MI-8149, 8150	Oct, 2000	K-40	1,358.10 ± 95.81	1,341.80 ± 178.00	1,349.95 ± 101.07
SO-8967, 8968	Oct, 2000	Be-7	1.25 ± 0.37	1.27 ± 0.35	1.26 ± 0.26
SO-8967, 8968	Oct, 2000	Cs-137	0.05 ± 0.02	0.05 ± 0.02	0.05 ± 0.02
SO-8967, 8968	Oct, 2000	K-40	4.53 ± 0.66	4.46 ± 0.58	4.50 ± 0.44
MI-8522, 8523	Oct, 2000	I-131	-0.05 ± 0.23	0.18 ± 0.25	0.07 ± 0.17
SWU-8894, 8895	Oct, 2000	Gr. Beta	3.63 ± 0.62	2.45 ± 0.61	3.04 ± 0.43
MI-8802, 8803	Nov, 2000	I-131	-0.22 ± 0.24	-0.25 ± 0.26	-0.24 ± 0.18
MI-8802, 8803	Nov, 2000	K-40	1,340.50 ± 113.80	1,453.50 ± 100.50	1,397.00 ± 75.91
MI-8802, 8803	Nov, 2000	Sr-89	0.19 ± 1.31	0.61 ± 1.34	0.40 ± 0.94
MI-8802, 8803	Nov, 2000	Sr-90	1.10 ± 0.39	0.90 ± 0.38	1.00 ± 0.27
LW-8823, 8824	Nov, 2000	Gr. Beta	2.13 ± 0.55	1.59 ± 0.52	1.86 ± 0.38
VE-9014, 9015	Nov, 2000	Gr. Alpha	0.10 ± 0.06	0.15 ± 0.07	0.12 ± 0.05
VE-9014, 9015	Nov, 2000	Gr. Beta	5.59 ± 0.17	5.90 ± 0.19	5.74 ± 0.13
PW-9991, 9992	Nov, 2000	Gr. Beta	2.50 ± 0.01	3.49 ± 1.18	3.00 ± 0.59
SW-9991, 9992	Nov, 2000	Co-60	1.16 ± 1.70	-2.94 ± 3.39	-0.89 ± 1.89
SW-9991, 9992	Nov, 2000	Cs-134	-0.07 ± 1.85	2.27 ± 3.73	1.10 ± 2.08
SW-9991, 9992	Nov, 2000	Cs-137	-0.88 ± 1.67	3.84 ± 3.45	1.48 ± 1.92
DW-9682, 9683	Dec, 2000	Gr. Beta	1.61 ± 1.02	2.10 ± 0.94	1.86 ± 0.69
MI-9749, 9750	Dec, 2000	K-40	1,562.40 ± 118.70	1,495.90 ± 168.30	1,529.15 ± 102.97
AP-10782, 10783	Dec, 2000	Be-7	0.21 ± 0.10	0.31 ± 0.14	0.26 ± 0.09
AP-10824, 10825	Dec, 2000	Be-7	0.06 ± 0.02	0.07 ± 0.01	0.06 ± 0.01
WW-10424, 10425	Dec, 2000	H-3	1,690.87 ± 137.81	1,551.48 ± 1,339.42	1,621.18 ± 673.25

Table A-6. Department of Energy's Mixed Analyte Performance Evaluation Program (MAPEP)[a].

