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REPORT TO

WISCONSIN PUBLIC SERVICE CORPORATION
WISCONSIN POWER AND LIGHT COMPANY
MADISON GAS AND ELECTRIC COMPANY

RADIOLOGICAL MONITORING PROGRAM FOR THE KEWAUNEE NUCLEAR POWER PLANT KEWAUNEE, WISCONSIN

ANNUAL REPORT - PART I
SUMMARY AND INTERPRETATION
January - December 1994

PREPARED AND SUBMITTED
BY
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PREFACE

The staff members of the Teledyne Isotopes Midwest Laboratory (TIML) were responsible for the acquisition of data presented in this report. Assistance in sample collection was provided by Wisconsin Public Service Corporation personnel.

The report was prepared by L. G. Huebner, Manager. He was assisted in report preparation by other staff members of the laboratory.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

In addition, the following tables are in the Appendices:

Appendix A

Appendix C

1.0 INTRODUCTION

The Kewaunee Nuclear Power Plant is a 535 megawatt pressurized water reactor located on the Wisconsin shore of Lake Michigan in Kewaunee County. The Kewaunee Nuclear Power Plant became critical on March 7, 1974. Initial Power generation was achieved on April 8, 1974, and the Plant was declared commercial on June 16, 1974. This report summarizes the environmental operation data collected during the period January - December 1994.

Wisconsin Public Service Corporation, an operating company for the Kewaunee Nuclear Power Plant, assumes the responsibility for the environmental program at the Plant and any questions relating to this subject should be directed to them.

2.0 SUMMARY

Results of sample analyses during the period January - December 1994 are summarized in Table 4.5. Radionuclide concentrations measured at indicator locations are compared with levels measured at control locations and in preoperational studies. The comparisons indicate background-level radioactivities in all samples collected.

3.0 RADIOLOGICAL SURVEILLANCE PROGRAM

Following is a description of the Radiological Surveillance Program and its execution.

3.1 Methodology

The sampling locations are shown in Figure 4-1. Table 4.1 describes the locations, lists for each direction and distance from the reactor, and indicates which are indicators and which are control locations.

The sampling program monitors the air, terrestrial, and aquatic environments. The types of samples collected at each location and the frequency of collections are presented in Table 4.2, using sample codes defined in Table 4.3. The collections and analyses that comprise the program are described below. Finally, the execution of the program in the current reporting year is discussed.

3.1.1 The Air Program

Airborne Particulates

The airborne particulate samples are collected on 47 mm diameter glass fiber filters at a volumetric rate of approximately one cubic foot per minute. The filters are collected weekly from six locations (K-1f, K-2, K-7, K-8, K-15 and K-16), and dispatched by mail to TIML for radiometric analysis. The material on the filter is counted for gross beta activity approximately five days after receipt to allow for decay of naturally-occurring short-lived radionuclides.

Quarterly composites from each sampling location are analyzed for gamma-emitting isotopes by a germanium detector.

Airborne Iodine

Charcoal filters are located at locations K-1f, K-2, K-7, K-8, K-15 and K-16. The filters are changed bi-weekly and analyzed for iodine-131 immediately after arrival at the laboratory.

Ambient Gamma Radiation - TLDs

The integrated gamma-ray background is measured at six air sampling locations (K-1f, K-2, K-7, K-8, K-15 and K-16), at four milk sampling locations (K-3, K-4, K-5 and K-6), and four additional sites (K-17, located 4.25 miles west of the plant; K-27, located 1.5 miles northwest of the plant; K-30, located 1.0 miles north of the plant and K-31, located 6.25 miles north-northwest of the plant) by thermoluminescent dosimetry (TLDs). Two TLD cards, each having four main readout areas containing $CaSO_4$:Dy phosphor, are placed at each location (eight TLDs at each location). One card is exchanged quarterly, the other card is exchanged annually and read only on an emergency basis.

Precipitation

Monthly composites of precipitation samples collected at K-11 are analyzed for tritium activity by liquid scintillation.

3.1.2 The Terrestrial Program

Milk

Milk samples are collected semimonthly (one gallon from each location) from May through October, and monthly (two gallons from each location) during the rest of the year from four herds that graze within four miles of the reactor site (K-4, K-5, K-12 and K-19), from two herds that graze between four and ten miles from the reactor site (K-3 and K-6), and from a dairy in Green Bay (K-28). The milk samples are analyzed for iodine-131, strontium-89 and-90, cesium-137, barium-140, potassium-40, calcium and stable potassium.

Well Water

One gallon water samples are collected quarterly from four off-site wells located at K-10, K-11, K-12, and K-13, and from two on-site wells located at K-1g and K-1h.

Gross beta and gamma spectroscopic analyses are performed on the total residue of each water sample. The concentration of potassium-40 is calculated from total potassium, which is determined by flame photometry on all samples.

Additionally, samples of water from two on-site wells (K-1g and K-1h) are also analyzed for gross alpha. Water from one on-site well (K-1g) is also analyzed for tritium, strontium-89, and strontium-90.

Domestic Meat

Domestic meat samples (chickens) are obtained annually (in the third quarter) at locations K-20, K-24, K-27, and K-29. The flesh is separated from the bones, gamma scanned, and analyzed for gross alpha and gross beta activities.

Eggs

Eggs are collected quarterly at location K-27. The samples are gamma scanned and analyzed for gross beta, strontium-89, and strontium-90 activities.

Vegetables

Vegetable samples (6 varieties) are collected at locations K-17 and K-26, and two varieties of grain, if available, at location K-23. The samples are gamma scanned and analyzed for gross beta, strontium-89 and strontium-90 activities.

Grass and Cattle Feed

Grass samples are collected during the second, third, and fourth quarters from two on-site locations (K-1b and K-1f) and from six dairy farms (K-3, K-4, K-5, K-6, K-12 and K-19). The samples are analyzed for gross beta, strontium-89, strontium-90 and gamma emitting isotopes. During the first quarter, cattle feed is collected from the same six dairy farms, and the same analyses are performed.

Soil

Soil samples are collected twice a year on-site at K-1f and from the six dairy farms (K-3, K-4, K-5, K-6, K-12, and K-19). The samples are analyzed for gross alpha, gross beta, strontium-89, strontium-90 and gamma emitting isotopes.

3.1.3 The Aquatic Program

Surface Water

One-gallon water samples are taken monthly from three locations on Lake Michigan: 1) at the point where the condenser water is discharged into Lake Michigan (K-1d); 2) Two Creeks Park (K-14) located 2.5 miles south of the reactor site; and 3) at the main pumping station located approximately equidistant from Kewaunee and Green Bay, that pumps water from the Rostok water intake (K-9) located 11.5 miles north of the reactor site. Both raw and tap water are collected at K-9. Additionally, one-gallon water samples are taken monthly from three creeks that pass through the site (K-1a, K-1b, and K-1e). Samples from North and Middle Creeks (K-1a, K-1b) are collected near the mouth of each creek. Samples from the South Creek (K-1e) are collected about ten feet downstream from the point where the outflow from the two drain pipes meet. Water samples at K-14 are collected and analyzed in duplicate.

The water samples are gamma scanned and analyzed for gross beta activity in the total residue, dissolved solids and suspended solids, and potassium-40. The concentration of potassium-40 is calculated from total potassium, which is determined by flame photometry. The tritium activity is determined by liquid scintillation technique. Quarterly composites of monthly grab samples are also analyzed for tritium, strontium-89 and strontium-90.

Fish

Fish samples are collected during the second, third and fourth quarters at location K-1d. The flesh is separated from the bones, gamma scanned and analyzed for gross beta activity. Ashed bone samples are analyzed for gross beta, strontium-89 and strontium-90 activities.

Slime

Slime samples are collected during the second and third quarters from three Lake Michigan locations (K-1d, K-9 and K-14), and from three creek locations (K-1a, K-1b, and K-1e), if available. The samples are analyzed for gross beta activity. If the quantity is sufficient, they are also gamma scanned and analyzed for strontium-89 and strontium-90 activities.

Bottom Sediments

Bottom sediments are collected in May and November from five locations (K-1c, K-1d, K-1j, K-9 and K-14). The samples are analyzed for gross beta, strontium-89, strontium-90 and gamma emitting isotopes. Since it is known that the measured radioactivity per unit mass of sediment increases with decreasing particle size, the sampling procedure is designed to assure collection of very fine particles.

3.1.4 Program Execution

Program execution is summarized in Table 4.4. The program was executed as described in the preceding sections, with the following exceptions:

No domestic meat sample was available at location K-20 during 1994.

3.1.5 Program Modifications

Two new TLD locations (K-30 and K-31) were added in the fourth quarter of 1994.

3.2 Results and Discussion

The results for the reporting period January to December 1994 are presented in summary form in Table 4.5. For each type of analysis of each sampled medium, this table shows the annual mean and range for all indicator locations and for all control locations. The location with the highest annual mean and the results for this location are also given.

The discussion of the results has been divided into three broad categories: the air, terrestrial, and aquatic environments. Within each category, samples will be discussed in the order listed in Table 4.4. Any discussion of previous environmental data for the Kewaunee Nuclear Power Plant refers to data collected by Teledyne Isotopes Midwest Laboratory or its predecessor, Hazleton Environmental Sciences.

The tabulated results of all measurements made in 1994 are not included in this section, although references to these results will be made in the discussion. The complete tabulation of the 1994 results is contained in Part II of the 1994 annual report on the Radiological Monitoring Program for the Kewaunee Nuclear Power Plant.

3.2.1 Atmospheric Nuclear Detonations and Nuclear Accidents

There were no reported atmospheric nuclear tests in 1994. The last reported test was conducted by the People's Republic of China on October 16, 1980. The reported yield was in the 200 kiloton to 1 megaton range.

There were no reported accidents at nuclear facilities in 1994.

3.2.2 The Air Environment

Airborne Particulates

In air particulates, the annual gross beta concentration at indicator and control locations measured 0.016 and 0.018 pCi/m^3 respectively. These concentrations were slightly lower than in 1988 (0.025 and 0.023 pCi/m^3, respectively), in 1989 (0.025 and 0.024 pCi/m^3, respectively), in 1990 (0.024 pCi/m^3 at both locations), in 1991 and in 1992 (0.018 and 0.019 pCi/m^3, respectively), and in 1993 (0.020 pCi/m^3 at both locations).

Gamma spectroscopic analyses of quarterly composites of air particulate filters yielded similar results for indicator and control locations. Beryllium-7, which is produced continuously in the upper atmosphere by cosmic radiation (Arnold and Al-Salih, 1955), was detected in all samples. All other gamma-emitting isotopes were below their respective LLD limits.

Airborne Iodine

Bi-monthly levels of airborne iodine-131 were below the lower limit of detection (LLD) of 0.03 pCi/m^3 at all locations. Thus, there is no indication of an effect of the plant operation on the local air environment.

Ambient Gamma Radiation - TLDs

Ambient gamma radiation was monitored by TLDs at twelve locations: six indicator and six control.

The quarterly TLDs at the indicator locations measured a mean dose equivalent of (14.8±1.3 mR/91 days)*, in agreement with the mean at the control locations of (13.8±0.6 mR/91 days)*, and were similar to the means obtained in 1988 (18.0 and 17.4 mR/91 days, respectively), in 1989 (17.5 and 16.9 mR/91 days, respectively), in 1990 (14.4 mR/91 days at both indicator and control locations), in 1991 (13.7 and 12.5 mR/91 days, respectively), in 1992 (15.0 and 13.8 mR/91 days, respectively, and in 1993 (15.0 and 13.8 mR/91 days, respectively). All these values are slightly lower than the United States average value of 19.5 mR/91 days due to natural background radiation (National Council on Radiation Protection and Measurements, 1975). The highest annual mean was 17.4 mR/91 days, measured at both indicator location K-7 and control location K-3.

Precipitation

Precipitation was monitored at one indicator location, K-11. The tritium concentration was below the LLD level of 330 pCi/L in all samples.

3.2.3 The Terrestrial Environment

Milk

Of the 126 analyses for iodine-131 in milk, all were below the LLD level of 0.5 pCi/L.

Strontium-89 concentration was below the LLD level of 1.6 pCi/L in all samples.

Low levels of Strontium-90 were found in all samples tested. The mean values were nearly identical for indicator and control locations (1.7 and 1.5 pCi/L, respectively) and were nearly identical to those in 1989 (1.6 and 1.7 pCi/L, respectively), in 1990 (1.7 and 1.6 pCi/L, respectively), in 1991 (1.6 and 1.7 pCi/L, respectively), in 1992 (1.7 and 1.6 pCi/L, respectively), and in 1993 (1.7 and 1.4 pCi/L, respectively) .

Barium-140-Lanthanum-140 concentration was below the LLD of 15 pCi/L in all samples. Cesium-137 concentration was below the LLD of 10 pCi/L in all samples.

Potassium-40 results were similar at both the indicator and control locations (1420 and 1430 pCi/L, respectively), and were essentially identical to the levels observed in 1978 through 1993.

*Unless otherwise indicated, uncertainties of average values are standard deviations of the individual measurements over the period averaged. The uncertainty for each location corresponds to the two-standard deviation error of the average dose of eight dosimeters placed at the location.

Milk (continued)

Due to the chemical similarities between strontium and calcium, and cesium and potassium, organisms tend to deposit cesium-137 in the soft tissue and muscle and strontium-89 and-90 in the bones. Consequently, the ratios of strontium-90 activity to the weight of calcium in milk and cesium-137 activity to the weight of potassium in milk were monitored in order to detect potential environmental accumulation of these radionuclides. No statistically significant variations in the ratios were observed. The measured concentrations of stable potassium and calcium are in agreement with previously determined values of 1.50±0.21 g/L and 1.16±0.08 g/L, respectively (National Center for Radiological Health, 1968).

Well Water

Gross alpha concentration was measured at the two on-site wells, (K-1g and K-1h) and averaged less than 2.8 pCi/L in all but one sample. One sample from location K-1g measured 3.3 pCi/L.

Gross beta concentration in well water averaged 1.2 pCi/L in samples from the control location. The mean value for all indicator locations was 2.0 pCi/L and was nearly identical to the values observed in 1977 through 1993 (3.3, 3.4, 3.0, 3.0, 3.6, 3.2, 2.9, 2.3, 2.6, 2.5, 2.1, 3.3, 2.5, 2.0, 2.2, 2.6 and 2.2 pCi/L respectively). The difference of 0.8 pCi/L in mean gross beta concentrations is not statistically significant because the counting uncertainties of the individual measurements are typically 0.3 to 1.3 pCi/L in all samples.

Tritium concentration in the on-site well (K-1g) was below the LLD of 330 pCi/L in all samples.

All gamma-emitting isotopes were below their respective LLDs in all samples.

The concentrations of strontium-89 and strontium-90 in well water were below their respective detection limits of 1.0 and 0.5 pCi/L.
Potassium-40 averages were quite low (under 1.7 pCi/L), in agreement with the previously measured values.

Domestic Meat

In meat (chickens), gross alpha concentration was below the LLD level of 0.066 pCi/g wet weight in all samples. Gross beta concentration averaged 2.69 pCi/g wet weight for indicator locations and 2.61 pCi/g wet weight for the control location. The difference is not significant. Gamma-spectroscopic analyses showed that almost all of the beta activity was due to naturally occurring potassium-40. All other gamma-emitting isotopes were below their respective LLD limits.

Eggs

In egg samples, gross beta concentration averaged 1.35 pCi/g wet weight, similar to the concentration of the naturally-occurring potassium-40 observed in the samples (1.23 pCi/g). All other gamma-emitting isotopes were below their respective LLDs. The level of strontium-89 was below the LLD of 0.006 pCi/g wet weight in all samples. Strontium-90 was below the LLD level of 0.002 pCi/g wet weight in all samples.

Vegetables

In vegetables, gross beta concentrations were similar at both the indicator location (3.34 pCi/g wet weight) and at the control locations (2.35 pCi/g wet weight) and was due primarily to the potassium-40 activity. Strontium-89 was below the LLD level of 0.003 pCi/g wet weight in all samples. Strontium-90 activity was below the LLD level of 0.002 pCi/g wet weight in all samples.

All other gamma-emitting isotopes were below their respective LLD levels.

In addition to potassium-40, naturally-occurring beryllium-7 was detected in both oat and clover samples. These samples were of similar radioisotopic composition to the vegetables, but the concentration of radionuclides was slightly higher due to the lower water content of oats and clover in comparison with the vegetables.

Grass and Cattle Feed

In grass, the mean gross beta concentration was similar at both indicator and control locations (7.01 and 7.79 pCi/g wet weight, respectively) and in both cases was predominantly due to naturally occurring potassium-40 and beryllium-7. All other gamma-emitting isotopes were below their respective LLD's. Strontium-89 was below the LLD of 0.018 pCi/g wet weight in all samples. Strontium-90 activity was below the LLD of 0.005 pCi/g wet weight in all but two samples (0.006 and 0.013 pCi/g wet weight).

For cattlefeed, the mean gross beta concentration was lower at the control locations (6.71 pCi/g wet weight) than at indicator locations (9.18 pCi/g wet weight). The highest average gross beta level was in the samples from the indicator location K-19 (12.00 pCi/g wet weight), and reflected the high potassium-40 level (11.14 pCi/g wet weight) observed in the samples. The pattern was similar to that observed in 1978 through 1993. Strontium-89 levels were below the LLD level of 0.014 pCi/g wet weight in all samples. Strontium-90 activity measured 0.020 pCi/g wet at the indicator locations, and was similar to that observed in 1993 (0.022 pCi/g wet weight). Measured activity at the control locations was 0.012 pCi/g wet weight, (0.013 pCi/g wet in 1993). The presence of the radiostrontium is attributable to the fallout from the previous nuclear tests. All other gamma-emitting isotopes were below their respective LLD levels.

Soil

No significant differences were found in gross alpha concentrations between indicator (6.9 pCi/g dry weight) and control (8.4 pCi/g dry weight values) in soil samples. Mean gross beta levels were similar at indicator and control locations (21.4 and 25.9 pCi/g dry weight, respectively), and is primarily due to the potassium-40 activity. Strontium-89 was below the LLD level of 0.032 pCi/g dry weight in all samples. Strontium-90 was detected in seven of ten samples and the level was slightly lower at indicator than at the control locations (0.037 and 0.056 pCi/g dry weight, respectively). Cesium-137 was detected in twelve of fourteen samples and was similar at both control and indicator locations (0.17 and 0.21 pCi/g dry weight, respectively). Beryllium-7 was detected above the LLD level of

Soil (continued)

0.55 pCi/g dry weight in only one of the fourteen samples tested (control location K-6 at 0.77 pCi/g dry). Potassium-40 was detected in all samples and averaged 20.88 and 21.96 pCi/g dry weight at indicator and control locations, respectively. All other gamma-emitting isotopes were below their respective LLD's. The levels of detected activities were similar to those observed from 1979 through 1993.

3.2.4 The Aquatic Environment

Surface Water

In surface water, mean gross beta activity in suspended solids was below the LLD level of 1.7 pCi/L in all samples. Mean gross beta concentration in dissolved solids was higher at indicator locations (5.0 pCi/L) as compared to the control locations (2.3 pCi/L) and was nearly identical to the activities observed in 1978 (5.4 and 2.7 pCi/L), 1979 (5.7 and 2.7 pCi/L), 1980 (5.1 and 2.7 pCi/L), 1981 (4.3 and 2.7 pCi/L), 1982 (4.9 and 2.4 pCi/L), 1983 (5.1 and 2.6 pCi/L), 1984 (5.0 and 2.7 pCi/L), 1985 (5.6 and 2.7 pCi/L), 1986 (4.1 and 2.5 pCi/L), 1987 (5.3 and 2.5 pCi/L) in 1988 (4.8 and 3.6 pCi/L), in 1989 (5.7 and 3.0 pCi/L), in 1990 (4.1 and 2.6 pCi/L), in 1991 (5.1 and 2.2 pCi/L), in 1992 (4.5 and 2.2 pCi/L) and identical to levels in 1993 (5.0 and 2.3 pCi/L). The control sample is Lake Michigan water, which varies very little in gross beta concentration during the year, while indicator samples include two creek locations (K-1a and K-1e) which are much higher in gross beta concentration and exhibit large month-to-month variations. The K-1a creek draws its water from the surrounding fields which are heavily fertilized; and the K-1e creek draws its water mainly from the Sewage Treatment Plant. In general, gross beta concentration levels were high when potassium-40 levels were high and low when potassium-40 levels were low, indicating that the fluctuations in beta concentration were due to variations in potassium-40 concentrations and not to plant operations. The fact that similar fluctuations at these locations were observed in the pre-operational studies conducted prior to 1974 supports this assessment.

Tritium concentration was below the LLD level of 330 pCi/L in all samples.

Strontium-89 concentration was below the LLD of 1.2 pCi/L in all samples. Strontium-90 was detected at both an indicator and a control location with concentrations of 0.8 and 0.7 pCi/L, respectively.

All gamma-emitting isotopes were below their respective LLDs in all samples.

