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Gentlemen:

2001 ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT SALEM AND HOPE CREEK GENERATING STATIONS DOCKET NOS. 50-272, 50-311 AND 50-354

As required by Section 6.9.1.7 of Appendix A to Facility Operating Licenses DPR-70 and DPR-75 for Salem Generating Station, Unit Nos. 1 and 2, and Section 6.9.1.6 of Appendix A to Facility Operating License NPF-57 for Hope Creek Generating Station, PSEG Nuclear hereby transmits one copy of the 2001 Annual Radiological Environmental Operating Report. This report summarizes the results of the radiological environmental surveillance program for 2001 in the vicinity of the Salem and Hope Creek Generating Stations. The result of this program for 2001 was specifically compared to the result of the pre-operational program.

If you have any questions or comments on this transmittal, please contact Michael Mosier at (856) 339-5434

Sincerely,

Gabor Salamon Nuclear Safety and Licensing Manager

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Attachment

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RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

For

Salem Generating Station, Unit 1: Docket No. 50-2/2 Salem Generating Station, Unit 2: Docket No. 50-311 Hope Creek Generating Station : Docket No. 50-354

2001 ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT JANUARY 1 TO DECEMBER 31, 2001

Prepared by

PSEG MAPLEWOOD TESTING SERVICES APRIL 2002

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM



SALEM & HOPE CREEK GENERATING STATIONS

2001 ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

JANUARY 1 TO DECEMBER 31, 2001

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SUMMARY

During normal operations of a nuclear power generating station there are releases of small amounts of radioactive material to the environment. To monitor and determine the effects of these releases a Radiological Environmental Monitoring Program (REMP) has been established for the environment around Artificial Island where the Salem Generating Stations (SGS) and Hope Creek Generating Station (HCGS) are located. The results of the REMP are published annually, providing a summary and interpretation of the data collected.

PSEG's Maplewood Testing Services (MTS) has been responsible for the collection and analysis of environmental samples during the period of January 1, 2001, through December 31, 2001, and the results are discussed in this report. The REMP for SGS/HCGS was conducted in accordance with the SGS and HCGS Technical Specifications/Offsite Dose Calculation Manual. The Lower Limit of Detection (LLD) values required by the Technical Specifications/ODCM were achieved for this reporting period. The objectives of the program were also met during this period. The data collected assists in demonstrating that SGS and HCGS were operated in compliance with Technical Specifications/ODCM.

Most of the radioactive materials noted in this report are normally present in the environment, either naturally, such as potassium-40, or as a result of non-nuclear generating station activity, such as nuclear bomb testing. Measurements made in the vicinity of SGS/HCGS were compared to background or control measurements and the preoperational REMP study performed before Salem Unit 1 became operational. Samples of air particulates, air iodine, milk, surface, ground and drinking water, vegetables, game, fodder crops, fish, crabs, and sediment were collected and analyzed. External radiation dose measurements were also made in the vicinity of SGS/HCGS using thermoluminescent dosimeters.

From the results obtained, it can be concluded that the levels and fluctuations of radioactivity in environmental samples were as expected for an estuarine environment. No unusual radiological characteristics were observed in the environs of SGS/HCGS during this reporting period. Since these results were comparable to the results obtained during the preoperational phase of the program, and with historical results collected since commercial operation, we can conclude that the operation of SGS and HCGS had no significant impact on the radiological characteristics of the environs of these stations.

To demonstrate compliance with Technical Specifications/ODCM (Sections 3/4.12.1 & 6.8.4.h -1,2,3), samples were analyzed for one or more of the following: gamma emitting isotopes, tritium (H-3), iodine-131 (I-131), gross beta and gross alpha. The results of these analyses were used to assess the environmental impact of SGS and HCGS operations,

thereby demonstrating compliance with Technical Specifications/ODCM (Section 3/4.11) and applicable Federal and State regulations, and to verify the adequacy of radioactive effluent control systems. The results provided in this report are summarized below:

There were a total of 1397 analyses on 1121 environmental samples during 2001. Direct radiation dose measurements were made using 196 thermoluminescent dosimeters (TLDs).

■ In addition to the detection of naturally-occurring isotopes (i.e. Be-7, K-40, Ra-226 and Th-232) trace levels of Cs-134 and Cs-137 were also detected. The concentrations of these nuclides were well below the Technical Specification reporting limit.

■ Dose measurements made with quarterly TLDs at 31 offsite locations around the SGS/HCGS site, averaged 49 millirems for the year 2001. The average dose measurements at the control locations (background) was 54 millirems for the year. This was comparable to the preoperational phase of the program which had an average of 55 millirems per year for 1973 to 1976.

THE RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

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Lower Alloways Creek Township, Salem County, New Jersey is the site of Salem (SGS) and Hope Creek (HCGS) Generating Stations. SGS consists of two operating pressurized water nuclear power reactors. Salem Unit One has a net rating of 1133 megawatt electric(MWe) and Salem Unit Two has a net rating of 1134 MWe. The licensed core power for both units is 3459 megawatt thermal (MWt). HCGS is a boiling water nuclear power reactor, which has a net rating of 1091 MWe (3339 MWt).

SGS/HCGS are located on a man-made peninsula on the east bank of the Delaware River. It was created by the deposition of hydraulic fill from dredging operations. The environment surrounding SGS/HCGS is characterized mainly by the Delaware River and Bay, extensive tidal marshlands, and low-lying meadowlands. These land types make up approximately 85% of the land area within five miles of the site. Most of the remaining land is used for agriculture [1,2]. More specific information on the demography, hydrology, meteorology, and land use of the area may be found in the Environmental Reports [1,2], Environmental Statements [3,4], and the Updated Final Safety Analysis Reports for SGS and HCGS [5,6].

Since 1968, a radiological environmental monitoring program (REMP) has been conducted at the SGS/HCGS Site. Starting in December, 1972, more extensive radiological monitoring programs were initiated. The operational REMP was initiated in December, 1976, when Salem Unit 1 achieved criticality. PSEG's Maplewood Testing Services (MTS) has been involved in the REMP since its inception. MTS is responsible for the collection of all radiological environmental samples and, from 1973 through June, 1983, conducted a quality assurance program in which duplicates of a portion of those samples analyzed by the primary laboratory were also analyzed by MTS.

From January, 1973, through June, 1983, Radiation Management Corporation (RMC) had primary responsibility for the analysis of all samples under the SGS/HCGS REMP and annual reporting of results. RMC reports for the preoperational and operational phase of the program are referenced in this report [7-9]. On July 1, 1983, MTS assumed primary responsibility for the analysis of all samples (except TLDs) and the reporting of results. Teledyne Brown Engineering Environmental Services (TBE), assumed responsibility for third-party QA analyses and TLDs. An additional vendor, Controls for Environmental Pollution Inc. (CEP), was retained to provide thirdparty QA analyses and certain non-routine analyses from May, 1988, until June 1, 1992. Currently, Duke Engineering and Services Environmental Laboratory (DE&SEL) is the third party QA vendor and the laboratory which performs the TLD analyses. MTS reports for the operational phase from 1983 to 2000 are referenced in this report [10].

An overview of the 2001 Program is provided in Table 1. Radioanalytical data from samples collected under this program were compared with results from the preoperational phase. Differences between these periods were examined statistically to determine the effects of station operations. This report presents the results from January 1 through December 31, 2001, for the SGS/HCGS REMP.

OBJECTIVES

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The objectives of the Operational REMP are:

- To fulfill the requirements of the Radiological Surveillance sections of the Technical Specifications/ODCM for SGS/HCGS.
- To determine whether any significant increase occurred in the concentration of radionuclides in critical pathways.
- To determine if SGS or HCGS has caused an increase in the radioactive inventory of long-lived radionuclides.
- To detect any change in ambient gamma radiation levels.
- To verify that SGS and HCGS operations have no detrimental effects on the health and safety of the public or on the environment.

This report, as required by Section 6.9.1.7 of the Salem Technical Specifications/ODCM and Section 6.9.1.6 of the Hope Creek Technical Specifications/ODCM, summarizes the findings of the 2001 REMP. Results of the four-year preoperational program have been summarized for comparison with subsequent operational reports [8].

In order to meet the objectives, an operational REMP was developed. Samples of various media were selected for monitoring due to the radiological dose impact to human and other organisms. The selection of samples was based on: (1), established critical pathways for the transfer of radionuclides through the environment to man, and, (2), experience gained during the preoperational phase. Sampling locations were determined based on site meteorology, Delaware estuarine hydrology, local demography, and land uses.

Sampling locations were divided into two classes, indicator and control. Indicator stations are those, which are expected to manifest station effects. Control samples are collected at locations which are believed to be unaffected by station operations, usually at 15 to 30 kilometers distance. Fluctuations in the levels of radionuclides and direct radiation at indicator stations are evaluated with respect to analogous fluctuations at control stations. Indicator and control station data are also evaluated relative to preoperational data. Appendix A describes and summarizes, in accordance with Section 6.9.1.7 of the Salem TS and Section 6.9.1.6 of the Hope Creek TS, the operational program as performed in 2001. Appendix B describes the coding system which identifies sample type and location. Table B-1 lists the sampling stations and the types of samples collected at each station. These sampling stations are indicated on Maps B-1 and B-2.

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DATA INTERPRETATION

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Results of analyses are grouped according to sample type and presented in Appendix C. All results above the Lower Limit of Detection (LLD) are at a confidence level of 2 sigma. This represents the range of values into which 95% of repeated analyses of the same sample should fall. As defined in Regulatory Guide 4.8, LLD is the smallest concentration of radioactive material in a sample that will yield a net count (above system background) that will be detected with 95% probability, with only 5% probability of falsely concluding that a blank observation represents a "real signal". LLD is normally calculated as 4.66 times the standard deviation of the background counting rate, or of the blank sample count, as appropriate, divided by counting efficiency, sample size, 2.22 (dpm per picocurie), the radiochemical yield when applicable, the radioactive decay constant and the elapsed time between sample collection and time of counting. The Minimum Detectable Concentration (MDC) is defined as the smallest concentration of radioactive material that can be detected at a given confidence level. The MDC differs from the LLD in that the MDC takes into consideration the interference caused by the presence of other nuclides while the LLD does not.

The grouped data were averaged and standard deviations calculated in accordance with Appendix B of Reference 16. Thus, the 2 sigma deviations of the averaged data represent sample and not analytical variability. For reporting and calculation of averages, any result occurring at or below the LLD is considered to be at that level. When a group of data was composed of 50% or more LLD values, averages were not calculated.

Grab sampling is a useful and acceptable procedure for taking environmental samples of a medium in which the concentration of radionuclides is expected to vary slowly with time or where intermittent sampling is deemed sufficient to establish the radiological characteristics of the medium. This method, however, is only representative of the sampled medium for that specific location and instant of time. As a result, variation in the radionuclide concentrations of the samples will normally occur. Since these variations will tend to counterbalance one another, averages based upon repetitive grab samples is considered valid.

QUALITY ASSURANCE PROGRAM

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MTS has a quality assurance program designed to ensure confidence in the analytical program. Approximately 20% of the total analytical effort is spent on quality control, including process quality control, instrument quality control, interlaboratory cross-check analyses, and data review.

The quality of the results obtained by MTS is ensured by the implementation of the Quality Assurance Program as described in the Maplewood Testing Services Quality Assurance Plan [11] and the Environmental and Chemical Division Procedures Manual. The internal quality control activity of MTS includes the quality control of instrumentation, equipment and reagents; the use of reference standards in calibration, documentation of established procedures and computer programs, and analysis of duplicate and spiked samples. The external quality control activity is implemented through participation in both the Analytics and the Environmental Resource Associates Interlaboratory Comparison Programs. The results of these Interlaboratory Comparison Programs are listed in Tables D-1 through D-4 in Appendix D.

RESULTS AND DISCUSSION

The analytical results of the 2001 REMP samples are divided into categories based on exposure pathways: atmospheric, direct, terrestrial, and aquatic. The analytical results for the 2001 REMP are summarized in Appendix A. The data for individual samples are presented in Appendix C. The data collected demonstrates that the SGS and HCGS REMP was conducted in compliance with the Technical Specifications/ODCM.

The REMP for the SGS/HCGS Site has historically included samples and analyses not specifically required by these Stations' Technical Specifications/ODCM. MTS continues to collect and analyze some of these samples in order to maintain personnel proficiency in performing these non-routine analyses. These analyses are referenced throughout the report as Management Audit samples. The summary tables in this report include these additional samples and analyses.

ATMOSPHERIC

Air particulates were collected on Schleicher-Schuell No. 25 glass fiber filters with low-volume air samplers. Iodine was collected from the air by adsorption on triethylenediamine (TEDA) impregnated charcoal cartridges connected in series after the air particulate filters. Air sample volumes were measured with calibrated dry-gas meters and were corrected to standard temperature and pressure.

Air Particulates (Tables C-1, C-2)

Air particulate samples were collected weekly, at 6 locations. Each of the 318 samples collected for the year were analyzed for gross beta. Quarterly composites of the weekly samples from each station were analyzed for specific gamma emitters. Total data recovery for the 6 sampling stations in 2001 was 99.91 percent.

- Gross beta activity was detected in 265 of the indicator station samples at concentrations ranging from 8 x 10⁻³ to 44 x 10⁻³ pCi/m³ and in 53 of the control station samples from 11 x 10⁻³ to 44 x 10⁻³ pCi/m³. The averages for the indicator and control station samples were 23 and 25 x 10^{-3} pCi/m³, respectively. The maximum preoperational level detected was 920 x 10⁻³ pCi/m³, with an average of 74 x 10⁻³ pCi/m³. Results from 1980 to current year are plotted on Figure 1 as quarterly averages. Included along with this plot, for purposes of comparison, is an inset depicting a continuation of this plot from the current year all the way back to 1973.
 - Gamma spectroscopy, performed on each of the 24 quarterly composite samples analyzed, indicated the presence of the naturally-occurring radionuclides Be-7 and K-40. All other gamma emitters searched for were below the LLD.
 - O Beryllium-7, attributed to cosmic ray activity in the atmosphere, was detected in all 20 indicator station composites that were analyzed, at concentrations ranging from 36 x 10^{-3} to 78 x 10^{-3} pCi/m³, with an average of 56 x 10^{-3} pCi/m³. It was detected in the 4 control station composites ranging from 33 x 10^{-3} to 66 x 10^{-3} pCi/m³, with an average of 53 x 10^{-3} pCi/m³. The maximum preoperational level detected was 330 x 10^{-3} pCi/m³, with an average of 109 x 10^{-3} pCi/m³.
 - O Potassium-40 activity was detected in 13 of the indicator station samples, with concentrations ranging from 7 x 10^{-3} to 14 x 10^{-3} pCi/m³, with an average of 10 x 10^{-3} pCi/m³. K-40 was also detected in 2 control station samples, with concentrations of 9 x 10^{-3} and 11 x 10^{-3} pCi/m³. No preoperational data is available for comparison.

Air Iodine (Table C-3)

Iodine in filtered air samples was collected weekly, at 6 locations. Each of the 318 samples collected for the year was analyzed for I-131.

Iodine-131 was not detected in any of the weekly samples analyzed. LLD sensitivities for all the stations, both indicator and control, ranged from <1 x 10^{-3} to <10 x 10^{-3} pCi/m³. The maximum preoperational level detected was 42 x 10^{-3} pCi/m³.

DIRECT RADIATION

Ambient radiation levels in the environs were measured with energycompensated $CaSO_4$ (Tl) thermoluminescent dosimeters (TLDs) supplied and read by DE&SEL. Packets containing TLD's for quarterly exposure were placed in the owner controlled area and around the Site at various distances. Direct Radiation (Table C-4)

A total of 49 locations were monitored for direct radiation during 2001, including 12 on-site locations, 31 off-site locations within the 10 mile zone, and 6 control locations beyond 10 miles. Effort was made to locate TLD's at schools and population centers in the area.

Five readings for each TLD (ie; 5 elements) at each location were taken in order to obtain a more statistically valid result. For these measurements, the rad is considered equivalent to the rem, in accordance with 10CFR20.1004.

The average dose rate for the 31 quarterly off-site indicator TLDs was 4.1 millirads per standard month, and the average control rate was 4.5 millirads per standard month. The preoperational average for the quarterly TLD readings was 4.4 millirads per standard month.

In Figure 2, the quarterly average radiation levels of the off-site indicator stations versus the control stations, are plotted for the period 1980 through 2001, with an inset graph depicting the current year back to 1973.

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TERRESTRIAL

Milk samples were taken semi-monthly when cows were on pasture and monthly when cows were not grazing on open pasture. Animals are considered on pasture from April to November of each year. Samples were collected in new polyethylene containers and transported in ice chests with no preservatives added.

A well water sample was collected monthly. Separate raw and treated potable water samples were composited daily at the City of Salem water treatment plant. All samples were collected in new polyethylene containers.

Locally grown vegetable and fodder crops were collected at the time of harvest. Such samples were weighed and packed in plastic bags.

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Game (muskrat) has been collected annually (time of year dependent on weather conditions, which affect pelt thickness) from local farms after being trapped, stripped of their pelts and gutted. The carcasses were packed in plastic bags and kept chilled in ice chests during transport.

Milk (Table C-5)

Milk samples were collected at 4 local dairy farms (2 farms in NJ and 2 in Delaware). Each sample was analyzed for I-131 and gamma emitters.

Iodine-131 was not detected in any of the 80 samples analyzed.