Lab Code	Sample Type	Date Collected	Analysis	Concentration[b] Laboratory result[c]	MAPEP Result[d] 1s, N=1	Control Limits
STSO-882	SOIL	Jan, 2000	Am-241	64.90 ± 6.49	61.10	42.77 - 79.43
STSO-882	SOIL	Jan, 2000	Co-57	721.10 ± 83.80	949.00	664.30 - 1,233.70
The MAPEP soil sample (STSO-882), as received, did not closely match a standard gamma geometry. The results for gamma-emitting isotopes are reanalyses, with a reduced sample size.						
STSO-882	SOIL	Jan, 2000	Co-60	1,264.40 ± 78.60	1,180.00	826.00 - 1,534.00
STSO-882	SOIL	Jan, 2000	Cs-134	969.30 ± 76.90	1,047.00	732.90 - 1,361.10
STSO-882	SOIL	Jan, 2000	Cs-137	944.00 ± 92.00	930.00	651.00 - 1,209.00
STSO-882	SOIL	Jan, 2000	K-40	811.70 ± 79.90	652.00	456.40 - 847.60
STSO-882	SOIL	Jan, 2000	Mn-54	1,103.30 ± 64.20	1,023.00	716.10 - 1,329.90
STSO-882	SOIL	Jan, 2000	Ni-63	711.00 ± 71.10	960.00	672.00 - 1,248.00
STSO-882	SOIL	Jan, 2000	Pu-239/40	67.90 ± 6.79	74.40	52.08 - 96.72
STSO-882	SOIL	Jan, 2000	Sr-90	345.00 ± 34.50	304.00	212.80 - 395.20
STSO-882	SOIL	Jan, 2000	U-233/4	62.90 ± 6.29	90.00	63.00 - 117.00
Incomplete dissolution of the sample is suspected. Results of reanalysis: U-233/234 67.3 ± 3.3 pCi/g, U-238 68.1 ± 8.9 pCi/g.						
STSO-882	SOIL	Jan, 2000	U-238	63.20 ± 6.32	93.00	65.10 - 120.90
STSO-882	SOIL	Jan, 2000	Zn-65	1,544.30 ± 61.50	1,540.00	1,078.00 - 2,002.00

[a] Results obtained by Environmental Inc., Midwest Laboratory as a participant in the Department of Energy's Mixed Analyte Performance Evaluation Program, Idaho Operations office, Idaho Falls, Idaho.

[b] All results are in Bq/kg or Bq/L as requested by the Department of Energy.

[c] Unless otherwise indicated, laboratory results are given as the mean ± 1 standard deviations for three determinations.

[d] Results are presented as the known values, expected laboratory precision (1 sigma, 1 determination), and control limits as defined by the MAPEP.

Table A-7. Environmental Measurements Laboratory Quality Assessment Program (EML)[a].