Fish

In fish samples, the gross beta concentration averaged 3.19 pCi/g wet weight in muscles and 1.17 pCi/g wet weight in bone fractions. In muscle, the gross beta concentration was primarily due to potassium-40 activity. The average beta concentration of 3.19 pCi/g wet weight was similar to the average of the 1973 range of 3.34 to 3.62 pCi/g wet weight. The cesium-137 concentration in muscle averaged 0.067 pCi/g wet weight and was roughly half the levels observed in 1979 and 1980 (0.12 pCi/g wet weight in both years), 1981 (0.15 pCi/g wet weight), 1982 (0.17 pCi/g wet weight), 1983 (0.14 pCi/g wet weight), 1984 (0.10 pCi/g

Fish (continued)

wet weight), 1985 (0.11 pCi/g wet weight), 1986 (0.11 pCi/g wet weight), 1987 (0.11 pCi/g wet weight), 1988 (0.12 pCi/g wet weight), 1989 (0.11 pCi/g wet weight), 1990 (0.075 pCi/g wet weight), and 1991 (0.11 pCi/g wet weight). The levels were almost identical to those seen in 1992 (0.066 pCi/g wet weight) and in 1993 (0.068 pCi/g wet weight). The strontium-89 concentration was below the LLD of 0.026 pCi/g wet weight in all samples. Strontium-90 was detected in all bone samples and averaged 0.112 pCi/g wet weight.

Periphyton (Slime)

In periphyton (slime) samples, mean gross beta concentrations were similar at both indicator and control locations (3.64 and 3.04 pCi/g wet weight, respectively). Strontium-89 concentration was below the LLD level of 0.031 pCi/g wet weight in all samples. Strontium-90 was detected at five of ten indicator locations and one of two control locations at concentrations of 0.034 and 0.015 pCi/g wet weight, respectively). Traces of Co-58 (0.061 pCi/g wet weight) and Co-60 (0.026 pCi/g wet weight) were detected in one slime sample from location K-1e (sewage effluent). Cs-137 was detected in five of ten samples and measured 0.055 pCi/g wet weight, slightly lower than 1993 (0.066 pCi/g wet weight). All other gamma-emitting isotopes, except naturally-occurring beryllium-7 and potassium-40, were below their respective LLDs.

Bottom Sediments

In bottom sediment samples, the mean gross beta concentration was similar at indicator locations and at the control location (7.8 and 6.0 pCi/g dry weight, respectively), due primarily to potassium-40. The difference is not statistically significant.

Cesium-137 was detected in two of ten samples and averaged 0.050 pCi/g dry weight at indicator locations and less than 0.036 pCi/g dry weight at control locations. Cs-134 was below the LLD level of 0.046 pCi/g dry weight in all samples. The cesium-137 level was slightly lower than the levels observed in 1979 (0.12 pCi/g dry weight), in 1980 (0.19 pCi/g dry weight), in 1981 (0.18 pCi/g dry weight), in 1982 (0.13 pCi/g dry weight), in 1983 (0.16 pCi/g dry weight), and in 1984 (0.07 pCi/g dry weight), and was about the same as observed in 1985 (0.05 pCi/g dry weight), in 1986 (0.037 pCi/g dry weight), in 1987 (0.038 pCi/g dry weight) and in 1988 (0.049 pCi/g dry weight), in 1989 (0.056 pCi/g dry weight), in 1990 (0.058 pCi/g dry weight), in 1991 (0.057 pCi/g dry weight), in 1992 (0.047 pCi/g dry weight) and in 1993 (0.034 pCi/g dry weight). Levels of Strontium-89 were below their respective LLDs of 0.024 pCi/g dry weight in all samples. Strontium-90 was detected in one of ten samples at a concentration of 0.021 pCi/g dry weight.

3.3 1994 Land Use Census

The 1994 Land Use Census was conducted by Teledyne Brown Engineering on September 6 and 7, 1994 and satisfies the requirements of KNPP Technical Specification 7.7.2 which states:

> A land use census shall be conducted and shall identify within a distance of 8 km (5 miles) the location, in each of the 10 meteorological sectors, of the nearest milk animal, the nearest residence and the nearest garden of greater than $50m^2$ ($500 ft^2$) producing broad leaf vegetation.

The Land Use Census is conducted annually during the growing season. In order to collect the necessary information for this year's census, both drive-by and resident interviews were conducted. Of the locations surveyed, a total of 20 met the Technical Specification criteria for inclusion in the Land Use Census. Table 4.6 lists the results of the census.

Land Use Census Changes

Sector A:

The distance of the nearest milk animal location has changed from 2.63 to 2.00 miles.

Sector B:

The distance of the nearest resident location has changed from 1.27 to 1.20 miles.

Sector K:

The distance of the nearest milk animal location has changed from 2.50 to 3.20 miles.

Sectors J, L, M, N, P, Q, R:

No changes.

4.0 FIGURES AND TABLES

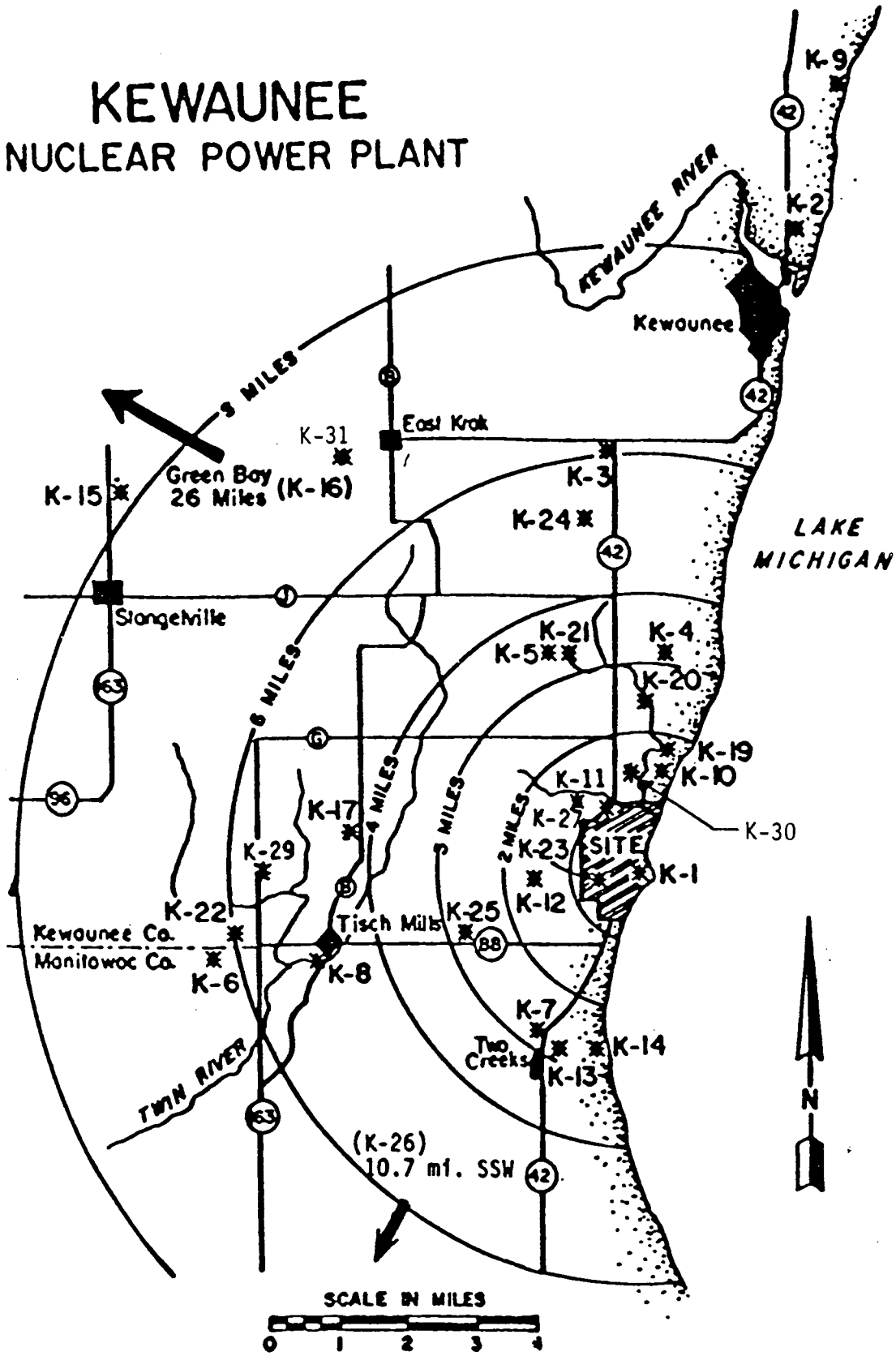

Figure 4-1. Sampling locations, Kewaunee Nuclear Power Plant

Table 4.1. Sampling locations, Kewaunee Nuclear Power Plant.

Code	Type[a]	Distance (miles)[b] and Sector	Location
K-1			Onsite
K-1a	I	0.62 N	North Creeek
K-1b	I	0.12 N	Middle Creek
K-1c	I	0.10 N	500' north of condenser discharge
K-1d	I	0.10 E	Condenser discharge
K-1e	I	0.12 S	South Creek
K-1f	I	0.12 S	Meteorological Tower
K-1g	I	0.06 W	South Well
K-1h	I	0.12 NW	North Well
K-1j	I	0.10 S	500' south of condenser discharge
K-2	C	9.5 NNE	WPS Operations Building in Kewaunee
K-3	C	6.0 N	Lyle and John Siegmund Farm, Route 1, Kewaunee
K-4	I	3.0 N	Tom Stangel Farm, Route 1, Kewaunee
K-5	I	3.5 NNW	Ed Paplham Farm, Route 1, Kewaunee
K-6	C	6.7 WSW	Novitsky Farm
K-7	I	2.75 SSW	Ron Zimmerman Farm, Route 3, Two Rivers
K-8	C	5.0 WSW	Saint Mary's Church, Tisch Mills
K-9	C	11.5 NNE	Rostok Water Intake for Green Bay, Wisconsin, two miles north of Kewaunee
K-10	I	1.5 NNE	Turner Farm, Kewaunee site
K-11	I	1.0 NW	Harlan Ihlenfeld Farm
K-12	I	1.5 WSW	Lecaptain Farm, one mile west of site
K-13	C	3.0 SSW	Rand's General Store
K-14	I	2.5 S	Two Creeks Park, 2.5 miles south of site
K-15	C	9.25 NW	Gas Substation, 1.5 miles north of Stangelville
K-16	C	26 NW	WPS Division Office Building, Green Bay, Wisconsin
K-17	I	4.25 W	Jansky's Farm, Route 1, Kewaunee
K-19	I	1.75 NNE	Wayne Paral Farm, Route 1, Kewaunee
K-20	I	2.5 N	Carl Struck Farm, Route 1, Kewaunee
K-23	I	0.5 W	0.5 miles west of plant, Kewaunee site
K-24	I	5.45 N	Fectum Farm, Route 1, Kewaunee
K-25[c]	C	2.75 WSW	Wotachek Farm, Route 1, Denmark
K-26	C	10.7 SSW	Bertler's Fruit Stand (8.0 miles south of "BB")
K-27	I	1.5 NW	Schlies Farm, 0.5 miles west of K-11
K-28	C	26 NW	Hansen Dairy, Green Bay, Wisconsin
K-29	I	5.75 W	Kunesh Farm, Route 1, Kewaunee
K-30	I	1.00 N	End of site boundary
K-31	C	6.25 NNW	E. Krok Substation

[a] I= indicator; C = control.

[b] Distances are measured from reactor stack.

[c] Replaced by K-29 in summer 1990 because Wotachek Farm no longer had chickens.

Table 4.2. Type and frequency of collection.

Location	Frequency					
	Weekly	Biweekly	Monthly	Quarterly	Semiannually	Annually
K-1a			SW		SL	
K-1b			SW	GR[a]	SL	
K-1c					BS[b]	
K-1d			SW	FI	BS[b], SL	
K-1e			SW		SL	
K-1f	AP	AI		GR[a], TLD	SO	
K-1g				WW		
K-1h				WW		
K-1j					BS[b]	
K-2	AP	AI		TLD		
K-3			MI[c]	GR[a], TLD, CF[d]	SO	
K-4			MI[c]	GR[a], TLD, CF[d]	SO	
K-5			MI[c]	GR[a], TLD, CF[d]	SO	
K-6			MI[c]	GR[a], TLD, CF[d]	SO	
K-7	AP	AI		TLD		
K-8	AP	AI		TLD		
K-9			SW		BS[b], SL	
K-10				WW		
K-11			PR	WW		
K-12			MI[c]	GR[a], CF[d], WW	SO	
K-13				WW		
K-14			SW		BS[b], SL	
K-15	AP	AI		TLD		
K-16	AP	AI		TLD		
K-17				TLD		VE
K-19			MI[c]	GR[a], CF[d]	SO	
K-20						DM
K-23						GRN
K-24						DM
K-25[e]						DM
K-26						VE
K-27				TLD, EG		DM
K-28			MI[c]			
K-29						DM
K-30				TLD		
K-31				TLD		

[a]Three times a year, second (April, May, June), third (July, August, September), and fourth (October, November, December) quarters.
[b]To be collected in May and November.
[c]Monthly from November through April; semimonthly May through October.
[d]First quarter (January, February, March) only.
[e]Replaced by K-29 in summer of 1990.

Table 4.3. Sample codes used in Table 4.2.

Code	Description
AP	Airborne Particulate
AI	Airborne Iodine
TLD	Thermoluminescent Dosimeter
PR	Precipitation
MI	Milk
WW	Well Water
DM	Domestic Meat
EG	Eggs
VE	Vegetables
GRN	Grain
GR	Grass
CF	Cattlefeed
SO	Soil
SW	Surface Water
FI	Fish
SL	Slime
BS	Bottom Sediments

Table 4.4. Sampling Summary, January - December 1994.

Sample Type	Collection Type and Frequency[a]	Number of Locations	Number of Samples Collected	Number of Samples Missed
Air Environment				
Airborne particulates	C/W	6	312	0
Airborne Iodine	C/BW	6	156	0
TLD's	C/Q	14	49	1
Precipitation	C/M	1	12	0
Terrestrial Environment				
Milk (May-Oct)	G/SM	7	84	0
(Nov-Apr)	G/M	7	42	0
Well water	G/Q	6	24	0
Domestic meat	G/A	4	3	1
Eggs	G/Q	1	4	0
Vegetables - 6 varieties	G/A	2	7	0
Grain - oats	G/A	1	1	0
- clover	G/A	1	1	0
Grass	G/TA	8	24	0
Cattle feed	G/A	6	12	0
Soil	G/SA	7	14	0
Aquatic Environment				
Surface water	G/M	7	98	0
Fish	G/TA	1	6	0
Slime	G/SA	6	12	0
Bottom sediments	G/SA	5	10	0

[a] Type of collection is coded as follows: C = continuous; G = grab.
Frequency is coded as follows: W = weekly; SM = semimonthly; M = monthly; Q=quarterly; SA = semiannually; TA = three times per year; FA = four times per year; A = annually; BW = bi-weekly.

Table 4.5 Environmental Radiological Monitoring Program Summary.

Name of Facility Kewaunee Nuclear Power Plant — Docket No. 50-305
Location of Facility Kewaunee County, Wisconsin (County, State) — Reporting Period January - December 1994

Sample Type (Units)	Type and Number of Analyses[a]	LLD[b]	Indicator Locations Mean (F)[c] Range[c]	Location with Highest Quarterly Mean Location[d]	Location with Highest Quarterly Mean Mean (F)[c] Range[c]	Control Locations Mean (F)[c] Range	Number Non-Routine Results[e]
Airborne particulates (pCi/m^3)	GB 312	0.003	0.016 (102/104) (0.004-0.044)	K-2, WPS Op. Bldg. 9.5 mi. NNE	0.019 (52/52) (0.007-0.075)	0.018 (205/208) (0.005-0.075)	0
				K-16, WPS Div. 26 mi. NW	0.019 (52/52) (0.007-0.051)		
	GS 24						
	Be-7	0.010	0.070 (8/8) (0.045-0.090	K-16, WPS Div. 26 mi. NW	0.086 (4/4) (0.070-0.108	0.076 (16/16) (0.049-0.108)	0
	Nb-95	0.0023	<LLD	-	-	<LLD	0
	Zr-95	0.0028	<LLD	-	-	<LLD	0
	Ru-103	0.0022	<LLD	-	-	<LLD	0
	Ru-106	0.014	<LLD	-	-	<LLD	0
	Cs-134	0.0018	<LLD	-	-	<LLD	0
	Cs-137	0.0015	<LLD	-	-	<LLD	0
	Ce-141	0.0038	<LLD	-	-	<LLD	0
	Ce-144	0.0094	<LLD	-	-	<LLD	0
Airborne Iodine (pCi/m^3)	I-131 156	0.03	<LLD	-	-	<LLD	0
TLD-Quarterly (mR/91 days)	Gamma 49	1	14.8 (24/24) (11.7-20.3)	K-3, Siegmund Farm, 6.0 mi. N	17.4 (4/4) (16.2-18.2)	13.8 (25/25) (11.7-18.2)	0
				K-7, Zimmerman Farm, 2.75 mi SSW	17.4 (4/4) (14.2-20.3)		
Precipitation (pCi/L)	H-3 12	330	<LLD	-	-	None	0
Milk (pCi/L)	I-131 126	0.5	<LLD	-	-	<LLD	0
	Sr-89 84	1.6	<LLD	-	-	<LLD	0
	Sr-90 84	0.5	1.7 (48/48) (0.7-3.7)	K-12, Lecaptain Farm 1.5 mi WSW	2.5 (12/12) (1.9-3.7)	1.5 (36/36) (0.7-2.6)	0
	GS 126						
	K-40	50	1420 (72/72) (1220-1660)	K-3, Siegmund Farm, 6.0 mi. N	1520 (18/18) (1420-1640)	1430 (54/54) (1180-1640)	0
	Cs-134	10	<LLD	-	-	<LLD	0
	Cs-137	10	<LLD	-	-	<LLD	0
	Ba-La-140	15	<LLD	-	-	<LLD	0
(g/L)	K-stable 84	1.0	1.63 (48/48) (1.41-1.92)	K-3, Siegmund Farm, 6.0 mi. N	1.76 (12/12) (1.64-1.82)	1.65 (36/36) (1.45-1.82)	0
(g/L)	Ca 84	0.4	0.91 (48/48) (0.62-1.13)	K-6, Novitsky Farm 6.7 mi WSW	1.04 (12/12) (0.95-1.10)	0.94 (36/36) (0.74-1.10)	0
Well Water (pCi/L)	GA 8	2.8	3.3 (1/8)	K-1g, South Well Onsite, 0.06 mi W	3.3 (1/4)	None	0
	GB 24	0.5	2.0 (20/20) (0.6-4.9)	K-1g, South Well Onsite, 0.06 mi W	3.8 (4/4) (3.2-4.8)	1.2 (4/4) (0.6-1.8)	0
	H-3 4	330	<LLD	-	-	None	0
	K-40 (flame) 24	0.86	1.69 (17/20) (0.95-2.85)	K-1h, North Well Onsite, 0.12 mi .NW	2.51 (4/4) (2.25-2.85)	1.01 (3/4) (0.95-1.04)	0
	Sr-89 4	1.0	<LLD	-	-	None	0
	Sr-90 4	0.5	<LLD	-	-	None	0
	GS 24						0
	Mn-54	15	<LLD	-	-	<LLD	0
	Fe-59	30	<LLD	-	-	<LLD	0
	Co-58	15	<LLD	-	-	<LLD	0
	Co-60	15	<LLD	-	-	<LLD	0
	Zr-Nb-95	15	<LLD	-	-	<LLD	0
	Cs-134	10	<LLD	-	-	<LLD	0
	Cs-137	10	<LLD	-	-	<LLD	0
	Ba-La-140	15	<LLD	-	-	<LLD	0

Table 4.5 Environmental Radiological Monitoring Program Summary.