LLD sensitivities for both the indicator and the control station samples ranged from <0.1 to <0.4 pCi/L. The maximum preoperational level detected was 65 pCi/L which occurred following a period of atmospheric nuclear weapons tests. Results from 1980 to 2001 are plotted on Figure 3, with an inset graph depicting the current year back to 1973.

- Gamma spectroscopy performed on each of the 80 samples indicated the presence of the naturally-occurring radionuclide K-40. All other gamma emitters searched for were below the LLD.
 - Potassium-40 was detected in all 80 samples. Concentrations for the 60 indicator station samples ranged from 1220 to 1460 pCi/L, with an average of 1350 pCi/L. The 20 control station sample concentrations ranged from 1220 to 1390 pCi/L, with an average of 1310 pCi/L. The maximum preoperational level detected was 2000 pCi/L, with an average of 1437 pCi/L.

Well Water (Ground Water) (Tables C-6, C-7)

Although wells in the vicinity of SGS/HCGS are not directly affected by plant operations, water samples were collected monthly from one farm's well during January through December of the year. Each sample was analyzed for gross alpha, gross beta, tritium, and gamma emitters.

Gross alpha activity was detected in 9 of the well water samples at concentrations ranging from 1.2 to 2.6 pCi/L and an average of 2.2 pCi/L. The maximum preoperational level detected was 9.6 pCi/L. There was no preoperational average determined for this analysis.

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- Gross beta activity was detected in all 12 well water samples. Concentrations for the samples ranged from 9.8 to 14 pCi/L, with an average of 12 pCi/L. The 2001 gross beta results are comparable with the preoperational results which ranged from <2.1 to 38 pCi/L, with an average value of 9 pCi/L.
- Tritium activity was not detected in any of the well water samples. The LLD sensitivities ranged from <150 to <180 pCi/L. The maximum preoperational level detected was 380 pCi/L.
- Gamma spectroscopy performed on each of the 12 well water samples indicated the presence of the naturally-occurring radionuclides K-40 and Radium. All other gamma emitters searched for were below the LLD.
 - O Radium was detected in all 12 of the well water samples at concentrations ranging from 90 to 193 pCi/L with an average of 146 pCi/L. The maximum preoperational level detected was 2.0 pCi/L.

These values are similar to those found in the past 11 years. However, as with the 1989 through 2000 results, they are higher than those found in the preoperational program. The results are most likely due to a procedural change for sample preparation. The change results in less removal of radon (and its daughter products) from the sample. It is reasonable to conclude that values currently observed are typical for this region.

O Potassium-40 was detected in 4 of the samples at concentrations ranging from 48 to 85 pCi/L and an average of 71 pCi/L. The maximum preoperational level detected was 30 pCi/L.

Potable Water (Drinking Water) (Tables C-8, C-9)

Both raw and treated potable water samples were collected and composited by Salem water treatment plant personnel. Each sample consisted of daily aliquots composited into a monthly sample. The raw water source for this plant is Laurel Lake and adjacent wells. Each of the 24 individual samples was analyzed for gross alpha, gross beta, tritium, iodine-131 and gamma emitters.

- Gross alpha activity was detected in 10 raw water samples at concentrations of 0.6 to 1.4 pCi/L and in 7 treated water samples ranging from 0.8 to 1.6 pCi/L. The averages for both raw and treated water samples was 0.9 pCi/L. The maximum preoperational level detected was 2.7 pCi/L.
- Gross beta activity was detected in all 24 samples at concentrations ranging from 2.7 to 4.7 pCi/L for both the raw and treated water. The average concentration for both raw and treated was 3.4 pCi/L. The maximum preoperational level detected was 9.0 pCi/L, with an average of 4.2 pCi/L.
- Tritium activity was not detected in any of the raw and treated water samples. LLD sensitivities ranged from <150 to <180 pCi/L. The maximum preoperational level detected was 350 pCi/L, with an average of 179 pCi/L.
- Iodine-131 measurements to a sensitivity of 1.0 pCi/L were performed. Since the receiving water body (Delaware River) is brackish, the water is not used for human consumption. Drinking water supplies are not affected by discharges from the site. Iodine-131 measurements for all 24 samples were below the LLD sensitivities. The LLD sensitivities ranged from <0.1 to <0.4 pCi/L.</p>
- Gamma spectroscopy performed on each of the 24 monthly water samples indicated the presence of the naturally-occurring radionuclides K-40 and Radium. All other gamma emitters searched for were below the LLD.

- O The radionuclide K-40 was detected in 11 of the raw and treated potable waters at concentrations ranging from 26 to 70 pCi/L. The combined average for both raw and treated positive results was 44 pCi/L. There was no preoperational data available for comparison.
- O Radium was detected in one potable raw samples and in four of the treated samples at concentrations of 4 to 6.5 pCi/L. LLD sensitivities for the remaining raw and treated waters ranged from <1.6 to <3.5 pCi/L. The maximum preoperational level detected was 1.4 pCi/L. The higher results in the two measurable samples are most likely due to the procedural change for sample preparation, as discussed in the Well Water section.

Vegetables (Table C-10)

Although vegetables in the region are not irrigated with water into which liquid plant effluents have been discharged, a variety of food products grown in the area for human consumption were sampled at 5 indicator stations (14 samples) and 5 control stations (15 samples). The vegetables collected as management audit samples were analyzed for gamma emitters and included asparagus, cabbage, sweet corn, peppers and tomatoes.

Gamma spectroscopy performed on each of the 29 samples indicated the presence of the naturally occurring radionuclides K-40 and Radium. All other gamma emitters searched for were below the LLD.

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Potassium-40 was detected in all 29 samples. Concentrations for the 14 indicator station samples ranged from 1420 to 2570 pCi/kgwet and averaged 2090 pCi/kg-wet. Concentrations for the 15 control station samples ranged from 1230 to 2710 pCi/kg-wet, and averaged 2060 pCi/kg-wet. The average concentration detected for all samples, both indicator and control, was 2070 pCi/kg-wet. The maximum preoperational level detected was 4800 pCi/kg-wet, with an average of 2140 pCi/kg-wet.

Radium was detected in 1 indicator sample (tomato) at a concentration of 16 pCi/kg-wet. It was not detected in any of the control station samples. No preoperational data is available for comparison.

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Game (Table C-11)

Although not required by the SGS or HCGS Technical Specifications/ODCM, samples of muskrats, inhabiting the marshlands surrounding the site, are collected. This game is consumed by local residents. The samples, when available, are collected from 2 locations once a year as management audit samples and analyzed for gamma emitters. Gamma spectroscopy performed on the flesh indicated the presence of the naturally-occurring radionuclide K-40. All other gamma emitters searched for were below the LLD.

Potassium-40 was detected in the indicator station sample at a concentration of 2600 pCi/kg-wet and the control station sample at 2840 pCi/kg-wet. The average for both muskrat samples was 2720 pCi/kg-wet. The maximum preoperational level detected was 27000 pCi/kg-wet, with an average of 4400 pCi/kg-wet.

Fodder Crops (Table C-12)

Although not required by the SGS or HCGS Technical Specifications/ODCM, six samples of crops normally used as cattle feed (silage and soybeans) were collected from three indicator stations (5 samples) and one control station (1 sample). It was determined that these products may be a significant element in the food-chain pathway. Fodder crops are collected as management audit samples and analyzed for gamma emitters. All of the locations from which samples were collected this year are milk sampling stations.

Gamma spectroscopy performed on each of the 6 samples indicated the presence of the naturally-occurring radionuclides Be-7, K-40 and Radium. All other gamma emitters searched for were below the LLD.

Beryllium-7, attributed to cosmic ray activity in the atmosphere, was detected in the 3 indicator silage samples at concentrations of 210 to 670 pCi/kg-wet. It was detected in the control station silage sample at 350 pCi/kg-wet. The average for all the silage samples was 400 pCi/kg-wet. The maximum preoperational level detected for silage was 4700 pCi/kg-wet, with an average of 2000 pCi/kg-wet. Be-7 was not detected in either of the two indicator soybean samples. LLD sensitivities for the soybean samples were <30 and <40 pCi/kg-wet. The maximum preoperational level detected for soybean samples was 9300 pCi/kg-dry.

Potassium-40 was detected in all 6 samples. Concentrations for the 5 indicator station samples ranged from 2560 to 16800 pCi/kgwet and for the 1 control station sample at 4380 pCi/kg-wet. The average concentration detected for the silage samples (both indicator and control) was 3710 pCi/kg-wet. Preoperational results averaged 7000 pci/kg-wet. Results for the soybean samples (both indicator and control) averaged 15900 pCi/kg-wet which is comparable to preoperational studies when the average wet/dry factor of 1.2 is used. Preoperational soybean results averaged 22000 pCi/kg-dry.

Soil (Table C-13)

Soil is sampled every three years at nine stations, including one control, and analyzed for gamma emitters. Samples are collected at each station, in areas that have been relatively undisturbed since

the last collection, in order to determine any change in the radionuclide inventory of the area.

Gamma spectroscopy performed on each of the 9 samples indicated the presence of the naturally-occurring radionuclides Be-7, K-40; Radium and Th-232, in addition to low levels of the fission product CS-137. All other gamma emitters searched for were below the LLD.

Beryllium-7, attributed to cosmic ray activity in the atmosphere, was detected in 3 of the indicator station samples at concentrations of 120 to 360 pCi/kg-dry and an average of 210 pCi/kg-dry. It was not detected in the control station sample. The maximum preoperational level detected for soil samples was 21000 pCi/kg-dry. · • • •

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Potassium-40 was detected in all 8 samples of the indicator station samples at concentrations ranging from 4610 to 12900 pCi/kg-dry with an average of 8850 pCi/kg-dry. The control station sample was 8190 pCi/kg-dry. The maximum preoperational level detected was 24000 pCi/kg-dry with an average of 10000 pCi/kq-dry.

Cesium-137 was detected in 7 of the indicator station samples ranging from 26 to 350 pCi/kg-dry, with an average of 210 pCi/kgdry. The control station sample showed a concentration of 160 pCi/kg-dry. The maximum preoperational level detected was 2800 pCi/kg-dry with an average of 800 pCi/kg-dry. Results from 1974 to the current year are plotted on Figure 7.

Radium was detected in all 8 of the indicator station samples in concentrations of 260 to 970 pCi/kg-dry, with an average of 660 pCi/kg-dry. The control station sample showed a concentration of 700 pCi/kg-dry. The maximum preoperational level detected was 1500 pCi/kg-dry with an average of 870 pCi/kg-dry.

Thorium-232 was detected in all 8 indicator station samples in ranges of 350 to 1200 pCi/kg-dry, and had an average of 790 pCi/kg-dry. The control station sample showed a concentration of 850 pCi/kg-dry. The maximum preoperational level detected was 1400 pCi/kg-dry with an average of 740 pCi/kg-dry.

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the contract of the second All aquatic samples were collected by Environmental Consulting Services, Inc. Surface water samples were collected in new polyethylene containers that were rinsed twice with the sample medium prior to collection.

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Edible fish and crabs are taken by net and then processed. In processing, the flesh is separated from the bone and shell and placed in sealed polyethylene containers and frozen before being transported in ice chests.

Sediment samples were taken with a bottom grab sampler and frozen in sealed polyethylene containers before being transported in ice chests.

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Surface Water (Tables C-14, C-15, C-16)

Surface water samples were collected monthly at 4 indicator stations and 1 control station in the Delaware estuary.

One location is at the outfall area (which is the area where liquid radioactive effluents from the Salem Station are allowed to be discharged into the Delaware River), another is downstream from the outfall area, and another is directly west of the outfall area at the mouth of the Appoquinimink River. Two upstream locations are in the Delaware River and at the mouth of the Chesapeake and Delaware Canal, the latter being sampled when the flow is from the Canal into the river. Station 12C1, at the mouth of the Appoquinimink River, serves as the operational control. All surface water samples were analyzed monthly for gross beta and gamma emitters. Quarterly composites were analyzed for tritium.

- Gross beta activity was detected in all 48 of the indicator station samples ranging from 4.7 to 224 pCi/L, with an average of 82 pCi/L. Beta activity was detected in all 12 of the control station samples with concentrations ranging from 6.4 to 129 pCi/L, with an average of 71 pCi/L. The maximum preoperational level detected was 110 pCi/L, with an average of 32 pCi/L. Quarterly results for all locations are plotted on Figure 4, for the years 1980 to 2001, with an inset graph depicting the current year back to 1973.
- Tritium activity was not detected in any of the indicator or control station composites. LLD sensitivities for the station composites, both indicator and control, ranged from <150 to <190 pCi/L. The maximum preoperational level detected was 600 pCi/L, with an average of 210 pCi/L. Positive results from 1980 to 2001 are plotted on Figure 5, with an inset graph depicting the current year back to 1973.
- Gamma spectroscopy performed on each of the 48 indicator station and 12 control station surface water samples indicated the presence of the naturally-occurring radionuclide K-40. All other gamma emitters searched for were below the LLD.

Potassium-40 was detected in 45 samples from the indicator stations at concentrations ranging from 42 to 178 pCi/L and in 11 of the control station samples ranging from 38 to 165 pCi/L. The average for the indicator station locations was 95 pCi/L, while the average for the control station locations was 99 pCi/L. The maximum preoperational level detected was 200 pCi/L, with an average of 48 pCi/L.

Fish (Table C-17)

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Edible species of fish were collected semi-annually at 3 locations and analyzed for gamma emitters (flesh), and for Sr-89 and Sr-90 (bones) in one location (11A1). This location was chosen since it is the outfall area for the Salem Station. Samples included catfish, weakfish, white perch and striped bass.

Gamma spectroscopy performed on each of the 4 indicator station samples and 2 control station samples indicated the presence of the naturally-occurring radionuclide K-40. All other gamma emitters searched for were below the LLD.

- O Potassium-40 was detected in all 4 samples from the indicator stations at concentrations ranging from 3240 to 3910 pCi/kg-wet for an average of 3500 pCi/kg-wet. K-40 was detected in both samples from the control location at 3650 and 3700 pCi/kg-wet. The average for the control samples was 3675 pCi/kg-wet. The maximum preoperational level detected was 13000 pCi/kg-wet, with an average of 2900 pCi/kg-wet.
- Strontium-89 and strontium-90 analyses were performed by DE&SLL on one sample of the first semi-annual sample collection (location 11A1), and reported as MDC. These are management audit analyses which are performed in recognition of the high bioaccumulation factor of strontium in bone.
 - O Strontium-89 was not detected in the bone sample. The MDC value for the sample was <600 pCi/kg-dry. The maximum preoperational level detected was 100 pCi/kg-dry.

O Strontium-90 was not detected in the bone sample. The MDC value for the sample was <130 pCi/kg-dry. The maximum preoperational level detected was 940 pCi/kg-dry, with an average of 335 pCi/kg-dry.

Blue Crab (Table C-18)

Blue crab samples were collected semi-annually at 2 locations, 1 indicator and 1 control, and the edible portions were analyzed for gamma emitters.

Gamma spectroscopy performed on the flesh of each of the 2 indicator station samples and 2 control station samples indicated the presence of the naturally-occurring radionuclide K-40. All other gamma emitters searched for were below the LLD.

Potassium-40 was detected in both indicator station samples at concentrations of 2510 and 2910 pCi/kg-wet and in both of the control station samples at 2660 and 3080 pCi/kg-wet. The average for both the indicator and control station samples was 2790 pCi/kg-wet. The maximum preoperational level detected was 12000 pCi/kg-wet, with an average of 2835 pCi/kg-wet. Sediment (Table C-19)

Sediment samples were collected semi-annually from 7 locations, 6 indicator stations and 1 control station. Each of the 14 samples was analyzed for gamma emitters. Although trace levels of man-made nuclides were detected in some sediment samples, these levels were expected and well within the acceptable levels specified in section 3/4.12.1 of the Technical Specifications/ODCM.

Gamma spectroscopy was performed on each of the 12 indicator station samples and 2 control station samples. In addition to the detection of the naturally-occurring radionuclides Radium, K-40, Be-7 and Th-232, low levels of Cs-134 and Cs-137 were also detected. All other gamma emitters searched for were below the LLD.

Cesium-134 was detected in 2 of the 12 indicator station samples at concentrations of 19 and 27 pCi/kg-dry. It was not detected in either control station samples. LLD sensitivities for the remaining station samples, both indicator and control ranged from <2.2 to <7.2 pCi/kg-dry. No pre-operational data is available for comparison.

Cesium-137 was detected in 9 indicator station samples at concentrations ranging from 19 to 120 pCi/kg-dry and an average of 59 pCi/kg-dry. It was detected in 1 control station sample at a concentration of 58 pCi/kg-dry. The maximum preoperational level detected was 400 pCi/kg-dry with an average of 150 pCi/kgdry. Results from 1980 to 2000 are plotted on Figure 6A, with an inset graph depicting the current year back to 1973.

Cobalt-60 was not detected in any of the sediment samples for the second year in a row. LLD sensitivities for these 14 samples, indicator and control, ranged from <2 to <22 pCi/kg-dry. Results of all the positive values from 1980 to 2001 are plotted on Figure 6B, with an inset graph depicting the current year back to 1973.

Potassium-40 was detected in all 12 indicator station samples at concentrations ranging from 1020 to 15900 pCi/kg-dry, with an average of 11550 pCi/kg-dry. Concentrations detected in both of the control station samples were at 15600 pCi/kg-dry. The average for both the indicator and control station samples was 12100 pCi/kg-dry. The maximum preoperational level detected was 21000 pCi/kg-dry, with an average of 15000 pCi/kg-dry.