Lab Code	Sample Type	Date Collected	Analysis	Concentration [b] Laboratory result[c]	EML Result[d]	Control Limits[e]
STSO-870	SOIL	Mar, 2000	Ac-228	98.30 ± 7.10	97.60	0.80 - 1.40
STSO-870	SOIL	Mar, 2000	Bi-212	98.50 ± 15.10	106.00	0.80 - 1.40
STSO-870	SOIL	Mar, 2000	Bi-214	88.00 ± 3.80	86.70	0.80 - 1.40
STSO-870	SOIL	Mar, 2000	Cs-137	324.00 ± 5.00	339.00	0.74 - 1.40
STSO-870	SOIL	Mar, 2000	K-40	872.00 ± 34.00	811.00	0.70 - 1.59
STSO-870	SOIL	Mar, 2000	Pb-212	93.70 ± 2.70	97.30	0.80 - 1.30
STSO-870	SOIL	Mar, 2000	Pb-214	100.10 ± 3.70	86.50	0.80 - 1.30
STSO-870	SOIL	Mar, 2000	Pu-238	19.80 ± 3.00	18.60	0.22 - 1.99
STSO-870	SOIL	Mar, 2000	Pu-239/40	8.10 ± 1.70	7.00	0.62 - 1.99
STSO-870	SOIL	Mar, 2000	Sr-90	13.60 ± 3.10	20.20	0.58 - 2.96
STVE-871	VEGETATION	Mar, 2000	Am-241	9.80 ± 0.90	10.40	0.58 - 2.86
STVE-871	VEGETATION	Mar, 2000	Co-60	46.50 ± 2.10	52.80	0.64 - 1.49
STVE-871	VEGETATION	Mar, 2000	Cs-137	1,872.00 ± 46.00	1,380.00	0.75 - 1.48
STVE-871	VEGETATION	Mar, 2000	K-40	506.40 ± 28.00	521.00	0.45 - 1.51
STVE-871	VEGETATION	Mar, 2000	Pu-239/40	14.30 ± 1.50	15.50	0.60 - 1.98
STVE-871	VEGETATION	Mar, 2000	Sr-90	1,198.00 ± 85.00	1,780.00	0.50 - 1.37
STAP-872	AIR FILTER	Mar, 2000	Co-57	5.90 ± 0.10	5.31	0.63 - 1.29
STAP-872	AIR FILTER	Mar, 2000	Co-60	5.90 ± 0.10	5.32	0.74 - 1.25
STAP-872	AIR FILTER	Mar, 2000	Cs-137	7.50 ± 0.10	6.10	0.72 - 1.32
STAP-872	AIR FILTER	Mar, 2000	Gr. Alpha	3.30 ± 0.10	3.02	0.82 - 1.58
STAP-872	AIR FILTER	Mar, 2000	Gr. Beta	2.70 ± 0.10	2.42	0.75 - 1.94
STAP-872	AIR FILTER	Mar, 2000	Mn-54	31.80 ± 0.30	27.20	0.76 - 1.33
STAP-872	AIR FILTER	Mar, 2000	Pu-238	0.06 ± 0.03	0.08	0.61 - 1.55
STAP-872	AIR FILTER	Mar, 2000	Pu-239/40	0.09 ± 0.01	0.09	0.67 - 1.58
STAP-872	AIR FILTER	Mar, 2000	Ru-106	3.50 ± 1.00	2.01	0.54 - 1.59
Result within activity ± error margin.						
STAP-872	AIR FILTER	Mar, 2000	Sr-90	0.31 ± 0.16	0.24	0.62 - 2.26
STAP-872	AIR FILTER	Mar, 2000	Uranium	0.12 ± 0.01	0.13	0.79 - 2.88
STW-874	WATER	Mar, 2000	Am-241	1.70 ± 0.22	1.95	0.66 - 1.56
STW-874	WATER	Mar, 2000	Co-60	51.00 ± 1.20	48.90	0.87 - 1.17

Table A-7. Environmental Measurements Laboratory Quality Assessment Program (EML)[a].