Name of Facility Kewaunee Nuclear Power Plant Docket No. 50-305
Location of Facility Kewaunee County, Wisconsin Reporting Period January - December 1994
(County, State)

Sample Type (Units)	Type and Number of Analyses[a]	LLD[b]	Indicator Locations Mean (F)[c] Range[c]	Location with Highest Quarterly Mean Location[d]	Location with Highest Quarterly Mean Mean (F)[c] Range[c]	Control Locations Mean (F)[c] Range	Number Non-Routine Results[e]
Domestic Meat (Chickens) (pCi/g wet)	GA 3	0.066	<LLD	-	-	<LLD	0
	GB 3	0.03	2.69 (2/2) (2.39-2.99)	K-29, Kunesh Farm 5.75 mi W	2.99(1/1)	2.61 (1/1)	
	GS 3						0
	Be-7	0.34	<LLD	-	-	<LLD	0
	K-40	0.5	2.68 (2/2) (2.22-3.15)	K-29, Kunesh Farm 5.75 mi W	3.15 (1/1)	2.70 (1/1)	0
	Nb-95	0.077	<LLD	-	-	<LLD	0
	Zr-95	0.13	<LLD	-	-	<LLD	0
	Ru-103	0.052	<LLD	-	-	<LLD	0
	Ru-106	0.25	<LLD	-	-	<LLD	0
	Cs-134	0.034	<LLD	-	-	<LLD	0
	Cs-137	0.025	<LLD	-	-	<LLD	0
	Ce-141	0.077	<LLD	-	-	<LLD	0
	Ce-144	0.15	<LLD	-	-	<LLD	0
Eggs (pCi/g wet)	GB 4	0.01	1.35 (4/4) (0.76-2.28)	K-27, Schlies Farm 1.5 mi NW	1.35 (4/4) (0.76-2.28)	None	0
	Sr-89 4	0.006	<LLD	-	-	None	0
	Sr-90 4	0.002	<LLD	-	-	None	0
	GS						
	Be-7	0.052	<LLD	-	-	None	0
	K-40	0.01	1.23 (4/4) (1.07-1.33)	K-27, Schlies Farm 1.5 mi NW	1.23 (4/4) (1.07-1.33)	None	0
	Nb-95	0.007	<LLD	-	-	None	0
	Zr-95	0.010	<LLD	-	-	None	0
	Ru-103	0.010	<LLD	-	-	None	0
	Ru-106	0.058	<LLD	-	-	None	0
	Cs-134	0.006	<LLD	-	-	None	0
	Cs-137	0.008	<LLD	-	-	None	0
	Ce-141	0.013	<LLD	-	-	None	0
	Ce-144	0.029	<LLD	-	-	None	0
Vegetables (pCi/g wet)	GB 7	0.1	3.34 (3/3) (2.53-4.44)	K-17, Jansky's Farm 4.25 mi W	3.34 (3/3) (2.53-4.44)	2.35 (4/4) (1.49-3.08)	0
	Sr-89 7	0.003	<LLD	-	-	<LLD	0
	Sr-90 7	0.002	<LLD	-	-	<LLD	0
	GS 7						
	Be-7	0.091	<LLD				
	K-40	0.75	2.88 (3/3) (2.53-4.44)	K-17, Jansky's Farm 4.25 mi W	2.88 (3/3) (2.53-4.44)	1.97(4/4) (1.50-2.45)	0
	Nb-95	0.018	<LLD	-	-	<LLD	0
	Zr-95	0.018	<LLD	-	-	<LLD	0
	Ru-103	0.009	<LLD	-	-	<LLD	0
	Ru-106	0.092	<LLD	-	-	<LLD	0
	Cs-134	0.011	<LLD	-	-	<LLD	0
	Cs-137	0.011	<LLD	-	-	<LLD	0
	Ce-141	0.017	<LLD	-	-	<LLD	0
	Ce-144	0.076	<LLD	-	-	<LLD	0

Table 4.5 Environmental Radiological Monitoring Program Summary.

Name of Facility Kewaunee Nuclear Power Plant — Docket No. 50-305
Location of Facility Kewaunee County, Wisconsin (County, State) — Reporting Period January - December 1994

Sample Type (Units)	Type and Number of Analyses[a]	LLD[b]	Indicator Locations Mean (F)[c] Range[c]	Location with Highest Quarterly Mean Location[d]	Location with Highest Quarterly Mean Mean (F)[c] Range[c]	Control Locations Mean (F)[c] Range	Number Non-Routine Results[e]
Grain - Oats & Clover (pCi/g wet)	GB 2	0.10	4.26 (2/2) (3.96-4.56)	K-23, Kewaunee Site 0.5 mi W	4.26 (2/2) (3.96-4.56)	None	0
	Sr-89 2	0.005	<LLD	-	-	None	0
	Sr-90 2	0.004	0.009 (1/2)	K-23, Kewaunee Site 0.5 mi W	0.009 (1/2)	None	0
	GS 2						
	Be-7	0.27	1.58 (2/2) (0.97-2.18)	K-23, Kewaunee Site 0.5 mi	1.58 (2/2) (0.97-2.18)	None	0
	K-40	0.10	4.74 (2/2) (4.55-4.94)	K-23, Kewaunee Site 0.5 mi W	4.74 (2/2) (4.55-4.94)	None	0
	Nb-95	0.021	<LLD	-	-	None	0
	Zr-95	0.028	<LLD	-	-	None	0
	Ru-103	0.026	<LLD	-	-	None	0
	Ru-106	0.12	<LLD	-	-	None	0
	Cs-134	0.025	<LLD	-	-	None	0
	Cs-137	0.022	<LLD	-	-	None	0
	Ce-141	0.046	<LLD	-	-	None	0
	Ce-144	0.20	<LLD	-	-	None	0
Cattlefeed (pCi/g wet)	GB 12	0.1	9.18 (8/8) (3.84-20.17)	K-5, Paplham Farm 3.5 mi NNW	12.00 (2/2) (3.84-20.17)	6.71 (4/4) (3.18-11.66)	0
	Sr-89 12	0.014	<LLD	-	-	<LLD	0
	Sr-90 12	0.002	0.020 (8/8) (0.007-0.044)	K-4, Stangel Farm 3.0 mi N	0.026 (2/2) (0.013-0.040)	0.012 (3/4) (0.006-0.022)	0
	GS 12						
	Be-7	0.19	0.32 (5/8) (0.20-0.37)	K-3, Siegmund Farm 6.0 mi N	0.40 (2/2) (0.33-0.47)	0.40 (3/4) (0.33-0.47)	0
	K-40	1.0	8.85 (8/8) (3.50-18.79)	K-5, Paplham Farm 3.5 mi NNW	11.14 (2/2) (3.50-18.79)	8.88 (4/4) (3.10-15.25)	0
	Nb-95	0.022	<LLD	-	-	<LLD	0
	Zr-95	0.043	<LLD	-	-	<LLD	0
	Ru-103	0.023	<LLD	-	-	<LLD	0
	Ru-106	0.18	<LLD	-	-	<LLD	0
	Cs-134	0.022	<LLD	-	-	<LLD	0
	Cs-137	0.022	<LLD	-	-	<LLD	0
	Ce-141	0.030	<LLD	-	-	<LLD	0
	Ce-144	0.13	<LLD	-	-	<LLD	0
Grass (pCi/g wet)	GB 24	0.1	7.01 (18/18) (5.31-11.38)	K-3, Siegmund Farm 6.0 mi N	9.14 (3/3) (7.43-12.32)	7.79 (6/6) (5.32-12.32)	0
	Sr-89 24	0.018	<LLD	-	-	<LLD	0
	Sr-90 24	0.005	0.010 (2/18) (0.006-0.013)	K-1b, Middle Creek Onsite 0.12 mi N	0.013 (1/3)	0.006 (1/6)	0
	GS 24						
	Be-7	0.36	4.27 (13/18) (0.67-7.71)	K-1b, Middle Creek Onsite 0.12 mi N	6.43 (2/3) (5.15-7.71)	3.20 (4/6) (1.74-5.08)	0
	K-40	0.1	7.18 (18/18) (5.70-8.96)	K-4, Stangel Farm 3.0 mi N	7.91 (3/3) (7.39-8.92)	7.16 (6/6) (6.06-9.19)	0
	Nb-95	0.037	<LLD	-	-	<LLD	0
	Zr-95	0.054	<LLD	-	-	<LLD	0
	Ru-103	0.034	<LLD	-	-	<LLD	0
	Ru-106	0.27	<LLD	-	-	<LLD	0
	Cs-134	0.040	<LLD	-	-	<LLD	0
	Cs-137	0.041	<LLD	-	-	<LLD	0
	Ce-141	0.058	<LLD	-	-	<LLD	0
	Ce-144	0.24	<LLD	-	-	<LLD	0

Table 4.5 Environmental Radiological Monitoring Program Summary.

Name of Facility: Kewaunee Nuclear Power Plant — Docket No.: 50-305
Location of Facility: Kewaunee County, Wisconsin (County, State) — Reporting Period: January - December 1994

Sample Type (Units)	Type and Number of Analyses[a]	LLD[b]	Indicator Locations Mean (F)[c] Range[c]	Location with Highest Quarterly Mean Location[d]	Location with Highest Quarterly Mean Mean (F)[c] Range[c]	Control Locations Mean (F)[c] Range	Number Non-Routine Results[e]
Soil (pCi/g dry)	GA 14	5.0	6.9 (10/10) (5.3-9.3)	K-6, Novitsky Farm 6.7 mi WSW	8.6 (2/2) (7.8-9.3)	8.4 (4/4) (7.8-9.3)	0
	GB 14	2.0	21.4 (10/10) (15.9-25.0)	K-6, Novitsky Farm 6.7 mi WSW	26.8 (2/2) (26.2-27.5)	25.9 (4/4) (23.7-27.5)	0
	Sr-89 14	0.032	<LLD	-	-	<LLD	0
	Sr-90 14	0.012	0.037 (7/10) (0.013-0.066)	K-6, Novitsky Farm 6.7 mi WSW	0.064 (2/2) (0.044-0.084)	0.056 (4/4) (0.019-0.084)	0
	GS 14						
	Be-7	0.55	<LLD	K-6, Novitsky Farm 6.7 mi WSW	0.77(1/2)	0.77(1/4)	0
	K-40	1.4	20.88 (10/10) (15.29-24.90)	K-5, Paplham Farm 3.5 mi NNW	23.63 (2/2) (23.08-24.18)	21.96 (4/4) (20.88-21.67)	0
	Nb-95	0.067	<LLD	-	-	<LLD	0
	Zr-95	0.093	<LLD	-	-	<LLD	0
	Ru-103	0.053	<LLD	-	-	<LLD	0
	Ru-106	0.52	<LLD	-	-	<LLD	0
	Cs-137	0.033	0.17 (8/10) (0.060-0.29)	K-6, Novitsky Farm 6.7 mi WSW	0.24 (2/2) (0.22-0.27)	0.21 (4/4) (0.12-0.27)	0
	Ce-141	0.090	<LLD	-	-	<LLD	0
	Ce-144	0.22	<LLD	-	-	<LLD	0
Surface Water (pCi/L)	GB (SS) 98	1.7	<LLD	-	-	<LLD	0
	GB (DS) 98	1.0	5.0 (74/74) (1.2-24.4)	K-1a, North Creek Onsite 0.62 mi N	11.2 (12/12) (4.9-24.4)	2.3 (24/24) (1.4-3.4)	0
	GB (TR) 98	1.0	5.1 (74/74) (1.2-24.4)	K-1a, North Creek Onsite 0.62 mi N	11.5 (12/12) (4.9-24.4)	2.3 (24/24) (1.4-3.4)	0
	GS 98						
	Mn-54	15	<LLD	-	-	<LLD	0
	Fe-59	30	<LLD	-	-	<LLD	0
	Co-58	15	<LLD	-	-	<LLD	0
	Co-60	15	<LLD	-	-	<LLD	0
	Zr-Nb-95	15	<LLD	-	-	<LLD	0
	Cs-134	10	<LLD	-	-	<LLD	0
	Cs-137	10	<LLD	-	-	<LLD	0
	Ba-La-140	15	<LLD	-	-	<LLD	0
	H-3 32	330	<LLD	-	-	<LLD	0
	Sr-89 32	1.2	<LLD	-	-	<LLD	0
	Sr-90 32	0.6	0.8 (2/24) (0.7-0.9)	K-14b, Two Creeks Park, 2.5 mi. S	0.8 (2/4) (0.7-0.9)	0.7 (2/8)	0
	K-40 (flame) 98	0.86	3.44 (74/74) (0.87-20.76)	K-1a, North Creek Onsite 0.62 mi N	8.91 (12/12) (4.50-20.76)	1.14 (20/24) (0.87-1.56)	0
Fish - Muscle (pCi/g wet)	GB 6	1.0	3.19 (6/6) (1.99-4.12)	K-1d, Condenser Discharge Onsite 0.10 mi E	3.19 (6/6) (1.99-4.12)	None	0
	GS 6						
	K-40	0.1	3.22 (6/6) (2.03-3.95)	K-1d, Condenser Discharge Onsite 0.10 mi E	3.22 (6/6) (2.03-3.95)	None	0
	Mn-54	0.011	<LLD	-	-	None	0
	Fe-59	0.043	<LLD	-	-	None	0
	Co-58	0.016	<LLD	-	-	None	0
	Co-60	0.019	<LLD	-	-	None	0
	Cs-134	0.014	<LLD	-	-	None	0
	Cs-137	0.019	0.067 (5/6) (0.048-0.085)	K-1d, Condenser Discharge Onsite 0.10 mi E	0.067 (5/6) (0.048-0.085)	None	0

Table 4.5 Environmental Radiological Monitoring Program Summary.

Name of Facility: Kewaunee Nuclear Power Plant — Docket No.: 50-305
Location of Facility: Kewaunee County, Wisconsin (County, State) — Reporting Period: January - December 1994

Sample Type (Units)	Type and Number of Analyses[a]	LLD[b]	Indicator Locations Mean (F)[c] Range[c]	Location with Highest Quarterly Mean Location[d]	Location with Highest Quarterly Mean Mean (F)[c] Range[c]	Control Locations Mean (F)[c] Range	Number Non-Routine Results[e]
Fish - Bones (pCi/g wet)	GB 6	0.1	1.17 (6/6) (0.70-1.80)	K-1d, Condenser Discharge Onsite 0.10 mi E	1.17 (6/6) (0.70-1.80)	None	0
	Sr-89 6	0.026	<LLD	-	-	None	0
	Sr-90 6	0.005	0.112 (6/6) (0.025-0.246)	K-1d, Condenser Discharge Onsite 0.10 mi E	0.112 (6/6) (0.025-0.246)	None	0
Periphyton (Slime) (pCi/g wet)	GB 12	0.1	3.64 (10/10) (1.65-5.84)	K-14, Two Creeks Park, 2.5 mi S	5.32 (2/2) (4.81-5.84)	3.04 (2/2) (3.02-3.05)	0
	Sr-89 12	0.031	<LLD	-	-	<LLD	0
	Sr-90 12	0.007	0.034 (5/10) (0.014-0.064)	K-1e, South Creek 0.12 mi. S	0.039 (1/2)	0.015 (1/2)	0
	GS 12						
	Be-7	0.28	1.13 (8/10) (0.34-2.81)	K-14, Two Creeks Park, 2.5 mi S	1.92 (2/2) (1.02-2.81)	<LLD	0
	K-40	0.2	2.82 (10/10) (1.29-4.10)	K-1b, Middle Creek 0.12 mi N	4.08 (2/2) (4.06-4.10)	3.06 (2/2) (2.99-3.13)	0
	Mn-54	0.021	<LLD	-	-	<LLD	0
	Co-58	0.024	0.061 (1/10)	K-1e, South Creek 0.12 mi. S	0.061 (1/2)	<LLD	0
	Co-60	0.019	0.026 (1/10)	K-1e, South Creek 0.12 mi. S	0.026 (1/2)	<LLD	0
	Nb-95	0.030	<LLD	-	-	<LLD	0
	Zr-95	0.054	<LLD	-	-	<LLD	0
	Ru-103	0.034	<LLD	-	-	<LLD	0
	Ru-106	0.20	<LLD	-	-	<LLD	0
	Cs-134	0.030	<LLD	-	-	<LLD	0
	Cs-137	0.027	0.055 (5/10)	K-14, Two Creeks Park, 2.5 mi S	0.076 (2/2) (0.070-0.083)	<LLD	0
	Ce-141	0.069	<LLD	-	-	<LLD	0
	Ce-144	0.26	<LLD	-	-	<LLD	0
Bottom Sediments (pCi/g dry)	GB 10	1.0	7.8 (8/8) (6.2-12.4)	K-1j, 500' S of Condenser Discharge, 0.10 mi S	10.4 (2/2) (8.5-12.4)	6.0 (2/2) (5.7-6.3)	0
	Sr-89 10	0.024	<LLD	-	-	<LLD	0
	Sr-90 10	0.012	0.021 (1/8)	K-1c, 500' N of Condenser Discharge 0.10 mi N	0.021 (1/8)	<LLD	0
	GS 10						
	K-40	1.0	8.42 (8/8) (6.89-9.92)	K-1c, 500' N of Condenser Discharge 0.10 mi N	9.90 (2/2) (9.89-9.92)	7.82 (2/2) (6.48-9.15)	0
	Co-58	0.032	<LLD	-	-	<LLD	0
	Co-60	0.031	<LLD	-	-	<LLD	0
	Cs-134	0.046	<LLD	-	-	<LLD	0
	Cs-137	0.036	0.050 (2/8) (0.049-0.050)	K-1d, Condenser Discharge Onsite 0.10 mi E	0.050 (1/2)	<LLD	0

a GA = gross alpha, GB = gross beta, GS = gamma spectroscopy, SS = suspended solids, DS = dissolved solids, TR = total residue.

b LLD = nominal lower limit of detection based on 4.66 sigma counting error for background sample.

c Mean based upon detectable measurements only. Fraction of detectable measurements at specified locations is indicated in parentheses (F).

d Locations are specified by station code (Table 4.1), distance (miles) and direction relative to reactor site.

e Non-routine results are those which exceed ten times the control station value. If no control station value is available, the result is considered non-routine if it exceeds ten times the pre-operational value for the location.

Table 4.6 Land Use Census

The following table lists an inventory of residence, gardens ≥ 500 ft^2 and milk animals found nearest to the plant in each of the 10 meteorological sectors within a five mile radius of the Kewaunee Nuclear Power Plant.

Sector	Section No.	Residence	Garden	Milk Animals	Distance From Plant (miles)
A	24	X	X		1.95
A	24			X	2.00
B	24	X			1.20
B	24 (K-19)		X	X	1.27
J	11	X	(Note 1)	(Note 1)	2.68
K	35	X	X		0.80
K	10			X	3.20
L	35	X			0.85
L	35		X	X	1.28
M	35	X	X		1.33
M	34			X	1.56
N	35	X			0.95
N	26		X		1.04
N	34 (K-12)			X	1.39
P	26	X	X		1.33
P	22			X	2.01
Q	23	X			1.31
Q	23 (K-27)		X	X	1.33
R	26 (K-11)	X		X	1.00
R	23		X		1.85

Note 1.: There were no milk animals or gardens ≥ 500 ft^2 located in Sector J within five miles of the Kewaunee Nuclear Power Plant.

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APPENDIX A

INTERLABORATORY COMPARISON PROGRAM RESULTS

NOTE: Teledyne Isotopes Midwest Laboratory participates in intercomparison studies administered by U.S. EPA Environmental Monitoring Systems Laboratory, Las Vegas, Nevada. The results are reported in Appendix A. Also reported are results of International Intercomparison and Teledyne testing of TLD's, as well as, in-house spikes, blanks and duplicates. Appendix A is updated four times a year; the complete Appendix is included in March, June, September and December monthly progress reports only. Please refer to March, June, September and December progress reports for information.

January, 1994 through December, 1994

Appendix A

Interlaboratory Comparison Program Results

Teledyne's Midwest Laboratory (formerly Hazleton Environmental Sciences) 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 the laboratory's analytical procedures and to alert it to 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 is conducted by the U.S. Environmental Protection Agency Intercomparison and Calibration Section, Quality Assurance Branch, Environmental Monitoring and Support Laboratory, Las Vegas, Nevada.

The results in Table A-2 were obtained for Thermoluminescent Dosimeters (TLDs), since 1976 via various International Intercomparisons of Environmental Dosimeters under the sponsorships listed in Table A-2. Also Teledyne testing results are listed.

Table A-3 lists results of the analyses on in-house "spiked" samples for the past twelve months. 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.

Attachment A lists acceptance criteria for "spiked" samples.

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

Table A-1. U.S. Environmental Protection Agency's crosscheck program, comparison of EPA and Teledyne's Midwest Laboratory results for various sample media[a].

Lab Code	Sample Type	Date Collected	Analysis	Concentration in pCi/L[b] Teledyne Results ±2 Sigma[c]	EPA Result[d] 1s, N=1	Control Limits
STW-702	WATER	Jan, 1994	Sr-89	20.0 ± 1.7	25.0 ± 5.0	16.3 - 33.7
STW-702	WATER	Jan, 1994	Sr-90	14.0 ± 1.0	15.0 ± 5.0	6.3 - 23.7
STW-703	WATER	Jan, 1994	Gr. Alpha	20.3 ± 0.6	15.0 ± 5.0	6.3 - 23.7
STW-703	WATER	Jan, 1994	Gr. Beta	55.3 ± 3.2	62.0 ± 10.0	44.7 - 79.3
STW-704	WATER	Feb, 1994	I-131	110.0 ± 2.7	119.0 ± 12.0	98.2 - 139.8
STW-705	WATER	Feb, 1994	Ra-226	19.4 ± 1.5	19.9 ± 3.0	14.7 - 25.1
STW-705	WATER	Feb, 1994	Ra-228	15.0 ± 0.8	14.7 ± 3.7	8.3 - 21.1
STW-705	WATER	Feb, 1994	Uranium	9.7 ± 0.4	10.1 ± 3.0	4.9 - 15.3
STW-706	WATER	Mar, 1994	H-3	4,843.3 ± 231.2	4,936.0 ± 494.0	4,078.9 - 5,793.1
STW-707	WATER	Mar, 1994	Pu-239	28.2 ± 0.9	27.6 ± 2.8	22.7 - 32.5
STW-708	WATER	Apr, 1994	Gr. Alpha	73.3 ± 2.9	86.0 ± 22.0	47.8 - 124.2
STW-708	WATER	Apr, 1994	Ra-226	16.9 ± 1.2	20.0 ± 3.0	14.8 - 25.2
STW-708	WATER	Apr, 1994	Ra-228	19.7 ± 0.7	20.1 ± 5.0	11.4 - 28.8
STW-708	WATER	Apr, 1994	Uranium	25.1 ± 0.1	25.0 ± 3.0	19.8 - 30.2
STW-709	WATER	Apr, 1994	Co-60	20.3 ± 0.6	20.0 ± 5.0	11.3 - 28.7
STW-709	WATER	Apr, 1994	Cs-134	32.3 ± 0.6	34.0 ± 5.0	25.3 - 42.7
STW-709	WATER	Apr, 1994	Cs-137	31.3 ± 0.6	29.0 ± 5.0	20.3 - 37.7
STW-709	WATER	Apr, 1994	Gr. Beta	101.0 ± 10.5	117.0 ± 18.0	85.8 - 148.2
STW-709	WATER	Apr, 1994	Sr-89	15.0 ± 1.7	20.0 ± 5.0	11.3 - 28.7
STW-709	WATER	Apr, 1994	Sr-90	14.3 ± 0.6	14.0 ± 5.0	5.3 - 22.7
STW-710	WATER	Jun, 1994	Ba-133	87.3 ± 0.6	98.0 ± 10.0	80.7 - 115.3
STW-710	WATER	Jun, 1994	Co-60	48.7 ± 3.2	50.0 ± 5.0	41.3 - 58.7
STW-710	WATER	Jun, 1994	Cs-134	35.0 ± 2.7	40.0 ± 5.0	31.3 - 48.7
STW-710	WATER	Jun, 1994	Cs-137	51.3 ± 0.6	49.0 ± 5.0	40.3 - 57.7
STW-710	WATER	Jun, 1994	Ru-106	184.7 ± 6.7	252.0 ± 25.0	208.6 - 295.4

A Letter from the EPA was received with the report. It states, "The Radiation Quality Assurance Program has been experiencing problems with the Ruthenium-106 currently used in the Performance Evaluation (PE) Studies and in the Standards Distribution Program. If these problems can be satisfactorily resolved, this analyte will once again be placed into this PE Study. If the problems cannot be resolved, the Ruthenium-106 will be replaced. Formal written notice will be given to all participants in the Gamma in Water PE Study before the Ruthenium-106 is reintroduced or replaced. At that time, new calibration standards will be available to all participants in the Gamma in Water PE Study." Teledyne will continue to monitor this situation, but at this time, plans to take no additional action.