Radium was detected in all 12 indicator station samples at concentrations ranging from 96 to 760 pCi/kg-dry, with an average of 530 pCi/kg-dry. Concentrations detected in both of the control station samples were at 550 and 820 pCi/kg-dry, with an average of 690 pCi/kg-dry. The grand average for both the indicator and control station samples was 560 pCi/kg-dry. The maximum preoperational level detected was 1200 pCi/kg-dry, with an average of 760 pCi/kg-dry. Thorium-232 was detected in all 12 indicator station samples at concentrations ranging from 82 to 1130 pCi/kg-dry, with an average of 710 pCi/kg-dry. Concentrations detected in both of the control station samples were at 480 and 1100 pCi/kg-dry, with an average of 790 pCi/kg-dry. The grand average for both the indicator and control station samples was 830 pCi/kg-dry. The maximum pre-operational level detected was 1300 pCi/kg-dry, with an average of 840 pCi/kg-dry.

Beryllium-7 was detected in 5 of the 12 indicator station samples at concentrations of 220 to 870 pCi/kg-dry, with an average of 550 pCi/kg-dry. It was detected in 1 of the control station samples at a concentration of 350 pCi/kg-dry. The LLD sensitivities for the remaining samples, both indicator and control, ranged from <40 to <250 pCi/kg-dry. The maximum preoperational level detected was 2300 pCi/kg-dry.

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CONCLUSIONS

The Radiological Environmental Monitoring Program for Salem and Hope Creek Generating Stations was conducted during 2001 in accordance with the SGS and HCGS Technical Specifications/ODCM. The LLD values required by the Technical Specifications/ODCM were achieved for this reporting period. The objectives of the program were also met during this period. The data collected assists in demonstrating that SGS and HCGS were operated in compliance with Technical Specifications/ODCM.

From the results obtained, it can be concluded that the levels and fluctuations of radioactivity in environmental samples were as expected for an estuarine environment. No unusual radiological characteristics were observed in the environs of SGS/HCGS during this reporting period. Since these results were comparable to the results obtained during the preoperational phase of the program, which ran from 1973 to 1976, and with historical results collected since commercial operation, we can conclude that the operation of the Salem and Hope Creek Stations had no significant impact on the radiological characteristics of the environs of that area.

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TABLE 1

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SALEM AND HOPE CREEK GENERATING STATIONS RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM (PROGRAM OVERVIEW)

	STATION CODE			COLLECTION			
MEDIUM	INDICAT	OR		CONTROL	FREQUENCY		TYPE/FREQUENCY* OF ANALYSIS
I. ATMOSPHERIC ENVIRONMENT							
a. Air Particulate	551 51 1F1 2F	16E1 6		14G1	Weekly		Gross beta/weekly Gamma scan/quarterly
b. Air Iodine	5S1 5	D1 16E1		14G1	Weekly		Iodine-131/weekly
$e^{-i\pi i \omega - i\omega x} e^{-i\omega x} e^{-i\omega x}$	1F1 2F	1 6	:		e en su Se da constru		an a
II. DIRECT RADIATION							
a. Thermoluminescent	151 2	S4 3S1	491	361	A	· •	
Dosimeters	252 5	D1 2E1	. 151	1G3	Quarterly	1.5	Gamma dose/ quarterly
	5S1 10	D1 3E1	2F2	10G1	and the stand of		··· •
en en esta esta esta esta esta esta esta esta	6 <u>52</u> 14	D1 13E1	2F6	16G1	Sec. Margare	A	4
	781 15	SI 16SI	4F2	14G1			
	10S1 16	E1 5F1	6F1	3H1			
	1151 7	F2 11F1	13F4		,		
	4D2 9	El 2F5	3F2			. *	
	11E2 15	D1 12E1	3F3				
	16F2 10	F2 12F1	13F2				
	13F3 14	F2 15F3		·	к.	•	
126							1 e 1 .
III. Terrestrial Environment					- 1		
					Monthly		Iodine-131/monthly
a. Milk	2F9 11	F3 14F4	;	3G1	(when animals ar pasture)	e on	Gamma scan/monthly
			·		Semi-monthly (when animals ar pasture)	e on	Iodine-131/semi-monthly Gamma scan/semi-monthly

TABLE 1 (cont'd)

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SALEM AND HOPE CREEK GENERATING STATIONS RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

1997 - Angel State (1997) 1997 - Angel State (1997) 1997 - Angel State (1997)

TAT (PROGRAM OVERVIEW)

	STATION	CODE	COLLECTION	
MEDIUM	INDICATOR	CONTROL	FREQUENCY	TYPE/FREQUENCY* OF ANALYSIS
b. Well Water	3 E 1		Monthly	Gross alpha/monthly
				Gross beta/monthly
				Tritium/monthly
	•			Gamma scan/monthly
	۰. ^۱			
a Dotable Water	2173	4 A	Monthly	Gross alpha/monthly
(Paw & Treated)			(composited	Gross beta/monthly
	2 H - 1		daily)	Tritium/monthly
			-	Gamma scan/monthly
٨				Iodine-131/monthly
				· · · · · ·
d. Vegetables	3 E1 2F4 2	F9 1G1	Annually	Gamma scan/on collection
	3F5 3F6 3	F8 2G2	(at harvest)	
	6F2 14	F3 3H5	ta	
		9G1 14G2		
e. Game (Muskrat)	11D1 3E1		Annually ·	Gamma scan/on collection
(1,2,3,3,3,3,3,3,3,3,3,3,3,3,3,3,3,3,3,3,				
f. Fodder Crops	2F9 11F3	14F4 3G1	Annually	Gamma scan/on collection
•	•			
g. Soil	6S2 2F7	11F3 3G1	Every 3 years	Gamma scan/on collection
-	10D1 2F9	14F4		
	16E1 5F1		•• · · · · · · · · · · · · · · · · · ·	

TABLE 1 (cont'd)

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SALEM AND HOPE CREEK GENERATING STATIONS RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM (PROGRAM OVERVIEW)

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	STAT:	ION CODE	COLLECTION		
MEDIUM	INDICATOR	CONTROL	FREQUENCY	TYPE/FREQUENCY* OF ANALYSIS	
IV. AQUATIC ENVIRONMENT		na An an an taogra			
a. Surface Water	11A1 7E1	1F2 12C1 16F1	Monthly	Gross beta/monthly Gamma scan/monthly Tritium/quarterly	
b. Edible Fish	11A1 7H	12C1	Semi- annually	Sr-89 & Sr-90 (bones)/on 1 loc.** Sr-89 & Sr-90 (flesh/on 1 loc.** Gamma scan (flesh)/on collection	
c. Blue Crabs	11A1	12C1	Semi- annually	Gamma scan (flesh)/on collection	
d. Sediment	11A1 68 15A1 16F 16A1	2 7E1 12C1 1	Semi- annually	Gamma scan/on collection	

* Except for TLDs, the quarterly analysis is performed on a composite of individual samples collected during the quarter.

** Management audit analyses, not required by Technical Specifications or by specific commitments to local officials.



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FIGURE 2 AMBIENT RADIATION - OFFSITE vs CONTROL STATION 1980 THROUGH 2001

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FIGURE 3

QUARTERLY AVERAGE

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FIGURE 4

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FIGURE 6A CESIUM-137 ACTIVITY IN AQUATIC SEDIMENT 1980 THROUGH 2001

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REFERENCES

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PROGRAM SUMMARY

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SALEM GENERATING STATION HOPE CREEK GENERATING STATION

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DOCKET 50-272/-311 DOCKET NO. 50-354

SALEM COUNTY, NEW JERSEY JANUARY 1, 2001 to DECEMBER 31, 2001

MEDIUM OR PATHWAY SAMPLE (UNIT OF MEASUREMENT)	Analysis Total Nu of Analy Perform	And mber yses ned	Lower Limit of Detection (LLD)*	All Indicator Locations Mean (Range)	Location with Highest Mean Name Distance and Direction	Mean (Range)	Control Location Mean (Range)	Number of Nonroutine Reported Measurements
I. AIRBORNE Air Particulates (10 ⁻³ pCi/m ³)	Beta	318	6.0	23 (265 /265) (8-44)	14G1 11.8 mi WNW	25 (53/53) (11-44)	25 (53 /53) (11-44)	0
	Gamma Be7	24	7.2	56 (20 /20) (36-78)	2F6 7.3 mi NNE	62(4 /4) (49-78)	53 (4 /4) (33-66)	0
٨	K-40	24	7.0	11 (13 /20) (7-14)	16E1 4.1 mi NNW	13 (2 /4) (12-14)	10 (2 /4) (9-11)	0
Air Iodine (10 ⁻³ pCi/m ³)	I-131	318	10	<lld< td=""><td></td><td><lld< td=""><td><lld< td=""><td>0</td></lld<></td></lld<></td></lld<>		<lld< td=""><td><lld< td=""><td>0</td></lld<></td></lld<>	<lld< td=""><td>0</td></lld<>	0
II DIRECT Direct Radiation (mrad/std. month)	Quarterly Badges	196	-	4.1 (172/172) (2.6-6.1)	2S2 0.4 mi NNE	5.6 (4 /4) (4.7-6.1)	4.5 (24 /24) (3.4-5.3)	0
III TERRESTRIAL Milk (pCi/L)	I-131	80	0.4	<ild< td=""><td>-</td><td><lld< td=""><td><lld< td=""><td>0</td></lld<></td></lld<></td></ild<>	-	<lld< td=""><td><lld< td=""><td>0</td></lld<></td></lld<>	<lld< td=""><td>0</td></lld<>	0
	K-40	80	50	1350 (60 /60) (1220-1460)	2F9 7.5 mi NNE	1370 (20/20) (1250-1450)	1310 (20 /20) (1220-1390)	0

SALEM GENERATING STATION HOPE CREEK GENERATING STATION

DOCKET 50-272/-311 DOCKET NO. 50-354

Control Location

Mean

(Range)

Mean

(Range)

Number of

Nonroutine

Reported

SALEM COUNTY, NEW JERSEY

Analysis And

Total Number

of Analyses

JANUARY 1, 2001 to DECEMBER 31, 2001

LowerAll Indicator LocationsLocation with Highest MeanLimit ofMeanNameDetection(Range)Distance and Direction

	Perforn	ned	(LLD) *	-		((nango)	Measurements
					ajajati i	,		
Well Water	- Ainha	12	17	0.0./10.		a a tha way		
(pCi/L)	Сірпа	12	1.7	(1.2-2.6)	3E1 4.1 mi NE	2.2 (9/12) (1.2-2.6)	No Control Location	O
	Beta	12	1.0***	12 (12/12) (9.8-14)	3E1 4.1 mi NE	12 (12/12) (9.8-14)	No Control	0
*	H-3	12	180	<lld< td=""><td>-</td><td><lld< td=""><td>No Control</td><td>0</td></lld<></td></lld<>	-	<lld< td=""><td>No Control</td><td>0</td></lld<>	No Control	0
	Gamma						Location	
	К-40	12	30	71 (4 /12) (48-85)	3E1 4.1mi NE	71 (4/12)	No Control	0
	RA-NAT	12	2.9	146 (12/12) (90-193)	3E1 4.1mi NE	146 (12 /12) (90-193)	No Control Location	0
	• .				and the second			
Potable Water (pCi/L)	Alpha	24	1.0	0.9 (17/24)	2F3 8.0 mi NNE	0.9 (17 /24)	No Control	0
	Beta	24	1.0***	3.4 (24/24)	2F3 8.0 mi NNE	(0.0-1.0) 3.4 (24 /24)	No Control	0
	H-3	24	180	<lld< td=""><td>n an an</td><td><lld< td=""><td>No Control</td><td>0</td></lld<></td></lld<>	n an	<lld< td=""><td>No Control</td><td>0</td></lld<>	No Control	0
	Gamma				191, s		Location	. 1. ⁵ .***
	K-40	24	30	44 (11 /24) (26-70)	2F3 8.0 mi NNE	44 (11 /24)	No Control	0
	I-131	24	0.3	<lld< td=""><td>-</td><td><lld< td=""><td>No Control</td><td>0</td></lld<></td></lld<>	-	<lld< td=""><td>No Control</td><td>0</td></lld<>	No Control	0
	RA-NAT	24	2.9	5.4 (5 /24) (4-6.5)	2F3 8.0 mi NNE	5.4 (5 /24) (4-6.5)	No Control Location	0

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MEDIUM OR PATHWAY

(UNIT OF MEASUREMENT)

SAMPLE

SALEM GENERATING STATION HOPE CREEK GENERATING STATION

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DOCKET 50-272/-311 DOCKET NO. 50-354

SALEM COUNTY, NEW JERSEY JANUARY 1, 2001 to DECEMBER 31, 2001

MEDIUM OR PATHWAY	Analysis	And	Lower	All Indicator Locations	Location with Highest Mean	Maan	Control Location	Number of
SAMPLE (UNIT OF MEASUREMENT)	Total Number of Analyses Performed		Limit of Detection (LLD) *	Mean (Range)	Distance and Direction	(Range)	(Range)	Reported Measurements
	0						at a s	
III TERRESTRIAL Fruit & Vegetables	Gamma K-40	29	70	2090 (14 /14) (1420-2570)	14G2 12.1 mi WNW	2460 (2 /2) (2290-2620)	2060 (15 /15) (1230-2710)	0
(pCi/Kg-wet)	RA-NAT	29	15	16 (1 /1) (16)	6F2 8.2 mi ESE	16 (1 /1) (16)	<lld< td=""><td>0</td></lld<>	0
Game	Gamma			· · · · · ·	the second second	5.3 × 3	ter tagen et al.	
(pCi/Kg-wet)	K-40	2	70	2600 (1 /1) (2600)	11D1 3.5 mi SW	2840 (1 /1) (2840)	2840 (1 /1) (2840)	0
							, jj.•€2	
Fodder Crops	Gámma	. •	1.4.4.7	• •				
(pCi/Kg-wet)	Be-7	6	35	420 (3 /5) (210-670)	2F9 7.5 mi NNE	670 (1 /1) (670)	350 (1 /1) (350)	0
	К-40	6	70	8430 (5 /5) (2560-16800)	11F3 5.3 mi SW	9950 (2 /2) (4990-14900)	4380 (1 /1) (4380-4380)	Q
· · •	RA-NAT	6	14	20 (1 /5) (20)	14F4 7.6 mi. WNW	20 (1 /1) (20)	10 (1 /1) (10)	0
Soil	Gamma			e a ang seatain	and the second second			
(pCi/kg (dry)	Be-7	. 9	80	210 (3 /8) (120-360)	11F3 5.3 mi. SW	360 (1 /1) (360)	<lld< td=""><td>0</td></lld<>	0
	K-40	9	70	8850 (8 /8) (4610-12900)	14F4 7.6 mi. WNW	12900 (1 /1) (12900)	8190 (1 /1) (8190)	0
	Cs-137	9	33	210 (7 /8) (26-350)	10D1-3.9 mi. SSW -	350 (1 /1) (350)	160 (1 /1) (160)	0
	Ra-NAT	9	45	660 (8 /8) (260-970)	11F3 5.3 mi. SW	970 (1 /1) (970)	700 (1 /1) (700)	0
	Th-232	9	50	790 (8 /8) (350-1200)	11F3 5.3 mi. SW	1200 (1 /1) (1200)	850 (1 /1) (850)	0

SALEM GENERATING STATION HOPE CREEK GENERATING STATION

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DOCKET 50-272/-311 DOCKET NO. 50-354

SALEM COUNTY, NEW JERSEY JANUARY 1, 2001 to DECEMBER 31, 2001

MEDIUM OR PATHWAY SAMPLE (UNIT OF MEASUREMENT)	Analysis And Total Number of Analyses Performed		ATHWAY Analysis And Lower <u>All Indicator Locations Location with Highest Mea</u> Total Number Limit of <u>Mean</u> Name SUREMENT) of Analyses Detection (Range) Distance and Direction Performed (LLD)*		Location with Highest Mean Name Distance and Direction	Mean (Range)	Control Location Mean (Range)	n Number of Nonroutine Reported	
	• • • •		1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 -				· · ·	mousurementa	
IV AQUATIC	:**		· · ·						
Surface Water (pCi/L)	Beta	60	3.8	82 (48 /48) (4.7-224)	7E1 4.5 mi SE	118 (12/12) (34-224)	71 (12/12)	0	
	H-3	20	180	<lld< td=""><td></td><td>(01 22 1)</td><td><lld< td=""><td>0</td></lld<></td></lld<>		(01 22 1)	<lld< td=""><td>0</td></lld<>	0	
	Gamma								
٨	K-40	60	30	95 (45 /48) (42-178)	11A1 0.2 mi SW	111 (12/12) (54-178)	99 (11/12) (38-165)	0	
Blue Crabs	Gamma			21					
(pCi/kg-wet)	K-40	4	70	2710 (2 /2) (2510-2910)	12C1 2.5 mi WSW	2870 (2/2)	2870 (2 /2)	Ō	
	•			(2010/2010)	$\{ (x_i) : i \in \{i,j\} \} \in \{i,j\}$	(2060-3080)	(2660-3080)		
Edible Fish	Sr-89	1	600	~!!.D	· · · · · · · · · · · · · · · · · · ·				
(pCi/kg-dry)	(bones)	•			· . •	<lld< td=""><td><lld< td=""><td>0</td></lld<></td></lld<>	<lld< td=""><td>0</td></lld<>	0	
	Sr-90	1	130	<lld< td=""><td></td><td><lld< td=""><td><lld< td=""><td>o</td></lld<></td></lld<></td></lld<>		<lld< td=""><td><lld< td=""><td>o</td></lld<></td></lld<>	<lld< td=""><td>o</td></lld<>	o	
	(bones)							·	
(pCi/kg-wet)	Gamma	et 1		4. 4 .			·· ·		
	K-40	6	70	3530 (4 /4) (3240-3910)	12C1 2.5 mi WSW	3675 (2 /2) (3650-3700)	3675 (2 /2) (3650-3700)	0	
Sediment		· ·	• 4v.	and the second	n vita in vita				
(pCi/ka-drv)	Gamma		· ·				1. S	· · · · ·	
(F - 1 3 - 1 1 , - 	Be-7	14	80	550 (5 /12) (220-870)	11A1 0.2 mi SW	870 (1 /2)	350 (1 /2)	0	
	K-40	14	70	11550 (12 /12) (1020-15900)	12C1 2.5 mi WSW	(070) 15600 (2/2) (15600)	(350) 15600 (2 /2) (15600)	0	
	Co-60	14	22	<lld< td=""><td>÷</td><td><lld< td=""><td><lld< td=""><td>0</td></lld<></td></lld<></td></lld<>	÷	<lld< td=""><td><lld< td=""><td>0</td></lld<></td></lld<>	<lld< td=""><td>0</td></lld<>	0	

SALEM GENERATING STATION HOPE CREEK GENERATING STATION DOCKET 50-272/-311 DOCKET NO. 50-354

SALEM COUNTY, NEW JERSEY JANUARY 1, 2001 to DECEMBER 31, 2001

((Range)	Reported Measurements
27 (1 /2) (27)	<lld< td=""><td>0</td></lld<>	0
98 (2 /2) (76-120)	58(1 /2) (58)	0
690 (2/2) (550-820)	690 (2 /2) (550-820)	0
995 (2/2) (860-1130)	790(2 /2) (480-1100)	0
	ha and An an Stat	N.
	690 (2 /2) (550-820) 995 (2 /2) (860-1130)	690 (2 /2) 690 (2 /2) (550-820) (550-820) 995 (2 /2) 790 (2 /2) (860-1130) (480-1100)

* LLD listed is the lower limit of detection which we endeavored to achieve during this reporting period. In some instances nuclides were detected at concentrations above the LLD values shown. All strontium results are reported by DESEL as MDC.