Lab Code	Sample Type	Date Collected	Analysis	Concentration [b] Laboratory result[c]	EML Result[d]	Control Limits[e]
STW-874	WATER	Mar, 2000	Cs-137	108.60 ± 1.80	103.00	0.87 - 1.17
STW-874	WATER	Mar, 2000	Fe-55	33.00 ± 1.20	33.10	0.27 - 1.62
STW-874	WATER	Mar, 2000	Gr. Alpha	1,217.00 ± 35.00	1,700.00	0.55 - 1.31
STW-874	WATER	Mar, 2000	Gr. Beta	792.00 ± 25.00	690.00	0.75 - 1.65
STW-874	WATER	Mar, 2000	H-3	147.00 ± 26.00	79.40	0.69 - 1.91
STW-874	WATER	Mar, 2000	Ni-63	101.00 ± 6.00	112.00	0.80 - 1.30
STW-874	WATER	Mar, 2000	Pu-238	0.75 ± 0.17	0.94	0.68 - 1.33
STW-874	WATER	Mar, 2000	Pu-239/40	0.99 ± 0.09	0.92	0.62 - 1.38
STW-874	WATER	Mar, 2000	Sr-90	4.46 ± 0.99	3.39	0.73 - 1.35
STW-874	WATER	Mar, 2000	Uranium	0.27 ± 0.02	1.00	0.40 - 1.45
Result reported was for U-234. Result for U (total); 0.58 ± 0.02 pCi/L.						
STSO-885	SOIL	Sep, 2000	Ac-228	78.00 ± 1.50	80.20	0.80 - 1.40
STSO-885	SOIL	Sep, 2000	Bi-212	73.00 ± 3.30	80.50	0.80 - 1.40
STSO-885	SOIL	Sep, 2000	Bi-214	91.00 ± 4.00	83.30	0.80 - 1.40
STSO-885	SOIL	Sep, 2000	Cs-137	925.70 ± 14.20	1,020.00	0.74 - 1.40
STSO-885	SOIL	Sep, 2000	K-40	713.60 ± 7.10	713.00	0.70 - 1.59
STSO-885	SOIL	Sep, 2000	Pb-212	66.10 ± 4.30	79.30	0.80 - 1.40
STSO-885	SOIL	Sep, 2000	Pb-214	100.10 ± 3.70	86.30	0.80 - 1.40
STSO-885	SOIL	Sep, 2000	Pu-239/40	18.40 ± 0.40	16.80	0.62 - 1.99
STSO-885	SOIL	Sep, 2000	Sr-90	39.90 ± 5.30	50.40	0.58 - 2.96
STSO-885	SOIL	Sep, 2000	Th-234	154.70 ± 9.30	148.00	0.80 - 1.40
STSO-885	SOIL	Sep, 2000	Uranium	254.30 ± 13.00	327.00	0.27 - 1.48
STW-886	WATER	Sep, 2000	Am-241	1.30 ± 0.20	1.19	0.66 - 1.56
STW-886	WATER	Sep, 2000	Co-60	71.90 ± 7.20	73.70	0.87 - 1.17
STW-886	WATER	Sep, 2000	Cs-137	62.70 ± 6.30	67.00	0.90 - 1.25
STW-886	WATER	Sep, 2000	H-3	92.30 ± 8.90	91.30	0.69 - 1.91
STW-886	WATER	Sep, 2000	Pu-238	0.70 ± 0.10	0.79	0.68 - 1.33
STW-886	WATER	Sep, 2000	Pu-239/40	0.60 ± 0.10	0.59	0.62 - 1.38
STW-886	WATER	Sep, 2000	Sr-90	4.60 ± 0.40	4.53	0.73 - 1.65
STW-886	WATER	Sep, 2000	Uranium	0.80 ± 0.10	0.92	0.40 - 1.45

Table A-7. Environmental Measurements Laboratory Quality Assessment Program (EML)[a].

Lab Code	Sample Type	Date Collected	Analysis	Concentration [b] Laboratory result[c]	EML Result[d]	Control Limits[e]
STW-887	WATER	Sep, 2000	Gr. Alpha	1,113.70 ± 17.90	1,070.00	0.55 - 1.31
STW-887	WATER	Sep, 2000	Gr. Beta	1,129.40 ± 16.70	950.00	0.75 - 1.65
STAP-888	AIR FILTER	Sep, 2000	Am-241	0.06 ± 0.01	0.03	0.62 - 1.93
STAP-888	AIR FILTER	Sep, 2000	Co-57	16.50 ± 0.60	14.50	0.63 - 1.29
STAP-888	AIR FILTER	Sep, 2000	Co-60	9.20 ± 0.40	8.43	0.74 - 1.25
STAP-888	AIR FILTER	Sep, 2000	Cs-137	8.80 ± 0.50	7.41	0.72 - 1.32
STAP-888	AIR FILTER	Sep, 2000	Mn-54	50.20 ± 2.30	43.20	0.76 - 1.42
STAP-888	AIR FILTER	Sep, 2000	Pu-238	0.03 ± 0.01	0.05	0.61 - 1.55
STAP-888	AIR FILTER	Sep, 2000	Pu-239/40	0.08 ± 0.01	0.07	0.67 - 1.58
STAP-888	AIR FILTER	Sep, 2000	Sr-90	3.30 ± 0.10	1.64	0.62 - 2.26
STAP-888	AIR FILTER	Sep, 2000	U-233/4	0.03 ± 0.00	0.04	0.79 - 2.88
STAP-888	AIR FILTER	Sep, 2000	U-238	0.03 ± 0.01	0.04	0.80 - 2.63
Result within activity ± error margin.						
STAP-888	AIR FILTER	Sep, 2000	Uranium	0.07 ± 0.01	0.08	0.79 - 2.88
STAP-889	AIR FILTER	Sep, 2000	Gr. Alpha	2.84 ± 0.01	2.35	0.82 - 1.58
STAP-889	AIR FILTER	Sep, 2000	Gr. Beta	2.08 ± 0.02	1.52	0.75 - 1.94
STVE-890	VEGETATION	Sep, 2000	Am-241	5.90 ± 1.20	5.60	0.58 - 2.86
STVE-890	VEGETATION	Sep, 2000	Cm-244	3.20 ± 0.10	3.60	0.40 - 1.87
STVE-890	VEGETATION	Sep, 2000	Co-60	29.40 ± 0.40	32.80	0.64 - 1.49
STVE-890	VEGETATION	Sep, 2000	Cs-137	739.30 ± 23.00	867.00	0.75 - 1.48
STVE-890	VEGETATION	Sep, 2000	K-40	597.50 ± 49.30	639.00	0.45 - 1.51
STVE-890	VEGETATION	Sep, 2000	Pu-239/40	4.50 ± 0.20	9.60	0.60 - 1.98
No reason for deviation was found with original result. The result of reanalysis; 12.1 ±1.1 pCi/g.						
STVE-890	VEGETATION	Sep, 2000	Sr-90	1,201.50 ± 117.30	1,150.00	0.50 - 1.37