STW-710	WATER	Jun, 1994	Zn-65	135.3 ± 2.3	134.0 ± 13.0	111.4 - 156.6
STW-711	WATER	Jun, 1994	Ra-226	15.0 ± 0.4	15.0 ± 2.3	11.0 - 19.0
STW-711	WATER	Jun, 1994	Ra-228	14.8 ± 0.3	15.4 ± 3.9	8.6 - 22.2
STW-711	WATER	Jun, 1994	Uranium	45.7 ± 0.2	52.6 ± 5.3	43.4 - 61.8
STW-712	WATER	Jul, 1994	Sr-89	26.0 ± 1.7	30.0 ± 5.0	21.3 - 38.7

Table A-1. U.S. Environmental Protection Agency's crosscheck program, comparison of EPA and Teledyne's Midwest Laboratory results for various sample media[a].

Lab Code	Sample Type	Date Collected	Analysis	Concentration in pCi/L[b] Teledyne Results ±2 Sigma[c]	EPA Result[d] 1s, N=1	Control Limits
STW-712	WATER	Jul, 1994	Sr-90	18.7 ± 0.6	20.0 ± 5.0	11.3 - 28.7
STW-713	WATER	Jul, 1994	Gr. Alpha	19.3 ± 1.2	32.0 ± 8.0	18.1 - 45.9
STW-713	WATER	Jul, 1994	Gr. Beta	12.7 ± 1.5	10.0 ± 5.0	1.3 - 18.7
STW-714	WATER	Aug, 1994	H-3	10,186.7 ± 66.6	9,951.0 ± 995.0	8,224.7 - 11,677.3
STAF-715	AIR FILTER	Aug, 1994	Cs-137	14.0 ± 0.0	15.0 ± 5.0	6.3 - 23.7
STAF-715	AIR FILTER	Aug, 1994	Gr. Alpha	29.3 ± 1.2	35.0 ± 9.0	19.4 - 50.6
STAF-715	AIR FILTER	Aug, 1994	Gr. Beta	56.0 ± 0.0	56.0 ± 10.0	38.7 - 73.3
STAF-715	AIR FILTER	Aug, 1994	Sr-90	18.0 ± 1.0	20.0 ± 5.0	11.3 - 28.7
STW-716	WATER	Sep, 1994	Ra-226	10.1 ± 0.3	10.0 ± 1.5	7.4 - 12.6
STW-716	WATER	Sep, 1994	Ra-228	9.8 ± 0.1	10.2 ± 2.6	5.6 - 14.7
STW-716	WATER	Sep, 1994	Uranium	31.9 ± 1.8	35.0 ± 3.0	29.8 - 40.2
STM-717	MILK	Sep, 1994	Cs-137	61.3 ± 0.6	59.0 ± 5.0	50.3 - 67.7
STM-717	MILK	Sep, 1994	I-131(g)	76.0 ± 1.7	75.0 ± 8.0	61.1 - 88.9
STM-717	MILK	Sep, 1994	K-40	1,770.0 ± 40.0	1,715.0 ± 86.0	1,565.8 - 1,864.2
STM-717	MILK	Sep, 1994	Sr-89	23.0 ± 1.7	25.0 ± 5.0	16.3 - 33.7
STM-717	MILK	Sep, 1994	Sr-90	14.7 ± 0.6	15.0 ± 5.0	6.3 - 23.7
STW-718	WATER	Oct, 1994	I-131	81.3 ± 3.1	79.0 ± 8.0	65.1 - 92.9
STW-721	WATER	Oct, 1994	Gr. Alpha	47.0 ± 4.6	57.0 ± 14.0	32.7 - 81.3
STW-721	WATER	Oct, 1994	Gr. Beta	25.3 ± 2.1	23.0 ± 5.0	14.3 - 31.7
STW-722	WATER	Nov, 1994	Ba-133	67.7 ± 0.6	73.0 ± 7.0	60.9 - 85.1
STW-722	WATER	Nov, 1994	Co-60	58.3 ± 1.2	59.0 ± 5.0	50.3 - 67.7
STW-722	WATER	Nov, 1994	Cs-134	20.0 ± 2.0	24.0 ± 5.0	15.3 - 32.7
STW-722	WATER	Nov, 1994	Cs-137	46.7 ± 1.2	49.0 ± 5.0	40.3 - 57.7
STW-722	WATER	Nov, 1994	Zn-65	93.7 ± 0.6	100.0 ± 10.0	82.7 - 117.3

[a] Results obtained by Teledyne's Midwest Laboratory as a participant in the environmental sample crosscheck program operated by the Intercomparison and Calibration Section, Quality Assurance Branch, Environmental Monitoring and Support Laboratory, U.S. Environmental Protection Agency (EPA), Las Vegas, Nevada.

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

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

[d] U.S. EPA results are presented as the known values and expected laboratory precision (1s, 1 determination) and control limits are defined by the EPA.

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

Lab Code	TLD Type	Date	Measurement	mR: Teledyne Results ± 2 Sigma	mR: Known Value ± 2 Sigma	mR: Average ± 2 Sigma (All Participants)
2nd International Intercomparison						
115-2	CaF_2: Mn Bulb	Apr, 1976	Field	17.0 ± 1.9	17.1	16.4 ± 7.7
115-2	CaF_2: Mn Bulb	Apr, 1976	Lab	20.8 ± 4.1	21.3	18.8 ± 7.6
Second International Intercomparison of Environmental Dosimeters conducted in April of 1976 by the Health and Safety Laboratory (HASL), New York, new York, and the School of Public Health of the University of Texas, Houston, Texas.						
3rd International Intercomparison						
115-3	CaF_2: Mn Bulb	Jun, 1977	Field	30.7 ± 3.2	34.9 ± 4.8	31.5 ± 3.0
115-3	CaF_2: Mn Bulb	Jun, 1977	Lab	89.6 ± 6.4	91.7 ± 14.6	86.2 ± 24.0
Third International Intercomparison of Environmental Dosimeters conducted in the summer of 1977 by Oak Ridge National Laboratory and the School of Public Health of the University of Texas, Houston, Texas.						
4th International Intercomparison						
115-4	CaF_2: Mn Bulb	Jun, 1979	Field	14.1 ± 1.1	14.1 ± 1.4	16.0 ± 9.0
115-4	CaF_2: Mn Bulb	Jun, 1979	Lab, High	40.4 ± 1.4	45.8 ± 9.2	43.9 ± 13.2
115-4	CaF_2: Mn Bulb	Jun, 1979	Lab, Low	9.8 ± 1.3	12.2 ± 2.4	12.0 ± 7.4
Fourth International Intercomparison of Environmental Dosimeters conducted in the summer of 1979 by the School of Public Health of the University of Texas, Houston, Texas.						
5th International Intercomparison						
115-5A	CaF_2: Mn Bulb	Oct, 1980	Field	31.4 ± 1.8	30.0 ± 6.0	30.2 ± 14.6
115-5A	CaF_2: Mn Bulb	Oct, 1980	Lab, End	96.6 ± 5.8	88.4 ± 8.8	90.7 ± 31.2
115-5A	CaF_2: Mn Bulb	Oct, 1980	Lab, Start	77.4 ± 5.8	75.2 ± 7.6	75.8 ± 40.4
Fifth International Intercomparison of Environmental Dosimeters conducted in the fall of 1980 at Idaho Falls, Idaho and sponsored by the School of Public Health of the University of Texas, Houston, Texas and the Environmental Measurements Laboratory, New York, New York, U.S. Department of Energy.						
5th International Intercomparison						
115-5B	LiF-100 Chips	Oct, 1980	Field	30.3 ± 4.8	30.0 ± 6.0	30.2 ± 14.6
115-5B	LiF-100 Chips	Oct, 1980	Lab, End	85.4 ± 11.7	88.4 ± 8.8	90.7 ± 31.2
115-5B	LiF-100 Chips	Oct, 1980	Lab, Start	81.1 ± 7.4	75.2 ± 7.6	75.8 ± 40.4
Fifth International Intercomparison of Environmental Dosimeters conducted in the fall of 1980 at Idaho Falls, Idaho and sponsored by the School of Public Health of the University of Texas, Houston, Texas and the Environmental Measurements Laboratory, New York, New York, U.S. Department of Energy.						
6th International Intercomparison						
115-6						
Teledyne did not participate in the Sixth International Intercomparison of Environmental Dosimeters.						
7th International Intercomparison						
115-7A	LiF-100 Chips	Jun, 1984	Field	75.4 ± 2.6	75.8 ± 6.0	75.1 ± 29.8

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

Lab Code	TLD Type	Date	Measurement	mR: Teledyne Results ± 2 Sigma	mR: Known Value ± 2 Sigma	mR: Average ± 2 Sigma (All Participants)
115-7A	LiF-100 Chips	Jun, 1984	Lab, Co-60	80.0 ± 3.5	79.9 ± 4.0	77.9 ± 27.6
115-7A	LiF-100 Chips	Jun, 1984	Lab, Cs-137	66.6 ± 2.5	75.0 ± 3.8	73.0 ± 22.2
	Seventh International Intercomparison of Environmental Dosimeters conducted in the spring and summer of 1984 at Las Vegas, Nevada, and sponsored by the U.S. Department of Energy, The Nuclear Regulatory Commission, and the U.S. Environmental Protection Agency.					
7th International Intercomparison						
115-7B	LiF-100 Chips	Jun, 1984	Field	71.5 ± 2.6	75.8 ± 6.0	75.1 ± 29.8
115-7B	LiF-100 Chips	Jun, 1984	Lab, Co-60	84.8 ± 6.4	79.9 ± 4.0	77.9 ± 27.6
115-7B	LiF-100 Chips	Jun, 1984	Lab, Cs-137	78.8 ± 1.6	75.0 ± 3.8	73.0 ± 22.2
	Seventh International Intercomparison of Environmental Dosimeters conducted in the spring and summer of 1984 at Las Vegas, Nevada, and sponsored by the U.S. Department of Energy, The Nuclear Regulatory Commission, and the U.S. Environmental Protection Agency.					
7th International Intercomparison						
115-7C	$CaSO_4$: Dy Cards	Jun, 1984	Field	76.8 ± 2.7	75.8 ± 6.0	75.1 ± 29.8
115-7C	$CaSO_4$: Dy Cards	Jun, 1984	Lab, Co-60	82.5 ± 3.7	79.9 ± 4.0	77.9 ± 27.6
115-7C	$CaSO_4$: Dy Cards	Jun, 1984	Lab, Cs-137	79.0 ± 3.2	75.0 ± 3.8	73.0 ± 22.2
	Seventh International Intercomparison of Environmental Dosimeters conducted in the spring and summer of 1984 at Las Vegas, Nevada, and sponsored by the U.S. Department of Energy, The Nuclear Regulatory Commission, and the U.S. Environmental Protection Agency.					
8th International Intercomparison						
115-8A	LiF-100 Chips	Jan, 1986	Field, Site 1	29.5 ± 1.4	29.7 ± 1.5	28.9 ± 12.4
115-8A	LiF-100 Chips	Jan, 1986	Field, Site 2	11.3 ± 0.8	10.4 ± 0.5	10.1 ± 9.1
115-8A	LiF-100 Chips	Jan, 1986	Lab, Cs-137	13.7 ± 0.9	17.2 ± 0.9	16.2 ± 6.8
	Eighth International Intercomparison of Environmental Dosimeters conducted in the fall and winter of 1985-1986 at New York, New York, and sponsored by the U.S. Department of Energy.					
8th International Intercomparison						
115-8B	LiF-100 Chips	Jan, 1986	Field, Site 1	32.3 ± 1.2	29.7 ± 1.5	28.9 ± 12.4
115-8B	LiF-100 Chips	Jan, 1986	Field, Site 2	9.0 ± 1.0	10.4 ± 0.5	10.1 ± 9.0
115-8B	LiF-100 Chips	Jan, 1986	Lab, Cs-137	15.8 ± 0.9	17.2 ± 0.9	16.2 ± 6.8
	Eighth International Intercomparison of Environmental Dosimeters conducted in the fall and winter of 1985-1986 at New York, New York, and sponsored by the U.S. Department of Energy.					
8th International Intercomparison						
115-8C	$CaSO_4$: Dy Cards	Jan, 1986	Field, Site 1	32.2 ± 0.7	29.7 ± 1.5	28.9 ± 12.4

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

Lab Code	TLD Type	Date	Measurement	Teledyne Results ±2 sigma (mR)	Known Value ± 2 sigma (mR)	Average ± 2 sigma (All Participants) (mR)
115-8C	$CaSO_4$: Dy Cards	Jan, 1986	Field, Site 2	10.6±0.6	10.4±0.5	10.1±9.0
115-8C	$CaSO_4$: Dy Cards	Jan, 1986	Lab, Cs-137	18.1±0.8	17.2±0.9	16.2±6.8

Eighth International Intercomparison of Environmental Dosimeters conducted in the fall and winter of 1985-1986 at New York, New York, and sponsored by the U.S. Department of Energy.

9th International Intercomparison

115-9

The Ninth International Intercomparison of Environmental Dosimeters was not available to Teledyne Isotopes Midwest Laboratory.

10th International Intercomparison

115-10A	LiF-100 Chips	Aug, 1993	Field	25.7±1.4	27.0±1.6	26.4±10.2
115-10A	LiF-100 Chips	Aug, 1993	Lab,1	22.7±1.6	25.9±1.3	25.0±9.4
115-10A	LiF-100 Chips	Aug, 1993	Lab,2	62.7±2.6	72.7±1.9	69.8±20.3

The Tenth International Intercomparison of Environmental Dosimeters conducted in 1993 at Idaho State University and sponsored by the U.S. Department of Energy and the Idaho State University.

10th International Intercomparison

115-10B	$CaSO_4$: Dy Cards	Aug, 1993	Field	26.0±2.3	27.0±1.6	26.4±10.2
115-10B	$CaSO_4$: Dy Cards	Aug, 1993	Lab 1	24.1±1.7	25.9±1.3	25.0±9.4
115-10B	$CaSO_4$: Dy Cards	Aug, 1993	Lab 2	69.2±3.0	72.7±1.9	69.8±20.3

The Tenth International Intercomparison of Environmental Dosimeters conducted in 1993 at Idaho State University and sponsored by the U.S. Department of Energy and the Idaho State University.

Teledyne Testing

89-1	LiF-100 Chips	Sep, 1989	Lab	21.0±0.4	22.4	ND

ND=No Data; Teledyne Testing was only performed by Teledyne.
Chips were irradiated by Teledyne Isotopes, Inc., Westwood, New Jersey, in September, 1989.

Teledyne Testing

89-2	Teledyne $CaSO_4$: Dy Cards	Nov, 1989	Lab	20.9±1.0	20.3	ND

ND=No Data; Teledyne Testing was only performed by Teledyne.
Cards were irradiated by Teledyne Isotopes, Inc., Westwood, New Jersey, in June, 1990.

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

Lab Code	TLD Type	Date	Measurement	mR: Teledyne Results ± 2 Sigma	mR: Known Value ± 2 Sigma	mR: Average ± 2 Sigma (All Participants)
Teledyne Testing						
90-1	Teledyne $CaSo_4$: Dy Cards	Jun, 1990	Lab	20.6 ± 1.4	19.6	ND
ND = No Data; Teledyne Testing was only performed by Teledyne. Cards were irradiated by Teledyne Isotopes, Inc., Westwood, New Jersey, in June, 1990.						
Teledyne Testing						
90-2	Teledyne $CaSo_4$: Dy Cards	Jun, 1990	Lab	100.8 ± 4.3	100.0	ND
ND = No Data; Teledyne Testing was only performed by Teledyne. Cards were irradiated by Dosimetry Asssociates, Inc., Northville, MI, in October, 1990.						
Teledyne Testing						
91-1	Teledyne $CaSo_4$: Dy Cards	Oct, 1990	Lab, 1	33.4 ± 2.0	32.0	ND
91-1	Teledyne $CaSo_4$: Dy Cards	Oct, 1990	Lab, 2	55.2 ± 4.7	58.8	ND
91-1	Teledyne $CaSo_4$: Dy Cards	Oct, 1990	Lab, 3	87.8 ± 6.2	85.5	ND
ND = No Data; Teledyne Testing was only performed by Teledyne. Cards were irradiated by Teledyne Isotopes, Inc., Westwood, New Jersey, in October, 1991.						
Teledyne Testing						
92-1	LiF-100 Chips	Feb, 1992	Lab, 1	11.1 ± 0.2	10.7	ND
92-1	LiF-100 Chips	Feb, 1992	Lab, 2	25.6 ± 0.5	25.4	ND
92-1	LiF-100 Chips	Feb, 1992	Lab, 3	46.4 ± 0.5	46.3	ND
ND = No Data; Teledyne Testing was only performed by Teledyne. Chips were irradiated by Teledyne Isotopes, Inc., Westwood, New Jersey, in February, 1992.						
Teledyne Testing						
92-2	Teledyne $CaSo_4$: Dy Cards	Apr, 1992	Reader 1, #1	20.1 ± 0.1	20.1	ND
92-2	Teledyne $CaSo_4$: Dy Cards	Apr, 1992	Reader 1, #2	40.6 ± 0.1	40.0	ND

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

				mR		
Lab Code	TLD Type	Date	Measurement	Teledyne Results ± 2 Sigma	Known Value ± 2 Sigma	Average ± 2 Sigma (All Participants)
92-2	Teledyne $CaSo_4$: Dy Cards	Apr, 1992	Reader 1, #3	60.0 ± 1.3	60.3	ND
92-2	Teledyne $CaSo_4$: Dy Cards	Apr, 1992	Reader 2, #1	20.3 ± 0.3	20.1	ND
92-2	Teledyne $CaSo_4$: Dy Cards	Apr, 1992	Reader 2, #2	39.2 ± 0.3	40.0	ND
92-2	Teledyne $CaSo_4$: Dy Cards	Apr, 1992	Reader 2, #3	60.7 ± 0.4	60.3	ND

ND = No Data; Teledyne Testing was only performed by Teledyne.
Cards were irradiated by Teledyne Isotopes, Inc., Westwood, New Jersey, in April, 1992.

Teledyne Testing

93-1	Teledyne LiF-100 Chips	Mar, 1993	Lab, 1	10.0 ± 1.0	10.2	ND
93-1	Teledyne LiF-100 Chips	Mar, 1993	Lab, 2	25.2 ± 2.2	25.5	ND
93-1	Teledyne LiF-100 Chips	Mar, 1993	Lab, 3	42.7 ± 5.7	45.9	ND

ND = No Data; Teledyne Testing was only performed by Teledyne.
Chips were irradiated by Teledyne Isotopes, Inc., Westwood, New Jersey, in March, 1993. Due to a potential error of 10-12% when cards where irradiated, results of the testing on the cards will not be published. Data is available upon request.

Teledyne Testing

94-1	Teledyne LiF-100 Chips	Nov, 1994	Lab, 1	15.6 ± 0.4	14.9	ND
94-1	Teledyne LiF-100 Chips	Nov, 1994	Lab, 2	30.2 ± 0.4	29.8	ND
94-1	Teledyne LiF-100 Chips	Nov, 1994	Lab, 3	59.2 ± 0.3	59.7	ND
94-1	Teledyne $CaSo_4$: Dy Cards	Nov, 1994	Reader 1, #1	14.9 ± 0.1	14.9	ND
94-1	Teledyne $CaSo_4$: Dy Cards	Nov, 1994	Reader 1, #2	30.8 ± 0.1	29.8	ND

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

				mR		
Lab Code	TLD Type	Date	Measurement	Teledyne Results ± 2 Sigma	Known Value ± 2 Sigma	Average ± 2 Sigma (All Participants)
94-1	Teledyne $CaSo_4$: Dy Cards	Nov, 1994	Reader 1, #3	58.9 ± 0.3	59.7	ND
94-1	Teledyne $CaSo_4$: Dy Cards	Nov, 1994	Reader 2, #1	15.4 ± 0.2	14.9	ND
94-1	Teledyne $CaSo_4$: Dy Cards	Nov, 1994	Reader 2, #2	31.4 ± 0.2	29.8	ND
94-1	Teledyne $CaSo_4$: Dy Cards	Nov, 1994	Reader 2, #3	60.1 ± 0.3	59.7	ND

ND = No Data; Teledyne Testing was only performed by Teledyne.
Cards were irradiated by Teledyne Isotopes, Inc., Westwood, New Jersey, in November, 1994.