** Mean calculated using values above LLD only. Fraction of measurements above LLD are in parentheses.

1. get 1.

*** Typical LLD values.

APPENDIX B

SAMPLE DESIGNATION

AND

LOCATIONS

APPENDIX B

SAMPLE DESIGNATION

The PSEG's Maplewood Testing Services identifies samples by a three part code. The first two letters are the program identification code. Because of the proximity of the Salem and Hope Creek Stations a common environmental surveillance program is being conducted. The identification code, "SA", has been applied to Salem and Hope Creek stations. The next three letters are for the media sampled.

AIO	=	Air Iodine	IDM =	Immersion Dose (TLD)
APT	=	Air Particulate	MLK =	Milk
ECH	=	Hard Shell Blue Crab	PWR =	Potable Water (Raw)
ESF	=	Edible Fish	PWT =	Potable Water (Treated)
ESS	=	Sediment	SOL =	Soil
FPL	=	Green Leafy Vegetables	SWA =	Surface Water
FPV	=	Vegetables (Various)	VGT =	Fodder Crops (Various)
GAM	=	Game (Muskrat)	WWA =	Well Water

The last four symbols are a location code based on direction and distance from a standard reference point. Of these, the first two represent each of the sixteen angular sectors of 22.5 degrees centered about the reactor site. Sector one is divided evenly by the north axis and other sectors are numbered in a clockwise direction; e.g., 2=NNE, 3=NE, 4=ENE, etc. The next digit is a letter which represents the radial distance from the reference point:

S	=	On-site lo	ocation	E	=	4-5 miles off-site
А	=	0-1 miles	off-site	F	=	5-10 miles off-site
в	=	1-2 miles	off-site	G	=	10-20 miles off-site
С	=	2-3 miles	off-site	н	=	>20 miles off-site
D	=	3-4 miles	off-site			

The last number is the station numerical designation within each sector and zone; e.g., 1,2,3,... For example, the designation SA-WWA-3E1 would indicate a sample in the Salem and Hope Creek program (SA), consisting of welk water (WWA), which had been collected in sector number 3, centered at 45° (north east) with respect to the reactor site at a radial distance of 4 to 5 miles off-site, (therefore, radial distance E). The number 1 indicates that this is sampling station #1 in that particular sector.

TABLE B-1 SAMPLING LOCATIONS

Specific information about the individual sampling locations are given in Table B-1. Maps B-1 and B-2 show the locations of sampling stations with respect to the site. A Portable Global Positioning System (GPS) was used to provide the coordinates of sampling locations. The Datem used was WGS 84.

	STATION CODE	STATION LOCATION	LATITUDINAL	LONGITUDINAL	SAMPLE TYPE
	1S1	0.55mi. N of vent	DEG. MIN. SEC	DEG. MIN. SEC	
	252	0.4 mi NNE of vent	39 - 28 - 16	75 - 32 - 15	IDM
	284	0.50 mi NNE of work	39 - 28 - 07	75 - 31 - 57	IDM
	204	0.59 ml. NNE OF Vent	39 - 28 - 16	75 - 31 - 55	IDM
	351	0.58 ml. NE of vent	39 - 28 - 08	75 - 31 - 41	IDM
	4S1	0.60 mi. ENE of vent that so that a second second second	39 - 28 - 02	75 - 31 - 33	IDM
	551	1.0 mi. E of vent; site access road	39 - 27 - 38	75 - 31 - 08	AIO, APT, IDM
>	652	0.2 mi. ESE of vent; observation building	39 - 27 - 43	75 - 31 - 55	IDM. SOL. ESS
Ŭ	7S 1	0.12 mi. SE of vent; station personnel gate	39 - 27 - 44	75 - 32 - 03	TDM
	1051	0.14 mi. SSW of vent; inlet cooling water bldg.	39 - 27 - 39	75 - 32 - 10	ד את
	1151	0.09 mi. SW of vent; service water inlet bldg.	39 - 27 - 43	75 - 32 - 12	TDM
	15S1	0.57 mi. NW of vent	39 - 28 - 10	75 - 32 - 32	
	1651	0.54 mi. NNW of vent	39 - 28 - 13	75 - 32 - 26	
	11A1	0.2 mi. SW of vent; outfall area	39 - 27 - 59	75 - 32 - 25	
	15A1	0.3 mi. NW of vent; cooling tower blowdown	39 - 27 - 67	75 - 32 - 10	ECH, ESF, ESS, SWA
		discharge line outfall		75 - 52 - 19	£55
	16A1	0.7 ml. NNW of vent; south storm drain discharge line	39 - 28 - 24	75 - 32 - 58	ESS
	12C1	2.5 mi. WSW of vent; west bank of Delaware River	39 - 27 - 22	75 - 34 - 08	ECH, ESF, ESS, SWA
	4D2	3.7 mi. ENE of vent; Alloway Creek Neck Road	39 - 29 - 18	75 - 32 - 11	IDM
	5D1	3.5 mi. E of vent; local farm	39 - 28 - 24	75 - 28 - 22	AIO, APT, TOM
	10D1	3.9 mi. SSW of vent; Taylor's Bridge Spur	39 - 24 '- 37	75 - 33 - 44	IDM. SOL
	11D1	3.5 mi. SW of vent	39 - 24 - 49	75 - 34 - 26	GAM
	14D1	3.4 mi. WNW of vent; Bay View, Delaware	39 - 29 - 02	75 - 35 - 31	
	15D1	3.8 mi. NW of vent; Rt. 9, Augustine Beach	39 - 30 - 08	75 - 35 - 02	
	2E1	4.4 mi. NNE of vent; local farm	39 - 31 - 23	75 - 30 - 36	
	3E1	4.1 mi. NE of vent; local farm	39 - 30 - 07	75 - 28 - 41	GAM, IDM, VGT, WWA, FPV

TABLE B-1 (cont'd)

STATION CODE	STATION LOCATION	LATITUDINAL	LONGITUDINAL	SAMPLE TYPE
		DEG. MIN. SEC $39 = 25 = 08$	DEG. MIN. SEC $75 - 28 - 64$	FOF FOG GWA
7E1	4.5 ml. SE OF Vent; 1 ml. w Of Mad Herse Creek	39 - 23 - 08	75 - 28 - 64	ESF, ESS, SWA
9E1	4.2 ml. S of vent	39 - 24 - 10	/5 - 32 - 42	IDM
11E2	5.0 mi. SW of vent; Rt. 9	39 - 24 - 20	75 - 35 - 33	1DM
12E1	4.4 mi. WSW of vent; Thomas Landing	39 - 26 - 52	75 - 36 - 59	IDM
13E1	4.2 mi. W of vent; Diehl House Lab	39 - 27 - 59	75 - 36 - 44	IDM
16E1	4.1 mi. NNW of vent; Port Penn	39 - 30 - 47	75 - 34 - 34	AIO, APT, IDM, SOL
1F1	5.8 mi. N of vent; Fort Elfsborg	39 - 32 - 45	75 - 31 - 06	AIO, APT, IDM
1F2	7.1 mi. N of vent; midpoint of Delaware River	39 - 33 - 08	75 - 32 - 54	SWA
2F2	8.7 mi. NNE of vent; Corner of 5 th & Howell, Salem	39 - 34 - 38	75 - 28 - 04	IDM
2F3	8.0 mi. NNE of vent; Salem Water Company	39 - 33 - 40	75 - 27 - 18	PWR, PWT
2F4	6.3 mi. NNE of vent; local farm	39 - 33 - 21	75 - 30 - 33	FPV, FPL
2F5	7.4 mi. NNE of vent; Salem High School	39 - 33 - 27	75 - 28 - 31	IDM
2F6	7.3 mi. NNE of vent; Southern Training Center	39 - 33 - 43	75 - 28 - 48	AIO, APT, IDM
2F7	5.7 mi. NNE of vent; local farm	39 - 32 - 40	75 - 30 - 53	SOL
2F8	5.3 mi. NNE OF vent; local farm	39 - 31 - 54	75 - 29 - 18	FPV
2F9	7.5 mi. NNE of vent; Tilbury Farms , 45 S. Tilbury Ed. Salem	39 - 33 - 55	75 - 29 - 30	MLK, FPV, VGT, SOL
3F2	5.1 mi. NE of vent; Hancocks Bridge Municipal Bld	39 - 30 - 25	75 - 27 - 36	IDM
3F3	8.6 mi. NE of vent; Quinton Township School	39 - 32 - 38	75 👾 24 👾 45 👘	IDM
3F5	9.4 mi. NE of vent; Harris's Farm Market	39 - 33 - 29	75 - 24 - 54	FPV
3F6	6.5 mi. NE of vent; #324 Salem/Hancocks Bridge	39 - 32 - 03	75 - 28 - 00	FPV
3F8	5.1 mi. NE of vent; 33 Maple Ave., Hancocks Bridge	39 - 30 -25	75 - 27 - 37	FPV, FPL
4F2	6.0 mi. ENE of vent; Mays Lane, Harmersville	39 - 29 - 58	75 - 26 - 03	IDM
5F1	6.5 mi. E of vent; Canton	39 - 28 - 22	75 - 24 - 59	IDM, SOL
6F1	6.4 mi. ESE of vent; Stow Neck Road	39 - 26 - 24	75 - 25 - 09	IDM
6F2	8.2 mi. ESE of vent; RD#3 Box 160 Bridgeton, NJ	39 - 26 - 04	75 - 23 - 09	FPV, FPL
7F2	9.1 mi. SE of vent; Bayside, New Jersey	39 - 22 - 56	75 - 24 - 17	IDM
10F2	5.8 mi. SSW of vent; Rt. 9	39 - 23 - 01	75 - 34 - 09	IDM
11F1	6.2 mi. SW of vent; Taylor's Bridge Delaware	39 - 24 - 44	75 - 37 - 37	IDM
11F3	5.3 mi. SW of vent; Townsend, Delaware	39 - 24 - 06	75 - 36 - 20	MLK, VGT, SOL
12F1	9.4 mi. WSW of vent; Townsend Elementary School	39 - 23 - 47	75 - 41 - 18	IDM
13F2	6.5 mi. W of vent; Odessa, Delaware	39 - 27 - 18	75 - 39 - 21	IDM

TABLE B-1 (cont'd)

STATION				
CODE	STATION LOCATION	LATITUDINAL	LONGITUDINAL	SAMPLE TYPE
13F3	9.3 mi. W of vent; Redding Middle School, Middletown, Delaware	DEG. MIN. SEC 39 - 27 - 14	DEG. MIN. SEC 75 - 42 - 32	IDM
13F4	9.8 mi. W of vent; Middletown, Delaware	39 - 26 - 51	75 - 43 - 07	IDM
14F2	6.6 mi. WNW of vent; Boyds Corner	39 - 30 - 00	75 - 38 - 59	IDM
14F3	5.4 mi. WNW of vent; local farm	39 - 29 - 33	75 - 37 - 55	FPV, FPI
14F4	7.6 mi. WNW of vent; local farm	39 - 30 - 44	75 - 40 - 52	MLK, VGT, SOL
15F3	5.4 mi. NW of vent	39 - 30 - 58	75 - 36 - 36	IDM
16F1	6.9 mi. NNW of vent; C&D Canal	39 - 33 - 55	75 - 34 - 25	ESS.SWA
16F2	8.1 mi. NNW of vent; Delaware City Public School	39 - 34 - 18	75 - 35 - 25	IDM
1G1	10.3 mi. N of vent; local farm	39 - 36 - 31	75 - 29 - 59	FPV. FPL
1G3	19 mi. N of vent; N. Church St. Wilmington, Del	39 - 44 - 16	75 - 32 - 31	IDM
1G4	10.8 mi. N of vent; (Dads Produce) Rte. 49, South Broadway, Pennsville	39 - 37 - 55	75 - 30 - 44	FPV
2G2	13.5 mi. NNE of vent; Moore's Market; 324 Pointers Auburn Road (Rt. 540), Salem, NJ 08079	39 - 38 - 19	75 - 26 - 10	FPV
3G1	17 mi. NE of vent; Mr. Lee Williams Farm	39 - 35 - 56	75 - 16 - 47	IDM, MLK, VGT, SOL
9G1	10.3 mi. S of Vent; Mr. Goldsburrough, 1784 Woodland Beach Rd., Smyrna, Delaware	39 - 18 - 47	75 - 33 - 50	FPV
10G1	12 mi. SSW of vent; Smyrna, Delaware	39 - 18 - 13	75 - 36 - 05	IDM
14G1	11.8 mi. WNW of vent; Rte. 286; Bethel Church Road; Delaware	39 - 31 - 18	75 - 46 - 30	AIO, APT, IDM
14G2	12.1 mi. WNW of vent; Locust Grove Farm & Garden Center; 1084 Bethel Church Road; Middletown, DE 19709	39 - 31 - 21	75 - 44 - 57	FPV
16G1	15 mi. NNW of vent; Greater Wilmington Airport	39 - 40 - 32	75 - 35 - 45	IDM
3H1	32 mi. NE of vent; National Park, New Jersey	39 - 51 - 36	75 - 11 - 06	IDM
3H5	25 mi. NE of vent; Sorbello Girl's Market	39 - 41 - 02	75 - 12 - 23	FPL, FPV
3H3	110 mi. NE of vent; Maplewood Testing Services	40 - 43 - 25	74 - 15 - 09	IDM

NOTE: All station locations are referenced to the midpoint of the two Salem Units' Vents. The coordinates of this location are: Latitude N 39° - 27' - 45.3" and Longitude W 75° - 32' - 09.7".

All Game (GAM), Vegetables(FPV & FPL) and Vegetation (VGT), are management audit samples. They are not required by the Salem & Hope Creek Stations' Tech Specs nor listed in the Station's ODCM. Vegetable samples are not always collected in consecutive years from the same farmer since they rotate the type of crop they grow.





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APPENDIX C

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DATA TABLES

APPENDIX C

DATA TABLES

Appendix C presents the analytical results of the 2001 Radiological Environmental Monitoring Program for the period of January 1 to December 31, 2001.