[a] The Environmental Measurements Laboratory provides the following nuclear species : Air Filters, Soil, Vegetation and Water.

[b] Results are reported in Bq/L with the following exceptions: Air Filter results are reported in Bq/Filter, Soil results are reported in Bq/Kg, Vegetation results are reported in Bq/Kg.

[c] Laboratory results are reported as the mean of three determinations ± standard deviation.

[d] The EML result listed is the mean of replicate determinations for each nuclide±the standard error of the mean.

[e] The control limits are reported by EML as the ratio of Reported Value / EML value.

Appendix B

Summary Tables in the format of NRC Radiological Assessment Branch Technical Position Revision 1, November 1979

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

Name of Facility: Wolf Creek Generating Station Docket No.: 50-482

Location of Facility: Coffey County, Kansas Reporting Period: Annual 2000

Medium of Pathway Sampled (Unit of Measurement)	Analysis and Total Number of Analysis Performed	ODCM Lower Limit of Detection (LLD)	All Indicator Locations ** Mean (f) ** Range	Indicator Location with Highest Annual Mean Name Distance and Direction	** Mean (f) ** Range	Control Locations ** Mean (f) ** Range	Number of Nonroutine Reported Measurements **
Air Particulate ($X10^{-3}$ pCi/Cu.M.)	Gross Beta (264)	10	27 (212/212) (12-63)	32 3.2 miles WNW	28 (52/52) (14-63)	Station No. 40 27 (52/52) (12-57)	0
	Gamma (20)						
	Be-7	-	69 (16/16) (42-130)	37 2.1 miles NNW	77 (4/4) (50-130)	68 (4/4) (40-100)	0
	I-131 (264)	70	- (0/212)	N/A	N/A	- (0/52)	0
External Radiation (mR/day)						Stations 39 & 40	
	TLD (374)	-	0.214 (358/358) (0.124-0.410)	47 .16 miles S	0.346 (8/8) (0.296-0.410)	0.197 (16/16) (0.171-0.226)	0
Surface Water (pCi/l)	Gamma (32)		-(0/20)	N/A	N/A	MUSH -(0/12)	0
	Tritium (32)	3000	14288 (20/20) (11000-28600)	DC 0.6 miles WNW	15205 (12/12) (11000-28600)	-(0/12)	0
Ground Water (pCi/l)	I-131 (20)	1	-(0/16)	N/A	N/A	B-12 -(0/4)	0
	Gamma (20)		-(0/16)	N/A	N/A	-(0/4)	0
	K-40		-(0/16)	N/A	N/A	18.7 (1/4)	
	Tritium (20)	3000	-(0/16)	N/A	N/A	-(0/4)	0