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

Lab Code	Sample Type	Date Collected	Analysis	Concentration in pCi/L[a]		
				Teledyne Results 2s, n=1[b]	Known Activity	Control[c] Limits
SPW-4821	WATER	Jan, 1994	Ce-144	2593.1 ± 54.9	2692.5	1615.5 - 2961.8
SPW-4822	WATER	Jan, 1994	Ce-144	1705.1 ± 48.1	1749.8	1049.9 - 1924.8
SPW-4823	WATER	Jan, 1994	Ce-144	55.4 ± 17.5	49.0	29.4 - 59.0
SPW-4825	WATER	Jan, 1994	Gr. Alpha	34.4 ± 1.6	41.7	20.9 - 62.6
SPW-4825	WATER	Jan, 1994	Gr. Beta	33.6 ± 1.2	30.2	20.2 - 40.2
SPW-4826	WATER	Jan, 1994	Gr. Alpha	66.8 ± 2.1	83.4	41.7 - 125.1
SPW-4826	WATER	Jan, 1994	Gr. Beta	63.8 ± 1.5	60.4	50.4 - 70.4
SPMI-4848	MILK	Jan, 1994	Cs-134	27.2 ± 5.7	31.7	21.7 - 41.7
SPMI-4848	MILK	Jan, 1994	Cs-137	34.6 ± 8.2	34.8	24.8 - 44.8
SPMI-4848	MILK	Jan, 1994	Sr-89	28.2 ± 3.8	35.0	25.0 - 45.0
SPMI-4848	MILK	Jan, 1994	Sr-90	41.2 ± 1.2	40.7	32.6 - 48.8
SPMI-4849	MILK	Jan, 1994	Sr-89	9.5 ± 1.6	11.9	1.9 - 21.9
SPMI-4849	MILK	Jan, 1994	Sr-90	19.4 ± 0.8	20.1	10.1 - 30.1
SPMI-4862	MILK	Jan, 1994	Cs-134	328.3 ± 16.3	338.0	304.2 - 371.8
SPMI-4862	MILK	Jan, 1994	Cs-137	1019.6 ± 18.3	1114.4	1003.0 - 1225.8
SPAP-4953	AIR FILTER	Jan, 1994	Gr. Beta	4.8 ± 0.1	4.2	0.0 - 14.2
SPAP-4954	AIR FILTER	Jan, 1994	Cs-137	1.4 ± 0.1	1.3	0.8 - 1.8
SPW-4955	WATER	Jan, 1994	H-3	17080.0 ± 364.0	17163.0	13730.4 - 20595.6
SPW-4956	WATER	Jan, 1994	Co-60	1514.0 ± 46.2	1545.0	1390.5 - 1699.5
SPW-4956	WATER	Jan, 1994	Cs-134	433.7 ± 25.5	479.0	431.1 - 526.9
SPW-4956	WATER	Jan, 1994	Cs-137	742.7 ± 45.9	732.0	658.8 - 805.2
SPCH-4928	CHARCOAL CANISTER	Feb, 1994	I-131(g)	1449.9 ± 65.1	1452.8	871.7 - 1598.1
SPW-4934	WATER	Feb, 1994	I-131	76.4 ± 1.4	90.8	72.6 - 109.0
SPW-4934	WATER	Feb, 1994	I-131(g)	90.2 ± 7.6	90.8	54.5 - 100.8
SPMI-4935	MILK	Feb, 1994	I-131	40.4 ± 1.0	43.6	31.6 - 55.6
SPMI-4935	MILK	Feb, 1994	I-131(g)	41.8 ± 6.7	43.6	26.2 - 53.6
SPBS-5102	SEDIMENT	Mar, 1994	H-3	97.2 ± 1.0	105.4	0.0 - 630.0
SPW-5146	WATER	Mar, 1994	Sr-89	25.5 ± 3.9	26.4	16.4 - 36.4
SPW-5146	WATER	Mar, 1994	Sr-90	16.2 ± 1.1	18.8	8.8 - 28.8
SPW-646	WATER	Apr, 1994	H-3	9847.8 ± 294.9	9855.0	7884.0 - 11826.0
SPW-648	WATER	Apr, 1994	Co-60	21.6 ± 6.6	22.6	12.6 - 32.6
SPW-648	WATER	Apr, 1994	Cs-134	33.3 ± 8.5	33.6	23.6 - 43.6
SPW-648	WATER	Apr, 1994	Cs-137	37.6 ± 9.8	36.3	26.3 - 46.3
SPMI-650	MILK	Apr, 1994	Cs-134	52.0 ± 5.3	50.6	40.6 - 60.6

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

Lab Code	Sample Type	Date Collected	Analysis	Concentration in pCi/L[a] Teledyne Results 2s, n=1[b]	Known Activity	Control[c] Limits
SPMI-650	MILK	Apr, 1994	Cs-137	61.6 ± 8.3	54.5	44.5 - 64.5
SPW-652	WATER	Apr, 1994	Gr. Alpha	44.8 ± 1.2	41.6	20.8 - 62.4
SPW-652	WATER	Apr, 1994	Gr. Beta	24.1 ± 1.0	25.4	15.4 - 35.4
SPAP-654	AIR FILTER	Apr, 1994	Cs-137	1.3 ± 0.1	1.3	0.8 - 1.8
SPW-974	WATER	May, 1994	Fe-55	56.7 ± 12.0	58.5	38.5 - 78.5
SPF-1023	FISH (JELLO)	May, 1994	Cs-137	6.9 ± 0.1	6.8	0.0 - 16.8
SPBS-1024	SEDIMENT	May, 1994	Cs-137	6.2 ± 0.1	6.0	0.0 - 16.0
SPW-1850	WATER	Jun, 1994	I-131	46.0 ± 0.7	51.8	39.8 - 63.8
SPW-1850	WATER	Jun, 1994	I-131(g)	50.9 ± 8.3	51.8	31.1 - 61.8
SPMI-1851	MILK	Jun, 1994	I-131	51.7 ± 0.6	51.8	39.8 - 63.8
SPMI-1851	MILK	Jun, 1994	I-131(g)	51.3 ± 10.8	51.8	31.1 - 61.8
SPVE-1854	VEGETATION (SAWDUST)	Jun, 1994	I-131(g)	0.9 ± 0.1	1.0	0.6 - 1.4
SPCH-1855	CHARCOAL CANISTER	Jun, 1994	I-131(g)	1.9 ± 0.1	1.8	1.1 - 2.5
SPW-3278	WATER	Jun, 1994	Gr. Alpha	20.8 ± 1.1	23.4	11.7 - 35.1
SPW-3278	WATER	Jun, 1994	Gr. Beta	29.5 ± 1.1	31.8	21.8 - 41.8
SPW-3276	WATER	Jul, 1994	H-3	24504.6 ± 421.7	25019.0	20015.2 - 30022.8
SPMI-3282	MILK	Jul, 1994	Sr-89	16.4 ± 4.8	22.5	12.5 - 32.5
SPMI-3282	MILK	Jul, 1994	Sr-90	25.3 ± 1.4	25.4	15.4 - 35.4
SPW-3284	WATER	Jul, 1994	Cs-137	240.8 ± 19.3	221.5	199.4 - 243.7
SPAP-3388	AIR FILTER	Jul, 1994	Gr. Beta	7.9 ± 0.1	8.3	0.0 - 18.3
SPAP-3390	AIR FILTER	Jul, 1994	Cs-137	1.3 ± 0.1	1.3	0.8 - 1.8
SPF-3603	FISH (JELLO)	Jul, 1994	Cs-137	8.3 ± 1.3	8.5	0.0 - 18.5
SPW-5549	WATER	Oct, 1994	I-131	77.4 ± 0.9	79.9	63.9 - 95.9
SPW-5549	WATER	Oct, 1994	I-131(g)	85.5 ± 9.5	79.9	47.9 - 89.9
SPMI-5550	MILK	Oct, 1994	Cs-134	35.0 ± 6.0	36.4	26.4 - 46.4
SPMI-5550	MILK	Oct, 1994	Cs-137	46.1 ± 9.4	44.1	34.1 - 54.1
SPMI-5550	MILK	Oct, 1994	I-131	65.2 ± 0.9	63.9	51.1 - 76.7
SPMI-5550	MILK	Oct, 1994	I-131(g)	68.4 ± 11.1	63.9	38.3 - 73.9
SPW-5594	WATER	Oct, 1994	I-131	92.5 ± 1.0	95.8	76.6 - 115.0
SPW-5594	WATER	Oct, 1994	I-131(g)	98.2 ± 10.1	95.8	57.5 - 105.8
SPVE-6067	VEGETATION (SAWDUST)	Oct, 1994	I-131(g)	1.7 ± 0.1	1.6	1.0 - 2.2
SPS-5946	SEDIMENT (BOTTOM)	Oct, 1994	Cs-134	0.3 ± 24.2	0.3	0.2 - 0.5
SPF-6208	FISH (JELLO)	Oct, 1994	Cs-137	11.6 ± 0.1	12.1	2.1 - 22.1

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

Lab Code	Sample Type	Date Collected	Analysis	Concentration in pCi/L[a] Teledyne Results 2s, n=1[b]	Known Activity	Control[c] Limits
SPW-6955	WATER	Nov, 1994	Ni-63	1851.6 ± 34.3	1931.0	1158.6 - 2703.4
SPW-6994	WATER	Nov, 1994	Tc-99	63.2 ± 7.8	66.0	46.2 - 85.7
SPW-7440	WATER	Nov, 1994	H-3	24099.2 ± 423.9	24260.0	19408.0 - 29112.0
SPAP-7507	AIR FILTER	Nov, 1994	Cs-137	2.2 ± 0.0	1.9	1.2 - 2.7
SPW-7479	WATER	Dec, 1994	Gr. Alpha	21.9 ± 1.7	20.2	10.1 - 30.3
SPW-7479	WATER	Dec, 1994	Gr. Beta	45.9 ± 1.2	50.4	40.4 - 60.4

[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.

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

Lab Code	Sample Type	Sample Date	Analysis	Concentration pCi/L[a]. Teledyne Results (4.66 Sigma) LLD	Teledyne Results (4.66 Sigma) Activity[b]	Acceptance Criteria (4.66 Sigma)
SPW-4820	WATER	Jan 1994	Cs-134	<1.9	-1.76 ± 7.24	< 10.0
SPW-4820	WATER	Jan 1994	Cs-137	<4.4	-0.31 ± 2.67	< 10.0
SPW-4824	WATER	Jan 1994	Gr. Alpha	<0.3	0.00 ± 0.20	< 1.0
SPW-4824	WATER	Jan 1994	Gr. Beta	<0.9	0.40 ± 0.59	< 3.2
SPW-4827	WATER	Jan 1994	Co-60	<1.8	1.10 ± 1.04	< 10.0
SPW-4827	WATER	Jan 1994	Cs-134	<1.9	0.51 ± 6.76	< 10.0
SPW-4827	WATER	Jan 1994	Cs-137	<2.0	0.43 ± 0.84	< 10.0
SPW-4827	WATER	Jan 1994	Gr. Alpha	<0.4	0.12 ± 0.25	< 1.0
SPW-4827	WATER	Jan 1994	Gr. Beta	<0.8	0.21 ± 0.55	< 3.2
SPW-4827	WATER	Jan 1994	H-3	<192.0	133.90 ± 101.00	< 200.0
SPW-4827	WATER	Jan 1994	I-131	<0.3	-0.12 ± 0.14	< 0.5
SPMI-4846	MILK	Jan 1994	Co-60	<3.6	0.62 ± 2.67	< 10.0
SPMI-4846	MILK	Jan 1994	Cs-134	<5.4	0.52 ± 3.83	< 10.0
SPMI-4846	MILK	Jan 1994	Cs-137	<3.4	-0.74 ± 2.93	< 10.0
SPMI-4846	MILK	Jan 1994	I-131	<0.5	0.27 ± 0.34	< 0.5
SPMI-4846	MILK	Jan 1994	Sr-89	<0.5	-0.54 ± 0.79	< 5.0
SPMI-4846	MILK	Jan 1994	Sr-90	N/A	1.93 ± 0.44	< 1.0
Low level of Sr-90 concentration in milk (1-5 pCi/L) is not unusual.						
SPAP-4950	AIR FILTER	Jan 1994	Co-60	<2.2	-2.61 ± 2.19	< 10.0
SPAP-4950	AIR FILTER	Jan 1994	Cs-134	<3.1	-0.31 ± 3.65	< 10.0
SPAP-4950	AIR FILTER	Jan 1994	Cs-137	<2.9	2.78 ± 23.94	< 10.0
SPAP-4952	AIR FILTER	Jan 1994	Gr. Beta	<0.9	0.00 ± 0.58	< 3.2
SPCH-4951	CHARCOAL CANISTER	Feb 1994	I-131(g)	<7.0	0.64 ± 4.80	< 9.6
SPW-5054	WATER	Mar 1994	Ra-226	<0.1	0.01 ± 0.03	< 1.0
SPW-5054	WATER	Mar 1994	Ra-228	<1.0	0.54 ± 0.67	< 1.0
SPBS-5101	SEDIMENT	Mar 1994	Co-60	<5.9	-0.19 ± 1.63	< 10.0
SPBS-5101	SEDIMENT	Mar 1994	Cs-134	<6.2	-31.20 ± 13.10	< 10.0
SPBS-5101	SEDIMENT	Mar 1994	Cs-137	<4.4	-0.26 ± 2.75	< 10.0
SPW-647	WATER	Apr 1994	Co-60	<5.8	0.56 ± 0.53	< 10.0
SPW-647	WATER	Apr 1994	Cs-134	<3.4	0.86 ± 0.72	< 10.0
SPW-647	WATER	Apr 1994	Cs-137	<5.1	2.65 ± 2.75	< 10.0
SPW-647	WATER	Apr 1994	H-3	<191.5	148.40 ± 100.90	< 200.0
SPW-647	WATER	Apr 1994	I-131	<0.5	-0.34 ± 0.22	< 0.5
SPMI-649	MILK	Apr 1994	Co-60	<6.5	0.55 ± 1.39	< 10.0

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

Lab Code	Sample Type	Sample Date	Analysis	Concentration pCi/L[a]. Teledyne Results (4.66 Sigma) LLD	Teledyne Results (4.66 Sigma) Activity[b]	Acceptance Criteria (4.66 Sigma)
SPMI-649	MILK	Apr 1994	Cs-134	<3.4	-3.45 ± 5.60	< 10.0
SPMI-649	MILK	Apr 1994	Cs-137	<4.6	0.59 ± 3.98	< 10.0
SPMI-649	MILK	Apr 1994	I-131	<0.5	-0.11 ± 0.19	< 0.5
SPW-651	WATER	Apr 1994	Gr. Alpha	<0.4	0.14 ± 0.25	< 1.0
SPW-651	WATER	Apr 1994	Gr. Beta	<0.8	0.12 ± 0.54	< 3.2
SPAP-653	AIR FILTER	Apr 1994	Cs-134	<2.1	-0.12 ± 0.18	< 10.0
SPAP-653	AIR FILTER	Apr 1994	Cs-137	<3.4	1.05 ± 1.55	< 10.0
SPCH-654	CHARCOAL CANISTER	Apr 1994	I-131(g)	<6.1	0.96 ± 3.84	< 9.6
SPAP-4956	AIR FILTER	Apr 1994	Gr. Beta	<1.0	0.32 ± 0.96	< 3.2
SPW-974	WATER	May 1994	Fe-55	<0.8	0.10 ± 0.47	< 1000.0
SPF-1022	FISH (JELLO)	May 1994	Cs-134	<9.2	12.70 ± 31.70	< 10.0
SPF-1022	FISH (JELLO)	May 1994	Cs-137	<10.0	27.30 ± 58.30	< 10.0
SPW-1075	WATER	May 1994	Ra-226	<0.1	0.01 ± 0.04	< 1.0
SPBS-3254	SEDIMENT	May 1994	Co-60	<5.8	5.93 ± 8.06	< 10.0
SPBS-3254	SEDIMENT	May 1994	Cs-134	<2.0	5.67 ± 6.69	< 10.0
SPBS-3254	SEDIMENT	May 1994	Cs-137	<5.0	-2.11 ± 4.69	< 10.0
SPVE-1852	VEGETATION (SAWDUST)	Jun 1994	Cs-134	<5.4	-1.47 ± 2.14	< 10.0
SPVE-1852	VEGETATION (SAWDUST)	Jun 1994	Cs-137	<6.6	2.12 ± 3.44	< 10.0
SPVE-1852	VEGETATION (SAWDUST)	Jun 1994	I-131(g)	<5.6	-0.73 ± 1.08	< 20.0
SPW-3277	WATER	Jun 1994	Gr. Alpha	<0.3	0.10 ± 0.22	< 1.0
SPW-3277	WATER	Jun 1994	Gr. Beta	<0.8	0.14 ± 0.54	< 3.2
SPW-3275	WATER	Jul 1994	H-3	<154.9	22.81 ± 77.81	< 200.0
SPMI-3281	MILK	Jul 1994	Co-60	<3.6	0.87 ± 2.22	< 10.0
SPMI-3281	MILK	Jul 1994	Cs-134	<2.3	-0.45 ± 2.61	< 10.0
SPMI-3281	MILK	Jul 1994	Cs-137	<4.2	0.07 ± 2.28	< 10.0
SPMI-3281	MILK	Jul 1994	I-131	<0.2	0.10 ± 0.16	< 0.5
SPMI-3281	MILK	Jul 1994	Sr-89	<0.9	-0.54 ± 1.32	< 5.0
SPMI-3281	MILK	Jul 1994	Sr-90	N/A	2.29 ± 0.56	< 1.0
Low level of Sr-90 concentration in milk (1-5 pCi/L) is not unusual.						
SPW-3283	WATER	Jul 1994	Co-60	<2.2	-3.09 ± 3.52	< 10.0
SPW-3283	WATER	Jul 1994	Cs-134	<5.4	0.79 ± 3.13	< 10.0

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

Lab Code	Sample Type	Sample Date	Analysis	Concentration pCi/L[a]. Teledyne Results (4.66 Sigma) LLD	Teledyne Results (4.66 Sigma) Activity[b]	Acceptance Criteria (4.66 Sigma)
SPW-3283	WATER	Jul 1994	Cs-137	<5.0	-0.10 ± 3.05	< 10.0
SPW-3283	WATER	Jul 1994	I-131	<0.4	0.14 ± 0.22	< 0.5
SPAP-3389	AIR FILTER	Jul 1994	Gr. Beta	<0.2	0.16 ± 0.26	< 3.2
SPAP-3391	AIR FILTER	Jul 1994	Co-60	<1.7	-0.74 ± 1.44	< 10.0
SPAP-3391	AIR FILTER	Jul 1994	Cs-134	<2.3	0.95 ± 4.86	< 10.0
SPAP-3391	AIR FILTER	Jul 1994	Cs-137	<4.1	-3.03 ± 3.15	< 10.0
SPF-3602	FISH (JELLO)	Jul 1994	Co-60	<3.6	-4.45 ± 4.27	< 10.0
SPF-3602	FISH (JELLO)	Jul 1994	Cs-134	<4.1	-3.91 ± 5.63	< 10.0
SPF-3602	FISH (JELLO)	Jul 1994	Cs-137	<4.7	-5.17 ± 5.80	< 10.0
SPMI-5551	MILK	Oct 1994	Cs-134	<4.3	0.90 ± 3.34	< 10.0
SPMI-5551	MILK	Oct 1994	Cs-137	<4.1	-0.55 ± 3.43	< 10.0
SPMI-5551	MILK	Oct 1994	I-131	<0.2	-0.03 ± 0.16	< 0.5
SPSO-5947	SOIL	Oct 1994	Cs-134	<2.3	-4.84 ± 4.84	< 10.0
SPSO-5947	SOIL	Oct 1994	Cs-137	<6.4	-0.50 ± 4.71	< 10.0
SPW-6995	WATER	Nov 1994	Tc-99	<4.2	1.24 ± 2.19	< 10.0
SPW-7441	WATER	Nov 1994	H-3	<169.0	-74.64 ± 80.48	< 200.0
SPW-7442	WATER	Nov 1994	H-3	<169.0	-37.02 ± 82.14	< 200.0
SPW-7451	WATER	Nov 1994	Gr. Alpha	<0.3	0.11 ± 0.19	< 1.0
SPW-7451	WATER	Nov 1994	Gr. Beta	<0.8	0.10 ± 0.52	< 3.2
SPAP-7506	AIR FILTER	Nov 1994	Co-60	<2.1	0.17 ± 1.63	< 10.0
SPAP-7506	AIR FILTER	Nov 1994	Cs-134	<1.6	-1.08 ± 1.70	< 10.0
SPAP-7506	AIR FILTER	Nov 1994	Cs-137	<3.0	-0.55 ± 1.65	< 10.0