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Table C-1

2001 CONCENTRATIONS OF GAMMA EMITTERS* IN QUARTERLY COMPOSITES OF AIR PARTICULATES

STATION	Samp	ling	Period	< Gamma E	mitters>
ID	Start	Start Stop		Be-7	K-40
SA-APT-5S1	12/26/2000	to	3/27/2001	38 ± 4	11 ± 4
SA-APT-1F1	12/26/2000	to	3/27/2001	36±3	10±3
SA-APT-2F6	12/26/2000	to	3/27/2001	51 ± 4	12±3
SA-APT-5D1	12/26/2000	to	3/27/2001	37±3	10 ± 2
SA-APT-16E1	12/27/2000	to	3/28/2001	37±4	14 ± 5
SA-APT-14G1(C)	12/27/2000	to	3/28/2001	33 ± 3	11±2
	0.07.0001	• •	6/05/0001	CA L C	- 4
SA-API-551	3/27/2001	to	6/25/2001	64±6	<4
SA-API-1F1	3/27/2001	to	6/25/2001	69±5	<4
SA-APT-2F6	3/27/2001	το	6/25/2001	69±4	< 4
SA-API-5D1	3/27/2001	to	6/25/2001	61 ± 4	12±3
SA-APT-16E1	3/28/2001	to	6/26/2001	68 ± 4	<4
SA-APT-14G1(C)	3/28/2001	to	6/26/2001	66±4	<4
SA-APT-5S1	6/25/2001	to	9/24/2001	70±5	10±2
SA-APT-1F1	6/25/2001	to	9/24/2001	67 ± 4	9±2
SA-APT-2F6	6/25/2001	to	9/24/2001	78±5	<6
SA-APT-5D1	6/25/2001	to	9/24/2001	60 ± 4	<3
SA-APT-16E1	6/26/2001	to	9/25/2001	58 ± 4	<4
SA-APT-14G1(C)	6/26/2001	to	9/25/2001	58 ± 6	<6
SA-APT-5S1	9/24/2001	to	1/2/2002	48 ± 4	12±3
SA-APT-1F1	9/24/2001	to	1/2/2002	47±4	9±2
SA-APT-2F6	9/24/2001	to	1/2/2002	49 ± 4	11±2
SA-APT-5D1	9/24/2001	to	1/2/2002	51 ± 4	7±3
SA-APT-16E1	9/25/2001	to	1/3/2002	51 ± 4	12 ± 3
SA-APT-14G1(C)	9/25/2001	to	1/3/2002	53 ± 4	9±3
AVERAGE				55 ± 25	8±7

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Results in Units of 10^{-3} pCi/m³ +/- 2 sigma

* All other gamma emitters searched for were <LLD; typical LLDs are given in Table 20. (C) Control Station

2001 CONCENTRATIONS OF GROSS BETA EMITTERS IN AIR PARTICULATES Results in Units of 10⁻³ pCi/m³ +/- 2 sigma

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	<> STATION ID>							
MONTH	SA-APT-14G1	SA-APT-16E1	SA-APT-1F1	SA-APT-2F6	SA-APT-5D1	SA-APT-5S1	AVERAGE	
January	23±2	24±2	21±2	21 ± 2	21±2	21+2	22+3	
	18 ± 3	22±3	17±2	18±2	21 ± 3	19 + 3	10 ± 1	
	17 ± 2	21 ± 2	17±2	22±2	20+2	16 ± 2	1016	
	19 ± 2	19±2	18±2	19 ± 2	15+2	18+2	1810	
	34 ± 3	33 ± 3	32 ± 3	32 ± 3	30 ± 3	32 ± 3	32 ± 3	
February	17±2	17±2	15 ± 2	21±2	15 ± 2	17+2	17+4	
	21±3	23 ± 3	16 ± 2	20 ± 2	13±2	15 ± 2	18+8	
	28 ± 2	25 ± 2	25±2	27 ± 2	24 ± 2	28 ± 2	26 + 3	
•	20 ± 2	21 ± 2	20 ± 2	23 ± 2	20 ± 2	18 ± 2	20 ± 3 20 ± 3	
March	14 ± 2	18±2	19±2	24 ± 2	21±3	20 + 2	1076	
	12 ± 2	11±2	15 ± 2	15 ± 2	18 ± 2	16+2	14 - 5	
	18±2	15 ± 2	16 ± 2	17 ± 2	17 ± 2	14+2	16+3	
	13±2	11±2	17±2	18 ± 2	17 ± 2	18 ± 2	16 ± 6	
April	13±2	12±2	11,±2	10±2	9±2	11+2	11 + 3	
	22 ± 3	18±3	20 ± 2	20 ± 2	19±2	19 + 3	20 ± 3	
	18±2	19±2	19±2	18±2	19+2	15+2	18+2	
	35 ± 4	32 ± 3	34 ± 3	33±3	29 ± 3	29+3	32 + 5	
	29 ± 3	27±2	27±3	29±3	27 ⁺ ±2	27±3	32 ± 3 27 ± 2	
lay	35±3	29 ± 2	32±3	35 ± 3	32±3	28+3	32+6	
	28±3	29±3	23±2	24 ± 2	26±2	25 ± 3	26 ± 4	
	11±2	9±2	10 ± 2	11 ± 2	8+2	9+2	0 ± 2	
r -	13±2	11±2	9±2	8±2	11±2	9±2	10±3	
une	15±2	16±2	18±2	15±2	13±2	16+2	15+3	
	24 ± 3	24±3	22±2	23±2	21±2	21+2	10±3 22+3	
	25 ± 2	25±2	22±2	21±2	21+2	21 ± 2 24 ± 2	22 1 3	
····	39 ± 3	42±3	24±2	24±2	20±2	20 ± 2	28 ± 20	

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2001 CONCENTRATIONS OF GROSS BETA EMITTERS IN AIR PARTICULATES

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Results in Units of 10⁻³ pCi/m³ +/- 2 sigma

		<		STATION ID			>	
MONTH	SA-APT-14G1	SA-APT-16E1	SA-APT-1F1	SA-APT-2F6	SA-APT-5D1	SA-APT-5S1	AVERAGE	
July	28±3	28±3	22±2	26±2	28±2	27±3	26 ± 5	
	20 ± 2	16±2	17±2	23±2	16 ± 2	20 ± 2	19 ± 5	
	20 ± 2	20 ± 2	19±2	22±2	15 ± 2	19 ± 2	19 ± 4	
	24 ± 3	23±3	23±3	22±3	17 ± 2	20 ± 3	21 ± 5	
	19 ± 2	17±2	18±2	19±2	15 ± 2	13 ± 2	17 ± 5	
August	29 ± 3	27±3	22 ± 3	26 ± 3	24±3	20±3	24 + 7	
	23 ± 2	29±3	24 ± 2	23 ± 2	19 ± 2	26 ± 3	24±6	
	33 ± 2	26 ± 2	26±2	29±2	21±2	22 ± 2	26 ± 9	
	28 ± 3	27±3	29±3	29±3	26±3	28 ± 3	28 ± 3	
September	27±2	25 ± 2	27±2	28 ± 2	26 ± 2	21 ± 2	26 ± 5	
	25 ±•3	23±3	24 ± 3	22±3	18 ± 2	25 ± 3	23 ± 5	
	25 ± 2	23 ± 2	23±2	26±2	22 ± 2	20 ± 2	23 ± 5	
	29 ± 3	25 ± 2	32±3	28 ± 3	32±3	30 ± 3	29 ± 6	
October	14 ± 2	13±2	16±2	14±2	15 ± 2	16+2	15+2	
	44±3	38±3	41±3	41±3	43 ± 3	44 ± 3	42 ± 5	
	21 ± 2	18±2	20 ± 2	22 ± 2	18 ± 2	18 ± 2	20 ± 4	
e i se e	26±3	24 ± 2	25±3	27 ± 3	28±3	24 ± 3	26 ± 3	
	28 ± 2	23 ± 2	21±2	24 ± 2	24 ± 2	23 ± 2	24 ± 5	
November	29±3	28±3	29±3	26±3	29+3	29+3	28+2	
	33±2	31±2	38±3	31.±2	30 ± 2	28+2	32 + 7	
	43±3	39±3	40 ± 3	39±3	37±3	39 + 3	40 + 4	
	21±2	19±2	19 ± 2	20 ± 2	20 ± 2	15 ± 2	19 ± 4	
December	34±3	28±3	32±3	33 ± 3	34±3	30 ± 3	32+4	
	41±3	34±3	34 ± 3	36±3	35 ± 3	31 ± 3	35 + 7	
	31±3	28±2	26 ± 2	26 ± 2	28 ± 2	29 ± 2	28 ± 4	
	26±2	25±2	28±2	26±2	28±2	29 ± 2	27 ± 2	
	36±2	33 ± 2	37 ± 3	33±3	35 ± 3	33 ± 3	34 ± 4	
AVERAGE	25 ± 16	23±15	23 ± 15	24 ± 14	22 ± 15	22 ± 14		
			· · · · · ·	1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1	GRAND AVER	AGE	23 + 15	

2001 CONCENTRATIONS OF IODINE-131* IN FILTERED AIR

<2.9

<3.2

< 2.4

< 1.7

	<	<> STATION ID>						
MONTH	SA-AIO-14G1	SA-AIO-16E1	SA-AIO-1F1	SA-AIO-2F6	SA-AIO-5D1	SA-AIO-581		
January	<2.2	<3.5	<6.7	<2	< 5.1	<3.9		
	<2.3	< 5.3	<2.2	<2.4	<2.6	<4.9		
	<1.7	<1.7	<3.1	<6.5	<2	< 2.5		
	< 2.3	<3.4	<1.3	<1.2	< 1.5	<1.7		
	<4.9	<4.4	<2.5	<4.4	<2.3	<1.9		
February	<1.4	<1.8	<1.8	<1.9	<2.1	<1.6		
	< 3.4	<2.9	<2.4	<2.8	<2	<2.2		
	< 2.3	<2.7	< 3.8	<1.3	< 3.2	< 5.7		
· . ·	<2.5	<1.5	<2.5	<2.2	<1.9	<2.5		
March	< 2.2	<2	<1.6	<4.6	<2.6	<4		
	< 2.9	<3.5	<2	<3	<2.2	<2.1		
	< 2.4	<2.7	<4.4	< 3.2	<4.8	<2.6		
	<1.7	<1.7	<1.8	<3	<4.3	<4.3		
April	< 5.7	<3.5	<2.6	<2.8	<4.8	<2.1		
	< 2.9	<6.7	<3.5	<2.9	<2.8	< 5.3		
	< 3.3	< 2.7	<3.6	<2	< 1.7	<3		
	< 6.1	<2.6	<2.8	<3.1	<5	< 2.1		
	<2.2	<3.7	<2.3	<3.7	<3.1	<4		
May	<3.7	<4.6	<4.1	<2	<4	<4.2		
	< 5.5	<5.7	<2.8	<2.5	<2.7	<1.6		
	<2	<1.6	<1.5	<2.7	< 3.6	<1.6		
	<1.7	<4	<2	<2	<2.7	<1.9		
June	~<2.8	<4.3	<2.1	<2.1	<3	< 5.1		
	< 3.5	<2.5	<1.4	<1.9	<1.8	<3.2		

<1.7

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<3.1 <1.7

<3.5 <2.4

<2.7

<2.6

<3.2

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2001 CONCENTRATIONS OF IODINE-131* IN FILTERED AIR

			Results in Units	s of 10 ⁻³ pCi/m ³		š.,	
	<> STATION ID>						
MONTH	Control SA-AIO-14G1	SA-AIO-16E1	SA-AIO-1F1	SA-AIO-2F6	SA-AIO-5D1	SA-AIO-5S1	
Julv	<2.4	<2	<1.9	<5.9	<3.5	<1.5	
,	<1.7	<4.5	<1.3	<2	< 1.8	<2.6	
	<2.4	<2.6	< 5.9	<3.7	<4.2	<2.5	
	<3.7	<1.9	<4	<5.8	<3.4	<1.4	
	<1.8	<2.6	<1.9	<1.4	<1.5	<3.7	
August	<1.6	<2.1	<3.3	<3.6	<1.1	<2.3	
U	<2.3	<2.3	<3.4	<1.7	<3 s	<2	
	<4.9	<3.1	<2.8	<3.9	<2.5	<1.9	
	<2.4	<2.2	<2.6	<2.2	<2.8	<3.1	
September	<2.3	<2.1	< 5.4	<1.2	<3.4	<3.5	
•	<4.1	<1.7	< 3.6	<2.3	< 3.2	<2.6	
	<1.3	<3	< 3.5	<1.2	<4.2	<2.7	
	< 1.7	<4.2	<3.9	<3	<4.9	<1.7	
October	<4.9	<3.4	< 1.8	<1.7	<1.8	<3.6	
	<1.4	<3.1	< 2.4	<1	<3	<1.5	
	<1.8	<1.1	<2.1	<1.4	<1.3	<1.8	
• .	<3.2	<2.8	<1.5	<6.4	<4.7	<4	
	<2	<1.6	<2.4	<2.8	<1	<1.6	
November	<2.3	<3.6	<9.5	<2.5	<2.1	<1.2	
	<2.9	<1.1	<2.7	<1.3	<2.1	<4.1	
	<1.7	<2.5	< 6.6	<4.5	<3.6	< 3.3	
	< 4	<2.2	< 2.6	<2.9	< 3.1	<1.7	
December	< 2.9	<3.3	<3.3	<3.9	<4.5	<4.3	
	<3.7	<3	< 3.6	<2.2	< 5.1	< 1.4	
	<1.7	<3.1	< 1.9	<2.1	<2.1	<2.4	
	· <1.6	<2.1	<2	<2.9	<2	<1.8	
	<2.3	<1.5	<3.7	<1.3	<1.7	<1.1	

* I-131 results are corrected for decay to sample stop date.

2001 DIRECT RADIATION MEASUREMENTS - QUARTERLY TLD RESULTS

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Results in mrad/standard month* +/- 2 sigma

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م میں موجود پیش میں میں م	JAN .	APR	JUL	ост "	OTR
STATION	to	to	to.	to	ELEMENTS
ID	, MAR	JUN	SEP	DEC	AVG
SA-IDM-2S2	^5.7±0.5 -	5.7±0.5	6.1±0.5	4.8±0.5	5.6'±1.1
SA-IDM-5S1	3.5 ± 0.3	3.8 ± 0.4	3.8±0.3	3.6±0.3	3.7±0.3
SA-IDM-6S2	4.9 ± 0.3	5.2 ± 0.5	5.3 ± 0.4	4.8±0.4	5.0 ± 0.5
SA-IDM-7S1	5.4 ± 0.3	5.6 ± 0.4	5.3 ± 0.6	5.9 ± 1.4	5.6 ± 0.6
SA-IDM-10S1	4.0 ± 0.4	4.3 ± 0.5	3.9±0.3	4.0±0.3	4.0+0.4
SA-IDM-11S1	3.6 ± 0.5	4.1 ± 0.5	3.4 ± 0.4	3.6 ± 0.4	3.7+0.6
SA-IDM-4D2	4.1±0.4	4.4 ± 0.4	4.3 ± 0.3	4.3 ± 0.4	4.3+0.3
SA-IDM-5D1	3.7 ± 0.5	4.1±0.4	4.0 ± 0.7	3.9 ± 0.3	3.9 ± 0.3
SA-IDM-10D1	4.3 ± 0.4	4.6 ± 0.4	4.9±0.4	4.5 ± 0.4	4.6+0.6
SA-IDM-14D1	3.8 ± 0.3	4.1 ± 0.4	4.2 ± 0.5	4.1±0.4	40+04
SA-IDM-15D1	4.5 ± 0.4	4.7 ± 0.5	4.7.±0.4	4.4+0.4	46+03
SA-IDM-2E1	4.1 ± 0.4	4.4 ± 0.4	4.3 ± 0.3	4.2+0.4	43+03
SA-IDM-3E1	3.4 ± 0.4	3.8±0.4	3.7 ± 0.6	35+04	36+04
SA-IDM-9E1	4.0±0.3	4.3±0.3	4.6 ± 0.3	44+04	43+04
SA-IDM-11E2	5.8 ± 4.1	4.7 ± 0.5	47+04	45+06	4.5 ± 0.4
SA-IDM-12E1	4.5 ± 0.5	4.6 ± 0.5	4.9+0.3	4.5±0.0	4.5±1.1
SA-IDM-13E1	3.7±0.7	3.9 ± 0.3	3.8+0.4	36+04	7.7 ± 0.4
SA-IDM-16E1	4.2 ± 0.4	4.4 ± 0.4	44+04	42+05	3.8±0.2
SA-IDM-1F1	4.0±0.4	4.3 ± 0.3	4.3+0.4	4.3+0.4	4.3 ± 0.2
SA-IDM-2F2	3.5±0.3	3.7 ± 0.4	3.6+0.3	36+03	7.2±0.3
SA-IDM-2F5	4.1±0.3	4.4 ± 0.3	4.4+0.4	41+04	42+02
SA-IDM-2F6	3.7±0.3	4.1±0.3	39+05	39+05	4.2 ±0.3
SA-IDM-3F2	3.5 ± 0.3	3.7 ± 0.4	3.7+0.5	36+03	3.5±0.4
SA-IDM-3F3	3.5±0.4	3.8 ± 0.5	36+04	35+03	3.0 ± 0.2
SA-IDM-4F2	3.4 ± 0.4	3.8+0.4	37+04	35+03	3.0 ± 0.3
SA-IDM-5F1	3.6 ± 0.4	4.0+0.4	40+03	37+05	3.0 ± 0.3
SA-IDM-6F1	3.0±0.3	3.4+0.4	32+04	3.7 ±0.5	3.0±0.4
SA-IDM-7F2	2.6 ± 0.3	3.0+0.4	29+02	28+02	3.2±0.4
SA-IDM-10F2	4.3 ± 0.9	4.6 ± 0.3	46+03	2.5±0.2	2.0±0.3
SA-IDM-11F1	4.5 ± 0.3	4.9 ± 0.3	4.8+0.4	4.5±0.4	4.5±0.5
SA-IDM-12F1	4.1±0.4	4.4 ± 0.4	43+04	4.3 ± 0.3	4.7 ±0.3 0
SA-IDM-13F2	4.2±0.6	4.4 ± 0.4	42+06	4.2 ± 0.3	4.2 ± 0.2
SA-IDM-13F3	3.9±0.3	4.2 ± 0.3	44+03	4.0 ± 0.5	4.2 ± 0.3
SA-IDM-13F4	4.0 ± 0.5	4.2 ± 0.3	43+04	4.2±0.5	4.2±0.4
SA-IDM-14F2	4.4 ± 0.4	4.8 ± 0.4	48+04	46+04	4.2 ± 0.2
SA-IDM-15F3	4.5 ± 0.5	5.0+0.5	51+06	4.0±0.4	4.7 ±0.4
SA-IDM-16F2	3.6 ± 0.3	3.9 ± 0.4	42+03	4.5±0.4	4.9±0.5
SA-IDM-1G3 (C)	5.0 ± 0.5	5.0 ± 0.4	50+04	4 9 + 0 3	5.9 ± 0.3
SA-IDM-3G1 (C)	4.3 ± 0.5	4.6 ± 0.4	46+03	4.5±0.3	5.0±0.2
SA-IDM-10G1(C)	4.2 ± 0.5	4.5+0.4	45+05	4.5 ± 0.3	4.5±0.3
SA-IDM-16G1(C)	4.5 ± 0.3	4.9+0.4	53+07	51±06	4.4 ± 0.3
SA-IDM-3H1 (C)	3.4 ± 0.4	3.7+0.4	36+04	3.1.±0.0	5.0±0.7
SA-IDM-1S1	4.2 ± 0.3	48+05	48+05	3.3 ±0.4	3.5±0.3
SA-IDM-3S1	3.4±0.4	3.6±0.4	35+04	4.4 ±0.3	4.5±0.6
SA-IDM-2S4	3.6 ± 0.4	3.9+0.4	39+04	3.410.3	3.5±0.2
SA-IDM-4S1	3.7 ± 0.3	40+03	30±0.4	3.5±0.4	3.7±0.4
SA-IDM-15S1	3.3 ± 0.3	3.8+0.4	3.5±0.3	4.U±U.4	3.9±0.3
SA-IDM-16S1	4.2 ± 0.6	4.7 ± 0.4	4.6+0.5	3.0 ± 0.4 4 2 + 0 4	3.0±0.5
SA-IDM-14G1(C)	4.4 ± 0.4	4.6 ± 0.3	4.6±0.5	4.5+0.4	4.4±0.0 45+02
AVERAGE	4.4.2	10.11			T.V 1 U.Z
AVENAUE	4±1.2	4.3 ± 1.1	4.3 ± 1.2	4.1 ± 1.1	

* The standard month = 30.4 days. ** Quarterly Element TLD results by DESEL.