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

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

Name of Facility: Wolf Creek Generating Station Docket No.: 50-482

Location of Facility: Coffey County, Kansas Reporting Period: Annual 2000

Medium of Pathway Sampled (Unit of Measurement)	Analysis and Total Number of Analysis Performed	ODCM Lower Limit of Detection (LLD)	All Indicator Locations ** Mean (f) ** Range	Indicator Location with Highest Annual Mean Name Distance and Direction	** Mean (f) ** Range	Control Locations ** Mean (f) ** Range	Number of Nonroutine Reported Measurements **
Drinking Water (pCi/l)	I-131 (24)	1	-(0-12)	N/A	N/A	BW-15 -(0/12)	0
	Gross Beta (24)	4	5.6 (12/12) (2.4-7.8)	LW-40 >10.0 miles SSE	5.6 (12/12) (2.4-7.8)	5.8 (12/12) (4.6-8.5)	0
	Gamma (24)		-(0/12)	N/A	N/A	-(0/12)	0
	Tritium (8)	2000	-(0/4)	N/A	N/A	-(0/4)	0
Shoreline Sediment (pCi/kg dry)	Gamma (6)					JRR	
	Be-7	-	868 (1/4)	EEA 3.0 miles NNW	868 (1/1)	- (0/2)	0
	K-40	-	10712 (4/4) (9466-12000)	EEA 3.0 miles NNW	12000 (1/1)	10721 (2/2) (9610-11831)	0
	Co-60	-	51.7 (1/4)	DC 0.6 miles WNW	51.7 (1/2)	-(0/2)	0
	Cs-137	180	165.4 (2/4) (66.8-264)	EEA 3.0 miles NNW	264 (1/1)	- (0/2)	0
	Ra-226	-	2757 (3/4) (2320-3190)	MUDS 1.5 miles WNW	3190 (1/1)	4520 (1/2)	0
	Th-228	-	1260 (3/4) (1110-1340)	MUDS 1.5 miles WNW	1340 (1/1)	1910 (1/2)	0

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

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

Name of Facility: Wolf Creek Generating Station Docket No.: 50-482

Location of Facility: Coffey County, Kansas Reporting Period: Annual 2000

Medium of Pathway Sampled (Unit of Measurement)	Analysis and Total Number of Analysis Performed	ODCM Lower Limit of Detection (LLD)	All Indicator Locations ** Mean (f) ** Range	Indicator Location with Highest Annual Mean Name Distance and Direction	** Mean (f) ** Range	Control Locations ** Mean (f) ** Range	Number of Nonroutine Reported Measurements **
Fish (pCi/kg wet)	Gamma (16)					JRR	
	K-40	-	3350 (9/9) (1990-4362)	WCL 0.6 miles	3350 (9/9) (1990-4362)	3186 (7/7) (2341-3750)	0
	Tritium (16)	-	8293 (9/9) (6300-10362)	WCL 0.6 miles	8293 (9/9) (6300-10362)	90 (3/7) (68-109)	0
Broadleaf Vegetation (pCi/kg wet)	Gamma (10)					S-4	
	Be-7	-	911 (6/7) (375-2080)	E-1 1.8 miles E	1005 (2/2) (479-1530)	795 (3/3) (184-1170)	0
	K-40	-	4423 (7/7) (2690-5870)	F-1 1.8 miles ESE	4750 (2/2) (4730-4770)	4467 (3/3) (3710-5610)	0
Crops (pCi/kg wet)	Gamma (4)					NR-U1	
	K-40	-	17845 (2/2) (17678-18012)	NR-D1 9.2 miles S	18012 (1/1)	10410 (2/2) (3967-16853)	0