[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[b]	Sample Date	Analysis	Concentration in pCi/L[a] First Result	Second Result	Averaged Result
WATER-4607, 4608	Jan, 1994	Gr. Beta	1.35 ± 0.70	1.38 ± 0.70	1.37 ± 0.49
MILK-166, 167	Jan, 1994	Co-60	1.42 ± 3.73	-1.13 ± 4.25	0.15 ± 2.83
MILK-166, 167	Jan, 1994	Cs-137	-0.26 ± 3.42	-0.65 ± 2.61	-0.46 ± 2.15
MILK-166, 167	Jan, 1994	I-131(G)	-0.10 ± 0.22	0.22 ± 0.22	0.06 ± 0.16
WATER-4711, 4712	Jan, 1994	Gr. Beta	1.70 ± 0.60	1.80 ± 0.60	1.75 ± 0.42
MILK-187, 188	Jan, 1994	Co-60	0.05 ± 2.88	-1.43 ± 3.35	-0.69 ± 2.21
MILK-187, 188	Jan, 1994	Cs-137	0.16 ± 1.87	1.86 ± 2.61	1.01 ± 1.61
MILK-187, 188	Jan, 1994	I-131	0.16 ± 0.18	0.13 ± 0.23	0.15 ± 0.15
WATER-4664, 4665	Jan, 1994	Gr. Beta	8.80 ± 1.80	4.40 ± 1.40	6.60 ± 1.14
A review of the raw data revealed no errors or discrepancies. The sample was reanalyzed. The result of the reanalysis was 6.6±1.5 pCi/L. No further action is planned.					
WATER-4664, 4665	Jan, 1994	H-3	92.98 ± 95.90	37.19 ± 93.63	65.09 ± 67.01
WATER-4687, 4688	Jan, 1994	Gr. Alpha	1.57 ± 1.48	0.00 ± 1.19	0.79 ± 0.95
WATER-4687, 4688	Jan, 1994	Gr. Beta	3.23 ± 0.82	2.51 ± 0.79	2.87 ± 0.57
WATER-4687, 4688	Jan, 1994	H-3	171.80 ± 98.99	183.40 ± 99.44	177.60 ± 70.16
WATER-4741, 4742	Jan, 1994	H-3	105.00 ± 101.00	127.00 ± 102.00	116.00 ± 71.77
MILK-208, 209	Jan, 1994	K-40	1,396.00 ± 148.00	1,586.00 ± 162.00	1,491.00 ± 109.71
MILK-208, 209	Jan, 1994	Sr-90	2.96 ± 0.56	3.58 ± 0.68	3.27 ± 0.44
WATER-4830, 4831	Jan, 1994	H-3	73.80 ± 89.38	79.33 ± 89.60	76.57 ± 63.28
WATER-4865, 4866	Jan, 1994	Gr. Beta	1.93 ± 0.19	1.94 ± 0.18	1.94 ± 0.13
WATER-5052, 5053	Jan, 1994	Gr. Beta	2.20 ± 0.55	2.58 ± 0.56	2.39 ± 0.39
WATER-4890, 4891	Jan, 1994	H-3	421.90 ± 109.00	454.80 ± 106.60	438.35 ± 76.23
WATER-4919, 4920	Jan, 1994	Gr. Beta	2.80 ± 0.80	3.40 ± 0.80	3.10 ± 0.57
WATER-4952, 4953	Feb, 1994	Gr. Beta	2.66 ± 0.55	2.14 ± 0.52	2.40 ± 0.38
WATER-5010, 5011	Feb, 1994	H-3	142.00 ± 99.00	119.00 ± 98.00	130.50 ± 69.65
MILK-250, 251	Feb, 1994	K-40	1,087.00 ± 77.00	1,036.00 ± 98.00	1,061.50 ± 62.32
MILK-250, 251	Feb, 1994	Sr-90	3.68 ± 0.62	4.09 ± 0.61	3.89 ± 0.43
MILK-271, 272	Feb, 1994	K-40	1,510.00 ± 90.00	1,520.00 ± 110.00	1,515.00 ± 71.06
WATER-4978, 4979	Feb, 1994	H-3	83.75 ± 96.98	69.80 ± 96.41	76.78 ± 68.37
MILK-229, 230	Feb, 1994	Co-60	-1.48 ± 4.16	-1.60 ± 5.54	-1.54 ± 3.46
MILK-229, 230	Feb, 1994	Cs-137	-0.67 ± 3.05	-1.96 ± 3.72	-1.32 ± 2.41
MILK-229, 230	Feb, 1994	I-131	0.17 ± 0.24	0.10 ± 0.17	0.14 ± 0.15
WATER-5081, 5082	Feb, 1994	H-3	28.00 ± 95.00	72.00 ± 96.00	50.00 ± 67.53
WATER-5124, 5125	Feb, 1994	H-3	465.80 ± 113.65	358.00 ± 109.80	411.90 ± 79.01
WATER-5212, 5213	Feb, 1994	Gr. Beta	2.86 ± 0.67	2.22 ± 0.59	2.54 ± 0.45
WATER-5183, 5184	Feb, 1994	Co-60	1.46 ± 1.64	-0.70 ± 2.04	0.38 ± 1.31
WATER-5183, 5184	Feb, 1994	Cs-137	0.33 ± 1.63	0.37 ± 2.05	0.35 ± 1.31
WATER-5183, 5184	Feb, 1994	Gr. Beta	4.92 ± 1.09	4.52 ± 1.07	4.72 ± 0.76
MILK-292, 293	Mar, 1994	K-40	1,377.00 ± 85.00	1,364.00 ± 100.00	1,370.50 ± 65.62
MILK-292, 293	Mar, 1994	Sr-90	1.20 ± 0.38	1.49 ± 0.41	1.35 ± 0.28
MILK-5246, 5247	Mar, 1994	Gr. Beta	6.54 ± 0.83	6.42 ± 0.88	6.48 ± 0.60

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

Lab Codes[b]	Sample Date	Analysis	Concentration in pCi/L[a] First Result	Second Result	Averaged Result
WATER-5270, 5271	Mar, 1994	Gr. Beta	3.28 ± 0.98	2.84 ± 0.96	3.06 ± 0.69
WATER-5293, 5294	Mar, 1994	H-3	620.18 ± 118.74	582.33 ± 117.46	601.26 ± 83.51
MILK-313, 314	Mar, 1994	I-131(G)	1.26 ± 47.70	-0.30 ± 0.78	0.48 ± 23.85
MILK-334, 335	Mar, 1994	K-40	1,392.00 ± 95.00	1,437.00 ± 115.00	1,414.50 ± 74.58
WATER-5400, 5401	Mar, 1994	H-3	77.70 ± 97.20	66.76 ± 96.54	72.23 ± 68.50
WATER-5485, 5486	Mar, 1994	H-3	336.00 ± 107.00	272.00 ± 105.00	304.00 ± 74.96
WATER-5446, 5447	Mar, 1994	Co-60	1.84 ± 4.35	0.07 ± 0.45	0.96 ± 2.19
WATER-5446, 5447	Mar, 1994	Cs-137	0.68 ± 1.61	1.01 ± 1.91	0.85 ± 1.25
WATER-5446, 5447	Mar, 1994	Gr. Beta	3.84 ± 1.25	3.72 ± 1.25	3.78 ± 0.88
WATER-5510, 5511	Mar, 1994	H-3	396.00 ± 89.00	458.51 ± 113.14	427.26 ± 71.98
WATER-5538, 5539	Mar, 1994	Gr. Beta	2.58 ± 0.62	2.02 ± 0.60	2.30 ± 0.43
WATER-5593, 5594	Mar, 1994	H-3	139.87 ± 101.14	169.37 ± 101.75	154.62 ± 71.73
WATER-5614, 5615	Mar, 1994	Co-60	0.36 ± 1.04	0.22 ± 2.15	0.29 ± 1.19
WATER-5614, 5615	Mar, 1994	Cs-137	0.90 ± 3.78	-0.39 ± 2.59	0.26 ± 2.29
WATER-5566, 5567	Mar, 1994	Gr. Beta	2.76 ± 0.50	2.20 ± 0.48	2.48 ± 0.35
WATER-72, 73	Mar, 1994	Gr. Beta	1.58 ± 0.50	1.46 ± 0.48	1.52 ± 0.35
WATER-49, 50	Apr, 1994	Gr. Beta	3.43 ± 0.92	3.43 ± 0.92	3.43 ± 0.65
WATER-102, 103	Apr, 1994	Gr. Beta	2.02 ± 0.50	2.05 ± 0.47	2.04 ± 0.34
WATER-102, 103	Apr, 1994	H-3	165.00 ± 102.00	79.00 ± 98.00	122.00 ± 70.72
WATER-187, 188	Apr, 1994	Gr. Beta	3.38 ± 0.66	3.19 ± 0.64	3.29 ± 0.46
MILK-246, 247	Apr, 1994	Co-60	1.75 ± 1.61	1.76 ± 1.61	1.76 ± 1.14
MILK-246, 247	Apr, 1994	Cs-137	0.10 ± 1.86	0.10 ± 1.86	0.10 ± 1.32
MILK-246, 247	Apr, 1994	I-131	0.07 ± 0.23	0.15 ± 0.34	0.11 ± 0.21
WATER-257, 258	Apr, 1994	Gr. Beta	3.28 ± 0.74	3.28 ± 0.79	3.28 ± 0.54
WATER-267, 268	Apr, 1994	Cs-137	0.19 ± 2.69	1.22 ± 2.18	0.71 ± 1.73
WATER-281, 282	Apr, 1994	Gr. Beta	15.73 ± 2.02	30.38 ± 2.60	23.06 ± 1.65
A review of the raw data revealed no errors or discrepancies. Both samples were recounted. The results of the recounts were in agreement with the initial results. The sample was reanalyzed. The result of the reanalysis was 30.7±2.1 pCi/L. No further action is planned.					
WATER-281, 282	Apr, 1994	H-3	381,181.00 ± 1,740.00	378,406.00 ± 1,733.00	379,793.50 ± 1,227.89
WATER-454, 455	Apr, 1994	Gr. Beta	3.34 ± 2.10	3.67 ± 2.20	3.51 ± 1.52
WATER-405, 406	Apr, 1994	H-3	65.90 ± 98.21	61.95 ± 98.05	63.93 ± 69.39
MILK-464, 465	Apr, 1994	K-40	1,630.00 ± 130.00	1,589.00 ± 162.00	1,609.50 ± 103.86
WATER-516, 517	Apr, 1994	H-3	37.60 ± 94.95	69.26 ± 95.77	53.43 ± 67.43
WATER-267, 268	Apr, 1994	Cs-137	0.19 ± 2.69	1.22 ± 2.18	0.71 ± 1.73
WATER-616, 617	Apr, 1994	Gr. Beta	2.50 ± 0.52	3.04 ± 0.55	2.77 ± 0.38
WATER-616, 617	Apr, 1994	H-3	193.00 ± 102.00	203.00 ± 103.00	198.00 ± 72.48
WATER-739, 740	Apr, 1994	Co-60	0.84 ± 11.40	0.31 ± 0.43	0.58 ± 5.70
WATER-739, 740	Apr, 1994	Cs-137	-0.30 ± 3.59	0.77 ± 3.23	0.24 ± 2.41
WATER-739, 740	Apr, 1994	Cs-137	-0.30 ± 3.59	0.77 ± 3.23	0.24 ± 2.41
WATER-697, 698	Apr, 1994	Co-60	3.41 ± 4.36	2.05 ± 2.79	2.73 ± 2.59

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

Lab Codes[b]	Sample Date	Analysis	Concentration in pCi/L[a] First Result	Second Result	Averaged Result
WATER-697, 698	Apr, 1994	Gr. Beta	2.93 ± 0.98	3.09 ± 0.78	3.01 ± 0.63
WATER-1003, 1004	May, 1994	Gr. Beta	2.77 ± 0.29	2.57 ± 0.34	2.67 ± 0.22
WATER-796, 797	May, 1994	Gr. Beta	1.66 ± 0.47	2.13 ± 0.48	1.90 ± 0.34
WATER-931, 932	May, 1994	H-3	531.26 ± 109.73	554.52 ± 110.55	542.89 ± 77.88
WATER-893, 894	May, 1994	Co-60	-1.45 ± 4.08	1.27 ± 3.23	-0.09 ± 2.60
WATER-893, 894	May, 1994	Cs-137	0.85 ± 2.25	1.46 ± 3.09	1.16 ± 1.91
WATER-893, 894	May, 1994	Gr. Beta	1.34 ± 1.85	-0.22 ± 1.75	0.56 ± 1.27
WATER-893, 894	May, 1994	H-3	158.96 ± 95.60	118.25 ± 93.99	138.61 ± 67.03
MILK-900, 901	May, 1994	Co-60	-2.76 ± 2.98	-1.74 ± 6.09	-2.25 ± 3.39
MILK-900, 901	May, 1994	Cs-137	-0.14 ± 1.31	0.54 ± 1.67	0.20 ± 1.06
MILK-900, 901	May, 1994	I-131	0.10 ± 0.17	0.11 ± 0.19	0.11 ± 0.13
MILK-1001, 1002	May, 1994	K-40	1,250.00 ± 180.00	1,370.00 ± 140.00	1,310.00 ± 114.02
WATER-1171, 1172	May, 1994	Gr. Beta	9.69 ± 2.01	7.49 ± 2.21	8.59 ± 1.49
WATER-1171, 1172	May, 1994	H-3	950.00 ± 108.00	1,012.00 ± 109.00	981.00 ± 76.72
MILK-1214, 1215	May, 1994	Co-60	0.72 ± 2.41	0.21 ± 0.58	0.47 ± 1.24
MILK-1214, 1215	May, 1994	Cs-137	-0.42 ± 1.47	1.42 ± 1.82	0.50 ± 1.17
MILK-1214, 1215	May, 1994	I-131	0.10 ± 0.19	0.06 ± 0.17	0.08 ± 0.13
WATER-1565, 1566	May, 1994	Gr. Beta	2.63 ± 0.88	2.61 ± 0.91	2.62 ± 0.63
WATER-1399, 1400	May, 1994	Gr. Beta	5.97 ± 0.67	5.46 ± 0.65	5.72 ± 0.47
MILK-1301, 1302	May, 1994	I-131(G)	-0.10 ± 0.18	0.00 ± 0.18	-0.05 ± 0.13
SEDIMENTS-1550, 1551	May, 1994	Gr. Beta	2.10 ± 0.10	2.15 ± 0.10	2.13 ± 0.07
WATER-1545, 1546	May, 1994	Gr. Beta	6.63 ± 0.62	5.38 ± 0.63	6.01 ± 0.44
WATER-1670, 1671	May, 1994	Co-60	-0.33 ± 0.55	1.35 ± 2.44	0.51 ± 1.25
WATER-1670, 1671	May, 1994	Cs-137	1.73 ± 2.95	-1.73 ± 2.64	0.00 ± 1.98
MILK-1510, 1511	May, 1994	I-131(G)	0.08 ± 0.13	-0.07 ± 0.12	0.01 ± 0.09
WATER-1520, 1521	May, 1994	H-3	48.44 ± 97.26	79.87 ± 98.52	64.16 ± 69.22
MILK-1744, 1745	Jun, 1994	I-131	0.90 ± 0.15	0.10 ± 0.15	0.50 ± 0.11
WATER-1786, 1787	Jun, 1994	Gr. Beta	31.36 ± 3.13	31.37 ± 2.98	31.37 ± 2.16
WATER-1786, 1787	Jun, 1994	H-3	236,078.00 ± 1,364.00	235,776.00 ± 1,363.00	235,927.00 ± 964.14
WATER-1843, 1844	Jun, 1994	Co-60	1.25 ± 1.03	0.48 ± 2.23	0.87 ± 1.23
WATER-1843, 1844	Jun, 1994	Cs-137	-0.02 ± 1.10	1.02 ± 1.79	0.50 ± 1.05
WATER-1843, 1844	Jun, 1994	H-3	138.74 ± 79.60	69.64 ± 76.69	104.19 ± 55.27
MILK-1818, 1819	Jun, 1994	Co-60	-1.28 ± 3.11	0.16 ± 4.48	-0.56 ± 2.73
MILK-1818, 1819	Jun, 1994	Cs-137	0.34 ± 2.27	1.92 ± 3.45	1.13 ± 2.06
MILK-1818, 1819	Jun, 1994	I-131(G)	-0.15 ± 0.16	0.04 ± 0.14	-0.06 ± 0.11
WATER-1882, 1883	Jun, 1994	Gr. Beta	5.00 ± 0.72	5.61 ± 0.77	5.31 ± 0.53
WATER-1882, 1883	Jun, 1994	H-3	-32.60 ± 76.90	-55.80 ± 76.90	-44.20 ± 54.38
GRASS-1900, 1901	Jun, 1994	Be-7	0.51 ± 0.08	0.49 ± 0.07	0.50 ± 0.05
GRASS-1900, 1901	Jun, 1994	K-40	4.31 ± 0.17	4.28 ± 0.17	4.30 ± 0.12
MILK-1982, 1983	Jun, 1994	I-131	0.00 ± 0.23	0.08 ± 0.13	0.04 ± 0.13
MILK-1982, 1983	Jun, 1994	K-40	1,562.00 ± 98.00	1,553.00 ± 116.00	1,557.50 ± 75.93

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

Lab Codes[b]	Sample Date	Analysis	Concentration in pCi/L[a] First Result	Second Result	Averaged Result
WATER-1972, 1973	Jun, 1994	Gr. Beta	25.66 ± 2.41	23.67 ± 2.33	24.67 ± 1.68
MILK-2092, 2093	Jun, 1994	K-40	1,430.00 ± 170.00	1,430.00 ± 140.00	1,430.00 ± 110.11
WATER-2116, 2117	Jun, 1994	C-14	-28.00 ± 49.00	-9.00 ± 52.00	-18.50 ± 35.72
WATER-2116, 2117	Jun, 1994	Gr. Alpha	0.60 ± 0.50	1.10 ± 0.60	0.85 ± 0.39
WATER-2116, 2117	Jun, 1994	Gr. Beta	8.40 ± 0.80	7.20 ± 0.70	7.80 ± 0.53
WATER-2116, 2117	Jun, 1994	H-3	2,544.00 ± 152.00	2,522.00 ± 152.00	2,533.00 ± 107.48
WATER-2116, 2117	Jun, 1994	U-233/4	1.54 ± 0.20	1.46 ± 0.19	1.50 ± 0.14
WATER-2116, 2117	Jun, 1994	U-235	0.00 ± 0.06	0.00 ± 0.06	0.00 ± 0.04
WATER-2116, 2117	Jun, 1994	U-238	0.91 ± 0.16	1.07 ± 0.17	0.99 ± 0.12
WATER-2198, 2199	Jun, 1994	Gr. Beta	5.31 ± 0.92	5.16 ± 0.84	5.24 ± 0.62
MILK-2156, 2157	Jun, 1994	Co-60	-0.51 ± 3.05	1.54 ± 3.95	0.52 ± 2.50
MILK-2156, 2157	Jun, 1994	Cs-137	1.27 ± 3.59	1.16 ± 5.91	1.22 ± 3.46
MILK-2156, 2157	Jun, 1994	I-131(G)	-0.08 ± 0.23	0.01 ± 0.18	-0.04 ± 0.15
MILK-2194, 2195	Jun, 1994	I-131	0.15 ± 0.32	0.08 ± 0.21	0.12 ± 0.19
WATER-2238, 2239	Jun, 1994	Gr. Beta	1.50 ± 0.63	1.68 ± 0.62	1.59 ± 0.44
WATER-2363, 2364	Jun, 1994	Gr. Beta	69.49 ± 84.03	5.89 ± 81.31	37.69 ± 58.46
WATER-2336, 2337	Jun, 1994	Gr. Beta	6.17 ± 1.26	6.44 ± 1.27	6.31 ± 0.89
WATER-2336, 2337	Jun, 1994	H-3	23.60 ± 80.07	-20.93 ± 78.21	1.34 ± 55.96
SLIME-2480, 2481	Jun, 1994	Be-7	0.41 ± 0.20	0.40 ± 0.17	0.41 ± 0.13
SLIME-2480, 2481	Jun, 1994	Cs-137	0.03 ± 0.01	0.03 ± 0.01	0.03 ± 0.01
SLIME-2480, 2481	Jun, 1994	K-40	1.31 ± 0.20	1.33 ± 0.19	1.32 ± 0.14
MILK-2334, 2335	Jun, 1994	I-131	0.06 ± 0.17	0.04 ± 0.20	0.05 ± 0.13
WATER-2733, 2734	Jun, 1994	Gr. Beta	1.98 ± 0.45	1.57 ± 0.44	1.78 ± 0.31
WATER-3056, 3057	Jun, 1994	Sr-89	-0.64 ± 1.05	-0.12 ± 0.76	-0.38 ± 0.65
WATER-3056, 3057	Jun, 1994	Sr-90	0.47 ± 0.36	0.28 ± 0.25	0.38 ± 0.22
MILK-2405, 2406	Jun, 1994	K-40	1,730.00 ± 190.00	1,710.00 ± 120.00	1,720.00 ± 112.36
WATER-2432, 2433	Jun, 1994	H-3	26.85 ± 81.89	123.15 ± 85.91	75.00 ± 59.34
WATER-3000, 3001	Jun, 1994	H-3	213.55 ± 86.19	192.43 ± 85.32	202.99 ± 60.64
WATER-2459, 2460	Jun, 1994	Gr. Alpha	0.12 ± 0.20	0.02 ± 0.18	0.07 ± 0.13
WATER-2459, 2460	Jun, 1994	Gr. Beta	2.26 ± 0.15	2.03 ± 0.17	2.15 ± 0.11
WATER-2712, 2713	Jun, 1994	H-3	260.00 ± 90.00	170.00 ± 80.00	215.00 ± 60.21
WATER-2501, 2502	Jun, 1994	H-3	70.00 ± 80.00	137.00 ± 80.00	103.50 ± 56.57
WATER-2662, 2663	Jun, 1994	Gr. Beta	5.01 ± 0.89	5.53 ± 0.88	5.27 ± 0.63
WATER-2691, 2692	Jun, 1994	Gr. Beta	2.41 ± 0.52	2.12 ± 0.46	2.27 ± 0.35
WATER-2691, 2692	Jun, 1994	H-3	192.56 ± 87.03	108.28 ± 83.56	150.42 ± 60.33
MILK-2522, 2523	Jul, 1994	Co-60	5.72 ± 4.46	-3.21 ± 5.27	1.26 ± 3.45
MILK-2522, 2523	Jul, 1994	Cs-137	0.22 ± 3.28	2.03 ± 3.29	1.13 ± 2.32
MILK-2522, 2523	Jul, 1994	I-131(G)	0.08 ± 0.20	0.09 ± 0.23	0.09 ± 0.15
WATER-2543, 2544	Jul, 1994	Gr. Beta	1.13 ± 0.31	1.11 ± 0.44	1.12 ± 0.27
WATER-2543, 2544	Jul, 1994	K-40	1.20 ± 0.12	1.20 ± 0.12	1.20 ± 0.08
WATER-2631, 2632	Jul, 1994	Gr. Alpha	0.28 ± 0.87	0.84 ± 0.98	0.56 ± 0.66