(C) Control Station

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GRAND AVG

4.2±1.2

2001 CONCENTRATIONS OF IODINE-131* AND GAMMA EMITTERS** IN MILK

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Results in	Units	of pCi/L	- +~ f~	2 sigma	۰.
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• •	. **	*	1.12	
• • • • •	SAMPLING			GAMMA EMITTERS
STATION ID	START	L STOP	L 121	×-40
STATION ID	JIANI	JIUF.		
SA MIK 250	01/01/2001	01/02/2001	<0.2	1250 + 70
SA-IVILK-2F9	-01/01/2001	01/02/2001	< 0.2	1250 ±70
SA-MLK-11F3	01/02/2001	01/03/2001	< 0.3	1310 ±80
SA-MLK-14F4	01/02/2001	01/03/2001	<0.2	1220 ± 100
SA-MLK-3G1 (C)	01/01/2001	01/02/2001	< 0.2	1360 ± 70
SA-MIK-2E9	02/05/2001	.02/06/2001	<01	1340 ± 60
SA-MEK-210	02/05/2001	02/06/2001	<0.7	1320 + 70
	02/05/2001	02/00/2001	<0.2	1320 ± 70
5A-WILK-14F4	02/05/2001	02/06/2001	< 0.2	1390 ± 80
SA-WILK-3GT (C)	02/04/2001	02/05/2001	< 0.2	1340 ± 70
SA-MLK-2F9	03/05/2001	03/06/2001	< 0.2	1390 ±70
SA-MLK-11F3	03/05/2001	03/06/2001	< 0.2	1410 ±80
SA-MI K-14F4	03/05/2001	03/06/2001	< 0.2	1370 +80
SA-MLK-3G1 (C)	03/04/2001	03/05/2001	<0.2	1320 ± 60
	-	00,00,2001	101E	1020 ±00
SA-MLK-2F9	04/02/2001	04/03/2001	< 0.3	1350 ±80
SA-MLK-11F3	04/03/2001	04/04/2001	< 0.2	1370 ±90
SA-MLK-14F4	04/03/2001	04/04/2001	<0.2	1340 ±80
SA-MLK-3G1 (C)	04/02/2001	04/03/2001	< 0.2	1390 ±70
				4000 00
SA-MLK-2F9	04/16/2001	04/17/2001	< 0.2	1330 ±80
SA-MLK-11F3	04/17/2001	04/18/2001	<0.2	1360 ± 90
SA-MLK-14F4	04/17/2001	04/18/2001	< 0.3	1280 ± 70
SA-MLK-3G1 (C)	04/17/2001	04/18/2001	<0.2	1330 ±70
SA-MIK-2EQ	05/06/2001	05/07/2001	<02	1360 + 70
SA-MIK 11E2	05/00/2001	05/09/2001	<0.2	1400 + 70
SA-IVILK-11F3	05/07/2001	05/08/2001	<0.2	1220 + 90
SA-IVILK-14F4	05/07/2001	05/08/2001	< 0.3	1330 ±90
SA-MLK-3G1 (C)	05/07/2001	05/08/2001	<0.2	1370 ± 60
SA-MLK-2F9	05/22/2001	05/23/2001	< 0.2	1360 ±80
SA-MLK-11F3	05/22/2001	05/23/2001	< 0.2	1320 ±70
SA-MIK-14F4	05/22/2001	05/23/2001	< 0.2	1390 +90
SA-MLK-3G1 (C)	05/21/2002	05/22/2002	< 0.2	1220 + 70
		1		÷
SA-MLK-2F9	06/03/2001	06/04/2001	< 0.2	1340 ±60
SA-MLK-11F3	06/04/2001	06/05/2001	< 0.2	1310 ±50
SA-MLK-14F4	06/05/2001	06/05/2001	. <0.2	1310 ±50
SA-MLK-3G1 (C)	06/04/2001	06/05/2001	< 0.2	1370 ±60
CA MIK 200	08/25/2001	00000000	201	1200 + 80
SA-IVILK-2F9	06/25/2001	06/26/2001	< 0.1	1390 ±80
SA-MLK-11F3	06/25/2001	06/26/2001	<0.1	1370 ±60
SA-MLK-14F4	06/25/2001	06/26/2001	<0.2	1350 ± 80
SA-MLK-3G1 (C)	06/24/2001	06/25/2001	<0.2	1270 ±70
SA-MI K-259	07/01/2001	07/02/2001	1202	1430 + 80
CA MLV 1152	07/01/2001	07/02/2001	~0.2	1270 + 70
CA MUK 1454	07/01/2001	07/02/2001		1370 ±70
SA-IVILIN- 14F4	07/01/2001	07/02/2001		1300 ± 100
SA-WILK-3GT (C)	07/01/2001	07/02/2001	<0.2	1340 ± 70
SA-MLK-2F9	07/17/2001	07/18/2001	<0.2	1340 ±70
SA-MLK-11F3	07/17/2001	07/18/2001	< 0.2	1330 ±70
SA-MLK-14F4	07/17/2001	07/18/2001	<0.2	1290 ±70
SA-MLK-3G1 (C)	07/16/2001	07/17/2001	<0.2	1250 ±70

2001 CONCENTRATIONS OF IODINE-131* AND GAMMA EMITTERS** IN MILK

	Results	in dnits of pCi/	L +/- 2 sigma 👘 -	
	***	14. R. P. 14		· · · · · · · · · · · · · · · · · · ·
	SAMPLING PERIOD			GAMMA EMITTERS
STATION ID	START	STOP	I-131	K-40
SA-MI K-2F9	08/06/2001	08/07/2001	<02	1420 + 70
SA-MIK-11E3	08/06/2001	08/07/2001	<0.2	1420 ± 70
SA-MIK-14F4	08/06/2001	08/07/2001	<0.2	$1+20 \pm 80$
SA-MLK-3G1 (C)	08/05/2001	08/06/2001	<0.2	1220 ± 80
SA-MIK-2F9	08/20/2001	08/21/2001	<0.2	1290
SA-MLK-11E3	08/21/2001	08/22/2001	<0.2	1380 ± 80
SA-MIK-14F4	08/21/2001	08/22/2001	< 0.2	1330 ±80
SA-MLK-3G1 (C)	08/20/2001	08/21/2001	< 0.2	1320 ± 80
	00/20/2001	00/21/2001	\U.2	1300 ±70
SA-MLK-2F9	09/03/2001	09/04/2001	<0.2	1300 ±70
SA-MLK-11F3	09/04/2001	09/05/2001	<0.2	1370 ±70
SA-MLK-14F4	09/03/2001	09/04/2001	<0.2	1320 ± 60
SA-MLK-3G1 (C)	09/04/2001	09/05/2001	<0.2	1280 ±70
SA-MLK-2F9	09/17/2001	09/18/2001	<0.1	1390 ±80
SA-MLK-11F3	- 09/18/2001	09/19/2001	<0.2	1350 ± 60
SA-MLK-14F4	09/17/2001	09/18/2001	< 0.4	1320 ±70
SA-MLK-3G1 (C)	09/18/2001	09/19/2001	< 0.2	1390 ±90
SA-MLK-2F9	10/01/2001	10/02/2001	<0.2	1400 ±60
SA-MLK-11F3	10/01/2001	10/02/2001	<0.2	1460 ±90
SA-MLK-14F4	10/01/2001	10/02/2001	< 0.2	1230 ±70
SA-MLK-3G1 (C)	09/30/2001	10/01/2001	<0.2	1350 ±80
SA-MLK-2F9	10/21/2001	10/22/2001	< 0.2	1380 +80
SA-MLK-11F3	10/22/2001	10/22/2001	< 0.2	1350 ± 80
SA-MLK-14F4	10/21/2001	10/22/2001	< 0.2	1240 ± 70
SA-MLK-3G1 (C)	10/22/2001	10/23/2001	< 0.2	1230 ± 80
SA-MIK-2F9	11/12/2001	11/13/2001	<0.2	1450 + 70
SA-MLK-11F3	11/13/2001	11/14/2001	<0.2	1380 ± 70
SA-MLK-14F4	11/13/2001	11/14/2001	< 0.7	1270 + 90
SA-MLK-3G1 (C)	11/13/2001	11/14/2001	< 0.2	1270 ± 30 1240 ± 60
SA MIK 2ED	11/26/2001	11/07/0001		
SA-WILK-2FS	11/20/2001	11/27/2001	< 0.2	1410 ± 80
SA-WILK-11F3	11/26/2001	11/27/2001	< 0.3	1420 ± 80
SA-IVILA-14F4	11/26/2001	11/27/2001	< 0.2	1310 ± 70
SA-WILK-3GT (C)	11/27/2001	17/28/2001	<0.1	1310 ± 90
SA-MLK-2F9	12/09/2001	12/10/2001	<0.2	1350 ±80
SA-MLK-11F3	12/09/2001	12/10/2001	<0.2	1370 ± 80
SA-MLK-14F4	12/10/2001	12/11/2001	<0.3	1380 ±80
SA-MLK-3G1 (C)	12/09/2001	12/10/2001	<0.3	1380 ± 70
		*		

AVERAGE

 1300 ± 100

* lodine-131 results are corrected for decay to midpoint of collection period & analyzed to a sensitivity of 1.0 pCi/L.

** All other gamma emitters searched for were <LLD; typical LLDs are given in Table C-20.

*** Monthly sample collected during Jan., Feb., March and Dec., when animals are not on pasture (C) Control Station

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2001 CONCENTRATIONS OF GROSS ALPHA AND GROSS BETA EMITTERS, AND TRITIUM IN WELL WATER

	SAMPLING	GROSS	GROSS	
STATION ID	DATE	ALPHA	ΒΕΤΑ	TRITIUM
SA-WWA-3E1	01/29/2001	1.8±1	13±1	<150
SA-WWA-3E1	02/26/2001	<1.4	11 ± 0.8	<160
SA-WWA-3E1	03/27/2001	2.4 ± 1.1	10±0.8	<160
SA-WWA-3E1	04/30/2001	2.6 ± 1.2	11±0.8	<150
SA-WWA-3E1	05/29/2001	2.5 ± 1.3	10±0.8	<150
SA-WWA-3E1	06/25/2001	2.5 ± 1.1	13±1	<150
SA-WWA-3E1	07/31/2001	<1.7	13±1	<160
SA-WWA-3E1	08/27/2001	2.1 ± 1.1	13±0.9	<180
SA-WWA-3E1	09/24/2001	2.2 ± 1.2	12 ± 0.9	<170
SA-WWA-3E1	10/30/2001	2.1 ± 1.1	14±1	< 150
SA-WWA-3E1	11/27/2001	1.2 ± 0.9	13±1	<160
SA-WWA-3E1	12/26/2001	<1	13±1	≤180

AVERAGE

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2±1.1 12±3

±3

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2001 CONCENTRATIONS OF GAMMA EMITTERS* IN WELL WATER

1971 - 1972 - 1975 yr 1973 - 1973 - 1973 - 1973 - 1973 - 1973 - 1973 - 1973 - 1975 yr 1975 - 1975 - 1975 - 1975

Results in Units of pCi/L +/- 2 sigma

്തിന്റെ പ്രതിന്തിന് കോണ് തന്നെ തിനെ തിന്നെങ്ങള് പോണ് നിന്നും പറഞ്ഞ നിന്നും പറഞ്ഞ നിന്നും നിന്നും പ്രതിനങ്ങള് പ പ്രതിന്റെ പ്രതിന്തിന് പ്രതിന്തിന്റെ പ്രതിന്തിന്റെ പ്രതിന്തിന്റെ പ്രതിന്ത്രം നിന്നും നിന്നും പ്രതിനങ്ങള് പ്രതിന്ന എന്നും

STATION ID	SAMPLING DATE	Anna ann an Anna	<gamma e<br="">K-40</gamma>	MITTERS> RA-NAT
SA-WWA-3E1	01/29/2001		<46	193±7
SA-WWA-3E1	02/26/2001	• . •	77±26	178±5
SA-ŴWA-3E1	03/27/2001	• •	74±25	193±6
SA-WWA-3E1	04/30/2001		<45	144 ± 5
SA-WWA-3E1	05/29/2001		<18	154 ± 5
SA-WWA-3E1	06/25/2001	• •	<41	98±4
SA-WWA-3E1	07/31/2001	· · · · · · · · · · · · · · · · · · ·	<28	138±5
SA-WWA-3E1	08/27/2001		<16	124 ± 4
SA-WWA-3E1	09/24/2001		<23	130 ± 5
SA-WWA-3E1	10/30/2001	·* • • • •	48±20	166±5
SA-WWA-3E1	11/27/2001	· 4) - 1	<16	90±4
SA-WWA-3E1	12/26/2001		85±35	139±7
		A		1

AVERAGE

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 146 ± 67

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* All other gamma emitters searched for were <LLD; typical LLDs are given in Table C-20.