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

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

Name of Facility: Wolf Creek Generating Station Docket No.: 50-482

Location of Facility: Coffey County, Kansas Reporting Period: Annual 2000

Medium of Pathway Sampled (Unit of Measurement)	Analysis and Total Number of Analysis Performed	ODCM Lower Limit of Detection (LLD)	All Indicator Locations ** Mean (f) ** Range	Indicator Location with Highest Annual Mean Name Distance and Direction	** Mean (f) ** Range	Control Locations ** Mean (f) ** Range	Number of Nonroutine Reported Measurements **
Bottom Sediment (pCi/kg dry)	Gamma (4)					JRR	
	Be-7	-	- (0/2)			1040 (1/2)	0
	K-40	-	12881 (2/2) (11100-14662)	DC 0.6 miles WNW	12881 (2/2) (11100-14662)	14105 (2/2) (13210-15000)	0
	Co-60	-	577 (2/2) (549-606)	DC 0.6 miles WNW	577 (2/2) (549-606)	- (0/2)	0
	Cs-134	-	98.4 (1/2)	DC 0.6 miles WNW	98.4 (1/2)	- (0/2)	0
	Cs-137	-	328 (2/2) (305-351)	DC 0.6 miles WNW	328 (2/2) (305-351)	127.8 (2/2) (94.7-161)	0
	Ra-226	-	2570 (1/2)	DC 0.6 miles WNW	2570 (1/2)	1700 (1/2)	0
	Th-228	-	1290 (1/2)	DC 0.6 miles WNW	1290 (1/2)	1240 (1/2)	0

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

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

Name of Facility: Wolf Creek Generating Station Docket No.: 50-482

Location of Facility: Coffey County, Kansas Reporting Period: Annual 2000

Medium of Pathway Sampled (Unit of Measurement)	Analysis and Total Number of Analysis Performed	ODCM Lower Limit of Detection (LLD)	All Indicator Locations ** Mean (f) ** Range	Indicator Location with Highest Annual Mean Name Distance and Direction	** Mean (f) ** Range	Control Locations ** Mean (f) ** Range	Number of Nonroutine Reported Measurements **
Aquatic Vegetation (pCi/kg wet)	Gamma (5)					No Control	
	Be-7	-	681 (3/5) (456-1110)	DC 0.6 miles WNW	1110 (1/1)		0
	K-40	-	3781 (5/5) (1744-5250)	MUDS 1.5 miles WNW	5250 (1/1)		0
	Co-58	-	19.7 (1/5)	DC 0.6 miles WNW	19.7 (1/1)		0
	Co-60	-	57.2 (3/5) (6.2-154)	DC 0.6 miles WNW	154 (1/1)		0
	Cs-134	-	44.4 (1/5)	DC 0.6 miles WNW	44.4 (1/1)		0
	Cs-137	-	45.1 (4/5) (6.0-94.5)	DC 0.6 miles WNW	94.5 (1/1)		0
	Ra-226	-	851 (3/5) (453-1560)	DC 0.6 miles WNW	1560 (1/1)		0
	Th-228	-	411 (3/5) (263-655)	DC 0.6 miles WNW	655 (1/1)		0

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

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

Name of Facility: Wolf Creek Generating Station Docket No.: 50-482

Location of Facility: Coffey County, Kansas Reporting Period: Annual 2000

Medium of Pathway Sampled (Unit of Measurement)	Analysis and Total Number of Analysis Performed	ODCM Lower Limit of Detection (LLD)	All Indicator Locations ** Mean (f) ** Range	Indicator Location with Highest Annual Mean Name Distance and Direction	** Mean (f) ** Range	Control Locations ** Mean (f) ** Range	Number of Nonroutine Reported Measurements **
Terrestrial Vegetation (pCi/kg wet)	Gamma (2)					No Control	
	Be-7	-	879 (2/2) (357-1400)	MUDS 1.5 miles WNW	1400 (1/1)		0
	K-40	-	4280 (2/2) (4270-4290)	MUDS 1.5 miles WNW	4290 (1/1)		0
Soil (pCi/kg dry)	Gamma (2)					No Control	
	K-40	-	10910 (2/2) (9720-12100)	EEA 3.0 miles NNW	12100 (1/1)		0
	Cs-137	-	168 (1/2)	EEA 3.0 miles NNW	168 (1/1)		0
	Ra-226	-	2765 (2/2) (2650-2880)	MUDS 1.5 miles WNW	2880 (1/1)		0
	Th-228	-	1375 (2/2) (1170-1580)	MUDS 1.5 miles WNW	1580 (1/1)		0

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