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

Lab Codes[b]	Sample Date	Analysis	Concentration in pCi/L[a] First Result	Second Result	Averaged Result
WATER-2631, 2632	Jul, 1994	Gr. Beta	8.05 ± 1.01	7.13 ± 0.99	7.59 ± 0.71
MILK-2863, 2864	Jul, 1994	I-131	0.10 ± 0.21	0.03 ± 0.20	0.07 ± 0.15
MILK-2863, 2864	Jul, 1994	K-40	1,360.00 ± 130.00	1,450.00 ± 100.00	1,405.00 ± 82.01
GRASS-2754, 2755	Jul, 1994	Be-7	2.15 ± 0.18	2.18 ± 0.08	2.17 ± 0.10
GRASS-2754, 2755	Jul, 1994	K-40	7.29 ± 0.35	6.93 ± 0.16	7.11 ± 0.19
WATER-2775, 2776	Jul, 1994	Co-60	-0.53 ± 3.13	0.30 ± 3.26	-0.12 ± 2.26
WATER-2775, 2776	Jul, 1994	Cs-134	-0.76 ± 3.35	-1.03 ± 3.16	-0.90 ± 2.30
WATER-2775, 2776	Jul, 1994	Cs-137	1.94 ± 3.03	0.65 ± 2.91	1.30 ± 2.10
WATER-2775, 2776	Jul, 1994	Gr. Beta	3.03 ± 0.52	2.94 ± 0.54	2.99 ± 0.37
WATER-2775, 2776	Jul, 1994	I-131	0.01 ± 0.15	0.07 ± 0.20	0.04 ± 0.13
MILK-2889, 2890	Jul, 1994	I-131	0.11 ± 0.21	0.15 ± 0.22	0.13 ± 0.15
WATER-2842, 2843	Jul, 1994	Gr. Beta	3.97 ± 1.14	5.20 ± 1.19	4.59 ± 0.82
WATER-2842, 2843	Jul, 1994	H-3	65.78 ± 83.65	32.30 ± 82.23	49.04 ± 58.65
WATER-2910, 2911	Jul, 1994	Gr. Beta	1.58 ± 0.44	1.48 ± 0.45	1.53 ± 0.31
WATER-2910, 2911	Jul, 1994	H-3	74.86 ± 82.57	146.79 ± 85.57	110.83 ± 59.46
WATER-2930, 2931	Jul, 1994	Gr. Beta	1.66 ± 0.56	2.19 ± 0.58	1.93 ± 0.40
MILK-2958, 2959	Jul, 1994	I-131	-0.07 ± 0.24	-0.06 ± 0.24	-0.07 ± 0.17
MILK-2958, 2959	Jul, 1994	K-40	1,445.00 ± 122.00	1,445.00 ± 134.00	1,445.00 ± 90.61
MILK-3010, 3011	Jul, 1994	Sr-89	-0.54 ± 1.01	-0.36 ± 0.73	-0.45 ± 0.62
MILK-3010, 3011	Jul, 1994	Sr-90	1.64 ± 0.55	1.34 ± 0.39	1.49 ± 0.34
WATER-3031, 3032	Jul, 1994	I-131	0.23 ± 0.24	0.24 ± 0.28	0.24 ± 0.18
MILK-3083, 3084	Jul, 1994	I-131	0.21 ± 0.22	0.08 ± 0.22	0.15 ± 0.16
MILK-3083, 3084	Jul, 1994	K-40	1,420.00 ± 170.00	1,380.00 ± 150.00	1,400.00 ± 113.36
WATER-3106, 3107	Jul, 1994	H-3	79.09 ± 80.43	98.42 ± 81.27	88.76 ± 57.17
WATER-3154, 3155	Jul, 1994	Gr. Beta	1.73 ± 0.76	2.20 ± 0.78	1.97 ± 0.54
URINE-3748, 3749	Jul, 1994	C-14	76.00 ± 83.00	74.00 ± 96.00	75.00 ± 63.45
URINE-3748, 3749	Jul, 1994	Gr. Alpha	0.30 ± 2.30	2.10 ± 2.50	1.20 ± 1.70
URINE-3748, 3749	Jul, 1994	Gr. Beta	3.90 ± 2.50	3.30 ± 2.70	3.60 ± 1.84
URINE-3748, 3749	Jul, 1994	H-3	175.00 ± 583.00	198.00 ± 584.00	186.50 ± 412.60
WATER-3209, 3210	Jul, 1994	H-3	-25.26 ± 82.29	0.87 ± 83.39	-12.20 ± 58.58
WATER-3234, 3235	Jul, 1994	H-3	7.67 ± 82.81	-38.33 ± 80.82	-15.33 ± 57.86
WATER-3261, 3262	Jul, 1994	Gr. Beta	4.42 ± 0.82	4.79 ± 0.87	4.61 ± 0.60
WATER-3310, 3311	Jul, 1994	Gr. Beta	2.60 ± 1.30	1.40 ± 1.20	2.00 ± 0.88
VEGETATION-3403, 3404	Jul, 1994	K-40	3.38 ± 0.41	3.50 ± 0.44	3.44 ± 0.30
WATER-3469, 3470	Jul, 1994	H-3	563.13 ± 99.60	510.56 ± 97.74	536.85 ± 69.77
WATER-3811, 3812	Jul, 1994	Co-60	5.57 ± 4.23	0.12 ± 2.26	2.85 ± 2.40
WATER-3811, 3812	Jul, 1994	Cs-137	2.93 ± 3.99	-0.35 ± 2.27	1.29 ± 2.30
WATER-3358, 3359	Jul, 1994	H-3	180.00 ± 100.00	200.00 ± 100.00	190.00 ± 70.71
WATER-3559, 3560	Aug, 1994	Gr. Beta	2.10 ± 0.78	1.41 ± 0.74	1.76 ± 0.54
GRASS-3586, 3587	Aug, 1994	Be-7	3.52 ± 0.51	3.68 ± 0.51	3.60 ± 0.36
GRASS-3586, 3587	Aug, 1994	Gr. Beta	7.42 ± 0.25	7.07 ± 0.23	7.25 ± 0.17

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

Lab Codes[b]	Sample Date	Analysis	Concentration in pCi/L[a] First Result	Second Result	Averaged Result
GRASS-3586, 3587	Aug, 1994	K-40	7.39 ± 0.78	7.07 ± 0.79	7.23 ± 0.56
GRASS-3586, 3587	Aug, 1994	Sr-89	0.00 ± 0.01	0.00 ± 0.01	0.00 ± 0.01
GRASS-3586, 3587	Aug, 1994	Sr-90	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00
WATER-3611, 3612	Aug, 1994	Gr. Beta	1.87 ± 0.57	2.02 ± 0.49	1.95 ± 0.38
MILK-3942, 3943	Aug, 1994	I-131	-0.14 ± 0.23	0.18 ± 0.25	0.02 ± 0.17
MILK-3942, 3943	Aug, 1994	K-40	1,544.00 ± 128.00	1,416.00 ± 191.00	1,480.00 ± 114.96
WATER-3638, 3639	Aug, 1994	H-3	147.41 ± 86.26	38.61 ± 81.71	93.01 ± 59.41
WATER-3683, 3684	Aug, 1994	H-3	7.07 ± 80.96	38.90 ± 82.34	22.99 ± 57.74
WATER-3727, 3728	Aug, 1994	Gr. Beta	4.47 ± 0.77	4.82 ± 0.84	4.65 ± 0.57
MILK-3842, 3843	Aug, 1994	K-40	1,419.00 ± 120.00	1,411.00 ± 142.00	1,415.00 ± 92.96
WATER-3869, 3870	Aug, 1994	Gr. Beta	4.15 ± 0.67	3.15 ± 0.64	3.65 ± 0.46
WATER-3869, 3870	Aug, 1994	H-3	43.82 ± 81.84	33.30 ± 81.38	38.56 ± 57.71
VEGETATION-3892, 3893	Aug, 1994	Gr. Beta	2.49 ± 0.08	2.54 ± 0.08	2.52 ± 0.06
VEGETATION-3892, 3893	Aug, 1994	K-40	1.89 ± 0.26	2.27 ± 0.28	2.08 ± 0.19
WATER-3964, 3965	Aug, 1994	Gr. Beta	3.91 ± 0.73	4.90 ± 0.83	4.41 ± 0.55
WATER-3913, 3914	Aug, 1994	Gr. Beta	4.26 ± 0.83	3.84 ± 0.73	4.05 ± 0.55
WATER-3991, 3992	Aug, 1994	Tc-99	84.90 ± 9.30	96.40 ± 9.90	90.65 ± 6.79
MILK-4016, 4017	Aug, 1994	Co-60	0.96 ± 3.58	-0.90 ± 0.43	0.03 ± 1.80
MILK-4016, 4017	Aug, 1994	Cs-137	-0.30 ± 2.66	2.33 ± 3.87	1.02 ± 2.35
MILK-4016, 4017	Aug, 1994	I-131	0.17 ± 0.22	0.04 ± 0.23	0.11 ± 0.16
MILK-4040, 4041	Aug, 1994	Sr-89	0.91 ± 1.05	-0.05 ± 0.82	0.43 ± 0.67
MILK-4040, 4041	Aug, 1994	Sr-90	0.92 ± 0.45	1.05 ± 0.40	0.99 ± 0.30
MILK-4459, 4460	Aug, 1994	K-40	1,528.00 ± 170.00	1,481.00 ± 151.00	1,504.50 ± 113.69
WATER-4061, 4062	Aug, 1994	Gr. Beta	4.56 ± 0.84	4.57 ± 0.79	4.57 ± 0.58
WATER-4113, 4114	Aug, 1994	Gr. Beta	1.62 ± 0.61	1.83 ± 0.64	1.73 ± 0.44
MILK-4168, 4169	Aug, 1994	K-40	1,300.00 ± 140.00	1,390.00 ± 140.00	1,345.00 ± 98.99
WATER-4284, 4285	Aug, 1994	Gr. Beta	5.42 ± 0.92	5.17 ± 0.89	5.30 ± 0.64
WATER-4504, 4505	Aug, 1994	H-3	378.00 ± 99.00	428.00 ± 100.00	403.00 ± 70.36
WATER-4259, 4260	Aug, 1994	Gr. Beta	2.92 ± 0.53	2.48 ± 0.50	2.70 ± 0.36
WATER-4308, 4309	Aug, 1994	Gr. Beta	2.07 ± 0.49	2.05 ± 0.50	2.06 ± 0.35
WATER-4308, 4309	Aug, 1994	H-3	172.74 ± 88.95	148.06 ± 87.97	160.40 ± 62.55
WATER-4333, 4334	Aug, 1994	Gr. Beta	5.13 ± 2.14	4.07 ± 2.03	4.60 ± 1.47
WATER-4333, 4334	Aug, 1994	H-3	161.29 ± 87.44	97.95 ± 84.86	129.62 ± 60.92
VEGETATION-4402, 4403	Aug, 1994	K-40	2.73 ± 0.12	2.95 ± 0.96	2.84 ± 0.48
MILK-4459, 4460	Aug, 1994	K-40	1,528.00 ± 170.00	1,481.00 ± 151.00	1,504.50 ± 113.69
WATER-4475, 4476	Aug, 1994	Gr. Beta	2.80 ± 0.28	2.85 ± 0.27	2.83 ± 0.19
WATER-4475, 4476	Aug, 1994	H-3	51.05 ± 80.26	56.34 ± 80.50	53.70 ± 56.84
MILK-4423, 4424	Sep, 1994	Co-60	-0.96 ± 5.00	-0.88 ± 4.05	-0.92 ± 3.22
MILK-4423, 4424	Sep, 1994	Cs-137	0.70 ± 4.06	-0.64 ± 2.83	0.03 ± 2.47
MILK-4423, 4424	Sep, 1994	I-131	0.21 ± 0.23	0.22 ± 0.23	0.22 ± 0.16
WATER-4446, 4447	Sep, 1994	H-3	186.23 ± 88.96	223.36 ± 90.42	204.80 ± 63.42

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

Lab Codes[b]	Sample Date	Analysis	Concentration in pCi/L[a] First Result	Second Result	Averaged Result
MILK-4525, 4526	Sep, 1994	Co-60	2.80 ± 3.47	1.23 ± 2.86	2.02 ± 2.25
MILK-4525, 4526	Sep, 1994	Cs-137	0.39 ± 3.22	1.27 ± 2.36	0.83 ± 2.00
MILK-4525, 4526	Sep, 1994	I-131	0.16 ± 0.26	-0.05 ± 0.25	0.06 ± 0.18
WATER-4571, 4572	Sep, 1994	Gr. Beta	0.09 ± 0.22	0.12 ± 0.23	0.11 ± 0.16
WATER-4571, 4572	Sep, 1994	K-40	7.20 ± 1.00	7.20 ± 1.00	7.20 ± 0.71
WATER-3636, 3637	Sep, 1994	H-3	445.19 ± 99.02	529.66 ± 101.98	487.43 ± 71.07
MILK-4550, 4551	Sep, 1994	I-131	-0.01 ± 0.24	0.25 ± 0.28	0.12 ± 0.18
MILK-4550, 4551	Sep, 1994	K-40	1,410.90 ± 109.00	1,398.10 ± 155.00	1,404.50 ± 94.74
SLUDGE-4613, 4614	Sep, 1994	Ra-226	1.38 ± 0.04	1.39 ± 0.05	1.39 ± 0.03
WATER-4810, 4811	Sep, 1994	H-3	36,966.34 ± 557.20	37,782.99 ± 563.06	37,374.67 ± 396.08
WATER-4688, 4689	Sep, 1994	H-3	62.77 ± 82.11	-9.39 ± 78.95	26.69 ± 56.95
MILK-4886, 4887	Sep, 1994	I-131	-0.04 ± 0.25	-0.06 ± 0.24	-0.05 ± 0.17
MILK-4886, 4887	Sep, 1994	K-40	1,397.90 ± 152.00	1,319.00 ± 171.00	1,358.45 ± 114.40
WATER-4744, 4745	Sep, 1994	Gr. Alpha	7.10 ± 2.30	7.60 ± 2.20	7.35 ± 1.59
WATER-4744, 4745	Sep, 1994	Gr. Beta	16.40 ± 1.70	16.00 ± 1.70	16.20 ± 1.20
SEDIMENTS-6570, 6571	Sep, 1994	K-40	7.80 ± 0.59	7.68 ± 0.56	7.74 ± 0.41
MILK-4934, 4935	Sep, 1994	K-40	1,519.50 ± 170.00	1,421.30 ± 190.00	1,470.40 ± 127.48
SEDIMENT-5000, 5001	Sep, 1994	Gr. Beta	8.57 ± 2.00	8.57 ± 2.00	8.57 ± 1.41
MILK-5022, 5023	Sep, 1994	I-131	0.17 ± 0.19	0.29 ± 0.33	0.23 ± 0.19
VEGETATION-5253, 5254	Sep, 1994	Sr-89	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00
VEGETATION-5253, 5254	Sep, 1994	Sr-90	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00
WATER-5952, 5953	Sep, 1994	Co-60	1.73 ± 2.46	1.15 ± 2.36	1.44 ± 1.70
WATER-5952, 5953	Sep, 1994	Cs-137	1.75 ± 2.38	0.32 ± 2.24	1.03 ± 1.63
AIR FILTER-5348, 5349	Sep, 1994	Sr-89	420.10 ± 11.40	439.40 ± 22.00	429.75 ± 12.39
FILTER-5348, 5349	Sep, 1994	Sr-89	420.10 ± 11.40	439.40 ± 22.00	429.75 ± 12.39
AIR FILTER-5348, 5349	Sep, 1994	Sr-90	5.60 ± 1.20	7.10 ± 2.00	6.35 ± 1.17
FILTER-5728, 5729	Sep, 1994	Gr. Alpha	-0.83 ± 2.56	1.90 ± 2.63	0.54 ± 1.84
FILTER-5728, 5729	Sep, 1994	Gr. Alpha	-0.83 ± 2.56	1.90 ± 2.63	0.54 ± 1.84
FILTER-5728, 5729	Sep, 1994	Sr-89	2.02 ± 6.30	-3.02 ± 3.57	-0.50 ± 3.62
FILTER-5728, 5729	Sep, 1994	Sr-90	0.86 ± 1.94	1.66 ± 1.26	1.26 ± 1.16
WATER-5373, 5374	Sep, 1994	H-3	565.00 ± 96.00	561.00 ± 96.00	563.00 ± 67.88
MILK-5274, 5275	Oct, 1994	I-131	0.16 ± 0.21	0.18 ± 0.25	0.17 ± 0.16
SOIL-5394, 5395	Oct, 1994	Be-7	0.66 ± 0.36	0.87 ± 0.52	0.77 ± 0.32
SOIL-5394, 5395	Oct, 1994	Cs-137	0.24 ± 0.06	0.20 ± 0.05	0.22 ± 0.04
SOIL-5394, 5395	Oct, 1994	Cs-137	0.24 ± 0.06	0.20 ± 0.05	0.22 ± 0.04
SOIL-5394, 5395	Oct, 1994	Gr. Alpha	8.89 ± 2.52	9.72 ± 2.71	9.30 ± 1.85
SOIL-5394, 5395	Oct, 1994	Gr. Beta	27.15 ± 2.36	27.83 ± 2.24	27.49 ± 1.63
SOIL-5394, 5395	Oct, 1994	K-40	22.93 ± 1.20	22.40 ± 1.36	22.67 ± 0.91
SOIL-5394, 5395	Oct, 1994	Sr-89	0.00 ± 0.03	0.02 ± 0.03	0.01 ± 0.02
SOIL-5394, 5395	Oct, 1994	Sr-90	0.09 ± 0.01	0.08 ± 0.01	0.08 ± 0.01
WATER-5421, 5422	Oct, 1994	Gr. Beta	2.56 ± 0.53	3.54 ± 0.51	3.05 ± 0.37