Results in Units of pCi/L +/- 2 sigma					
TYPE	SAMPLING PERIOD	GRQSS ALPHA	GROSS BETA	TRITIUM	
RAW	1/1-31/2001	1±0.5	3.6 ± 0.5	<150	
TREATED	1/1-31/2001	1.1 ± 0.6	3.4 ± 0.5	<150	
RAW	2/1-28/2001	0.8 ± 0.5	2.9 ± 0.5	<160	
TREATED	2/1-28/2001	<1.1	3.3 ± 0.5	<160	
RAW	3/1-31/2001	1.3±0.6	3 ± 0.5	<160	
TREATED	3/1-31/2001	1.1 ± 0.6	3.1 ± 0.5	<160	
RAW	4/1-30/2001	0.7 ± 0.5	3.4 ± 0.5	<150	
TREATED	4/1-30/2001	0.9 ± 0.6	2.8 ± 0.5	<150	
RAW	5/1-31/2001	<0.7	2.9 ± 0.5	<150	
TREATED	5/1-31/2001	<0.8	3±0.5	<150	
RAW	6/1-30/2001	1.4±0.6	4.7 ± 0.6	<150	
TREATED	6/1-30/2001	1.6 ± 0.8	4.7 ± 0.6	<150	
RAW	7/1-31/2001	<0.9	4.6 ± 0.6	<150	
TREATED	7/1-31/2001	<1.1	3.9±0.6	<160	
RAW	8/1-31/2001	0.6 ± 0.5	3.5 ± 0.5	<180	
TREATED	8/1-31/2001	1±0.7	4.4 ± 0.6	<170	
RAW	9/1-30/2001	0.8 ± 0.6	3±0.6	<170	
TREATED	9/1-30/2001	0.8 ± 0.6	3.2 ± 0.6	<170	
RAW	10/1-31/2001	0.7±0.5	2.7±0.5	<160	
TREATED	10/1-31/2001	0.8 ± 0.6	3 ± 0.6	<160	
RAW	11/1-30/2001	0.7 ± 0.5	2.8 ± 0.5	<160	
TREATED	11/1-30/2001	<0.8	3.3 ± 0.6	<160	
RAW	12/1-31/2001	0.6 ± 0.4	3.5 ± 0.6	<170	
TREATED	12/1-31/2001	<0.6	3.7 ± 0.6	<170	
AVERAGE					
RAW		0.8 ± 0.4	3.4 ± 1.3	-	
TREATED		1 ± 0.3	3.5 ± 1.2	-	
GRAND AVERAGE		0.9 ± 0.5	3.4 ± 1.2	-	

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2001 CONCENTRATIONS OF GROSS ALPHA AND GROSS BETA EMITTERS AND TRITIUM IN RAW AND TREATED POTABLE WATER

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2001 CONCENTRATIONS OF IODINE-131* AND GAMMA EMITTERS**

* 1.			*	
	Results	n Units of pCi/L	+/- 2 sigma	and a second
ТҮРЕ	SAMPLING PERIOD	I-131	<gamma e<br="">K-40</gamma>	MITTERS> RA-NAT
RAW TREATED	1/1-31/2001 1/1-31/2001	<0.2 <0.3	33±13 70±18	<3.5 <2.6
RAW	2/1-28/2001	<0.2	< 17	<3.4

IREATED	1/1-31/2001	<0.3	70±18	<2.6
RAW	2/1-28/2001	<0.2	<17	<3.4
TREATED	2/1-28/2001	<0.2	<13	6 5 + 1 2
RAW	3/1-31/2001	<0.3	61 ± 18	<1.7
TREATED	3/1-31/2001	<0.3	< 14	
RAW TREATED	4/1-30/2001 4/1-30/2001	<0.1 <0.2	46±17 29±14	<1.5 <2.1 <1.9
RAW	5/1-31/2001	<0.2	<14	<1.9
TREATED	5/1-31/2001	<0.4	<16	<2.2
RAW	6/1-30/2001	<0.1	<33	<1.6
TREATED	6/1-30/2001	<0.2	<7	<2
RAW 63	7/1-31/2001	<0.2	<14	<1.6
TREATED	7/1-31/2001		<13	<2.2
RAW	8/1-31/2001	<0.3	61±15	<2.3
TREATED	8/1-31/2001	<0.2	<16	5±2.2
RAW	9/1-30/2001	<0.3	<14	4±1.4
TREATED	9/1-30/2001	<0.2	50±16	<3.2
RAW	10/1-31/2001	<0.2	40±18	<1.9
TREATED	10/1-31/2001	<0.2	34±13	<4.5
RAW	11/1-30/2001	<0.3	<17	<1.7
TREATED	11/1-30/2001	<0.4	<16	6.1±2.6
RAW	12/1-31/2001	<0.3	31 ± 13	<1.8
TREATED	12/1-31/2001	<0.2	26 ± 11	5.4+2
AVERAGES RAW TREATED			32 ± 35	-
GRAND AVERAGE		2	_	-

* lodine-131 analyzed to a sensitivity of 1.0 pCi/L.

** All other gamma emitters searched for were <LLD; typical LLDs are given in Table C-20.

		: .*	
2001 CONCENTRATIONS OF	GAMMA	EMITTERS*	IN VEGETABLES

an tha an tha an tha		
	Results in Units of pCi/kg (Wet) +/- 2 sigma	

	SAMPLING		< GAMMA EN	IITTERS>
STATION ID	DATE	SAMPLE TYPE	K-40	Ra-NAT
A-FPV-2F9	04/23/2001	Asparagus	2470 ± 260	<15
A-FPV-2G2 (C)	05/07/2001	Asparagus	2480 ± 100	<9.6
ERAGE	ni Rosan Marina (normania), norma	in the second	2480 ± 10	-
-FPL-14F3	07/24/2001	Cabbage	1860 ± 140	< 5.8
4-FPL-3H5 (C)	07/18/2001	Cabbage	2510 ± 140	<9.8
A-FPL-6F2	07/23/2001	Cabbage	2190 ± 140	<8.7
/ERAGE	e.		2190 ± 650	-
-FPV-2F4	07/18/2001	Corn	2490±180	<7.7
A-FPV-2F9	07/18/2001	Corn	2470 ± 160	<6.7
4-FPV-1G1 (C)	07/10/2001	Corn	2710 ± 90	< 5.8
4-FPV-3H5 (C)	07/18/2001	Corn	2430 ± 100	<9.2
-FPV-2G2 (C)	07/18/2001	Corn	2440±160	<7.1
-FPV-14F3	07/24/2001	Corn	2140±170	<6.8
-FPV-14G2 (C)	07/17/2001	Corn	2620 ± 170	<7.3
ERAGE	. •		2470±360	-
FPV-2F4	07/23/2001	Peppers	1700 ± 140	<8.6
-FPV-3F5	07/18/2001	Peppers	1440 ± 160	<8.5
FPV-1G1 (C)	07/18/2001	Peppers	1500 ± 160	< 9.3
-FPV-3H5 (C)	07/18/2001	Peppers	1230 ± 150	<11
-FPV-2G2 (C)	07/18/2001	Peppers	1380 ± 100	<9.3
-FPV-9G1 (C)	07/24/2001	Peppers	1480 ± 130	< 8
-FPV-6F2	07/23/2001	Peppers	1420 ± 140	<8.7
ERAGE	u.		1450 ± 280	. –
-FPV-2F4	07/24/2001	Tomatoes	2090 ± 150	<6.8
-FPV-2F9	07/24/2001	Tomatoes	1930 ± 130	<6.9
-FPV-3F5	07/18/2001	Tomatoes	2000 ± 80	<7.9
-FPV-1G1 (C)	07/18/2001	Tomatoes	1900 ± 210	<7.2
-FPV-3H5 (C)	07/18/2001	Tomatoes	1930 ± 150	<7.4
-FPV-2G2 (Č)	07/18/2001	Tomatoes	2160 ± 150	<6.9
-FPV-9G1 (C)	07/24/2001	Tomatoes	1810 ± 150	<7.2
-FPV-6F2	07/23/2001	Tomatoes	2570 ± 80	16 ± 3
-FPV-14G2 (C)	07/24/2001	Tomatoes	2290 ± 160	<6.6
۱-FPV-14F3	07/24/2001	Tomatoes	2500 ± 90	<5.4
VERAGE			2120 ± 520	-
AND AVERAGE			2070 ± 870	-
•				

* All other gamma emitters searched for were <LLD; typical LLDs are given in Table C-20 (C) Control Station

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2001 CONCENTRATIONS OF GAMMA EMITTERS* IN GAME

Results in Units of pCi/kg (wet) +/- 2 sigma

STATION ID	SAMPLING DATE	SAMPLE TYPE	GAMMA EMITTERS K-40
•	et i transferencia		
SA-GAM-11D1 (C)	02/26/2001	Muskrat	2840 ± 160
SA-GAM-3E1	02/20/2001	Muskrat	2600 ± 190
AVERAGE		Muskrat	2720±340

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*All other gamma emitters searched for were <LLD; typical LLDs are given in Table C-20.

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2001 CONCENTRATIONS OF GAMMA EMITTERS* IN FODDER CROPS

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	SAMPLING	1 . :	: <- 0	AMMA EMITTER	S ->
STATION ID	DATE	SAMPLE TYPE	Be-7	K-40	Ra-NAT
					-
SA-VGT-2F9	10/22/2001	Silage	670±70	2560 ± 150	<10
SA-VGT-3G1 (C)	10/30/2001	Silage	350±70	4380±180	10 ± 5
SA-VGT-14F4	10/22/2001	Silage	370 ± 60	2920 ± 160	<5
SA-VGT-11F3	10/30/2001	Silage	210 ± 50	4990 ± 220	<8
AVERAGE			400±390	3710±2320	-
SA-VGT-11F3	10/30/2001	Soybeans	<40	14900±320	<10
SA-VGT-14F4	11/14/2001	Soybeans	<30	16800 ± 310	20 ± 6
AVERAGE			-	15900 ± 2700	15±14

Results in Units of pCi/kg (wet) +/- 2 sigma

* All other gamma emitters searched for were <LLD; typical LLDs are given in Table C-20. (C) Location 3G1 is the Control Station.

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2001 CONCENTRATIONS OF GAMMA EMITTERS* IN SOIL

Results in Units of pCi/kg (dry) +/- 2 sigma

	SAMPLING		₩			
STATION ID	DATE	Be-7	K-40	<u>Cs-137</u>	Ra-NAT	Th-232
					-	
SA-SOL-6S2	05/15/2001	<110	5540 ± 220	~ 26±7	260 ± 15	350 ± 40
SA-SOL-2F7	05/16/2001	<85	$\textbf{7910} \pm 300$	290 ± 18	590 ± 23	710 ± 51
SA-SOL-2F9	05/15/2001	120 ± 54	6100 ± 140	240 ± 9	490 ± 11	530±24
SA-SOL-5F1	05/15/2001	150 ± 56	4610 ± 130	260 ± 9	550 ± 12	620 ± 31
SA-SOL-10D1	05/14/2001	<70	9070±290	350±19	850 ± 27	990 ± 50
SA-SOL-14F4	05/15/2001	<130	12900 ± 380	180±12	910±22	1090 ± 54
SA-SOL-16E1	05/15/2001	<120	11900 ± 290	110±13	660 ± 16	840 ± 60
SA-SOL-11F3	05/15/2001	360 ± 130	12800±390	<49	970±29	1200 ± 54
SA-SOL-3G1(C)	05/16/2001	<140	8190 ± 250	160 ± 13	700 ± 16	850 ± 57

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GRAND AVERAGE

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8780±6290 190±220 660±450 800±550

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* All other gamma emitters searched for were <LLD; typical LLDs are given in Table C-20 (C) Control Station

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2001 CONCENTRATIONS OF GROSS BETA EMITTERS IN SURFACE WATER

	<		STATION ID		>	· · · · · · · · · · · · · · · · · · ·
SAMPLING DATE	SA-SWA-11A1	SA-SWA-12C1 (Control)	SA-SWA-16F1	SA-SWA-1F2	SA-SWA-7E1	AVERAGE
January	114±7	86±6	72 ± 5	61±5	126±8	92 ± 55
-ebruary	78 ± 6	75 ± 6	44 ± 4	33 ± 4	98±7	66 ± 53
March	89 ± 6	77±6	58±5	40 ± 4	122±8	77±62
April	16 ± 3	6 ± 2	5±2	5±2	34 ± 4	13 ± 25
Мау	41±4	33 ± 4	25 ± 3	21±3	66±5	37±36
June	56 ± 5	29±4	20 ± 3	23±3	60±5	37±38
July	71 ± 6	43±5	32±4	23±4	99±7	53±62
August	80±6	67±6	48±5	57±5	104±7	71 ± 43
September	128±9	85±7	79 ± 6	77 ± 6	138±9	101±58
Dctober	163 ± 9	129 ± 8	114±7	100±7	224±11	146 ± 99
November	156 ± 12	112 ± 10	109±10	108 ± 10	167±12	130±57
December	150 ± 12	108 ± 11	111 ± 11	100 ± 10	173 ± 13	128 ± 63
AVERAGE	95 ± 95	71 ± 74	60 ± 75	54 ± 71	118 ± 106	:
			4.	GRAND AVERAGE	• •	79±95

Results in Units of pCi/l + l - 2 sigma

2001 CONCENTRATIONS OF GAMMA EMITTERS* IN SURFACE WATER

Results in Units of pCi/L +/- 2 sigma

	SAMFLING	GAMMA EMITTERS	· · · · · · · · · · · · · · · · · · ·
STATION ID	DATE	K-40	
•	ty en an		
SA-SWA-1F2	01/08/2001	60±19	
SA-SWA-7E1	01/08/2001	120 ± 22	· · · ·
SA-SWA-11A1	01/08/2001	137±21	
SA-SWA-12C1(C)	01/08/2001	85±19	
SA-SWA-16F1	01/08/2001	62±25	÷.
SA-SWA-1F2	02/06/2001	80±24	
SA-SWA-7E1	02/06/2001	131 ± 21	•
SA-SWA-11A1	02/06/2001	118±28	ι.
SA-SWA-12C1(C)	02/06/2001	61 ± 20	
SA-SWA-16F1	02/06/2001	68±22	÷.,
SA-SWA-1F2	03/08/2001	73±20	
SA-SWA-7E1	03/08/2001	101 ± 23	
SA-SWA-11A1	03/08/2001	103 ± 25	
SA-SWA-12C1(C)	03/08/2001	134 ± 23	
SA-SWA-16F1	03/08/2001	53±18	
SA-SWA-1F2	04/06/2001	43±19	
SA-SWA-7E1	04/06/2001	65±18	
SA-SWA-11A1	04/06/2001	58±19	
SA-SWA-12C1(C)	04/06/2001	38±13	
SA-SWA-16F1	04/06/2001	58±23	1
SA-SWA-1F2	05/11/2001	42±19	
SA-SWA-7E1	05/11/2001	75±21	
SA-SWA-11A1	05/11/2001	54 ± 20	
SA-SWA-12C1(C)	05/11/2001	<21	
SA-SWA-16F1	05/11/2001	<28	
SA-SWA-1F2	06/06/2001	<23	
SA-SWA-7E1	06/06/2001	· 71 ± 15	
SA-SWA-11A1	06/06/2001	101 ± 20	
SA-SWA-12C1(C)	06/06/2001	87±12	
SA-SWA-16F1	06/06/2001	72 ± 20	
SA-SWA-1F2	07/03/2001		
SA-SWA-7E1	07/03/2001	102 ± 19	
SA-SWA-11A1	07/03/2001	88±18	
SA-SWA-12C1(C)	07/03/2001	67 ± 16	
SA-SWA-16F1	07/03/2001	74±17	

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2001 CONCENTRATIONS OF GAMMA EMITTERS* IN SURFACE WATER

and a second	ar solora (kira) San da solora	SAMPLING	GAMMA EMITTERS		
STATION ID	je je se	DATE	and a second s	K-40	
SA-SWA-1F2	1.1	08/08/2001		92±19	
SA-SWA-7E1		08/08/2001		111 ± 21	
SA-SWA-11A1		08/08/2001		93 ± 19	
SA-SWA-12C1(C)		08/08/2001		102 ± 19	
SA-SWA-16F1		08/08/2001		75 ± 16	
SA-SWA-1F2		09/03/2001		50±18	
SA-SWA-7E1	,	09/03/2001	~ *	117 ± 22	
SA-SWA-11A1	4. ¹	09/03/2001		162 ± 20	
SA-SWA-12C1(C)		09/03/2001	Distriction of the	79 ± 14	
SA-SWA-16F1		09/03/2001	• • • •	74 ± 22	
SA-SWA-1F2		10/03/2001	n an	112 ± 20	to to grant Maria
SA-SWA-7E1	/	10/03/2001	an an tha an tha an tao an Tao an tao an t	101 ± 23	
SA-SWA-11A1	* 2 *	10/03/2001		178±28	· · · · · · · · ·
SA-SWA-12C1(C)	· ·	10/03/2001	n sentis presidentes presidentes	107 ± 23	
SA-SWA-16F1	<i></i>	10/03/2001	tari di <u>A</u> ri	<14	
SA-SWA-1F2		11/13/2001		79±19	
SA-SWA-7E1		11/13/2001		153 ± 18	
SA-SWA-11A1		11/13/2001		101 ± 23	
SA-SWA-12C1(C)		11/13/2001		165 ± 25	
SA-SWA-16F1	÷.	11/13/2001		124 ± 16	
SA-SWA-1F2	1	12/10/2001	t - Mirthe Carl	110±21	
SA-SWA-7E1		12/10/2001	a Chanair ann a' An Anns	176 ± 24	
SA-SWA-11A1		12/10/2001		138 ± 20	•
SA-SWA-12C1(C)		12/10/2001		164 ± 32	•
SA-SWA-16F1	•	12/10/2001		144 ± 29	
AVERAGE			1000 - 1000 - 1000 1000 - 1000 - 1000 1000 - 1000 - 1000 - 1000	91±79	•
		د			. <i>t</i>

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Results in Units of pCi/L/ +/- 2asigma

* All other gamma emitters searched for were <LLD; typical LLDs are given in Table C-20. C) Control Station C) Control Station
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2001 CONCENTRATIONS OF TRITIUM IN QUARTERLY COMPOSITES OF SURFACE WATER

,	<		ST.	ATION ID		>
SAMPLING PERIOD	SA-SWA-11A1	SA-SWA-12C1 (Control)	SA-SWA-16F1	SA-SWA-1F2	SA-SWA-7E1	AVERAGE
•						
01/08/2001 to 03/08/2001	<150	<160	<160	<160	<150	· · · · · ·
04/06/2001 to	<160	<160	<160	< 160	< 150	
07/03/2001 to	<190	<170	<170	< 170	- 170	2
09/03/2001 10/03/2001						
to 12/10/2001	<150	<160	<160	<160	<160	• -
						:
· .				·		é

Results in Units of pCi/L +/- 2 sigma

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2001 CONCENTRATIONS OF STRONTIUM-89, STRONTIUM-90* AND GAMMA EMITTERS** IN EDIBLE FISH

		STRO < BC	NTIUM)NE>	GAMMA EMITTERS (FLESH)
STATION ID	SAMPLING PERIOD	Sr-89	Sr-90	K-40
SA-ESF-7E1	5/14-16/2001	*	*	3390±220
SA-ESF-11A1	5/14-16/2001	<600	<130	3240 ± 190
SA-ESF-12C1 (C)	5/14-16/2001	*	*	3700 ± 180
AVERAGE		· _	-	3440±470
SA-FSF-7F1	9/12-13/2001	* .	*	3580 + 210
SA-ESF-11A1	9/12-13/2001	*	*	3910 + 100
SA-ESF-12C1 (C)	9/12-13/2001	*	* :	3650±190
AVERAGE		-	-	3710 ± 350
GRAND AVERAGE		-	-	3580±470

Results in Units of pCi/kg (wet) +/- 2 sigma (Strontium in bone is reported in pCi/kg (dry))

* Strontium results for one location for the first semi annual collection are analyzed and reported by Duke Engineering & Services Environmental Laboratory as MDC. This is done as a management audit sample.

** All other gamma emitters searched for were <LLD; typical LLDs are given in Table C-20 (C) Control Station

2001 CONCENTRATIONS OF GAMMA EMITTERS* IN CRABS

Results in Units of pCi/kg (wet) +/- 2 sigma



(C) Control Station

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2001 CONCENTRATIONS OF GAMMA EMITTERS* IN SEDIMENT

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	SAMPLING	~~~~	,	GAM				
STATION ID	DATE	Be-7	К-40	Co-60	Cs-134	Cs-137	RA NAT	> Th-232
SA-ESS-6S2	07/02/2001	<110	1020 ± 140	<2	<2.2	<4.1	98±9.2	82 + 20
SA-ESS-11A1	06/27/2001	870 ± 150	15600 ± 400	<8	19 ± 6.9	72 ± 11	630 ± 17	840 + 49
SA-ESS-15A1	06/27/2001	< 250	9310 ± 300	<10	<4.9	44 ± 11	530 ± 20	660 ± 49
SA-ESS-16A1	06/27/2001	220 ± 100	15100 ± 410	<10	< 5.9	120 ± 16	620 ± 23	990 + 60
SA-ESS-12C1(C)	06/27/2001	< 78	15600 ± 440	<11	<4.8	<7.6	550 ± 19	480 ± 89
SA-ESS-7E1	06/27/2001	< 80	12600 ± 330	<9	27 ± 8.2	<23	760 ± 19	840±60
SA-ESS-16F1	06/27/2001	820 ± 120	15100 ± 350	<20	<6.8	46 ± 9.6	570 ± 16	.860±49
AVERAGE		-	12000±10700			45±81	540 ± 420	780 ± 360
SA-ESS-6S2	10/22/2001	<40	1570 ± 94	<2.8	<1.8	<3.7	96 ± 6.8	92±18
SA-ESS-11A1	10/10/2001	<76	13800 ± 350	<22	<5.7	50 ± 14	660 ± 19	790 ± 41
SA-ESS-15A1	10/10/2001	370 ± 120	11200 ± 410	<11	<6.4	38 ± 12	580 ± 20	750 ± 58
SA-ESS-16A1	10/10/2001	480 ± 160	15900 ± 430	<15	< 5.4	76 ± 16	630 ± 25	880 ± 54
SA-ESS-12C1(C)	10/10/2001	350 ± 63	15600 ± 220	<11	<7.2	58 ± 9.2	820±13	1100 ± 30
SA-ESS-7E1	10/10/2001	<55	12000 ± 290	<13	< 3.9	19 ± 7.1	570 ± 14	620 ± 37
SA-ESS-16F1	10/10/2001	<79	15400 ± 470	<14	<6.4	67±21	660 ± 32	1130 ± 72
AVERAGE		-	12200±10100	-	-	45±52	570 ± 450	880±400
GRAND AVERAGE		-	12100 ± 10000	-	·. -	45 ± 66	560 ± 420	830±380
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Results in Units of pCi/kg (dry) +/- 2 sigma

* All other gamma emitters searched for were <LLD; typical LLDs are given in Table C-20

(C) Control Station

2001 MAPLEWOOD TESTING SERVICES

LLDS FOR GAMMA SPECTROMETRY

SAMPLE TYPE:	<a1< th=""><th>(R></th><th><w01< th=""><th></th><th colspan="3"> MTT У</th></w01<></th></a1<>	(R>	<w01< th=""><th></th><th colspan="3"> MTT У</th></w01<>		MTT У		
	IODINE	PARTICULATES	GAMMA SCAN	IODINE	GAMMA SCAN		
ACTIVITY:	10-3 pCi/m ³	10 ⁻³ pCi/m ³	pCi	pCi/L	pCi/L	pCi/L	
GEOMETRY:	47 ML	13 FILTERS	3.5 LITER	100 ML	3.5 LITER	100 ML	
COUNT TIME:	120 MINS	500 MINS	1000 MIN	1000 MINS	500 MINS	1000 MINS	
DELAY TO COUNT:	2 DAYS	5 DAYS	7 DAYS.	3 DAYS	2 DAYS	2 DAYS	
NUCLIDES							
BE-7	-	7.2	7.8	· <u>-</u>	18	-	
NA-22	-	1.2	8		6.7	_	
K-40	-	7.0	30	-	50	-	
CR-51	-	1.8	9.1	-	14	-	
MN-54	-	0.22	1.2	-	3.6	<u> </u>	
CO-58	-	0.30	1.3	-	2.8	-	
FE-59	- .	0.80	1.6		10.3	-	
CO-60	-	0.39	1.3	-	5.6		
ZN-65	-	0.70	2.1	2	12	<u> </u>	
ZRNB-9.5		0.57	2.0		4.5	_	
MO-99		27	60	. –	27	-	
RU-103	-	0.30	1.2	· <u>-</u>	1.9	-	
RU-106	-	3.0	9.5	-	18		
AG-110M	-	0.45	2.3	-	3.3	-	
SB-125	-	0.66	2.7	-	5.1	- .'	
TE-129M	- ,	8.0	47	-	81		
I-131	9.5	0.52	2.5	0.3	2.0	0.4	
TE-132	-	0.6	4.3	-	1.7	-	
BA-133		0.29	1.6	-	1.8		
CS-134	-	0.34	1.3	-	1.6	-	
CS-136	-	0.54	1.9	-	3.0	_ ·	
CS-137	-	0.44	2.4	-	3.7	-	
BALA-140	-	1.3	3.8	-	7.5	-	
CE-141	-	0.25	1.3	-	2.5	-	
CE-144		0.65	7.5	-	9.8	-	
RA-NAT	-	0.57	2.9	· _	5.4	_	
TH-232	-	5.0	11	-	37	-	

TABLE C-20 (Cont'd)

2001 MAPLEWOOD TESTING SERVICES

LLDS FOR GAMMA SPECTROMETRY

.

SAMPLE TYPE: ACTIVITY: GEOMETRY: COUNT TIME: DELAY TO COUNT:	FOOD PRODUCTS pCi/kg WET 500 ml 500 MINS 3 DAYS	VEGETATION pCi/kg WET 3.5 LITER 500 MINS 7 DAYS	GAME pCi/kg WET 500 ml 500 MINS 5 DAYS	FISH & SHELLFISH pCi/kg WET 500 ml 500 MINS 5 DAYS	SEDIMENT & SOIL pCi/kg DRY 500 ml 500 MINS 30 DAYS
NUCLIDES	••••••••••••••••••••••••••••••••••••••	· · · · · · · · · · · · · · · · · · ·			<u> </u>
BE-7	50	35	32	82	80
NA-22	13	13	14.4	12	14
K-40	70	70	70	70	70
CR-51	32	28	28	32	127
MN-54	10	6.0	5.8	5.0	30
CO-58	6.6	5.0	5.0	6.0	19
FE-59	- 27	16	. 14.1	10	49
CO-60	17.5	7.8	5.5	12	22
ZN-65	17	13	12.0	10	22
ZRNB-95	11	11.0	8.0	8.1	34
MO-99	104	49	20	272	166000
RU-103	5.2	5.0	3.2	5.5	14
RU-106	114	36	35	36	81
AG-110M	14	7.0	7.5	8.9	39
SB-125	11	9.9	11	6.4	29
TE-129M	225	286	157	207	470
I-131	5.8	4.0	6.2	6.4	108
TE-132	7.0	3.9	9.0	5.1	5600
BA-133	5.4	4.0	3.7	6.4	12
CS-134	4.9	4.2	4.2	6.4	27
CS-136	8.6	4.2	6.1	6.1	70
CS-137	9.1	7.9	6.1	7.2	33
BALA-140	26	12.6	∗ 20	13.4	143
CE-141	6.1	5.0	5.0	4.4	21
CE-144	20	16	19.6	14.0	50
RA-NAT	15	14	8.0	8.2	45
TH-232	34	35	40.0	41	50

APPENDIX D

SUMMARY OF RESULTS FROM ANALYTICS AND ENVIRONMENTAL RESOURCE ASSOCIATES INTERLABORATORY COMPARISON PROGRAMS

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APPENDIX D

SUMMARY OF RESULTS FOR ANALYTICS AND ENVIRONMENTAL RESOURCE ASSOCIATES INTERLABORATORY COMPARISON PROGRAM

Appendix D presents a summary of the analytical results for the 2001 Analytics and Environmental Resource Associates (ERA) Interlaboratory Comparison Program.

TABLE

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D-3	Gamma Emitters in Air and Soil	84
D-4	Tritium Analysis in Water and Iodine in Air	85

RESULTS FOR ANALYTICS AND ERA INTERLABORATORY COMPARISON PROGRAM

DATE MM-YY	PSEG SAMPLE CODE	MEDIUM	ANALYSIS	* PSEG Mean ± s.d.	ANALYTICS ERA Known	ANALYT Accer Crit Lower Limit	ICS/ERA otance ceria & Upper Limit
06-2001	ANL-WAT-AB529	Water	Alpha Beta	33±2 321±4	35 248	25 176	45 320
07-2001	ERA-WAT-AB528	Water	Alpha Beta	29±1.2 60±2.9	18 53	9.3 35.7	26.7 70.3
12-2001	ANL-WAT-AB539	Water	Alpha Beta	51 <u>±</u> 3 269 <u>±</u> 9	72 214	48 148	96 280

Gross Alpha and Gross Beta Emitters In Water (pCi/L)

* s.d. - one standard deviation of three individual analytical results

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RESULTS FOR ANALYTICS AND ERA INTERLABORATORY COMPARISON PROGRAM

Gamma Emitters In Water and Milk (pCi/L)

				و دوم معرف الم	.		ANALYTI	CS/ERA
							Accep	tance
		2020			*	ANALYTICS	Crit	teria
,	DATE	PSEG			PSEG	ERA	Lower	& Upper
		SAMPLE CODE	MEDIUM	ANALYSIS	Mean ± s.d.	Known	Limit	Limit
	00.000			e y Na nana a sa sa		- M.Q		
	03-2001	ANL-WAT-G524	Water	Cr-51	270±19	242	170	314
				Mn-54	112±2	101	71	131
			\$ <u>.</u>	Fe-59	100 <u>+</u> 2	84	60	108
				Co-60	162 <u>+</u> 6	147	105	189
				Zn-65	211 <u>+</u> 6	186	132	240
	•			I-131	98±2	90	60	120
				Cs-137	112 <u>+</u> 2	102	72	132
				Ce-141	105±2	94	64	124
	02 2001	ANT WIT OF A		-				
	03-2001	ANL-MLK-G526	Milk	Cr-51	436±19	418	292	544
				Mn-54	: 186 <u>+</u> 6	175	121	229
			÷*	Fe-59	162 <u>+</u> 7	146	104	188
				Co-60	256 <u>+</u> 7	254	176	332
		v		Zn-65	346 <u>+</u> 10	322	226	418
				I-131	79±5	77	53	101
				Cs-134	195±6	223	157	289
				Cs-137	181±1	176	63	230
				Ce-141	165±3	162	114	210
	06-2001		Notion	D- 100				
		ERA-WAI-G526	water	Ba-133	36±1.2	36	27.3	44.7
	*			CO-60	48±1.5	47	38.3	55.7
				CS-134	16±0.6	16	7.3	24.7
				CS-137	203±1	197	180	214
				Zn-65	· 37±1.5	36	27.3	44.7
	1.				• .			
	12-2001	ANL-WAT-G541	Water	Cr-51	284±5	293	203	383
			۰.	Mn-54	89 <u>+</u> 3	88	64	112
		• •		Fe-59	71 <u>+</u> 3	60	42	78
				Co-60	206 <u>+</u> 6	209	149	269
				Zn-65	127 ± 14	122	86	158
		•		I-131	97±5	93	63	123
			•	Cs-134	101±7	117	81	153
				Cs-137	196 <u>+</u> 6	188	134	242
				Ce-141	227 <u>+</u> 8	224	158	290

* s.d. - one standard deviation of three individual analytical results

RESULTS OF ANALYTICS AND ERA INTERLABORATORY COMPARISON PROGRAM

		······································	``··	·····			ANALYT	TCS/ERA
.7							Accer	tance
					*	ANALYTICS	Crit	ceria
	DATE	PSEG		· .	PSEG	ERA	Lower	& Upper
	MM-YY	SAMPLE CODE	MEDIUM	ANALYSI	S Mean \pm s.d.	Known	Limit	Limit
•								
	03-2001	ANL-SOL-G525	Soil	Cr-51	470±24	479	335	623
				Mn-54	208±9	201	141	261
				Fe-59	180±4	167	119	215
				Co-60	284 <u>+</u> 4	291	201	381
				Zn-65	353±11	369	261	477
				Cs-137	316±9	328	232	424
				Ce-141	172 <u>+</u> 7	186	132	240
						<u>,</u> 2		
	06-2001	ANL-APT-G531	APT	Cr-51	237+10	210	144	276
				Mn-54	156+7	141	99	183
				Co-60	- 132±4	127	91	163
:				Fe-59	99±6	82	58	106
				Zn-65	193±10	170	116	224
				Cs-134	108±3	125	89	161
•			<u>.</u>	Cs-137	128±4	114	78	150
•	·			Co-58	92±4	90	60	120
				Ce-141	175±12	153	105	201
					e a car			
	09-2001	ANL-SOL-G536	Soil	Cr-51	439 <u>+</u> 13	404	284	524
				Mn-54	237 <u>+</u> 4	226	160	292
				Co-60	292 <u>+</u> 2	294	198	390
				Fe-59	- 113±5	95	65	125
				Zn-65	271+16	281	197	365
				Cs-134	172+5	177	123	231
			$z \in \mathcal{I}$	Cs-137	437+59	480	336	624
۰.			· .	Ce-141	135414	134	92	176

Gamma Emitters In Soil (pCi/Kg-dry) and Air Particulate Samples (pCi/m³)

* s.d. - one standard deviation of three individual analytical results

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RESULTS OF ANALYTICS AND ERA INTERLABORATORY COMPARISON PROGRAM

Tritium Analysis In Water (pCi/L) And Iodine In Air Samples (pCi/ m^3)

			1.2.25 AM (1992)				
		۳۳. مدلا	to and she with			ANALYTI	CS/ERA
						Acce	ptance
				*	ANALYTICS	Crit	eria
DATE	PSEG			PSEG	ERA	Lower &	Upper
MM-YY	SAMPLE CODE	MEDTUM	ANALYSTS	Mean + g d	Knowm	Limit	Limit
	·····			neun <u>1 b.u.</u>	10100011		
03-2001	ANL-WAT-H523	Water	H-3	3145±177	3114	2178	4050
03-2001	ANL-AIO-1527	AIO	I-131	90+0	90	60	120
					20	00	120
06-2001	ANL-AIO-1530	AIO	I-131	77 <u>±</u> 1	80	56	104
06-2001	ANL-WAT-H532	Water	H-3	7890 <u>+</u> 85	7494	5244	9744
09-2001	ANL-AIO-1535	AIO	I-131	64+4	68	50	86
				• • <u>-</u> -	00	50	00
08-2001	ERA-WAT-H534	Water	H-3	2719 <u>+</u> 36	2730	2113	3347
10 2001		Materia	T 101				
10-2001	ERA-WAT-1538	water	1-131	6.6 ± 0.4	7.7	-6.6	21.9
12-2001	ANL-AIO-1540	AIO	I-131	96±5	92	62	122
12-2001	ANL-WAT-H542	Water	Н-З	14950+417	14060	9842	18279
						2012	20210

* s.d. - one standard deviation of three individual analytical results

APPENDIX E

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SYNOPSIS OF LAND USE CENSUS

APPENDIX E

SYNOPSIS OF 2001 LAND USE CENSUS

A land use census was conducted to identify, within a distance of 8 km (5 miles), the location of the nearest milk animal, the nearest residence, and the nearest garden of greater than $50m^2$ ($500ft^2$) producing broad leaf vegetation, in each of the 16 meteorological sectors.

Tabulated below are the results of these surveys:

	Milk Animal	Nearest Residence	Vegetable Garden
Meteorological	July, 2001	July, 2001	July, 2001
Sector	km (miles)	km (miles)	km (miles)
N	None	None	None
NNE	None	None	None
NE	None	6.4 (4.0)	None
ENE	None	5.8 (3.6)	None
E	None	5.4 (3.4)	None
ESE	None	None	None
SE	None	None	None
SSE	None	None	None
S	None	None	None
SSW	None	5.5 (3.4)	None
SW	None	6.9 (4.3)	None
WSW	None	7.1 (4.4)	None
W	7.8 (4.9)	6.5 (4.0)	None
WNW	None	5.5 (3.4)	None
NW	None	5.9 (3.7)	None
NNW	None	6.8 (4.2)	None