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

Lab Codes[b]	Sample Date	Analysis	Concentration in pCi/L[a] First Result	Second Result	Averaged Result
WATER-5421, 5422	Oct, 1994	K-40	0.87 ± 0.09	0.95 ± 0.10	0.91 ± 0.06
MILK-5527, 5528	Oct, 1994	Co-60	-1.11 ± 3.26	0.89 ± 3.88	-0.11 ± 2.53
MILK-5527, 5528	Oct, 1994	Cs-137	3.21 ± 2.44	-0.55 ± 3.51	1.33 ± 2.14
MILK-5527, 5528	Oct, 1994	I-131	0.00 ± 0.18	-0.03 ± 0.20	-0.02 ± 0.13
VEGETATION-5573, 5574	Oct, 1994	K-40	3.00 ± 0.30	2.82 ± 0.37	2.91 ± 0.24
MILK-5552, 5553	Oct, 1994	Co-60	2.04 ± 3.26	1.32 ± 4.10	1.68 ± 2.62
MILK-5552, 5553	Oct, 1994	Cs-134	-0.79 ± 2.79	0.25 ± 2.99	-0.27 ± 2.04
MILK-5552, 5553	Oct, 1994	Cs-137	1.03 ± 2.58	-0.53 ± 3.59	0.25 ± 2.21
MILK-5552, 5553	Oct, 1994	I-131	0.10 ± 0.22	-0.09 ± 0.21	0.01 ± 0.15
MILK-5552, 5553	Oct, 1994	I-131	0.10 ± 0.22	-0.09 ± 0.21	0.01 ± 0.15
MILK-5552, 5553	Oct, 1994	K-40	1,468.10 ± 122.00	1,322.00 ± 146.00	1,395.05 ± 95.13
MILK-5552, 5553	Oct, 1994	Sr-89	0.69 ± 1.06	-0.08 ± 0.88	0.31 ± 0.69
MILK-5552, 5553	Oct, 1994	Sr-90	1.73 ± 0.45	1.37 ± 0.39	1.55 ± 0.29
WATER-5595, 5596	Oct, 1994	I-131	0.13 ± 0.21	0.12 ± 0.26	0.12 ± 0.17
FISH-5637, 5638	Oct, 1994	Co-60	-0.06 ± 1.28	-0.82 ± 1.92	-0.44 ± 1.15
FISH-5637, 5638	Oct, 1994	Cs-137	0.27 ± 1.25	2.02 ± 1.65	1.15 ± 1.04
SEDIMENT-5850, 5851	Oct, 1994	Cs-137	0.22 ± 0.04	0.22 ± 0.05	0.22 ± 0.03
SEDIMENT-5850, 5851	Oct, 1994	K-40	13.53 ± 0.85	12.20 ± 0.85	12.87 ± 0.60
WATER-5658, 5659	Oct, 1994	Gr. Beta	7.42 ± 1.07	7.97 ± 1.03	7.70 ± 0.74
WATER-5682, 5683	Oct, 1994	Co-60	0.16 ± 3.36	2.01 ± 3.54	1.09 ± 2.44
WATER-5682, 5683	Oct, 1994	Cs-137	0.23 ± 3.07	0.70 ± 3.68	0.47 ± 2.40
WATER-5682, 5683	Oct, 1994	H-3	78.63 ± 76.44	-41.76 ± 71.13	18.44 ± 52.21
WATER-5707, 5708	Oct, 1994	H-3	12,727.10 ± 1,756.35	12,799.14 ± 1,766.14	12,763.12 ± 1,245.39
SEDIMENTS-5829, 5830	Oct, 1994	Co-60	0.40 ± 1.51	-0.58 ± 1.68	-0.09 ± 1.13
SEDIMENTS-5829, 5830	Oct, 1994	Cs-137	0.19 ± 0.04	0.19 ± 0.05	0.19 ± 0.03
GRASS-5879, 5880	Oct, 1994	Be-7	2.40 ± 0.12	2.40 ± 0.13	2.40 ± 0.09
GRASS-5879, 5880	Oct, 1994	K-40	6.55 ± 0.22	6.58 ± 0.25	6.56 ± 0.17
VEGETATION-5903, 5904	Oct, 1994	K-40	3.40 ± 0.38	3.13 ± 0.29	3.26 ± 0.24
VEGETATION-5903, 5904	Oct, 1994	Sr-89	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00
VEGETATION-5903, 5904	Oct, 1994	Sr-90	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00
WATER-5928, 5929	Oct, 1994	H-3	402.89 ± 94.65	446.30 ± 96.23	424.59 ± 67.49
WATER-6018, 6019	Oct, 1994	Gr. Beta	2.40 ± 0.69	1.59 ± 0.44	1.99 ± 0.41
SEDIMENTS-6301, 6302	Oct, 1994	Co-60	1.07 ± 0.06	1.07 ± 0.06	1.07 ± 0.04
SEDIMENTS-6301, 6302	Oct, 1994	Cs-137	1.64 ± 0.10	1.57 ± 0.08	1.60 ± 0.06
SEDIMENTS-6301, 6302	Oct, 1994	Gr. Beta	11.82 ± 1.72	8.28 ± 1.83	10.05 ± 1.26
SEDIMENTS-6301, 6302	Oct, 1994	Mn-54	0.74 ± 0.06	0.79 ± 0.08	0.77 ± 0.05
WATER-6070, 6071	Oct, 1994	I-131	0.07 ± 0.22	-0.17 ± 0.21	-0.05 ± 0.15
WATER-6116, 6117	Oct, 1994	H-3	-7.55 ± 76.85	-21.48 ± 76.21	-14.51 ± 54.12
SEDIMENT-6256, 6257	Oct, 1994	Gr. Beta	5.47 ± 1.69	7.44 ± 1.37	6.46 ± 1.09
SEDIMENT-6256, 6257	Oct, 1994	K-40	9.34 ± 0.27	9.34 ± 0.29	9.34 ± 0.19
SEDIMENT-6256, 6257	Oct, 1994	Ra-226	0.13 ± 0.02	0.11 ± 0.02	0.12 ± 0.01

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

Lab Codes[b]	Sample Date	Analysis	Concentration in pCi/L[a] First Result	Second Result	Averaged Result
SEDIMENT-6256, 6257	Oct, 1994	Ra-228	0.06 ± 0.01	0.05 ± 0.01	0.05 ± 0.01
MILK-6091, 6092	Oct, 1994	I-131	0.22 ± 0.24	0.03 ± 0.22	0.12 ± 0.16
WATER-6139, 6140	Oct, 1994	H-3	23,478.00 ± 782.00	23,509.00 ± 782.00	23,493.50 ± 552.96
FISH-6162, 6163	Oct, 1994	Co-60	0.00 ± 0.01	0.01 ± 0.02	0.01 ± 0.01
FISH-6162, 6163	Oct, 1994	Co-60	0.09 ± 0.03	0.08 ± 0.02	0.09 ± 0.02
WATER-6635, 6636	Oct, 1994	Co-60	1.83 ± 2.42	-0.20 ± 1.66	0.81 ± 1.47
WATER-6635, 6636	Oct, 1994	Cs-137	1.07 ± 3.38	0.68 ± 2.25	0.88 ± 2.03
GRASS-6235, 6236	Oct, 1994	Be-7	1.89 ± 0.14	1.93 ± 0.12	1.91 ± 0.09
GRASS-6235, 6236	Oct, 1994	K-40	7.03 ± 0.28	6.80 ± 0.24	6.91 ± 0.19
WATER-6277, 6278	Oct, 1994	Gr. Beta	2.38 ± 0.56	2.37 ± 0.56	2.38 ± 0.40
WATER-6277, 6278	Oct, 1994	H-3	-4.11 ± 79.62	66.30 ± 89.86	31.10 ± 60.03
WATER-6489, 6490	Oct, 1994	Gr. Beta	1.98 ± 0.49	2.04 ± 0.46	2.01 ± 0.34
WATER-6489, 6490	Oct, 1994	H-3	742.19 ± 106.47	763.16 ± 107.15	752.68 ± 75.53
WATER-6214, 6215	Oct, 1994	H-3	4,466.00 ± 189.00	4,595.00 ± 191.00	4,530.50 ± 134.35
WATER-6327, 6328	Oct, 1994	H-3	131.64 ± 82.83	147.29 ± 83.49	139.46 ± 58.80
SOIL-6447, 6448	Oct, 1994	AC-228	0.72 ± 0.06	0.68 ± 0.05	0.70 ± 0.04
SOIL-6447, 6448	Oct, 1994	BI-212	0.67 ± 0.17	0.67 ± 0.10	0.67 ± 0.10
SOIL-6447, 6448	Oct, 1994	BI-214	0.52 ± 0.02	0.53 ± 0.02	0.53 ± 0.02
SOIL-6447, 6448	Oct, 1994	Gr. Alpha	6.54 ± 2.67	6.62 ± 2.51	6.58 ± 1.83
SOIL-6447, 6448	Oct, 1994	Gr. Beta	21.52 ± 2.41	20.61 ± 2.42	21.06 ± 1.71
SOIL-6447, 6448	Oct, 1994	K-40	18.07 ± 0.37	18.72 ± 0.31	18.40 ± 0.24
SOIL-6447, 6448	Oct, 1994	PB-212	0.71 ± 0.02	0.68 ± 0.02	0.70 ± 0.02
SOIL-6447, 6448	Oct, 1994	PB-214	0.58 ± 0.03	0.60 ± 0.03	0.59 ± 0.02
SOIL-6447, 6448	Oct, 1994	RA-226	1.15 ± 0.17	0.96 ± 0.16	1.06 ± 0.11
SOIL-6447, 6448	Oct, 1994	TL-208	0.24 ± 0.02	0.25 ± 0.01	0.24 ± 0.01
FISH-6372, 6373	Oct, 1994	Co-60	0.00 ± 0.02	0.01 ± 0.02	0.00 ± 0.01
FISH-6372, 6373	Oct, 1994	Cs-137	0.00 ± 0.01	0.00 ± 0.01	0.00 ± 0.01
WATER-6468, 6469	Oct, 1994	Gr. Beta	1.76 ± 0.47	1.79 ± 0.49	1.78 ± 0.34
WATER-6468, 6469	Oct, 1994	H-3	137.58 ± 84.56	90.36 ± 82.58	113.97 ± 59.10
WATER-6401, 6402	Nov, 1994	Gr. Beta	1.78 ± 0.47	1.67 ± 0.64	1.72 ± 0.40
SEDIMENTS-6422, 6423	Nov, 1994	Gr. Beta	6.06 ± 0.61	6.44 ± 0.59	6.25 ± 0.42
SEDIMENTS-6422, 6423	Nov, 1994	K-40	8.18 ± 0.49	7.18 ± 0.56	7.68 ± 0.37
SEDIMENTS-6422, 6423	Nov, 1994	Sr-89	0.01 ± 0.01	0.00 ± 0.02	0.00 ± 0.01
SEDIMENTS-6422, 6423	Nov, 1994	Sr-90	0.00 ± 0.00	0.00 ± 0.01	0.00 ± 0.00
WATER-6534, 6535	Nov, 1994	H-3	67.94 ± 82.60	36.31 ± 81.24	52.13 ± 57.93
WATER-6614, 6615	Nov, 1994	Gr. Beta	4.97 ± 2.01	3.94 ± 1.82	4.45 ± 1.35
WATER-6614, 6615	Nov, 1994	H-3	30.68 ± 81.46	-4.05 ± 79.96	13.31 ± 57.07
WATER-6746, 6747	Nov, 1994	H-3	2,734.00 ± 176.00	2,851.00 ± 178.00	2,792.50 ± 125.16
WATER-6767, 6768	Nov, 1994	H-3	107.00 ± 83.00	95.00 ± 82.00	101.00 ± 58.34
WATER-6788, 6789	Nov, 1994	Co-60	-1.87 ± 2.17	-0.16 ± 3.22	-1.01 ± 1.94
WATER-6788, 6789	Nov, 1994	Cs-137	1.60 ± 3.68	-1.81 ± 3.04	-0.11 ± 2.39

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

Lab Codes[b]	Sample Date	Analysis	Concentration in pCi/L[a] First Result	Second Result	Averaged Result
WATER-6788, 6789	Nov, 1994	Gr. Beta	5.20 ± 1.30	3.00 ± 0.90	4.10 ± 0.79
WATER-6985, 6986	Nov, 1994	Gr. Beta	2.02 ± 0.46	1.99 ± 0.48	2.00 ± 0.33
WATER-6957, 6958	Nov, 1994	H-3	97.00 ± 83.00	27.00 ± 80.00	62.00 ± 57.64
WATER-7036, 7037	Nov, 1994	H-3	3,371.00 ± 198.00	3,273.00 ± 196.00	3,322.00 ± 139.30
WATER-7059, 7060	Nov, 1994	Gr. Beta	8.62 ± 1.30	7.68 ± 1.70	8.15 ± 1.07
WATER-7059, 7060	Nov, 1994	H-3	0.00 ± 100.12	0.00 ± 100.12	0.00 ± 70.79
WATER-7615, 7616	Nov, 1994	Co-60	1.33 ± 2.68	1.43 ± 3.14	1.38 ± 2.06
WATER-7615, 7616	Nov, 1994	Cs-137	-1.64 ± 3.77	1.05 ± 3.01	-0.30 ± 2.41
MILK-7144, 7145	Nov, 1994	I-131	0.24 ± 0.28	0.27 ± 0.32	0.26 ± 0.21
MILK-7144, 7145	Nov, 1994	K-40	1,226.80 ± 161.00	1,298.20 ± 152.00	1,262.50 ± 110.71
MILK-7144, 7145	Nov, 1994	Sr-89	0.52 ± 0.73	-0.47 ± 0.75	0.03 ± 0.52
MILK-7144, 7145	Nov, 1994	Sr-90	0.79 ± 0.40	1.12 ± 0.46	0.96 ± 0.30
SOIL-7193, 7194	Nov, 1994	Cs-137	0.08 ± 0.04	0.09 ± 0.03	0.09 ± 0.02
SOIL-7193, 7194	Nov, 1994	Gr. Alpha	11.65 ± 4.05	8.15 ± 3.44	9.90 ± 2.66
SOIL-7193, 7194	Nov, 1994	Gr. Beta	21.96 ± 2.80	18.00 ± 2.63	19.98 ± 1.92
SOIL-7193, 7194	Nov, 1994	K-40	15.93 ± 0.83	17.12 ± 0.78	16.53 ± 0.57
WATER-7594, 7595	Nov, 1994	Co-60	2.38 ± 3.00	-2.71 ± 3.15	-0.17 ± 2.18
WATER-7594, 7595	Nov, 1994	Cs-137	1.52 ± 2.62	1.55 ± 2.89	1.54 ± 1.95
GRASS-7246, 7247	Nov, 1994	Be-7	5.25 ± 0.19	5.30 ± 0.21	5.27 ± 0.14
GRASS-7246, 7247	Nov, 1994	K-40	5.76 ± 0.29	5.96 ± 0.35	5.86 ± 0.23
WATER-7309, 7310	Nov, 1994	H-3	136.00 ± 85.00	134.00 ± 85.00	135.00 ± 60.10
WATER-7367, 7368	Nov, 1994	Gr. Beta	6.00 ± 0.61	4.93 ± 0.51	5.46 ± 0.40
WATER-7367, 7368	Nov, 1994	H-3	-67.81 ± 80.94	-98.69 ± 79.54	-83.25 ± 56.74
WATER-7288, 7289	Dec, 1994	Gr. Beta	2.21 ± 0.72	2.57 ± 0.73	2.39 ± 0.52
WATER-7330, 7331	Dec, 1994	Co-60	-0.29 ± 2.79	-0.97 ± 2.68	-0.63 ± 1.93
WATER-7330, 7331	Dec, 1994	Cs-137	1.37 ± 2.82	1.22 ± 2.44	1.30 ± 1.86
WATER-7330, 7331	Dec, 1994	Gr. Beta	2.55 ± 0.75	2.38 ± 0.77	2.46 ± 0.54
MILK-7391, 7392	Dec, 1994	I-131(G)	1.57 ± 2.82	-2.96 ± 4.55	-0.70 ± 2.68
WATER-7513, 7514	Dec, 1994	H-3	10,896.00 ± 286.00	10,612.00 ± 282.00	10,754.00 ± 200.82
WATER-7536, 7537	Dec, 1994	H-3	142.34 ± 83.52	61.00 ± 79.84	101.67 ± 57.77
WATER-7639, 7640	Dec, 1994	Gr. Beta	5.52 ± 0.83	4.83 ± 0.77	5.18 ± 0.57
WATER-7639, 7640	Dec, 1994	H-3	60.87 ± 82.65	23.60 ± 80.95	42.24 ± 57.84
WATER-7660, 7661	Dec, 1994	H-3	644.00 ± 136.00	718.00 ± 138.00	681.00 ± 96.88
WATER-7691, 7692	Dec, 1994	H-3	117.13 ± 84.51	89.90 ± 83.26	103.51 ± 59.32
WATER-7810, 7811	Dec, 1994	H-3	19,870.00 ± 404.00	19,711.00 ± 402.00	19,790.50 ± 284.96
WATER-7838, 7839	Dec, 1994	Co-60	3.81 ± 2.82	-0.32 ± 2.18	1.74 ± 1.78
WATER-7838, 7839	Dec, 1994	Cs-137	1.16 ± 2.94	-0.24 ± 2.72	0.46 ± 2.00
WATER-7838, 7839	Dec, 1994	Gr. Beta	2.68 ± 0.83	3.88 ± 0.96	3.28 ± 0.63
WATER-7940, 7941	Dec, 1994	Gr. Beta	1.96 ± 0.42	2.39 ± 0.46	2.18 ± 0.31
WATER-7940, 7941	Dec, 1994	H-3	212.51 ± 85.75	208.76 ± 87.59	210.64 ± 61.29
WATER-8128, 8129	Dec, 1994	Sr-89	0.09 ± 0.69	-0.24 ± 0.74	-0.08 ± 0.51

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

Lab Codes[b]	Sample Date	Analysis	Concentration in pCi/L[a] First Result	Second Result	Averaged Result
WATER-8128, 8129	Dec, 1994	Sr-90	0.36 ± 0.31	0.54 ± 0.35	0.45 ± 0.23
MILK-7889, 7890	Dec, 1994	K-40	1,468.10 ± 191.00	1,373.20 ± 160.00	1,420.65 ± 124.58
WATER-7961, 7962	Dec, 1994	Gr. Beta	2.01 ± 1.06	2.57 ± 1.06	2.29 ± 0.75
WATER-7961, 7962	Dec, 1994	H-3	49.77 ± 82.72	-9.95 ± 79.98	19.91 ± 57.53
WATER-7982, 7983	Dec, 1994	H-3	-2.00 ± 95.00	0.00 ± 95.00	-1.00 ± 67.18
WATER-8107, 8108	Dec, 1994	Gr. Alpha	0.26 ± 0.77	0.59 ± 0.82	0.43 ± 0.56
WATER-8107, 8108	Dec, 1994	Gr. Beta	1.21 ± 0.69	1.54 ± 0.69	1.38 ± 0.49
WATER-8086, 8087	Dec, 1994	Gr. Beta	3.30 ± 0.64	2.51 ± 0.57	2.91 ± 0.43
WATER-8009, 8010	Dec, 1994	H-3	71.38 ± 82.32	11.79 ± 79.58	41.59 ± 57.25
WATER-8039, 8040	Dec, 1994	H-3	154.29 ± 85.18	64.34 ± 81.13	109.31 ± 58.82
WATER-8253, 8254	Dec, 1994	H-3	6,802.01 ± 238.58	6,680.64 ± 236.67	6,741.33 ± 168.03

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	>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-64[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] Teledyne limit.

APPENDIX B

DATA REPORTING CONVENTIONS

Data Reporting Conventions

1.0 All activities except gross alpha and gross beta are decay corrected to collection time or the end of the collection period.

2.0 Single Measurements

Each single measurement is reported as follows:

$$x \pm s$$

where x = value of the measurement;
$s = 2\sigma$ counting uncertainty (corresponding to the 95% confidence level).

In cases where the activity is found to be below the lower limit of detection L it is reported as

$$<L$$

where L = the lower limit of detection based on 4.66σ uncertainty for a background sample.

3.0 Duplicate analyses

3.1 Individual results: $x_1 \pm s_1$
$x_1 \pm s_2$

Reported result: $x \pm s$

where $x = (1/2)(x_1 \pm x_2)$

$$s = (1/2)\sqrt{s_1^2 + s_2^2}$$

3.2 Individual results: $<L_1$

$<L_2$

Reported result: $<L$

where L = lower of L_1 and L_2

3.3 Individual results: $x \pm s$

$<L$

Reported result: $x \pm s$ if $x \geq L$;

$<L$ otherwise

4.0. Computation of Averages and Standard Deviations

4.1 Averages and standard deviations listed in the tables are computed from all of the individual measurements over the period averaged; for example, an annual standard deviation would not be the average of quarterly standard deviations. The average $\bar{x}$ and standard deviation(s) of a set of n numbers $x_1, x_2 \ldots x_n$ are defined as follows:

$$\bar{x} = \frac{1}{n} \Sigma x$$

$$s = \sqrt{\frac{\Sigma(\bar{x} - x_i)^2}{n-1}}$$

4.2 Values below the highest lower limit of detection are not included in the average.

4.3 If all of the values in the averaging group are less than the highest LLD, the highest LLD is reported.

4.4 If all but one of the values are less than the highest LLD, the single value x and associated two sigma error is reported.

4.5 In rounding off, the following rules are followed:

4.5.1. If the figure following those to be retained is less than 5, the figure is dropped, and the retained figures are kept unchanged. As an example, 11.443 is rounded off to 11.44.

4.5.2. If the figure following those to be retained is greater than 5, the figure is dropped and the last retained figure is raised by 1. As an example, 11.446 is rounded off to 11.45.

4.5.3. If the figure following those to be retained is 5, and if there are no figures other than zeros beyond the five, the figure five is dropped, and the last-place figure retained is increased by one if it is an odd number or it is kept unchanged if an even number. As an example, 11.435 is rounded off to 11.44, while 11.425 is rounded off to 11.42.

APPENDIX C

Maximum Permissible Concentrations of Radioactivity in Air and Water Above Background in Unrestricted Areas

Table C-1. Maximum permissible concentrations of radioactivity in air and water above natural background in unrestricted areas[a].

Air			Water	
Gross alpha	3	pCi/m^3	Strontium-89	3,000 pCi/L
Gross beta	100	pCi/m^3	Strontium-90	300 pCi/L
Iodine-131[b]	0.14	pCi/m^3	Cesium-137	20,000 pCi/L
			Barium-140	20,000 pCi/L
			Iodine-131	300 pCi/L
			Potassium-40[c]	3,000 pCi/L
			Gross alpha	30 pCi/L
			Gross beta	100 pCi/L
			Tritium	3×10^6 pCi/L

[a] Taken from Code of Federal Regulations Title 10, Part 20, Table II and appropriate footnotes. Concentrations may be averaged over a period not greater than one year.

[b] From 10 CFR 20 but adjusted by a factor of 700 to reduce the dose resulting from the air-grass-cow-milk-child pathway.

[c] A natural radionuclide.